CHAPTER III TRADE AND FINANCIAL INTEGRATION

A crucial and often-overlooked feature of globalization is that trade and financial integration typically go hand in hand (Table 3.1). This is true both over time and across countries, reflecting the inherent linkages between the two—as emphasized by recent theoretical work. The complementarity between trade and finance not only reflects production possibilities—for example, technological improvements in ocean shipping increased both opportunities for world trade and the need to finance these ventures—but also is desirable in order to reap the full benefits of globalization. For example, trade integration is needed to take full advantage of international financial integration, as low trade penetration tends to increase an economy's vulnerability to external financial crises.

An important innovation of this chapter is that it jointly examines the two major pillars of globalization—trade and international financial integration—because of the important links between the two.[1] At a basic level, international trade is accompanied by international financial flows, so greater trade will tend to increase the demand for financial instruments to hedge the riskiness of these flows, and greater financial integration will tend to facilitate international trade. Similarly, "greenfield" foreign direct investment is usually associated with increased capital goods imports during the construction of the project and increased exports after the completion of the project. Also, financial development, which is related to international financial integration, can facilitate specialization and the exploitation of economies of scale, which are related to trade—for example, by helping firms that rely on external finance to overcome liquidity constraints.

Table 3.1. Rising Global Integration

	Change in the Ratio to GDP from 1981–85 to 1997–2001	
	Trade[1]	External finance[2]
	Percentage points	
Industrial countries	3.9	77.3
Developing countries	15.4	19.9

Sources: IMF staff estimates. See Appendix 3.1 for details.
[1]Sum of exports and imports of goods and services, divided by GDP.
[2]Sum of external assets and liabilities of foreign direct investment and portfolio investment, divided by GDP.

Specifically, this chapter examines three key aspects of the recent increase in trade and international financial integration.

- How does the evolution of trade and international financial integration in the past three decades compare to the experience over the past century and a half? Have the roles of technology and policy differed across historical periods?
- What factors account for the differences in trade integration between developing and industrial countries, and for the unevenness in trade integration across developing countries? How important are trade policies and capital account restrictions?
- What are the consequences of trade integration for the frequency of external financial crises, and of international financial integration for output volatility?

Note: The main authors of this chapter are James Morsink (lead), Thomas Helbling, and Silvia Sgherri. Emily Conover provided able research assistance.

[1]The discussion of globalization has largely treated trade integration and financial integration separately. For example, the May 1997 *World Economic Outlook* addressed trade issues, while the October 2001 *World Economic Outlook* focused on international financial integration. One important exception is the literature on the sequencing of liberalization, which has generally argued that trade liberalization is a precondition for capital account liberalization.

An important theme running through the chapter is that more trade integration is usually associated with more international financial integration, as they respond to many of the same technological and policy factors. The chapter looks at several dimensions of this complementarity. First, openness to trade and capital flows has increased in both industrial and developing countries in recent decades, reflecting the liberalization of trade policies and capital account restrictions. Second, global economic integration in the late nineteenth century was driven mostly by technological developments, while integration since World War II has been driven primarily by the liberalization of policies. Third, an analysis of recent trade patterns suggests that trade remains significantly below expected and that both trade and capital account restrictions play important roles in explaining this finding. Finally, evidence suggests that trade integration tends to reduce the likelihood of external financial crises, while financial integration tends to lower output volatility.

Increasing Integration in Recent Decades

Global economic integration is widely acknowledged to have increased in recent decades, but how should it be measured? How has the increase in trade integration compared with the increase in international financial integration, and are they linked? Are global goods and assets markets now fully integrated, or is there further to go? This section addresses these questions.

Economic integration is not easy to quantify, reflecting difficulties in measuring the nature, extent, intensity, and effectiveness of barriers to transactions involving goods and assets. Notwithstanding these measurement problems, price- and quantity-based indicators of market integration yield similar conclusions (Box 3.1).[2] To capture the experience of as many countries over as long a period as possible, this chapter focuses on quantity-based measures of economic integration (Appendix 3.1). Trade integration is defined as the sum of exports and imports of goods and services, divided by GDP (trade openness). Applying the same principle to measuring asset market integration, financial integration is defined as the sum of external assets and liabilities of foreign direct investment and portfolio investment, divided by GDP (financial openness). Other financial stocks, including bank debt, are excluded from the measure of financial openness because these stocks are much more volatile (see Edison and others, 2002). These measures reflect not only trade policies and capital account restrictions, but also other policies that affect integration (such as labor market policies and institutional frameworks) as well as technological factors (such as transport and other transaction costs) and other fundamentals (like geography, cultural heritage, and language).[3]

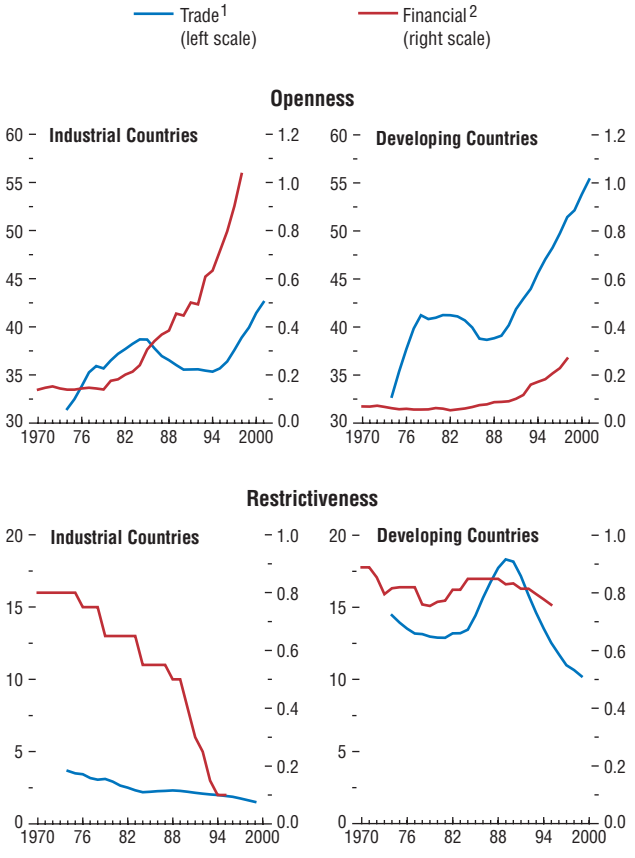
Trade openness and financial openness have increased over the past three decades in both industrial and developing countries (upper panels of Figure 3.1). Trade openness rose more than financial openness in developing countries, while financial openness increased much more sharply than trade openness in industrial countries. The rise and then fall in trade openness between the mid-1970s and mid-1980s in both industrial and developing countries reflect mainly the changes in petroleum prices relative to nontraded goods prices over that period. Greater trade openness in developing countries relative to industrial countries mainly reflects the empirical regularity that smaller countries trade more as a share of income than larger countries (average developing country GDP is only one-half of average industrial country GDP), rather than less restrictive policies. Indeed, while trade policies and capital accounts have been liberalized over the past three decades, they remain

