

## International Capital Flows and Economic Growth

**A**FTER A CELEBRATED BOOM IN CAPITAL flows to developing countries between 1990 and 1997, a series of international financial crises increased doubts about the benefits of such flows. Underlining this new skepticism were studies that implied only a weak relationship between capital flow liberalization and long-run growth. The concerns tempered the enthusiasm for capital inflows and have led to a reassessment of the policy approaches to attracting and managing them.

This chapter presents a broad assessment of the relationship between capital inflows and the performance of developing economies. Specifically, it examines the association between international capital flows and domestic investment and productivity growth, and the costs that arise from capital flow volatility. Highlighted throughout is the diversity of developing countries' experiences, reflecting the heterogeneity of capital flows and differences in countries' absorptive capacity. The main conclusions are the following:

- Over the past three decades, private capital flows into developing countries have been associated with about an equal increase in domestic investment, although this relationship has weakened over time as the extent of financial integration across borders has increased. The relationship is strongest where, as in Africa, countries are least integrated with international financial markets and where, therefore, flows in the form of foreign direct investment (FDI) add to domestic saving and serve to identify and finance new investment opportunities. Elsewhere, as mergers and acquisitions (M&A) have increased relative to greenfield

investments and as portfolio flows have risen, domestic investment and foreign inflows have become less tightly linked. However, the association remains relatively high where the conditions are favorable for domestic investment (high education levels, political stability, and well-developed financial systems).

- The relationship between productivity growth and private capital flows appears to have strengthened over time. The productivity benefits of capital flows—through the transfer of technology and management techniques and the stimulation of financial sector development—are significant in countries where a developed physical infrastructure, a strong business environment, and open trade regimes have facilitated the absorption of those flows, but not otherwise.
- Capital flow volatility significantly dampens economic growth. Indeed, the crisis-ridden later years of the 1990s were associated with enormous shocks to output and consumption in some countries. Even so, many countries appear increasingly able to manage volatility—and in the aftermath of the crises, growth rates have rebounded quickly in many affected countries. Adjustment was promoted by greater exchange rate flexibility, more diversified production structures, and better risk-management techniques.

Taken altogether, the evidence suggests that capital flows reinforce a positive growth dynamic. They tend to go more to countries with strong investment climates, and their long-run benefits are most pronounced in such environments. As many of the countries with strong investment climates are middle- rather than low-income economies,

international capital flows in recent decades may have contributed to a widening of income differentials between the developing countries, just as they did a century ago (Taylor 1996; O'Rourke and Williamson 1999).

For policymakers, the analysis in this chapter shows that both the celebration of capital flows in the early 1990s and the subsequent skepticism were both excessive. The reality is more complicated and therefore requires a more nuanced policy response. At issue is not whether international capital flows have long-term value or whether international financial integration offers real benefits. In the inevitable process of integration with international markets, capital flows can deliver enormous benefits. However, that transition also implies costs, some of which are important and others less so. The challenge for policymakers is to prepare their economies to best absorb the potential benefits of capital inflows while reducing the risks of sudden capital outflows. This implies a multiplicity of measures that not only foster absorption of international capital flows but also generate long-term domestic benefits.

### Capital inflows and domestic investment

Summers (2000) maintains that “enormous social benefits” are made possible by the efficiency gains from the reallocation of capital from industrial to developing countries. The reallocation can improve living standards by mobilizing global savings to finance investments in countries where the marginal productivity of investment is relatively high.

Private capital flows have been associated with a rise in domestic investment in many developing countries, although whether such flows have an independent role in raising investment, or simply finance investment that would have occurred in any event, is frequently unclear. The relationship between capital flows and investment is complex, and depends on the extent of integration of domestic economies into global capital markets, on the nature of the capital flows, and on the domestic investment climate:

- Long-term capital flows are strongly and positively related to domestic investment; short-term flows have little or no relationship with

investment. Further, whereas certain types of long-term flows, such as FDI and bank lending, are clearly associated with increases in investment, the relationship between portfolio flows and investment, although typically positive, has been less robust. The evidence also suggests that the relationship between private capital flows and investment is strong in those regions, such as Africa, where foreign investment is able to supplement domestic saving and to identify and realize investment opportunities.

- The relationship between private capital flows and domestic investment weakened in the 1990s, a period in which countries liberalized their capital accounts. The evidence is consistent with two possibilities. Either, as countries become more integrated into international markets, domestic saving and investment decisions are less correlated, and hence the relationship between capital flows and investment weakens. The evidence is also consistent with the increasing importance of portfolio flows as a part of total capital flows, and of M&A as a part of FDI, both of which have less of a relationship with domestic investment than other flows.
- A variety of domestic factors, such as the level of human capital, political stability, and the depth of domestic financial markets, define a country's ability to translate foreign capital into domestic investment.

### *Capital inflows and investment: differences across types of flows and regions*

As a matter of theory, the impact of foreign capital inflows on domestic investment is ambiguous (Feldstein 1994). Inbound capital may raise domestic investment, but it may also increase imports and hence can dampen domestic production and investment. Moreover, even if access to foreign capital allows one firm to increase investment, that firm's expansion may induce another to reduce investment. From a more general perspective, understanding the impact of foreign capital on domestic investment requires considering the possibility that capital outflows may be induced. In a world of perfect capital mobility, an increase in inflows may have no impact on the level of domestic investment, since funds would move only to finance investment demand without actually increasing that demand.

However, Feldstein (1994) notes that, despite the large volume of global financial transactions, a country's saving tends to be largely invested within its borders. The close association between foreign inflows and domestic investment suggests a lack of deep integration in the financing of investments. In other words, when almost all domestic saving is invested domestically, international capital inflows will not be significantly offset by international outflows, and aggregate domestic investment will reflect close to the full amount of the inflow. But as global financial integration increases, the link between foreign flows and domestic investment will weaken.

However, along another dimension, the relationship between foreign capital and investment may also depend on several structural factors, such as the depth of financial markets or the level of human capital. This suggests that even a country with a high level of integration may better employ a dollar of foreign capital than a less closely integrated country, if structural deficiencies are more pronounced in the second country than in the first.

*The aggregate relationship between foreign capital and domestic investment.* A number of studies have analyzed the impact of foreign capital on domestic investment. Feldstein (1994) found that a dollar of capital inflows or outflows tends to be associated, respectively, with a one-dollar rise or fall in domestic investment. Borensztein, De Gregorio, and Lee (1998) find, in fact, that a dollar of FDI may be linked to an increase in domestic investment of more than a dollar, although their findings are sensitive to the choice of variables used to explain investment. In a recent study, Bosworth and Collins (1999) carefully analyze the relationship between various types of private capital flows and both investment and saving, focusing on the variation over time within countries rather than the variation across countries. They find that capital flows have a strong impact on domestic investment. This is especially so for FDI and bank lending; in contrast, portfolio flows have a positive but statistically insignificant impact on domestic investment.

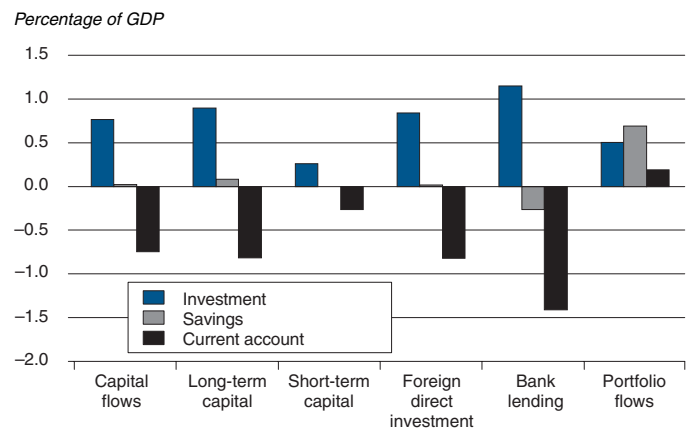
*Investment and different types of capital inflows.* For the purpose of this report, the Bosworth and Collins study was replicated using a data set with broader country coverage and a longer time period (1972–98 instead of 1979–95). The technical details of the estimation procedure and the data

sources are described in the annex to this chapter. The essential conclusions remain unchanged: controlling for other determinants, private capital flows (long-term plus short-term) are seen to have close to a one-to-one relationship with domestic investment (figure 3.1). Since some part of the inflow is offset by outflows or the accumulation of reserves, however, the implication is not necessarily that all private capital entering an economy is invested in the domestic economy, but rather that capital inflows are associated with a broader stimulation of demand.

*Regional variations.* The relationship between capital flows and investment has also varied across regions. In particular, private capital flows are seen to have been strongly associated with higher domestic investment in Sub-Saharan Africa. Indeed, the relationship in this region has been even stronger than in East Asia and Pacific or in Latin America and the Caribbean (figure 3.2).<sup>1</sup>

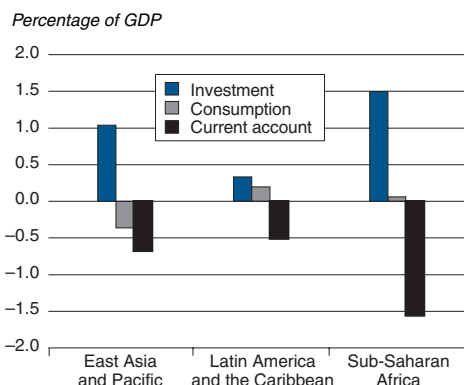
This regional variation reflects differences in both the composition of capital flows and the extent to which countries are integrated with the world economy. Latin America and East Asia have received a larger share of portfolio flows in their total capital flows than Sub-Saharan Africa (table 3.1), and as noted, the association between port-

**Figure 3.1 Computed incremental relationships between private capital flows and investment, savings, and the current account, 1972–98**



Note: The bars in this chart are computed coefficients representing the change associated with an increase in capital inflow equal to 1 percent of GDP.  
Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see annex 3.1 for details).

**Figure 3.2 Computed incremental relationships between private capital flows and investment, consumption, and the current account, by region, 1972–98**



Note: The bars in this chart are computed coefficients representing the change associated with an increase in capital inflow equal to 1 percent of GDP.  
Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see annex 3.1 for details).

folio flows and domestic investment is relatively weak. East Asia and Latin America are more integrated into the global economy than other regions and thus enjoy expanded opportunities for holding foreign assets while also relying more on foreign exchange reserves and foreign assets to cope with the volatility of capital flows. Finally, in contrast to East Asia, capital flows into Latin America are associated with increased consumption, reflecting Latin America's generally low propensity to save.