[2]Neither prices nor quantities provide unambiguous evidence about integration.

[3]An increase in trade openness could even reflect a deterioration in policies, which reduces GDP while leaving trade (say, of a specific mineral product) roughly unchanged.

Figure 3.1. Complementarity of Trade and Financial Integration
(Percent unless otherwise indicated)

Trade openness and financial openness have largely moved together in industrial and developing countries, reflecting the parallel liberalization of trade and capital controls.



Sources: IMF, *Government Finance Statistics;* IMF, *International Financial Statistics;* IMF, October 2001 *World Economic Outlook;* and IMF staff calculations.

[1]Trade openness: Sum of exports and imports, divided by GDP (five-year moving average). Trade restrictiveness: Import duties divided by imports (five-year moving average).

[2]Financial openness: Sum of the stocks of external assets and liabilities of foreign direct investment and portfolio investment, divided by GDP. Financial restrictiveness: Index of capital account restrictions.

considerably more restrictive in developing countries than in industrial countries (lower panels of Figure 3.1). The reversal in trade liberalization in developing countries during the late 1980s primarily reflects increases in import tariffs in two relatively large countries—India and Colombia.

Financial openness in industrial countries increased sharply, especially during the 1980s and 1990s, relative to both the increase in trade openness in industrial countries and the increase in financial openness in developing countries. The rise in financial flows among industrial countries has enabled the United States to become both the world's largest creditor and its largest debtor, while financial flows to developing countries have remained steady at about 4 percent of developing country GDP (Obstfeld and Taylor, 2002). In other words, industrial countries have greatly increased asset swapping among themselves (reflecting hedging and risk sharing) rather than accumulated large one-way positions vis-à-vis developing countries.[4] The contrast between the rise in diversification flows and the steadiness of development flows is consistent with the more rapid capital account liberalization and the greater reduction in investment risk—reflecting the relative stability of the policy and institutional environments—in industrial countries.

The linkage between trade and financial integration is also evident across countries. Trade and financial openness are positively and significantly correlated in both industrial and developing countries (Figure 3.2). This is especially true in developing countries, where the correlation coefficient is 0.66, compared with 0.38 in industrial countries. The linkage is also underscored by the fact that developing countries with higher trade ratios tend to have a lower dependence of investment on domestic saving, suggesting that trade openness improves a country's ability to

[4]This is consistent with Lucas's (1990) observation that flows to capital-poor countries are surprisingly low, given that the marginal product of capital is presumably higher.

Table 3.2. Trade Openness and Saving-Investment Correlations

	Slope Coefficient[1]
Developing countries	0.47
By degree of trade openness:	
Open[2]	0.38
Closed[2]	0.70
By region	
Africa, sub-Saharan	0.49
Asia	
East Asia	0.35
South Asia	0.75
Middle East and North Africa	—
Western Hemisphere	
Caribbean and Central America	0.76
South America	0.78

[1]Slope coefficient from a pooled OLS regression of the saving rate (gross domestic saving divided by GDP) on a constant and the investment rate (gross investment divided by GDP), estimated over 1975–99. "—" indicates that the coefficient is not significantly different from zero at the 5 percent level.

[2]Based on a country's degree of trade openness relative to the median.

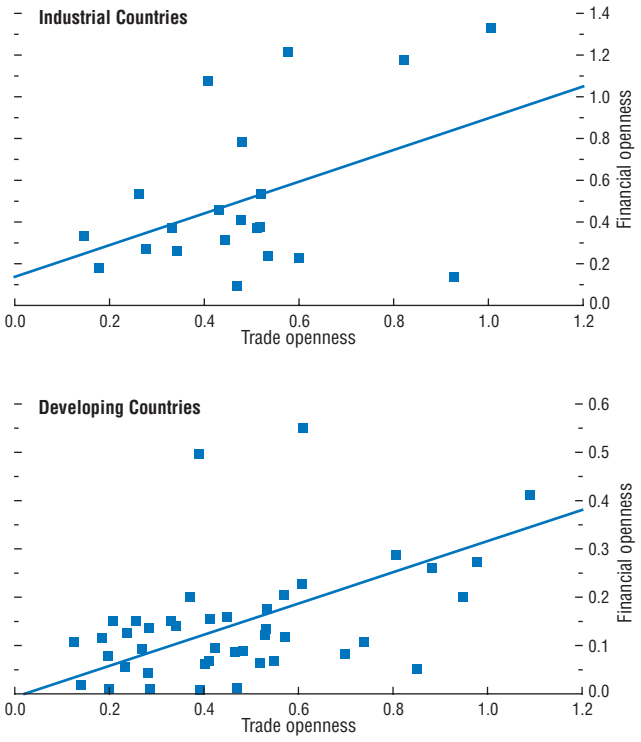
borrow from abroad (Table 3.2). In particular, the Western Hemisphere, which has the lowest share of countries that are open to trade (see the section on the consequences of integration for macroeconomic volatility), features the highest correlation between domestic saving and investment rates.