#### *Capital flows and investment in the 1990s*

The relationship between capital flows and investment weakened in the 1990s (figure 3.3). This trend may, in part, result from the growing importance of offsetting transactions on the capital account, reflecting increased integration of some countries and capital flight from some others (see chapter 2). Countries have typically also begun to divert a larger share of their capital inflows to reserve accumulation in order to safeguard against sudden capital outflows. The consequence of these changes has been that a smaller fraction of capital inflows is being channeled into domestic investment. Moreover, during the 1990s cross-border M&A activity accounted for an increasing fraction of FDI (United

Nations Conference on Trade and Development 2000 and chapter 2). Although M&A may have a positive impact on productivity, FDI of the green-field variety implies an immediate increase in productive capacity, whereas M&A do not. As a consequence, the association between FDI and domestic investment became noticeably weaker in the 1990s.

#### *Absorptive capacity: policy and institutions*

The positive relationship between private capital flows and investment, which holds to varying degrees across various regions and over time, also depends crucially on a country's absorptive capacity. The capacity to absorb capital inflows is a multifaceted phenomenon. It encompasses not just the macroeconomic policy framework but also political stability, the health of the financial system, the educational attainment of the work force, the quality of physical infrastructure, the efficiency of government services, and the degree of corruption. Different types of capital flows are affected differently by these various aspects of a country's absorptive capacity.

For instance, in a cross-country analysis Borensztein, De Gregorio, and Lee (1998) find that FDI is positively associated with investment, but only in a setting with sufficiently high levels of human capital. An extension of their analysis was done for this report across a different sample of countries and over a longer period. It was again found that FDI is positively associated with investment, and that this effect increases with the stock of human capital.<sup>2</sup> The left-hand panel of figure 3.4 plots average investment ratios against average school enrollment ratios and average FDI flows for the extended sample. Domestic investment is higher when FDI is greater and when domestic educational levels are higher; the synergy between FDI and schooling is seen to operate in this representation when human capital reaches medium to high levels.

The absorptive capacity of a country also depends on the political climate. Short-term capital flows are more highly correlated with domestic investment under stable political regimes (middle panel of figure 3.4). Thus short-term flows, which can have a destabilizing impact (as discussed in *Global Development Finance 2000*), tend to perform their role of trade and bridging finance better in more stable situations. Portfolio flows and bank lending are likewise more strongly associated with

**Table 3.1 Composition of net resource flows to developing countries by region, 1972–98***(percent of total)*

	All developing countries	East Asia and Pacific	Latin America and the Caribbean	Europe and Central Asia	South Asia	Sub-Saharan Africa	Middle East and North Africa
<i>Sources of net flows</i>							
Net long-term resource flows	89	87	92	94	98	90	89
Private flows	55	60	70	55	29	27	42
FDI	20	31	29	15	9	15	15
Bank loans	20	15	28	22	10	4	6
Portfolio flows	8	10	8	10	9	2	9
Other flows	7	4	5	8	1	6	12
Official flows	34	28	22	32	69	63	47
Net short-term flows	11	13	8	6	2	10	11
<i>Uses of net flows</i>							
Net external finance	54	45	66	67	74	68	25
Current account deficit	34	22	47	66	65	67	-27
Change in reserves	19	23	19	1	9	1	52
Capital outflows and E&O <sup>a</sup>	46	55	34	33	26	32	75

Note: The calculations are based on a sample of up to 118 countries (depending on data availability) that were used in the regression analyses.

a. Errors and omissions.

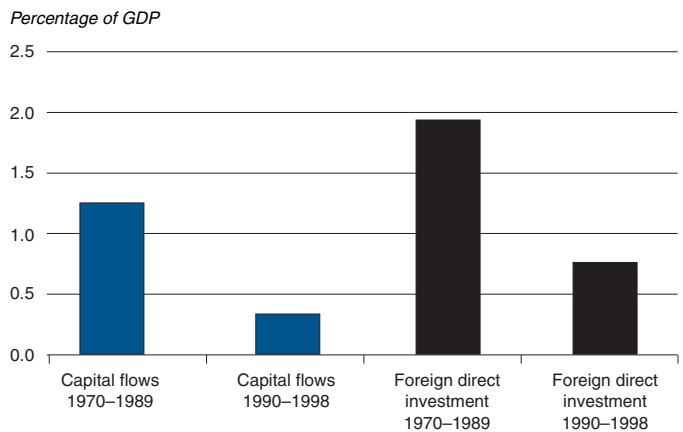
Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years; and IMF, *International Financial Statistics* (see annex 3.1 for details).

domestic investment in countries where financial markets are deeper (right-hand panel of figure 3.4).

*An assessment.* In assessing the development impact, three considerations need to be borne in mind. First, low-income countries, which are typically weakly integrated into financial markets and rely primarily on FDI as the source of capital inflows, appear to achieve more domestic investment for every dollar received through this channel, as indicated, for example, by the finding for Sub-Saharan Africa. However, as chapter 2 showed, the poorest countries receive very limited FDI, and much of what they do receive as a group is concentrated in a few countries with mineral and oil resources. Put another way, although the additional dollar of inflows may translate into an additional dollar of new investment in these countries, there are few additional dollars arriving in the first place.

A select group of countries (the “top 10”) captured the lion’s share of private capital flows during the 1990s; these inflows rose in relation to their gross domestic product (GDP), as did their economic growth rates. In contrast, the share of capital flows to low-income countries fell from already modest levels, along with their growth rates (figure 3.5). The discussion in this section—and in the next—recognizes the importance of the domestic investment climate in determining both the extent of inflows and their productivity. However, to the extent that poor investment climates are also as-

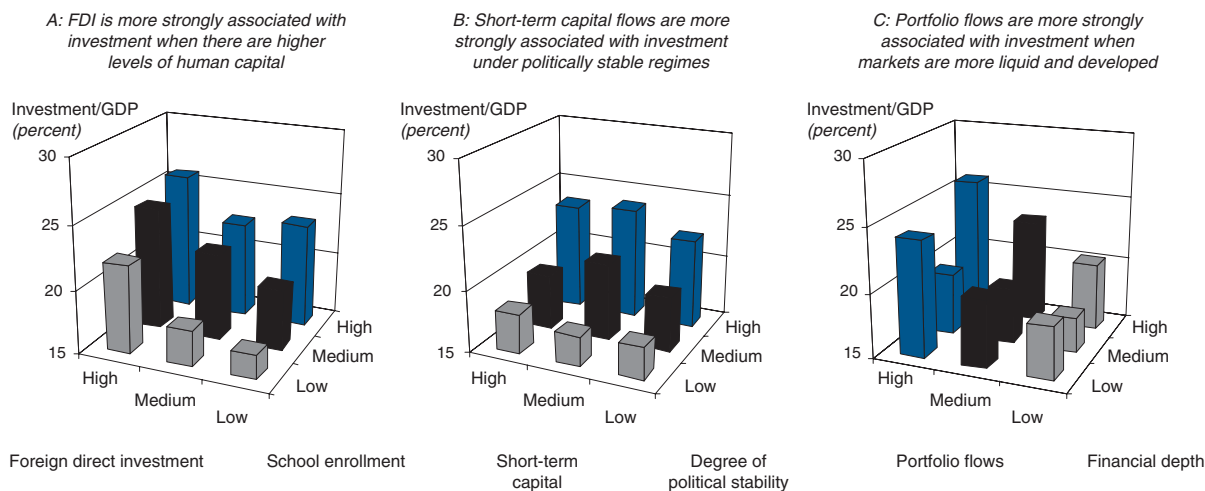
sociated with low incomes, capital flows may well have contributed to a divergence in economic performance across developing countries in recent decades. This outcome has at least one precedent: O’Rourke and Williamson (1999) note that, in the late 19th and early 20th centuries, an era of mas-

**Figure 3.3 Computed incremental relationships between private capital flows and investment, and between FDI and investment, over time**

Note: The bars in this chart are computed coefficients representing the change associated with an increase in capital inflow equal to 1 percent of GDP.

Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see annex 3.1 for details).

**Figure 3.4 The relationships between various types of capital flows and investment as a function of school enrollment, political stability, and financial depth**



Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years; World Bank, *World Development Indicators*, various years; and PRS *International Country Risk Guide* (see annex 3.1)

sive international capital flows, capital “chased” high-growth opportunities in the United States and other resource-rich locations. Asia, Africa, and even some European nations such as Ireland, Portugal, and Spain received only modest inflows.

Second, as financial integration has progressed over time, the relationship between capital flows and investment has also declined. In particular, the association between FDI and domestic investment is seen to have been reduced in those countries where M&A have been on the rise, as they have been in East Asia and Latin America. However, M&A may generate significant long-term productivity benefits, as discussed below.

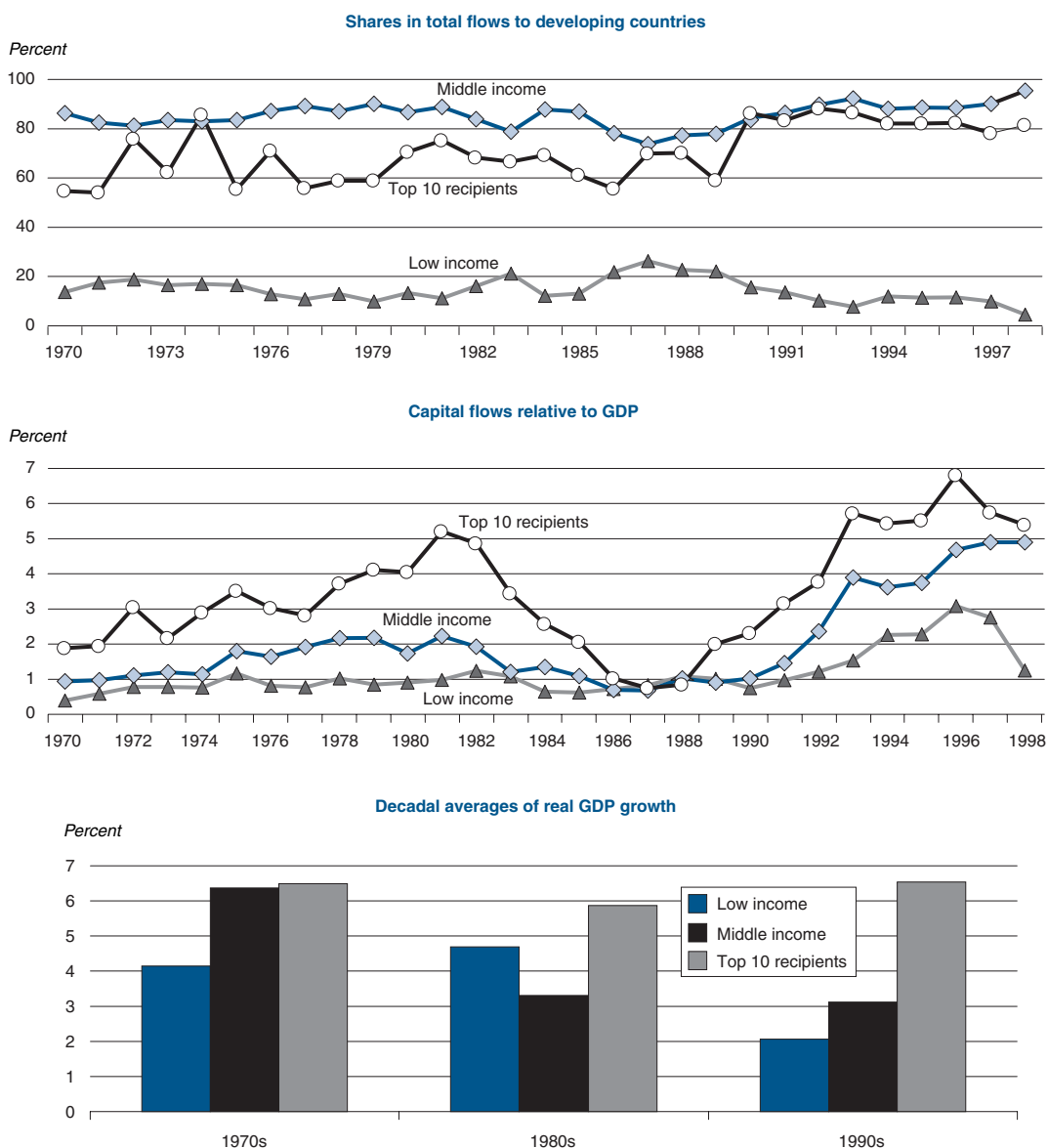
Finally, a crucial point is that an increase in domestic investment—whether financed by capital inflows or not—does not necessarily translate into faster growth. In the past, considerable emphasis was placed on capital accumulation as a means of boosting growth (Lewis 1954; World Bank 1993). But although investment is seen to be robustly associated with faster growth (Levine and Renelt 1992), a large body of evidence based on growth accounting techniques indicates that, as a primary cause, investment can only account for a small part of the cross-country variation in growth performance. Klenow and Rodriguez-Clare (1997) and

Easterly and Levine (2000) find that when changes in capital stock induced by productivity changes are attributed causally to total factor productivity, their productivity accounts for about 90 percent of the cross-country variation in growth rates. Blomstrom, Lipsey, and Zejan (1996) and Bils and Klenow (1998) also emphasize the role of total factor productivity rather than capital accumulation as the ultimate driving force behind growth. They suggest that if private capital flows are to play a significant role in promoting growth, it must be through its impact on productivity.

### Private capital flows and productivity

Foreign capital flows may be associated with increased efficiency of production, and thus with higher growth rates. Increases in productivity through the transmission of ideas across national borders offer an apparently costless way for developing countries to catch up, generating, according to one scholar, an “advantage of backwardness” (Gerschenkron 1952). In practice, however, this mechanism has operated only weakly. Abramowitz (1986), for example, highlighted the importance of “social capability” for the ability to exploit the po-

**Figure 3.5 Private capital flows and growth: low-income, middle-income, and top 10 emerging markets, 1970–98**



Notes: "Private capital flows" refers to private long-term (and short-term) resource flows. The group of top 10 emerging markets consists of Argentina, Brazil, Chile, China, India, Indonesia, the Republic of Korea, Malaysia, Mexico, and Thailand. This group of countries is based on *World Development Indicators 1999* (World Bank 1999).

Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see annex 3.1 for details).

tential created by the international gap in ideas. Thus, paradoxically, although the potential for productivity growth has grown in the past decade, the standards of domestic capability required for absorption have grown as well.

An improvement in productivity may accrue principally to the enterprise receiving foreign capital, or it may spill over more broadly to other domestic firms and even to the society as a whole. For example, FDI can facilitate the transfer of

technologies and skills to the firm receiving it, as its workers become trained in the best techniques available from abroad. But those workers may then move to other domestic firms, transferring their skills to their new employers. In addition, portfolio flows and bank lending can increase financial sector development, and this can increase the efficiency of capital allocation.

The evidence strongly suggests that certain domestic conditions are critical if a country is to enjoy the spreading of the productivity benefits from capital flows. Countries where the work force is well educated and trained, where infrastructure services are efficient, and where the business climate is positive are more likely to experience an increase in overall productivity with capital inflows. Theoretical considerations, cross-country regressions, and country case studies all support these conclusions. Box 3.1 presents some evidence based on cross-country regressions, and the rest of this section focuses on more detailed country evidence, first on FDI and then on capital market flows.

***Foreign direct investment and productivity: evidence from selected countries***

FDI has considerable potential to transfer ideas from industrial to developing countries (Romer 1993) and hence to increase productivity in the latter. However, FDI does not always play this role effectively. The evidence suggests that those countries with the greatest absorptive capacity are likely to benefit the most from the presence of foreign capital (Caves 1999). In such settings, not only greenfield investment but also M&A by foreigners, which are not associated with new investments, can increase productivity, for both the firm in question and society as a whole.<sup>3</sup> By contrast, where absorptive capacity is low, the benefits of FDI are muted or nonexistent. Although such an economy may experience some benefit if foreign firms are more productive than domestic firms, spillover effects to other firms do not occur. Indeed, in the short term, the productivity of domestically owned firms may actually decline.

The rest of this section focuses on the experience in five economies: Malaysia, Morocco, Taiwan (China), Uruguay, and the República Bolivariana de Venezuela. Table 3.2 shows, for these economies, a set of widely used indicators that proxy for absorptive capacity (see World Bank, *Global Economic Prospects 1997*). These include

macroeconomic management, openness to trade, the amount and quality of infrastructure, and the amount of human capital. Although extensive commentary on these indicators is not necessary, it is worth noting that a stronger orientation toward engaging in international trade has been found to facilitate the absorption of FDI (see Balasubramanyam, Salisu, and Sapsford 1991; World Bank, *Global Economic Prospects 1997*). In terms of these indicators, three of the countries (Morocco, Uruguay, and the República Bolivariana de Venezuela) have relatively low absorptive capacity, and the other two (Malaysia and Taiwan, China) have high absorptive capacity.

*Low absorptive capacity and productivity.* Haddad and Harrison (1993) find that foreign-owned firms in Morocco (from 1985 to 1989) achieved a higher level of productivity than their domestic counterparts. Domestic firms did not exhibit faster-than-average productivity growth even in sectors with a larger foreign presence. This could reflect the fact that some foreign firms invest in highly protected sectors, so that the incentives for domestic competitors to improve productivity are weak.

In an influential study of Venezuelan manufacturing firms during 1976–89, Aitken and Harrison (1999) also find that foreign equity participation is associated with superior plant performance. However, this positive effect appears robust only for plants with fewer than 50 employees. Importantly, productivity in domestically owned plants was found to decline as domestic firms contract in the face of foreign competition. These findings are echoed in a study of the Czech Republic (Djankov and Hoekman 2000), which finds that productivity growth is higher in firms with foreign partnership. However, the study also finds a significant *negative* spillover effect of foreign investment on domestically owned firms. Using survey data on training and investment, they argue that many domestically owned firms have relatively weak capacity to absorb the know-how spillovers from foreign firms. Hence they find their market share declining after the entry of foreign firms, and the reduced scale of production results in lower profitability.<sup>4</sup>

Finally, using plant-level survey data, Kokko, Tansini, and Zejan (1996) examined the intra-industry spillovers from FDI in the Uruguayan manufacturing sector in 1988. Their analysis shows no signs of spillovers in statistical tests covering the entire sample of 159 locally owned manufacturing

## Box 3.1 Capital flows and growth: what do cross-country regressions tell us?

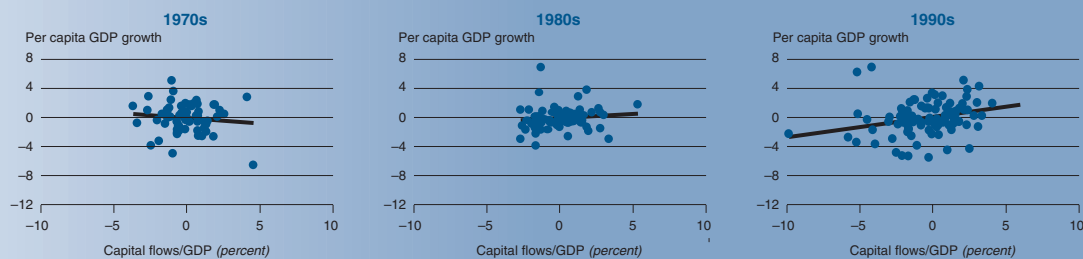
There has been considerable debate in the academic literature as to whether capital flows promote economic growth. The average growth rate among developing countries remained stable at a relatively low level during the capital flows boom of the 1990s (Easterly 2000), although the more advanced middle-income countries that received the bulk of private capital flows did achieve faster growth. Rodrik (1998), echoing an earlier study by Grilli and Milesi-Ferretti (1995), finds in a cross-country analysis that capital account liberalization is not associated with growth. Carkovic and Levine (2000) reach a similar conclusion on the effect of foreign direct investment (FDI) on growth.

Two principal reasons can be offered for the failure to find a strong association, on average, between capital flows and growth. First, high volatility of capital flows may negate their beneficial impact. Cross-country regressions that control for the impact of volatility find a positive relationship between capital flows and growth of real gross domestic product (GDP) per capita: an increase in private capital flows by 1 percentage point of GDP is associated with an increase in the per capita growth rate of 0.25 to 0.5 percentage point. The reliability of this finding naturally depends on whether other factors that are associated with growth have been controlled for. The conclusion to be drawn is not that private capital flows have an independent causal effect on growth. Rather, private capital flows are typically associated with other features of the economy that promote growth—and, in turn, such growth pulls in more flows. The data suggest that such an association has become stronger over the decades (see figure). The (partial) correlation between capital flows and growth was  $-0.09$  in the 1970s,  $0.13$  in the 1980s, and  $0.28$  (and statistically significant) in the 1990s. In other words, in the 1990s a 1-percentage-point increase in the ratio of capital flows to

GDP was associated with an increase in growth rates of just under 0.3 percentage point (see also Wacziarg 1998 for a similar estimate). Since the relationship between investment and growth appears to have weakened over time (see the previous section), this may indicate that capital flows were more strongly associated with productivity gains during the 1990s than in the two previous decades.