The inverse relationship between trade openness and saving-investment correlations is consistent with the idea that trade frictions can help to explain the segmentation of international financial markets. Obstfeld and Rogoff (2000a) demonstrate theoretically how, even in a world of perfectly integrated international financial markets where global capital should flow to the countries with the highest real rates of return and thus eliminate any dependence of investment on domestic saving, trade frictions can give rise to highly correlated saving and investment rates. The idea is that trade frictions increase the effective real interest rates faced by borrowers, thereby discouraging further saving-investment imbalances. However, the result is also consistent with the idea that, over the long run, trade frictions and international financial frictions tend to go hand in hand, possibly reflecting policy choices.

Notwithstanding the increase in trade integration and financial integration in recent

Figure 3.2. Complementarity of Trade and Financial Integration Across Countries[1]

Trade and financial openness are positively and significantly correlated. The correlation coefficient is 0.38 in industrial countries and 0.66 in developing countries.



Source: IMF staff estimates.

[1]Trade openness is defined as the sum of imports and exports as a ratio to GDP, averaged over 1975–99. Financial openness is defined as the average gross stock of accumulated FDI and portfolio flows as a ratio to GDP, averaged over 1975–99.

Box 3.1. Using Prices to Measure Goods Market Integration

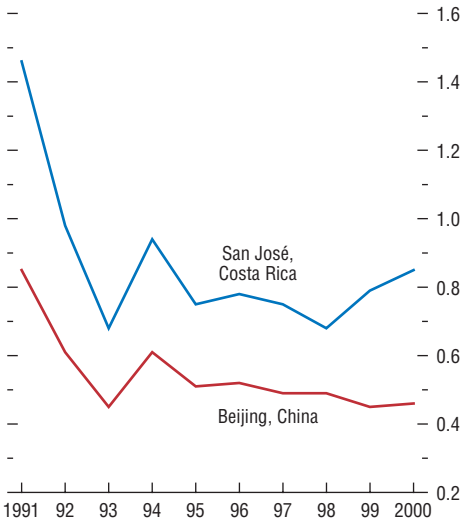
Goods market integration is traditionally measured using bilateral trade flows, with larger flows implying greater integration. One important reason for the popularity of this approach is that data on bilateral trade flows are readily available, including from the IMF *Direction of Trade Statistics*. The determinants of goods market integration are then typically analyzed using a gravity model, which consistently finds that countries that are closer to each other and more similar (in terms of historical and cultural factors) are more integrated (Box 3.3). One potential limitation of the flows-based approach is that trade flows may not be a good proxy for market integration. For example, across countries with similar production structures, even small trade barriers could make it uneconomic to trade certain goods, leading to low trade flows. To check the robustness of the flows-based approach, it is useful to look at the prices of goods across markets, with smaller price differentials implying greater goods market integration.

In one of the first studies to use price dispersion to measure goods market integration across a large number of countries, Parsley and Wei (2001) analyze data on the prices of 95 tradable goods across 83 cities all over the world from 1990 to 2000.[1] The goods are highly disaggregated and essentially identical, such as frozen chicken, light bulbs, toilet paper, and tonic water, all standardized by weight or volume. The data set was compiled by a single source, the *Economist Intelligence Unit (EIU)*, ensuring comparability of the goods across locations. Using all tradable products, the authors compute the standard deviation of the price differences for every pair of cities for each year, with a smaller standard deviation indicating greater market integration. The standard deviations are then used in an econometric analysis of the factors underlying goods market integration, including transport costs, tariffs, and currency arrangements.

Reassuringly, the price-based approach reaches similar conclusions about the pattern and determinants of goods market integration as the more traditional flows-based approach.[2] Specifically, both approaches suggest the following.

- Goods market integration has increased over the past decade. The figure shows the downward trends in the standard deviation of price differences for two city-pairs: Hong Kong SAR and San Jose, Costa Rica; and Hong Kong SAR and Beijing, China.

Price Dispersion Vis-à-vis Hong Kong SAR[1]
(Percentage points)



Source: Parsley and Wei (2001).
[1]Average absolute price difference (measured in logarithms) across 95 tradable products.

Note: The main authors of this box are David Parsley and Shang-Jin Wei.

[1]Engel and Rogers (1996) were the first to use price dispersion to measure goods market integration, but they only considered Canada and the United States. Other recent studies include Engel and Rogers (2001), Rogers (2001), and Hufbauer, Wada, and Warren (2002).

[2]Both approaches take account of the effects of a variety of factors—including tariffs—in a single framework.

- Higher transport costs—proxied by distance—lead to lower market integration. In the flows-based gravity model, bilateral distance always has a negative coefficient, indicating that farther-away countries tend to trade less. In the price-based approach, the distance variable consistently has a positive coefficient, indicating that the price dispersion for identical products (i.e., lack of market integration) increases with distance. For example, the figure shows that price differences are lower between Beijing, China, and Hong Kong SAR than between Hong Kong SAR and San Jose, Costa Rica.
- Some regional preferential trading arrangements have a positive and significant impact on goods market integration. One way to characterize the magnitude of these effects is by their equivalent tariff reductions, i.e., how much tariffs would have to decline to achieve the same effect. The paper finds that the North American Free Trade Area and the European Union both have equivalent tariff reductions of about 5 percent. This effect is large compared with the average external tariff rate of industrial countries of about 4 percent.
- Institutionalized currency arrangements (a union or a board) generally increase goods market integration among their member countries.[3] However, the authors find that the effects of institutionalized currency arrangements are not all the same. For example, the estimate of the equivalent tariff reduction associated with the Communauté Financière Africaine (CFA) is small and not significantly different from zero, while the estimate for the euro area is about 2 percent and significant.
- Finally, border effects are significant, even after taking account of common currencies and free trade areas. The authors find that city-pairs within the United States are the most highly integrated. Relative to the U.S. benchmark, the degree of goods market integration across other city-pairs, including those within common currency and free trade areas, still has further to go.

The similarities in the results from the different approaches imply that the two are complementary, each providing insights into the measurement and determinants of goods market integration.