Second, capital flows may not be associated with more rapid growth where absorptive capacity is poor. Lucas (1990) notes that not all developing countries exhibit a high marginal productivity of capital. A lack of supporting infrastructure, skills, and policies will lower the productive potential of the recipient economy and hence limit the impact of capital inflows. In a recent paper, Canning and Bennathan (2000) find that the marginal productivity of infrastructural capital is low in low-income countries and initially rises with income levels before experiencing the predicted decline. (Because the most advanced economies have abundant capital, the marginal productivity of new capital is relatively low.) This perspective helps us interpret the studies that do find a positive impact of capital inflows. Blomstrom, Lipsey, and Zejan (1994) find that higher-income countries do gain more from capital inflows. Borensztein, De Gregorio, and Lee (1998) find that FDI is negatively associated with growth when educational levels are low. However, if the average adult in a country has more than one year of secondary education, FDI can have a particularly important growth-enhancing effect. Edwards (2000) finds that measures of a country's capital account liberalization are negligibly (or even negatively) related to growth in low-income countries but that the relationship turns positive as income levels increase. Eichengreen (2000) reviews several studies (some of which include industrial countries) that find that capital inflows have a greater impact on growth, the higher the level of income.

The relationship between private capital flows and growth



Note: Partial scatters after controlling for initial real GDP, initial schooling, investment share, a measure of policy, and volatility.

Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see annex 3.1 for details).

**Table 3.2 Indicators of absorptive capacity in selected developing countries, 1980–98**

	Morocco	Uruguay	República Bolivariana de Venezuela	Malaysia	Taiwan (China)
Macroeconomic management					
Inflation (percent per year)	6.0	53.2	35.2	3.8	3.8
Openness (trade as a percentage of GDP)	47.4	42.6	48.1	147.8	94.2
Infrastructure					
Waiting time for a telephone mainline (years)	0.2	0.0	2.5	0.4	0.0
Share of all roads paved (percent)	50.3	82.0	35.8	74.0	87.1
Human capital					
Share of labor force with secondary education (percent)	n.a.	14.3	14.5	20.5	28.9
Share of population with access to sanitation (percent)	45.0	60.6	51.5	86.7	n.a.

n.a. Not available.

Note: Data are period averages.

Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years; and World Bank, *World Development Indicators*, various years (see annex 3.1 for details).

plants. However, spillovers appear to be positive and statistically significant in the subsample of plants with moderate technology gaps between themselves and their foreign counterparts, but not in the group of locally owned plants facing large technology gaps. The authors argue that selective support to local firms to improve their capacity to identify and employ modern technologies is a necessary ingredient in any policy package to maximize the technological spillovers from FDI.

*High absorptive capacity and productivity.* When absorptive capacity is high, FDI does have the expected positive relationship with productivity (for the East Asian and, especially, the Malaysian experience, see the summary of studies in World Bank 1993 and World Bank, *Global Development Finance* 1997). For Taiwan, China, Chuang and Lin (1999) find that FDI has been associated with higher productivity in foreign-owned firms and with positive spillovers to domestically owned firms. A 1 percent increase in FDI in an industrial sector is associated with an increase in the productivity of domestic firms in that sector of 1.40 to 1.88 percent. Schive and Majumder (1990) describe the extensive productivity benefits achieved through foreign investment in the Taiwanese sewing machine industry. Examining the growth performance of the Chinese coastal provinces, Mody and Wang (1997) find that the benefits of FDI are amplified under conditions of good infrastructure and superior human capital. They find, moreover, that FDI and the supporting physical and human infrastructure grow in tandem, creating a self-reinforcing growth process.

Barrell and Pain (1997), using disaggregated sectoral data for Germany and the United King-

dom, show that FDI is associated with higher productivity also when it flows between industrial economies. They estimate that each 1 percent rise in the FDI stock raises technological progress by an estimated 0.27 percent in Germany and 0.26 percent in the U.K. manufacturing sector. They also estimate that around 30 percent of the growth in U.K. manufacturing productivity since 1985 can be attributed to the impact of inward direct investment. For smaller European economies such as Ireland and Belgium, studies have shown that high FDI and the associated spillover effects have played an important role in economic development (see Cassiers, De Ville, and Solar 1996). Since a relatively large proportion of FDI flowing into industrial countries consists of M&A rather than investment in greenfield sites, these studies support the hypothesis that much of the benefit of foreign investment comes from spillover effects rather than from capital accumulation effects.

#### *Financial spillovers: capital market integration and growth*

In similar fashion, international bank lending and portfolio flows are more productive in a more developed financial environment. International capital market flows and the financial environment can reinforce each other over the long run. Greater financial sector development is expected to be associated with faster economic growth, and larger international capital flows are associated with improvements in financial sector depth and liquidity. However, an inflow of foreign capital does not in itself guarantee improvements in the financial sector. The short-term consequences may well be unfavorable,

given the volatility of capital flows, which can have negative implications for output and employment.

*The role of financial intermediaries.* By specializing in the production of financial services, banks economize on the costs of acquiring information (Diamond 1984), increase liquidity and facilitate investment in long-term projects, and diversify risks by pooling the funds of depositors. Stock markets can also contribute to the efficient allocation of capital by improving information, increasing liquidity, allowing savers to better diversify risks by adjusting their portfolios, and enabling firm owners to exercise greater control over managers (Diamond and Verrecchia 1982).

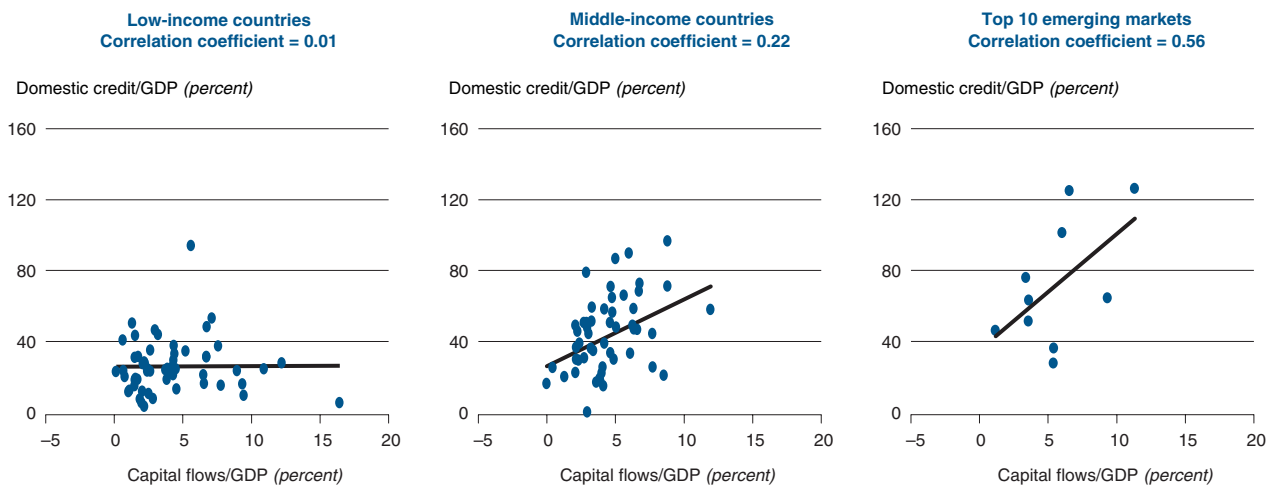
It follows that developing countries with thin, illiquid financial markets are likely to lack the ability to allocate existing capital efficiently. Improving the ability of financial systems in developing countries to provide the full range of financial services, supported by the establishment of sound legal and regulatory frameworks, will boost growth (World Bank 2001). Studies at the level of the firm (Demirgüç-Kunt and Maksimovic 1998), at the level of the industry (Rajan and Zingales 1998), and across countries (Haber 1991; King and Levine 1993; Beck, Levine, and Loayza 2000) have typically found that financial sector development is significantly associated with faster growth.<sup>5</sup> Denizer, Iyigun, and Owen (2000) also find that develop-

ment of the financial sector helps reduce economic volatility by improving the information-processing capacity of the domestic economy and by acting directly to smooth consumption.

*International flows and domestic financial development.* A positive relationship typically exists between international capital market flows and the development of the financial sector. However, in some poorer countries no such relationship can be found. Figure 3.6 plots, for three groups of developing countries, the ratio of domestic credit to GDP against average private capital inflows. A positive relationship between these measures is found in the top 10 emerging market countries, as well as (less robustly) in the middle-income countries as a whole; however, no such relationship can be found in the low-income group.

Foreign capital often brings with it new financial techniques and practices that can find application in the domestic financial markets of emerging market economies. For example, foreign capital may facilitate the introduction of new financial instruments, allowing individuals to better diversify risks, as well as better accounting and disclosure practices. Although reforms that removed ceilings on interest rates and abolished directed credit requirements were the principal reason for rapid financial sector development in many developing countries, it is also likely that foreign capital, and

**Figure 3.6 Foreign capital and financial sector development across various groups of countries, 1970–98**



Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see annex 3.1 for details).

consequently foreign ownership, have contributed significantly.

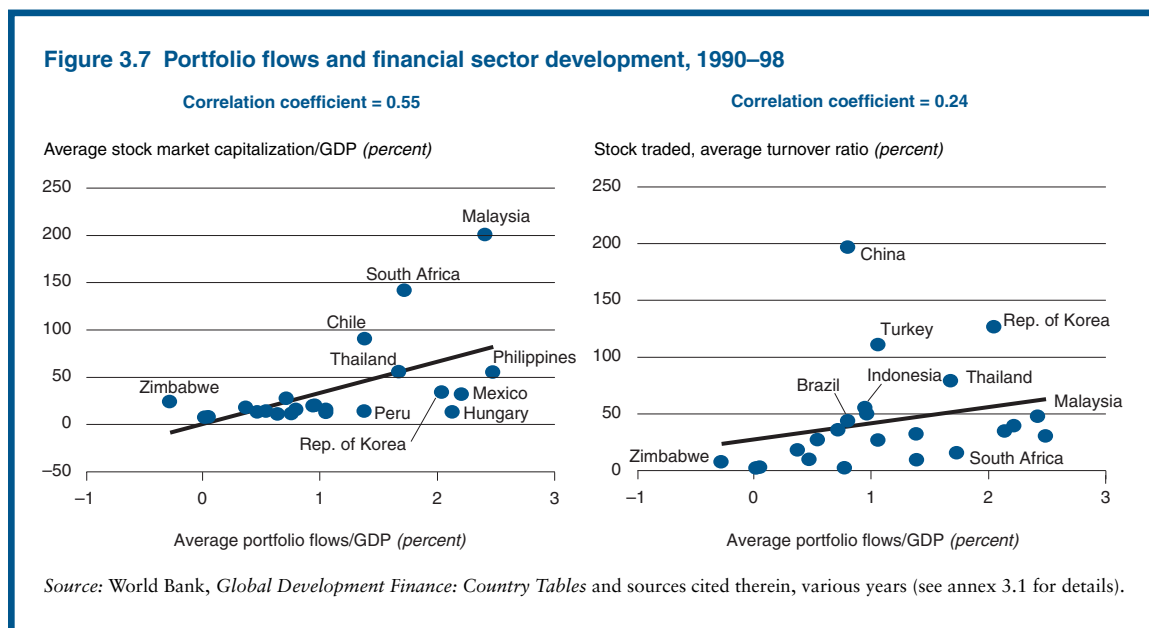
Often deregulation in the financial sector has involved a relaxation of controls on foreign ownership. In conjunction with a liberalization of capital controls, this has led to a wave of foreign capital inflows and a massive transfer of ownership in the financial sectors in many emerging market economies. For instance, in Central Europe between 1994 and 1999, the share of bank assets controlled by foreign banks increased from 10 percent to more than 50 percent (see box 2.4 in chapter 2). Foreign involvement in the Latin American banking sector also increased dramatically in the 1990s, contributing to greater efficiency of domestic banks. Typically, foreign-owned banks are more efficient than their domestically owned counterparts. For instance, Clarke and others (2000) find that foreign-owned banks in Argentina typically have better-quality loan portfolios, higher net worth, and a higher ratio of income to costs than domestic banks. These better practices can place pressure on domestic financial intermediaries to raise their own efficiency. Thus Claessens, Demirgüç-Kunt, and Huzinga (2000) find that foreign entry significantly reduces the overhead and profitability of domestic banks (see the discussion of foreign investment in the banking sector in chapter 2).

*Portfolio flows and financial sector development.* Although a strong association has not been

found between portfolio flows and increased investment, portfolio flows are associated with increased financial sector development. Figure 3.7 shows the positive relationship between the size of portfolio flows and two different measures of financial sector development: stock market capitalization and stock market turnover. Portfolio flows, particularly bond flows, are typically subject to rating by international credit rating agencies. These agencies make periodic assessments of sovereign and corporate credit, and this greater scrutiny may contribute to greater vigilance in external policy. To the extent that such flows are concentrated in a limited number of emerging markets, their benefits also accrue to those economies.

### The volatility of capital flows

When financial markets are well integrated and functioning smoothly, access to foreign capital flows should reduce the volatility of growth, not increase it. During an economic downturn or following an external shock, access to financial capital should cushion the fall in consumption and reduce the damage to and depreciation of the country's infrastructure. In practice, however, the opposite has happened: private capital flows have been procyclical, plentiful in good times and scarce in bad times (see, for example, World Bank



2000). Such volatility can impose significant costs, not only in the form of periodic crises but also, the evidence suggests, through a reduction in long-run growth. This outcome reflects, in part, the imperfect integration of developing economies into world financial markets and informational asymmetries—hence the sometimes herdlike behavior of foreign investors (Calvo and Mendoza 1999). However, the procyclical nature of capital flows also reflects volatility induced by a country's own actions—and inactions—through uncertain government policies and, especially, the underdeveloped state of its own financial markets.

Thus, although opening up domestic financial markets to international competition has attracted more capital to developing countries and has bolstered growth in some, the larger volume of capital market transactions has also contributed to a more volatile climate. Where capital flows are large, any sudden effort by investors to withdraw from a country can precipitate or deepen a crisis. As the abundant literature on the Asian crisis has also shown, rapid reforms to liberalize the financial sector and to remove barriers to the entry of foreign capital often proceeded without the development of the institutions or practices that characterize a mature financial market. Particularly noticeable in their absence have been effective accounting practices, appropriate supervisory rules, and strong oversight of the banking system. Without these foundations, capital flows have often powered overinvestment and speculative booms. Eichengreen (1999) has described the mingling of foreign capital flows in a fragile financial sector as an “explosive mix.”

This need not be so. Kaminsky and Schmukler (1999) find that, although the exposure of domestic financial markets to foreign capital tends to increase instability in the first year, foreign inflows are ultimately (starting from about the third year) associated with greater, not less, stability. The evidence also suggests that volatility can be managed. Chile drew some important lessons from the severe financial crisis it suffered in the early 1980s, and that country's subsequent experience with strengthening the domestic financial sector while gradually liberalizing capital flows serves as an example of how to achieve the benefits from both. Finally, some have also proposed that flexibility of exchange rates has helped recently in containing the length of crises (Cline 2000), although this evidence remains controversial.

This section considers the costs of financial volatility, the sources from which it arises, and the techniques and prospects for managing it. Whereas the costs arising from volatility are real, other costs attributed to international capital flows have less of a basis. For example, no evidence exists of environmental degradation from an investor “race to the bottom” (box 3.2).

### *Volatility and growth*

Economic theory offers strong reasons to think that volatility may be negatively associated with both investment and growth. For instance, Bernanke (1983) and Pindyck (1991) point to irreversibilities in investment, which in a climate of greater uncertainty can lead to lower investment. Similarly, Scott and Uhlig (1999) argue that, where external investors are fickle, the uncertainty about their behavior is transmitted to domestic financial markets, and the incentives for entrepreneurial risk taking are reduced. Thus, as Easterly, Islam, and Stiglitz (1999) note, short-run investment and entrepreneurial decisions come to determine long-run outcomes. Volatility is relevant for overall economic growth but perhaps even more relevant for the poor in developing countries, who suffer disproportionately in economic downturns (see World Bank, *World Development Report 2000*).

The empirical evidence suggests that these theoretical relationships between capital flow volatility and economic growth are important. In particular, countries with growth rates that are lower than implied by their fundamentals (for example, by their investment rates and human capital) also tend to have relatively high capital flow volatility, as measured by the standard deviation of flows (figure 3.8).

Of course, this association need not imply that capital flow volatility acts as an independent force. Volatility in different forms has been shown to be inimical to growth, and capital flow volatility is often associated with those other sources of volatility. Ramey and Ramey (1995) find that long-run growth is lowered by more volatile GDP growth rates (which, in turn, are positively correlated with capital flow volatility, as documented by Easterly, Islam, and Stiglitz 1999). From a policy perspective, then, it is important to identify the sources of volatility in the domestic economy that may be associated with or may even amplify volatility that is externally induced by private capital flows.

## Box 3.2 Has there been an environmental race to the bottom?

One concern over the 1990s' surge in global trade and capital flows to developing countries is the potential for an erosion of environmental standards, commonly referred to as a "race to the bottom."<sup>6</sup> The argument is as follows: Firms can produce certain goods more cheaply when local environmental regulation does not force them to pay the costs of the associated pollution. In the absence of enforceable environmental standards at the global level, or of barriers to trade and capital flows, the supply of such low-cost goods from countries with low environmental standards impairs the competitive position of firms in countries with high standards. Firms in polluting industries will therefore tend to relocate to countries where environmental standards are lax. In short, the race-to-the-bottom model predicts that open trade and capital flows tend to erode environmental standards globally.

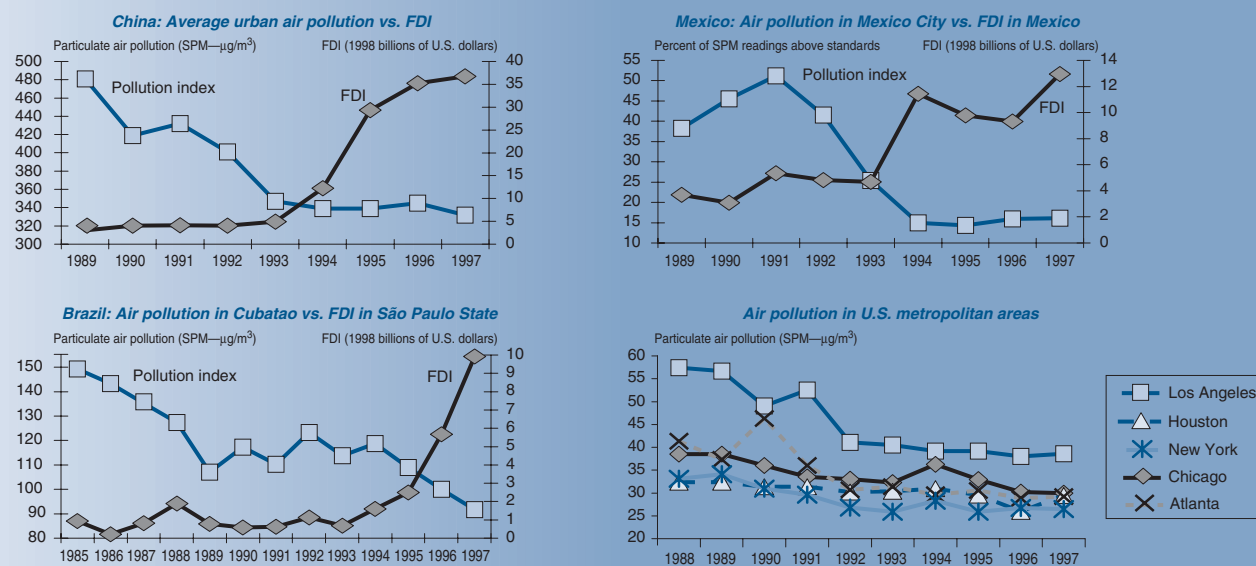
A contrary case can be made, however. Greater access to foreign capital promotes economic growth in developing countries, and the resulting higher incomes increase demand for goods and services generally, including demand for a cleaner environment. This leads, in turn, to more vigorous measures and efforts to improve environmental quality. This view may also oversimplify. The evidence suggests, instead, that both local communities and international firms find it in their self-interest to safeguard and improve environmental standards, even in countries with low levels of income.

Trends in available pollution data provide a reasonable basis for testing these propositions. The figure below presents pollution trends along with data on foreign direct investment for China, Mexico, and the state of São Paulo, Brazil's dominant industrial region. For comparison, pollution data from five U.S. metropolitan areas (Atlanta, Chicago, Houston, Los Angeles, and New York) are also presented.