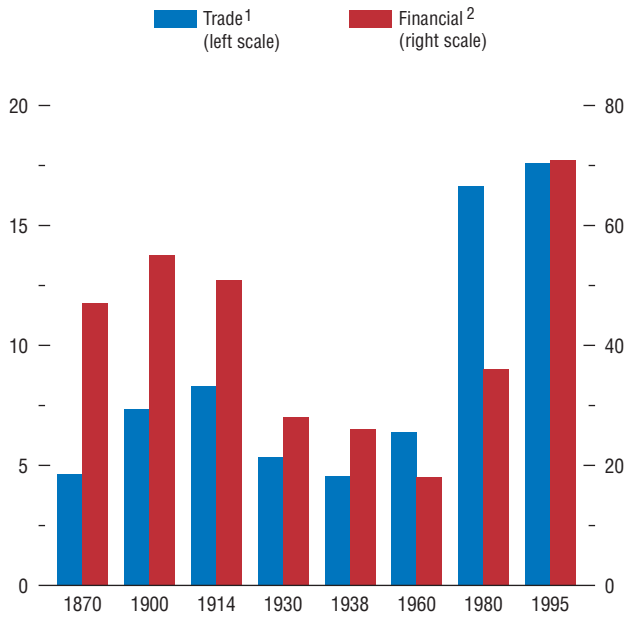
[3]Reducing nominal exchange rate variability reduces price dispersion and improves goods market integration, but by a smaller order of magnitude than a currency union or currency board.

decades, international markets remain far more segmented than domestic markets, even among advanced economies (Obstfeld and Rogoff, 2000b). Intracountry trade is significantly greater than international trade, after taking account of distance, economic size, and other factors (McCallum, 1995; Wei, 1996; and Anderson and van Wincoop, 2001), and manufactured goods prices adjust only slowly to exchange rate changes—typically, about 50 percent after one year. Evidence regarding the continued segmentation of international financial markets is equally strong, though segmentation has decreased in recent years. For example, the share of foreign stocks in U.S. residents' holdings of equities rose from about 4 percent in 1987 to about 11 percent in 2001, but this is still far less than the roughly 50 percent share of non-U.S. stocks in global equity market capitalization. Similarly, global saving-investment correlations (high correlation is suggestive of segmentation) have fallen from about 0.9 to about 0.6 over the past two decades, but remain higher than implied by perfectly integrated international financial markets.[5]

[5]Calvo and Végh (1999) find little evidence that developing countries engage in consumption smoothing through international borrowing and lending.

Figure 3.3. Global Integration
(Percent)

Trade and financial integration have generally moved together over the past one-and-a-half centuries.



Sources: Maddison (1995); Obstfeld and Taylor (2002); and IMF staff estimates.
[1]Ratio of the sum of exports and imports to GDP.
[2]Ratio of foreign assets to GDP.

Comparison with Earlier Historical Periods

Historical evidence on trade integration and financial integration suggests that there are important similarities, but also differences, between the increase in global integration in recent decades and the experience of earlier periods. Trade integration and financial integration have generally moved together over the past one-and-a-half centuries (Figure 3.3). Both increased from the mid-nineteenth century until the outbreak of World War I, then generally declined until the end of World War II, and rose again during the postwar period. What were the primary factors behind these developments and what were the main linkages between trade and international finance?

The increase in trade and financial integration from 1870 to 1914 mostly reflected technological improvements in transport (like railroads, steamships, and the opening of the Suez and Panama Canals) and communications (such as the telegraph, radio telephone, and transatlantic cable). The technological breakthroughs that spurred trade, like steamships and railroads, also created new investment opportunities that required the mobilization of large sums and long waiting periods before investment returns were realized, which stimulated financial development, including international financial integration (Neal, 1990).[6] The gold standard helped foster trade and financial flows.[7] Private international financial transactions remained mostly

[6]Rousseau and Sylla (2001) illustrate how trade and financial integration reinforced each other with examples from the early development of what are now advanced economies. Their econometric analysis finds that, for a broad group of industrial countries between 1850 and 1929, financial development had a positive, significant effect on trade integration, and that trade integration had a positive, significant effect on the decline in long-term interest rates.

[7]The gold standard encouraged stabilizing short-term financial flows among the core countries as well as long-term flows from the core to the periphery, as adherence to gold served as evidence that countries were following responsible macroeconomic and financial policies (Eichengreen, 1996; and Bordo and Rockoff, 1996)

free of government control, consistent with the general acceptance of the gold standard and the willingness to subordinate monetary policy to the fixed exchange rate.[8] Trade policy, if anything, tended to restrain integration, as tariffs increased in many countries (Bairoch, 1993).

Between 1914 and 1945, trade integration and financial integration fell sharply, as government controls on both trade and financial flows expanded during the two World Wars and the interwar period. Countries at war had to shift production both toward military goods and away from exports, necessitating controls on trade, and pay for the resulting trade deficit at minimum cost, requiring financial controls to economize on scarce foreign exchange. In the first part of the interwar period, governments increasingly used trade barriers to try to inhibit adjustment to the changing pattern of global production. During the Great Depression, many governments tried to stimulate their economies by imposing quantitative restrictions and other trade barriers, to increase net exports, and reintroducing financial controls, to simultaneously maintain their gold parities and pursue independent monetary policies.[9]

Since World War II, trade and financial integration have increased, reflecting mainly the liberalization of trade and financial flows. Trade barriers have generally been reduced first, reflecting the Bretton Woods consensus that trade was essential to economic prosperity but financial controls were needed to ensure monetary autonomy while maintaining fixed exchange rates.[10] Industrial countries started reducing trade barriers in the 1960s and 1970s, followed by developing countries in the 1980s and 1990s (Krugman, 1995; and Sachs and Warner, 1995). Rising trade integration permitted the circumvention of financial controls through leads and lags, which in turn allowed pressures from global imbalances to affect—and eventually bring about the downfall of—the system of fixed exchange rates. Following the breakdown of the Bretton Woods system, industrial countries—starting with the major currencies—were able to relax financial controls and retain their monetary autonomy. Developing countries generally liberalized financial controls more gradually during the 1980s and 1990s.[11] By contrast, transport costs have not declined much in the postwar period (Box 3.2).

An important insight from this historical overview is that global economic integration in recent decades has been driven primarily by the liberalization of trade policies and of capital controls, in contrast to the previous episode of globalization in the late nineteenth century, when integration was driven mostly by technological developments. The implication is that policymakers today should pay close attention to the interaction between the different aspects of globalization.

Why Does Trade Integration Differ Across Regions?