These data show no sign of a race to the bottom in pollution levels in the urban centers of China, Mexico, and São Paulo State during the past two decades: trends in particulate pollution are downward in all three. Thus, far from racing toward the bottom, major urban areas in these three countries have all experienced significant improvements in air quality. Moreover, this has happened during a period of rapid economic liberalization and foreign investment growth in the developing countries shown. At the same time, the improvements in Los Angeles and Mexico City are noteworthy, since they are the dominant industrial centers most strongly affected by competition generated on account of the North American Free Trade Agreement. These trends are no coincidence. People living in high-pollution areas and foreign firms operating in such areas have little reason to maintain pollution havens. The incentives, if anything, run in the opposite direction.

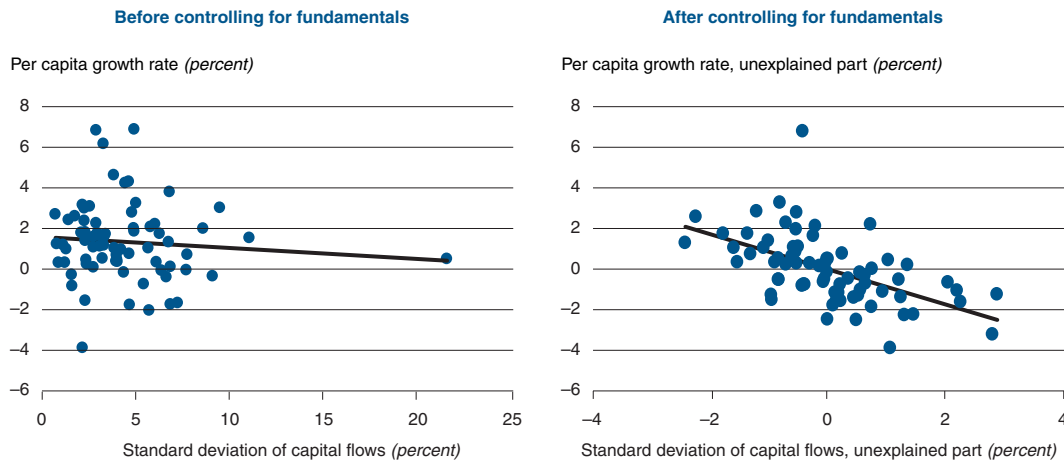
Source: Wheeler 2001.

Urban air pollution and foreign direct investment in China, Mexico, and Brazil, and air pollution in selected U.S. metropolitan areas



Note: "SPM" refers to suspended particulate matter measured in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ).  
Source: Wheeler 2001.

**Figure 3.8 Correlations and partial correlations between per capita average growth rates and private capital flows volatility, 1970–98**



*Note:* The partial correlation between the growth rate and capital flows volatility is the correlation between the residual growth rate and residual volatility in capital flows, after controlling for various fundamentals (see annex 3.1 for details). This residual variation in the growth rate and capital flows volatility is termed “unexplained part.”

*Source:* World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see annex 3.1 for details).

### Sources of volatility

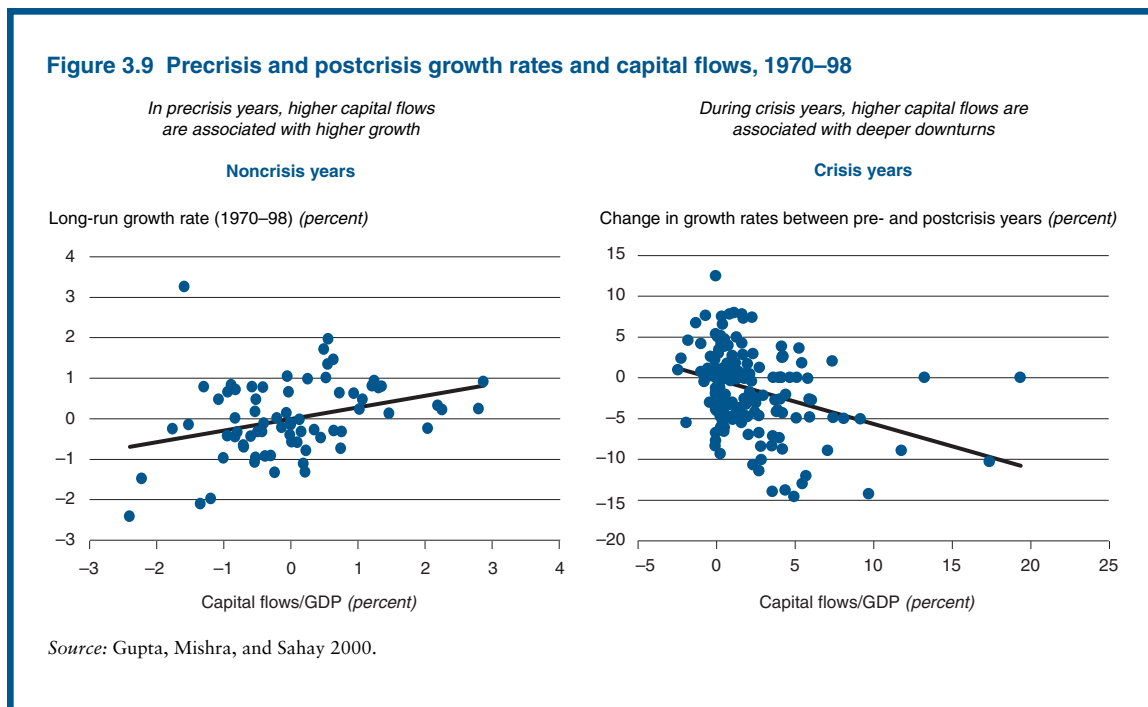
Various external and internal factors may contribute to the volatility of capital flows.<sup>7</sup> Easterly, Islam, and Stiglitz (1999) have found that, among domestic factors, the financial sector is the most important source of instability. Although a healthy financial sector helps to smooth consumption and production rather than accentuate their fluctuations, an excessively large or rapidly growing financial sector can make matters worse. Capital flow volatility works through financial sector instability; that is, it contributes to amplifying the volatility of domestic consumption and production when the domestic financial sector is weak. Caballero (2000), in a study of Argentina, Chile, and Mexico, reaches the same conclusion. Bertola and Drazen (1994) suggest that volatility of capital flows reflects fluctuations arising from the variability in domestic economic conditions and, importantly, that this volatility is enhanced by policy measures (for example, through capital controls imposed when capital is fleeing, which further discourage external capital, and through procyclical government expenditure).

But externally initiated volatility is a matter of serious policy concern. As noted by Caballero (2000, p. 35), “Large swings in capital flows and sovereign spreads . . . seem to bear little relation—

at least in terms of magnitude—to economic fundamentals.” Volatility may reflect, for example, the composition of capital flows. Sarno and Taylor (1999) have shown that flows mediated through capital markets are significantly more volatile than FDI.<sup>8</sup> This fact is underlined by the resilience of FDI during the recent crises, when capital market flows largely dried up yet FDI remained buoyant (see World Bank, *Global Development Finance* 1999). Portfolio flows and short-term debt have been particularly volatile, and large increases in both of these types of flows have thus implied that the volatility of capital flows is likely to remain high, especially in those regions and countries where such flows are concentrated.

The experience of the 1990s has also raised concerns that the incidence of financial crises is increasing, driven by the boom in capital flows (see Kaminsky and Reinhart 1999; Bordo and Eichengreen 2000).<sup>9</sup> In terms of lost output and the implications for poverty and unemployment, the Asian crisis represents one of the most acute periods of financial instability in this century (see World Bank, *Global Economic Prospects 1998/99* for a discussion of the costs of this crisis).

In summary, it is difficult to determine to what extent the surge in capital flows in the early 1990s



contributed to the recent crises and to what extent they reflect more fundamental economic mismanagement on the part of the recipient countries. Volatility in growth rates is related to domestic actions, such as procyclical fiscal policies and sudden, arbitrary changes in economic policies. Nevertheless, a historical pattern of boom and bust during periods of large capital flows is well established (World Bank, *Global Development Finance 2000*). For instance, the borrowing booms in Latin America in 1825, 1880, and 1890 all ended in financial crisis (see Marichal 1989; Ferns 1960). The recent crises in Latin America and East Asia were classic examples of this boom-bust cycle (McKinnon and Pill 1997). Larger capital flows in the years preceding a crisis have been associated with both higher growth rates in the precrisis years and a sharper fall in growth when the crisis arrives (figure 3.9).

**Managing volatility**

The experience with crises in the 1990s revealed that the cost of capital flow volatility can be enormous. However, dramatic as these crises were, the volatility of capital flows does not appear to have increased substantially for developing countries as a group. Figure 3.10 shows the median volatility

of capital flows by decade across various regions. The evidence is mixed. Although volatility increased sharply in the 1990s in East Asia with the financial crisis, and in Europe and Central Asia with the transition to capitalism, the other regions have seen little change in volatility since the 1980s.

Moreover, evidence based on cross-country growth regressions seems to suggest that countries in general are managing volatility better than they used to (figure 3.11). On average, a unit of volatility was less harmful to long-run growth in the 1990s than in the past. Thus, taken in conjunction with the unclear trends in long-term volatility, the overall negative effect of capital flow volatility on long-term growth was lower in the 1990s than in the 1980s or 1970s.

At first blush, this conclusion that the consequences of volatility have been no more serious lately than they were in the past seems somewhat surprising in light of the recent crises. However, first, as pointed out above, only a few countries had an enormous increase in capital inflows that could subsequently put them at risk of reversal.

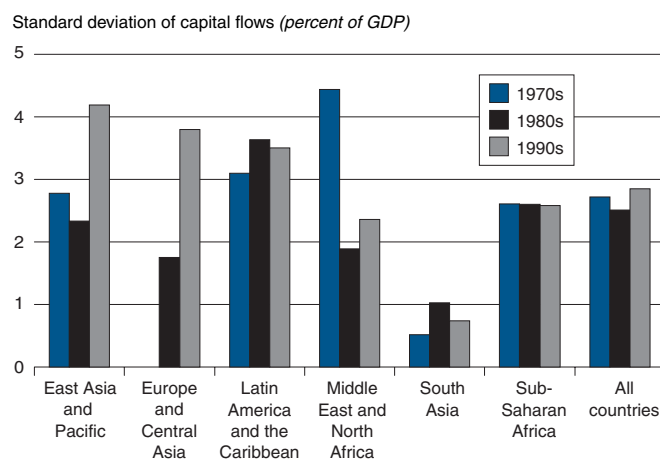
Second, as Cline (2000) notes, following the crises in East Asia and the Russian Federation, countries have in general been quick to rebound to-

ward precrisis growth trends. Caballero (2000), while highlighting the importance of vigilance against volatility induced by imperfections in the operation of international capital markets, also notes the quick recovery from recent crises. This contrasts with the pattern observed in the 1980s, where the initial impact of crises may have been smaller but the effects were longer lasting. Cline argues that this change is an outcome of greater exchange rate flexibility and capital mobility. In the 1980s, when exchange rates were relatively fixed and capital controls generally tight, adjustment to a crisis required rationing of foreign exchange. In the 1990s, in contrast, currencies were allowed to depreciate rapidly. Although the immediate effect may have been to worsen the ensuing recession, the subsequent recovery was also faster.

Third, in the 1990s more countries took steps to ward off crises. For example, by the time the crises of the late 1990s struck, Chile had strengthened its defenses through a tax on capital inflows that lengthened the average maturity of its debt. Chile also undertook extensive reforms of its financial markets. Argentina put in place contingent credit lines and likewise strengthened its financial sector, and both China and its Hong Kong province had built substantial reserves to manage immediate liquidity needs. The large rescue packages put together by the international financial community also stemmed a systemic slide in the 1990s. Finally, greater economic diversification, particularly in the more sophisticated developing economies, may also have helped limit their downturns by enabling them to shift production between sectors as international demand conditions changed.

Continued efforts to safeguard against externally generated volatility must be a priority for policymakers. The best safeguards are those aimed at the long run, such as stronger financial systems, that reduce economic vulnerability. However, short-term safeguards may also be needed to insulate countries from speculative attack (Feldstein 1998; Caballero 2000). This could involve increasing liquidity through a prudent amount of reserves—one that provides a short-term buffer but does not impose large fiscal costs—or contingent credit lines. It might also involve Chilean-style taxes to limit the volatility of short-term capital flows, although the effectiveness of this instrument remains a matter of dispute (see World Bank,

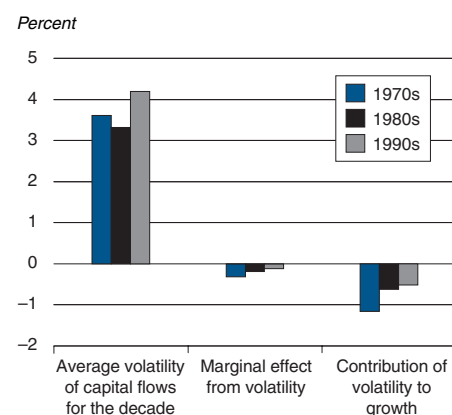
**Figure 3.10 Capital flows volatility by decade and by region**



Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see annex 3.1).

*Global Development Finance 2000*; Kletzer and Mody 2000). However, neither of these approaches is perfect, and countries will need to adopt those measures that best meet their specific requirements. The same is true for so-called early

**Figure 3.11 Volatility of capital flows and the changing relationship with growth**



Note: The sample of countries for this figure is smaller than that for figure 3.10. Hence the average volatilities are different, though their time pattern is the same.  
Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see annex 3.1).

## Box 3.3 Early warning indicators

The search for early warning indicators of financial crises gained momentum during the turbulence of the 1990s. Edison (2000) reviews a variety of measures proposed as early warning indicators and their record of success, as measured by their ability to predict a currency crisis within the next 24 months. These comparative indicators proved generally unsuccessful in predicting crises, which points to the importance of a country-specific approach to monitoring vulnerability.

Possible early warning indicators include measures of global economic conditions (such as output growth in the Group of Seven, U.S. interest rates, and oil prices) as well as measures of domestic weaknesses. Domestic vulnerability to currency crises can be expected to show up either in a country's balance of payments, in the real sector, or in the financial sector. The choice of indicators is partly determined by their intuitive appeal and partly by data availability. Possible indicators for the balance of payments include, for the current account, real exchange rate overvaluation and trade performance, and for the capital account, foreign exchange reserves, short-term debt, and interest rate differentials. Indicators for the domestic financial sector include money balances, commercial bank deposits, and interest rates, and those for the real sector include indexes of industrial production and equity prices.

One study of these indicators found that a few are of some use in predicting financial crises, but several provided predictions that were no better than random

guesses. Three indicators that stand out as being particularly useful are real exchange rate overvaluation, the ratio of the money supply (M2) to reserves, and the ratio of short-term debt to reserves (Edison 2000, p. 60). Edison finds that an overall vulnerability index (constructed from 19 indicators) was weakly informative after the fact but performed poorly in forecasting crises. An out-of-sample "prediction" based on data available in December 1996, for instance, rated no country as having more than a 50 percent probability of suffering a crisis. In fact, the highest predicted crisis probability was for Bangladesh, which did not have a crisis. The probabilities for Malaysia, the Philippines, and Thailand were a little over 30 percent, while that for the Republic of Korea was around 25 percent and Indonesia at 15 percent.

One problem shared by many potential indicators is that they are not available in a sufficiently timely fashion. More critically, any early warning model faces a tradeoff between overpredicting crises and underpredicting them. For instance, the ratio of short-term debt to reserves had a very good record at signaling in advance crises that actually occurred, but it also signaled many crises that did not occur. The real exchange rate measure, in contrast, tended to avoid giving false signals but missed a number of actual crises. Thus users facing different types of exposure, or who are active in countries with different characteristics, may be able to improve these results by including information that is more country-specific, rather than simply relying on cross-country indicators of the likelihood of crisis.

warning indicators (box 3.3). Each country has its own vulnerabilities, which it will need to monitor.

### The policy agenda

Many developing countries are making the transition to greater integration with international financial markets. Both theory and practice suggest that long-term gains are possible, but the interim costs can also be significant. The policy agenda that emerges from this review is complex because the tradeoffs are often unclear and analysts do not always agree on the right course of action.

Creating the link between capital flows and the growth agenda is conceptually straightforward but is an operationally complex, long-term task. The benefits of private capital flows may be small

in a country with a poorly educated work force, macroeconomic instability, and substantial administrative impediments to private economic activities. Improvement of the business climate would be good for such a country not just because it would achieve greater effectiveness of international capital and not just because it would also stimulate domestic saving and investment—but primarily because investments would then be effective in raising living standards.

Dealing with volatility poses greater challenges. As this chapter has amply documented, countries with weak domestic financial institutions (and those highly dependent on portfolio flows and short-term bank lending) are most subject to capital flow volatility and its ill effects. Such countries need to improve their policies pertaining to domestic financial institutions in order

to reap the benefits of private capital flows, and such measures will also contribute to growth. A recent World Bank Policy Research Report (World Bank 2001) reaches four conclusions:

- Governments are not good at providing financial services—even when a crisis hits. Reducing, even eliminating, state ownership should be a high priority, but privatization should be designed carefully to limit systemic risks. Even in a crisis, reliance should be placed, as far as possible, on using the market to identify winners and losers.
- Well-functioning markets need legal and regulatory underpinning. Regulatory and supervisory arrangements should help ensure constructive incentives for financial market participants.
- Diversity is good for stability. Banks, securities markets, and a range of other types of intermediary and ancillary firms are all needed for balanced financial development.
- Open markets can spur development. Most developing countries are too small to be able to afford to do without the benefits of access to global finance, including services from foreign financial firms.

What should be done beyond strengthening domestic financial markets? On that there is an active debate. Although the case has sometimes been made for Chilean-style taxes on short-term capital inflows, their practicality in other settings remains controversial (see World Bank, *Global Development Finance 2000*). Financial sector stability and prudence, induced through measures such as those described above, can also provide important elements of capital controls.

In parallel, governments may choose to take precautions to deal with potential capital flow volatility by holding substantial foreign reserves or arranging access to contingent credit lines in case of a sudden withdrawal of flows from international capital markets. These can provide safeguards against crises where the long-term stability of the financial sector is not yet in place. But the possible costs and, again, the practical implementation of these measures remain subject to debate (World Bank, *Global Development Finance 2000*).

Finally, flexible exchange rates, as suggested above, can help dampen the volatility of capital flows. However, the choice of the right exchange

rate regime continues to be keenly debated. Whereas proponents of a universal solution can be heard on all sides—fully floating, fixed, and intermediate regimes—others argue that a one-size-fits-all prescription is misleading (Frankel 1999). This remains an area of significant intellectual ferment.

### Annex 3.1

This annex provides the technical details and data sources underlying some of the figures in this chapter that are based on various panel and cross-country regressions.

In figures 3.1 to 3.3 the heights of the bars, which correspond to the incremental relationship of capital flows with investment, saving, and the current account, are obtained as a two-stage panel regression based on Bosworth and Collins (1999). By removing the country means from the data, this approach focuses on the within-country variation and permits a relatively simple specification in which investment (and saving) shares are regressed against capital flows (relative to GDP), the lagged growth rate, the change in the terms of trade, and the lagged inflation rate. The marginal relationship of capital flows with the current account is calculated as the sum of the coefficients on capital flows in the investment and saving equations.

The instrumental variables estimator used by Bosworth and Collins to allow for consistent estimation in the presence of two-way relationships between foreign capital and investment (and saving) is also adopted here. The instrument for capital flows is based on the aggregate flow of capital to developing countries, which for any given country should be largely exogenous. Specifically, the flow of capital (as a fraction of GDP) is regressed on itself lagged one period, the sum of flows to all developing countries (as a fraction of total developing-country GDP), the lagged growth rate, and the change in the terms of trade, after removing country-specific means.<sup>10</sup> An instrument was constructed for each type of flow in similar fashion. For instance, an instrument for FDI was obtained by regressing FDI on itself lagged one period, the total of foreign investment to developing countries as a fraction of total developing-country GDP, as well as lagged growth and a shock to the terms of trade. As above, the country-specific fixed effects were removed from the data. Good instruments

for the various types of capital flows could typically be found, except for short-term debt flows. (Actual values for short-term debt were, therefore, used instead of fitted values.)

This approach essentially maintains the structure in Bosworth and Collins (1999). However, in a departure from their study, the analysis here is based on three-year averages of the variables as opposed to annual series. Thus the time-series variation in the sample is restricted to only nine periods. Although an annual series does provide additional sample information, the short-term cyclical variation in the dependent variable and its determinants introduces more noise into the underlying long-term relationships. The use of three-year averages represents a compromise between the need to focus on long-term relationships and the need to maximize the time-series (within-country) variation in the data.