While developing countries have generally become more integrated into the world trading system over the past two decades, the degree of integration remains uneven across regions. In particular, artificial barriers to trade—including protectionist trade policies—are preventing greater integration. This section will first develop a measure of expected trade and compare actual trade to expected trade across devel-

[8]Central banks occasionally used moral suasion over banks, and intervened to change gold export and import points (Obstfeld and Taylor, 2002). If a central bank could no longer defend the exchange rate through such noncoercive methods, the exchange rate was generally set free to float with no control employed, as sometimes occurred in Latin America.

[9]This was necessary because of the familiar inconsistency between free financial flows, a fixed exchange rate, and monetary policy geared toward domestic objectives—the "impossible trinity" or "trilemma" (Obstfeld and Taylor, 2002).

[10]The sequencing of liberalization is consistent with Lane and Milesi-Ferretti's (2000) finding that financial openness in the 1990s was strongly influenced by trade openness, and Rousseau and Sylla's (2001) result that financial development did not have a significant effect on trade integration in the postwar period, in contrast to the earlier period.

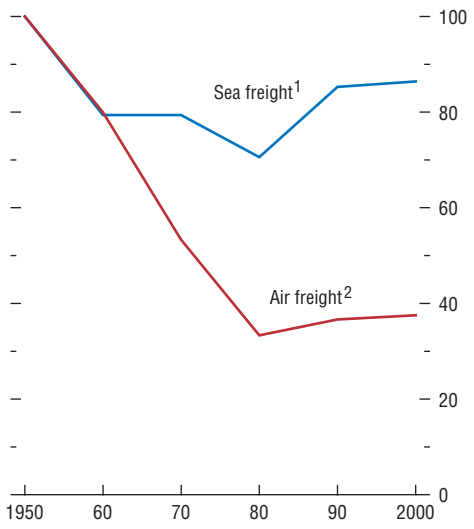
[11]Some countries in Latin America attempted to liberalize during the late 1970s, but these attempts were not adequately supported by fiscal discipline and domestic financial system reform.

Box 3.2. Transport Costs

Transport costs play a central role in explaining trade patterns. Transport costs are still large when compared with tariffs and represent the main impediment to trade in a majority of countries (World Bank, 2002). Transport costs, usually proxied by distance and other geographical variables, are highly significant in the gravity model (Box 3.3) and are important in explaining international vertical specialization—the slicing up of production processes into distinct steps, allowing specialization across countries (Box 3.4). They also help explain the substitution between trade and foreign direct investment (Loungani, Mody, and Razin, 2002).

Transport costs have declined considerably in the past fifty years, but not by as much as during the late nineteenth century, which was also a period of rapid global economic integration. Time series measures of transport costs are difficult to obtain, because no single data set covers all transport costs in a systematic way.[1] The costs of shipping a bushel of wheat from New York to Liverpool declined by about two-thirds between 1854 and 1913, and from New York to Chicago by about three-fourths between 1870 and 1913 (Harley, 1980). The figure shows that sea freight costs have not changed much since 1960, while airfreight costs have been steady since 1980. These trends are broadly consistent with more detailed estimates in Hummels (1999).[2] They are also consistent with Baier and Bergstrand's (2001) finding that the effect of declining transport costs on the growth of industrial country trade between the late 1950s and the late 1980s was only about one-third of the impact of tariff reductions.

Transport Costs
(Constant U.S. dollars; 1950 = 100)



Sources: *Statistical Abstract of the United States; Review of Maritime Transport* (UNCTAD); and IMF staff calculations.
[1]Average ocean freight and port charges per ton of import and export cargo.
[2]Average air transport revenue per passenger mile.

The less rapid decline in transport costs in the recent era reflects three main factors.

- *Innovations in transport technology.* The late nineteenth century saw more dramatic improvements in transport technology, including the introduction of steamships and railroads, as well as the construction of the Suez and Panama Canals. The most important technological breakthroughs of the past fifty years have been the introduction of containers for sea transport in the late 1960s and the introduction of jet engines and large body aircraft for air transport.[3]

Note: The main author of this box is Antonio Spilimbergo.

[1]Estimating transport costs is difficult because transport services are not homogenous and available measures are unreliable. A commonly used method is to calculate transport costs as the difference between the value of f.o.b. exports and the value of c.i.f. imports for pairs of countries. However, the original data sources are unreliable and the composition of trade changes over time, making any cross-time comparison problematic (Hummels, 1999).

[2]However, Hummels (1999) reports increasing sea shipping charges between 1970 and 1985.

[3]The share of U.S. import value transported by air rose from 6.2 percent in 1965 to 24.7 percent in 1998.

- *Competitive environment.* In the late nineteenth century, the disappearance of trading monopolies sharply lowered shipping costs. By contrast, the introduction of containers in the late 1960s raised fixed costs, which increased market concentration, preventing the efficiency gains from being transmitted to users of transport services (Gilman, 1984).[4] Partly in response to this concentration, many developing countries adopted policies to ensure that national flag fleets were granted a large share of shipping, which further stifled competition and increased transport costs, especially for developing countries.
- *Measurement issues.* Comparing the recent decline in transport costs with that in an earlier historical period is complicated by the fact that transport services are not homogenous. Transport services differ along several dimensions, such as speed, reliability, and frequency, and prices are not adjusted for changes in quality. The past fifty years have seen major improvements in quality: Hummels (2000) finds that the decline in shipping time between 1950 and 1998 due to the introduction of air shipping and faster ocean vessels was equivalent to reducing tariffs on manufactured goods from 32 percent to 9 percent. However, because prices are not adjusted for quality, they do not capture this significant improvement in speed.

Notwithstanding the measurement issues, the decline in transport costs—driven by improvements in technology—was likely a more important factor behind the increase in economic integration in the late nineteenth century than globalization in the late twentieth century.

[4]However, the practice of registering ships under flags of convenience reduced shipboard operating costs by 12–27 percent (Hummels, 1999).