Table 3A.1 reports the estimated coefficients on various types of capital flows; these coefficients underlie figure 3.1, where fitted values of capital flows were used instead of actual values. It is clear from the table that capital flows are significantly associated with investment, although the relationship with saving is small and statistically insignificant. Decomposing capital flows into their various components suggests that long-term capital typically has a stronger influence on investment than do short-term debt flows, and within the category

of long-term flows, foreign investment and bank lending are more robustly associated with investment than are portfolio flows. The impact of portfolio flows on saving is positive and statistically significant, but FDI and bank lending are not associated with saving.

The same approach was taken in estimating the incremental relationship between capital flows and investment and saving across various regions. However, lack of data necessitated restricting the analysis to only three regions: East Asia and Pacific, Latin America and the Caribbean, and Sub-Saharan Africa. As above, the coefficients were estimated using two-stage least squares, and the marginal impact of capital flows on the current account was calculated as the sum of the coefficients on capital flows in the investment and saving (alternatively consumption) equations (see figure 3.2). The regression results, not reported here, seem to support the conclusion that capital flows have a larger impact on investment in regions where markets are less integrated. Moreover, the significantly stronger relationships observed in Sub-Saharan Africa are consistent with the relatively larger component of FDI in foreign capital inflows to that region.

The change over time in the relationship between capital flows and investment was explored within the same type of framework. In figure 3.3 the height of the bars illustrates the marginal relationship of capital flows generally, and of FDI,

**Table 3A.1 Marginal impact of various types of capital flows on investment and saving**

Independent variable	Dependent variable											
	Investment (1A)	Saving (1B)	Investment (2A)	Saving (2B)	Investment (3A)	Saving (3B)	Investment (4A)	Saving (4B)	Investment (5A)	Saving (5B)	Investment (6A)	Saving (6B)
Aggregate capital flows	0.72**	0.03										
Long-term capital			0.88**	0.10								
Bank lending					1.45**	-0.17						
FDI							0.84**	-0.03				
Portfolio investment									0.50	0.84*		
Short-term debt											0.23**	0.05
All other flows			0.22	-0.16	0.53**	-0.03	0.58**	-0.23	0.52**	-0.27	0.62	0.06
Growth rate, lagged	0.33**	0.33**	0.31**	0.36**	0.33**	0.46**	0.36**	0.45**	0.49**	0.48**	0.32**	0.39**
Change in terms of trade	0.01	0.04**	0.01	0.04**	0.01	0.05**	0.02**	0.05**	-0.00	0.04**	0.01**	0.05**
Inflation, lagged	-0.00	-0.00**	-0.00	-0.00**	0.00	-0.00**	-0.00	-0.00**	-0.00	-0.00*	-0.00	-0.00
Adjusted R <sup>2</sup>	0.70	0.70	0.70	0.70	0.71	0.72	0.72	0.71	0.72	0.73	0.73	0.73

\* denotes significance at the 10 percent level, and \*\* at the 5 percent level.

Note: Fixed-effects regressions of investment (or saving) ratios against capital flows based on an unbalanced sample, consisting of a maximum of 118 countries, spanning the period 1972–98. The method of estimation was two-stage least squares, when a good instrument could be found; otherwise simple ordinary least squares results are reported.

Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see data sources for further details).

**Table 3A.2 Effect of capital flows and their volatility on growth per capita, by decade**

Independent variable	Dependent variable: rate of GDP growth per capita			
	1970–98	1970–79	1980–89	1990–98
Capital flows	0.287**	-0.149	0.133	0.275**
Capital flow volatility	-0.344**	-0.322**	-0.188	-0.124
Initial GDP per capita	-0.508**	-0.345	-0.940**	0.159
Initial schooling	1.429	-1.749	3.640*	-0.446
Population growth rate	-0.513**	-0.438	-0.573**	0.869**
Investment	0.182**	0.309**	0.164**	0.094**
Policy	0.008**	0.007**	0.011**	0.013**
Inflation rate	-0.002**	-0.008	-0.001**	-0.004**
Openness of the economy	0.001	0.006	0.001	-0.024**
Adjusted R <sup>2</sup>	0.75	0.59	0.57	0.38
No. of countries	72	56	74	100

\* denotes significance at the 10 percent level, and \*\* at the 5 percent level.

Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see data sources for details).

with investment for two time periods: 1970–89 and 1990–98. The evidence suggests a decline in the relationship of private capital with domestic investment, which is consistent with the increasing financial market integration of developing countries. Unfortunately, given the extensive country coverage, the data set is necessarily unbalanced, and therefore strict comparisons across time periods need to be made with caution. Nevertheless, the result is fairly robust and seems to hold in a smaller, but balanced, sample consisting of 60 countries.

Whereas figures 3.1 to 3.3 were based on a series of panel regressions that used instrumental variables to deal with the potential endogeneity of capital flows, the procedures underlying figure 3.8 and the figure in box 3.1 are much simpler. Figure 3.8 focuses on the relationship between capital flow volatility and the 30-year average real per capita GDP growth rate. The figure in box 3.1 examines the changing relationships between capital flows and the 10-year average growth rate over time. The first column of table 3A.2 reports the results from a regression of the 30-year average growth rate on a set of control variables. The controls used consist of initial GDP, initial levels of human capital (as measured by the school enrollment ratio), investment ratios, the volatility of capital flows, and a measure of policy. The World Bank's Country Policy and Institutional Assessment index was used as the measure of policy, openness was measured by the ratio of total trade to GDP, and the standard deviation of capital flows was used as a measure of volatility. Columns

two to four of table 3A.2 report the results from the cross-country regressions using decadal average growth rates as the dependent variable and the same set of controls.

The results suggest, first, that capital flow volatility has an important influence on the growth rate and, further, that the relationship between capital flows and growth rates has strengthened over time. To show these underlying trends, the figures in the text illustrate the partial correlations between per capita growth rates and capital flows (figure in box 3.1), as well as the partial correlations between per capita growth rates and the standard deviation of capital flows (figure 3.8). The partial correlations are estimated by first regressing each variable against a common set of factors. In the figures, the residuals from these regressions are referred to as the “unexplained part,” as in Barro (1997). Thus the unexplained part of the per capita growth rate in figure 3.8 is the variation that cannot be attributed to initial GDP, initial schooling, population growth rates, investment, policy, openness, and, finally, capital flows. The unexplained part of capital flow volatility is that variation which cannot be attributed to the same set of variables. A comparison of the correlation in these residuals—that is, the “unexplained variation” in the data—provides a clearer indication of the association between any two variables. Thus, for instance, the correlation between per capita growth rates of GDP and the standard deviation of capital flows, after controlling for fundamentals, is seen to be stronger than the raw correlation between these variables (see figure 3.8).

**Table 3A.3 Data sources**

Data series	Description	Source
<i>Capital flows data</i>		
Capital flows	Sum of long-term flows and short-term debt, as a share of GDP	GDF: Country Tables
Long-term capital flows	Measured as a share of GDP	GDF: Country Tables
Bank lending	Commercial bank lending, measured as a share of GDP	GDF: Country Tables
Foreign direct investment	Measured as a share of GDP	GDF: Country Tables
Portfolio flows	Measured as a share of GDP	GDF: Country Tables
Other flows	Estimated as the difference between long-term capital and the sum of FDI, bank lending, and portfolio flows, as a share of GDP	World Bank staff estimates
Short-term debt	Measured as a share of GDP	GDF: Country Tables
<i>Other financial and macroeconomic variables</i>		
Current account deficit	Measured as a share of GDP	GDF: Country Tables
Growth rate	Real GDP growth rate	GDF: Country Tables
Inflation	Percentage change in consumer prices	GDF: Country Tables
Investment	Gross domestic fixed capital formation	GDF: Country Tables
Openness of the economy	Sum of exports and imports, as a share of GDP	GDF: Country Tables
Reserves	Change in reserves, as a share of GDP	International Financial Statistics
Saving	Estimated as the sum of investment and the current account deficit	GDF: Country Tables
Terms of trade	Change in net barter terms of trade	GDF: Country Tables
<i>Structural variables</i>		
Financial depth	Money supply (M2) as a share of GDP	GDF: Country Tables
Human capital	Secondary school enrollment ratio, percent	World Development Indicators
Labor force education	Percentage of total labor force with secondary education	World Development Indicators
Policy	Country Policy and Institutional Assessment index	World Bank
Political stability	International Country Risk Guide political risk rating	International Country Risk Guide, produced by the PRS Group
<i>Infrastructure</i>		
Paved roads	Percentage of all roads that are paved	World Development Indicators
Sanitation	Percentage of population with access to sanitation	World Development Indicators
Telephone mainlines	Waiting times, in years	World Development Indicators

## Notes

1. The effects for other regions are not described because data are available for fewer countries or a shorter time period, making the estimated effects imprecise.

2. Results based on fixed-effects regressions suggest that foreign direct investment (FDI) is positively associated with investment but that threshold effects may be present: the effectiveness of FDI at low levels of schooling may be close to zero (or even negative).

3. For a careful, annotated review of the literature on FDI and spillover effects, see Klein (2000).

4. In another study of the Czech Republic, Kinoshita (2000) finds no evidence of technology spillovers to local firms from those with a foreign joint venture partner, except in the electrical machinery and consumer electronics industries. In these industries domestic firm capabilities are high, reflecting their greater research and development efforts.

5. See Levine (2000) for a review of the literature and more extensive references.

6. For forceful statements of the race-to-the-bottom argument, see Daly (2000) and Bonior (1999).

7. Volatility may be particularly pronounced in small, open economies, where capital flows may be large and particularly lumpy in relation to gross domestic product (GDP).

For instance, countries such as Guyana, Panama, Papua New Guinea, and Trinidad and Tobago have all received sizable and volatile capital flows relative to their GDP.

8. On the other hand, Claessens, Dooley, and Warner (1995) have argued that there is little difference in volatility across flows of various types.

9. Note, however, that in Latin America, a region greatly affected by capital flow volatility over the past decade, the volatility of growth did not increase in the 1990s compared with the 1980s (World Bank 2000).

10. The choice of instruments was motivated by Bosworth and Collins (1999). They use a measure of global capital flows to developing countries, as well as lagged values of capital flows and growth rates, in addition to changes in the terms of trade and a dummy to capture whether capital controls are in place. Their choice of instruments was largely preserved; however, the dummy for capital account restrictions was dropped due to the paucity of data for selected years.

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