For developing countries, an important issue is that the quality of transport infrastructure is a significant determinant of transport costs. Freight costs as a share of import values vary considerably across countries, ranging from about 4.5 percent in industrial countries to 12 percent in Africa (UNCTAD, 2001). These variations in transport costs are mostly due to differences in geography and transport infrastructure. Limão and Venables (2001) find that transport costs in landlocked countries are about 50 percent higher than average. Clark, Dollar, and Micco (2002) find that improving the efficiency of a seaport from below-average to above-average decreases transport costs by more than 12 percent. Low-quality transport infrastructure is especially relevant for poorer countries and substantially limits their trading potential.

Looking forward, the terrorist attacks of September 11, 2001, will likely increase transport costs in the long run. The fact that transport costs remained generally stable in the months after September 11, during a recession and a period of relatively low oil prices (when transport costs usually fall), suggests that underlying transport costs may have increased. Higher transport costs could result, for example, from the need for customs authorities to examine shipping containers on a systematic basis. Costs of security measures could be on the order of 1–3 percent of the value of trade (OECD, 2002). Checking even a small share of containers will imply an explicit cost for governments and a much higher implicit cost for importers and exporters in terms of delays. Hummels (2000) estimates that a one-day delay is equivalent to a loss of 0.8 percent of the value of a manufactured good. In addition, greater uncertainty about delays will force firms to hold higher levels of inventories.

oping regions. The idea is that the difference between actual and expected trade represents a comprehensive measure of artificial barriers to trade, including all aspects of a country's policy and institutional environment, not just trade policies.

The section will then assess the contribution of explicit measures of trade and balance of pay-

ments restrictiveness to the shortfall in trade in developing countries. While such policies are generally thought to have important effects on trade, this analysis is one of the first to explicitly include policy-related variables in the gravity model.[12] Illustrative calculations of the trade impact of reducing policy restrictiveness will be presented. Finally, the section will put the role of policies into perspective by comparing it to other key factors—like economic size, level of economic development, and geography—in determining trading patterns in developing countries. The analysis will focus on assessing the role of policies in explaining why developing countries have lower trade volumes than industrial countries, and why east Asia trades more than other developing regions.

Which Regions Undertrade?

To measure the shortfall in actual trade, a benchmark for expected trade is needed. The gravity model of international trade without explicit policy variables is used to derive measures of the expected volume of trade between trading partners (Box 3.3). Just like the force of gravity between two objects is proportional to their mass and inversely proportional to the distance between them, the gravity model of trade postulates that the magnitude of bilateral trade flows between two countries is positively related to the joint size of the two trading economies and negatively related to the distance between them. Over time, the gravity model of trade has been elaborated to incorporate a wide variety of other factors.

A country is said to "undertrade" if its actual trade across trading partners is, on average, substantially below the level predicted by the gravity model without explicit policy variables. Similarly, a country is said to "overtrade" if its actual bilateral trade is substantially above the average level predicted by the gravity model. As the gravity model accounts for the "natural" causes of trade, under- and overtrading must largely represent above- or below-average "artificial" impediments (Rose, 2002).[13] This approach has the benefit of capturing the overall impact of a country's policy and institutional environment, including a wide variety of artificial impediments and not just trade policies. However, this approach depends on getting the natural causes exactly right—that is, the results are sensitive to the specification of the gravity model.

The analysis of undertrading is based on a conventional gravity model estimated over the period 1995–99, along the lines of Rose (2002). Bilateral merchandise trade data covering 131 industrial and developing countries are taken from the IMF's *Direction of Trade Statistics*. The country coverage reflects the availability of data for the explanatory variables in the gravity model.[14] The data are averaged over 1995–99 to abstract from cyclical developments. The estimated coefficients of the gravity model are similar in sign, magnitude, and statistical significance to the results in the recent literature.

The results suggest that significant undertrading occurs in certain developing country regions, though of course individual countries sometimes diverge from regional averages. Table 3.3 shows the average differences between actual and predicted trade by region, expressed in logarithms following convention.[15] The same rank ordering of regional undertrading is found by Rose (2002). The degree of undertrading is

[12]The trade effects of regional trade agreements have received a lot of scrutiny by, among others, Bayoumi and Eichengreen (1997), Frankel (1997), and Soloaga and Winters (2001).

[13]Leamer (1988), Lee (1993), and Spilimbergo, Londoño, and Székely (1999) also use differences between actual and predicted trade as measures of policy-related distortions.

[14]Much of the dataset was kindly provided by Andrew Rose and is available via the Internet at: http://faculty.haas.berkeley.edu/arose/RecRes.htm.

[15]The degree of over- or undertrading in percentage terms implied by an amount x is given by $100\ (e^x - 1)$. For small magnitudes, the numbers can be interpreted as percentage deviations. For large magnitudes, the approximate correspondence between $100x$ and $100(e^x - 1)$ disappears because the term e^x becomes increasingly nonlinear.

Table 3.3. Undertrading in Developing Countries, 1995–99[1]
(Average difference between actual and predicted trade, in logarithms)

Region	Average Difference Between Actual and Predicted Trade				
			Extraregional trade[3]		
	All trade[2]	Intraregional trade	Total	Developing countries[4]	Industrial countries[4]
Africa, sub-Saharan	0.05	0.50	−0.01	−0.04	0.01
Asia					
East Asia	0.45	0.96	0.42	0.40	0.45
South Asia	−0.44	−0.76	−0.43	−0.46	−0.35
Middle East and North Africa	−0.49	−0.74	−0.48	−0.60	−0.24
Western Hemisphere					
Caribbean and Central America	−0.12	0.82	−0.24	−0.41	−0.09
South America	−0.11	0.44	−0.15	−0.34	0.18

Source: IMF staff estimates.
[1]Based on a gravity equation estimated with data averaged over 1995–99.
[2]All bilateral trade flows involving at least one country from this region.
[3]Bilateral trade with other developing and industrial countries.
[4]Extraregional trade flows involving other developing countries or industrial countries.

large in the Middle East and North Africa, in line with the results of Al-Atrash and Yousef (2000), and south Asia, though this assessment does not take account of trade in services, which have grown especially rapidly in that region. The degree of undertrading is smaller in the Western Hemisphere. Countries in sub-Saharan Africa trade slightly more than predicted, consistent with Foroutan and Pritchett (1993), Rodrik (1998), and Coe and Hoffmaister (1999). Countries in east Asia are strong traders relative to other developing countries.

Undertrading is generally less pervasive in intraregional than in extraregional trade. This result is not obvious, because geographical factors that tend to boost intraregional trade are already taken into account in the gravity model. One possible reason for this finding is regional preferential trading arrangements, such as MERCOSUR. If dummy variables representing regional preferential trade agreements are included in the gravity model, the extent of intraregional overtrading in the Western Hemisphere is noticeably reduced, though intraregional overtrading in other regions is not affected much. Also, extraregional over- or undertrading remains roughly unchanged, suggesting that regional trade agreements do not divert trade in developing country regions.[16]

Over the past twenty years, the degrees of regional undertrading have changed, reflecting developments in artificial barriers to trade (Table 3.4). Two regions became relatively weaker traders: sub-Saharan Africa and—especially—the Middle East and North Africa, which went from slight overtrading to large undertrading. The weakening of sub-Saharan Africa's trade performance (which is only partly related to a secular decline in non-oil commodity prices) is consistent with the concerns noted in the May 2001 *World Economic Outlook* about the marginalization of this region within the world trading system. The other regions—east Asia, south Asia, South America, and especially the Caribbean and central America—became relatively stronger traders. Changes in regional preferential trade agreements cannot account for changes in intraregional overtrading during the

[16]Soloaga and Winters (2001) also find that intraregional trade effects are only significant in Latin American countries (they do not include Caribbean countries) and that evidence of trade diversion due to regional trade agreements is only conclusive in the case of the European Union and the European Free Trade Area (EFTA). Egoumé-Bossogo and Mendis (2002) also find positive intra-Caribbean trade effects.

Table 3.4. Changes in Undertrading Over Time[1]
(Average difference between actual and predicted trade, in logarithms)

	Average Difference Between Actual and Predicted[2]				
Region	1980–84	1985–89	1990–94	1995–99	Change from 1980–84 to 1995–99
Africa, sub-Saharan	0.29	0.32	0.25	0.05	–0.24
Asia					
East Asia	0.27	0.19	0.28	0.45	0.18
South Asia	–0.68	–0.54	–0.65	–0.44	0.24
Middle East and North Africa	0.08	–0.19	–0.29	–0.49	–0.57
Western Hemisphere					
Caribbean and Central America	–0.49	–0.40	–0.30	–0.12	0.37
South America	–0.30	–0.26	–0.17	–0.11	0.19

Source: IMF staff estimates.
[1]Based on a gravity equation estimated with data averaged over the period indicated in the table.
[2]All bilateral trade flows involving at least one country from this region.

1980s and 1990s, except in South America where MERCOSUR led to an increase in intrabloc trade during the 1990s.[17]

In summary, the analysis suggests that undertrading remains a serious problem in many developing countries, especially in the Middle East and North Africa, and south Asia. Undertrading reflects above-average artificial barriers to trade in all aspects of a country's policy and institutional environment.

What Is the Impact of Trade and Balance of Payments Restrictions?

While undertrading is a measure of overall artificial barriers to trade, it is not directly connected to any specific policies. As a result, this measure cannot be used to assess the impact of trade or balance of payments liberalization on trade flows. To answer this type of question, the gravity model was reestimated over 1995–99 with two measures of policy restrictiveness as explanatory variables: (1) the IMF's index of overall trade regime restrictiveness, which is based on average import tariffs and nontariff barriers (IMF, 1998); and (2) an index of balance of payments restrictiveness, which ranks the overall restrictiveness of current and capital account restrictions (Mody and Murshid, 2002).[18]

Both indices suggest that trade and balance of payments policies are generally less restrictive in sub-Saharan Africa, east Asia, and the Western Hemisphere than in other developing country regions, though there are important measurement problems (Table 3.5).[19] In other words, the marginalization of sub-Saharan Africa within the global trading system noted above is not primarily due to measured trade and balance of payments restrictiveness, but rather to other aspects of the region's policy and institutional environment. Similarly, measured trade and balance of payments restrictions are relatively small

[17]Soloaga and Winters (2001) report similar results. From a longer-term historical perspective, the effects of regional preferential trading agreements on intra- and extraregional trade depend on the particular agreement (see, for example, Frankel, 1997).

[18]To characterize bilateral restrictiveness, the indices for each country in a bilateral relationship were summed. The main results are robust to multiplicative or maximum operator-based specifications.

[19]Unweighted average tariff rates are problematic because similar rates can have different economic effects if applied to different commodities. Nontariff barriers are notoriously difficult to measure and their effects depend on other distortions. Moreover, many measures are based on information about whether some regulations are in place rather than on information about their actual enforcement. Also, the difficulties are amplified in the case of bilateral trade flows because the effects of the same policy intervention in one country can differ across trade relations with partner countries. For surveys of measures of trade policy and their shortcomings, see Rodriguez and Rodrik (2000) and Berg and Krueger (2002).

Table 3.5. Bilateral Policy Restrictiveness in Developing Countries, 1997–99[1]

(Deviations from unweighted average of all countries)

Region	Trade Policy Restrictiveness[2]		Balance of Payments Restrictiveness[3]	
	All trade	Intraregional trade	All trade	Intraregional trade
Africa, sub-Saharan	0.21	1.52	0.51	2.00
Asia				
East Asia	–0.32	0.37	0.51	1.70
South Asia	2.95	5.07	1.62	3.18
Middle East and North Africa	3.19	6.76	0.70	1.59
Western Hemisphere				
Caribbean and Central America	–0.46	–0.09	–0.66	–0.29
South America	–0.93	–1.48	–0.04	–0.13
Memorandum:				
North-North trade	—	–1.78	—	–2.65
North-South trade	–0.53	—	–0.82	—
South-South trade	—	0.87	—	1.33

Source: IMF staff calculations.

[1]Indices are averaged over 1997–99. Scale varies by index so that only rank comparisons across indices are possible. The indices are averages over bilateral trade relations indices and were constructed under the assumption of additivity.

[2]Index ranging from 2 to 20, based on average tariff rates and nontariff barriers. See IMF (1998).

[3]Index ranging from zero to eight, based on a country's current and financial account openness, the existence of multiple exchange rates for financial account transactions, and the stringency of surrender and repatriation requirements. See Mody and Murshid (2002).

Table 3.6. Gravity Model Estimates[1]

	Without Policy Variables	With Policy Variables
Product of trading partners' GDP[2]	0.91**	0.94**
Product of trading partners' per capita income[2]	0.27**	0.19**
Distance[2]	–1.15**	–1.17**
Number of landlocked countries[3]	–0.34**	–0.41**
Adjacent land border[4]	0.75**	0.70**
Number of islands[3]	0.03	0.06
Product of trading partners' land surface areas[2]	–0.09**	–0.09**
Common language[4]	0.46**	0.45**
Common colonizer[4]	0.69**	0.71**
Past or present colonial relation[4]	1.06**	1.04**
Strict currency union between trading partners[4]	1.23**	1.32**
Trade policy restrictiveness[5]		–0.05**
Balance of payments restrictiveness[6]		–0.05**
Adjusted R^2	0.799	0.803
Number of observations	4,815	4,815

Source: IMF staff calculations.

[1]Estimated with data averaged over 1995–99. Dependent variable: log of bilateral trade volume. One asterisk indicates significance at the 5 percent level; two asterisks, at the 1 percent level. Significance levels based on standard errors that are robust to heteroscedasticity.

[2]Variable in logs.

[3]In bilateral trade relationship.

[4]Dummy variable.

[5]Index ranging from 2 to 20, based on average tariff rates and nontariff barriers. See IMF (1998).

[6]Index ranging from zero to eight, based on a country's current and financial account openness, the existence of multiple exchange rates for financial account transactions, and the stringency of surrender and repatriation requirements. See Mody and Murshid (2002).

in the Western Hemisphere, although the region's undertrading suggests that overall artificial barriers to trade are higher than average.

The two policy variables have significantly negative effects on bilateral trade flows (Table 3.6). The magnitudes of the coefficients measure the effects on trade of changes in policy restrictiveness: one-point increases in both trade and balance of payments restrictiveness reduce trade volumes by about 5 percent. The coefficients on the other variables are generally similar to those obtained for the gravity model without explicit policy measures, and remain comparable in sign, magnitude, and statistical significance to the results reported in the recent literature. Interestingly, the coefficient on the product of per capita incomes becomes somewhat smaller once the policy variables are included, indicating that policy restrictiveness is inversely related to the level of economic development. In other words, trade and balance of payments policies tend to be more restrictive in poorer countries, which presumably reflects in part the adverse effect of policy restrictiveness on growth.

A striking result is that balance of payments restrictiveness has a significant and large adverse effect on trade, consistent with the idea that *financial* frictions can help to explain the segmentation of global *goods* markets. This idea parallels the view that *trade* frictions are a factor behind the segmentation of international *financial* markets (Obstfeld and Rogoff, 2000a). There is a growing literature on the role of international financial frictions in dampening trade. Tamirisa (1999) finds that exchange and financial controls represent a significant barrier to

Box 3.3. Gravity Model of International Trade

The gravity model has been widely used in empirical trade research during the past four decades. Borrowing from Newtonian physics, the model consists of a single equation postulating that the amount of trade between two countries depends positively on economic mass and negatively on resistance. The key mass variables are the combined size of the trading economies and their combined level of economic development. Including both income and income per capita implies that population is included, which takes account of the empirical regularity that larger countries trade less as a share of income.

Combined size, which is usually measured as the product of gross domestic products, matters for the simple reason that international trade—like virtually any other economic activity—generally increases with the overall size of the economy. The combined level of development, which is usually measured as the product of incomes per capita, is included because bilateral trade tends to rise more than proportionally as economies get richer (see Frankel, 1997; and Boisso and Ferrantino, 1997). In particular, the demand for variety—goods that differ slightly in design, materials, or technology—increases with income, which leads to two-way or intra-industry trade in similar goods because the production of differentiated goods remains specialized, reflecting increasing returns to scale (see Helpman and Krugman, 1985).[1]

The main resistance factor in the gravity model is transport costs, which are usually proxied by geographical variables, for reasons discussed in Box 3.2. The primary geographical variable is the absolute distance between the two trading countries, with closely located country-pairs generally trading more than country-pairs that are far apart.[2] Recently, some theoretical models of trade have suggested that relative distance (i.e., the distance between two trading partners relative to the distances between them and other trading partners) matters more than absolute distance (e.g., Anderson and van Wincoop, 2001).[3] In line with this insight, some recent empirical studies have included relative distance instead of absolute distance, or added a measure of remoteness like the average distance of each trading partner (see Frankel and Wei; 1998, Soloaga and Winters, 2001; and Mélitz, 2001). The empirical results presented in the main text of this chapter are robust to including remoteness or replacing absolute distance with relative distance.

Other proxies for transport costs are the number of landlocked countries in a bilateral trade relationship, the surface areas in both economies (both associated with higher transport costs), and the existence of adjacent land borders (which lowers transport costs). In particular, being landlocked is associated with large negative trade effects.[4] Historical and cultural similarities, including colonial links and common language, tend to reduce cross-border search and communications costs because of familiarity with customs, institutions, and legal systems, thus facilitating trade.

Besides the "natural" frictions, there are artificial—especially policy-related—frictions. Most obvious among these are trade policies, including tariffs, quotas, and regional preferential trade agreements. Other important policy barriers are exchange and capital controls, which affect trade through a variety of channels, including the

Note: The main author of this box is Thomas Helbling.

[1]There is still a vigorous debate about the relative roles of intra-industry trade and trade based on factor endowments (see, for example, Davis and Weinstein, 2001).

[2]The adverse effect of distance on trade flows is consistent with the idea that countries in close proximity are natural trading partners (see Krugman, 1991). However, the case for the natural trading partner hypothesis may be weaker when other considerations are taken into account (Panagariya, 2000).

[3]This is related to the more general issue about how to properly account for third-country effects in the gravity model.

[4]Limão and Venables (2001) find that the median landlocked economy in their sample faces 42 percent higher transport costs than the median coastal economy, and external trade of the former is only about one-third of the latter.

domestic price of imports and transaction costs. While such policies are generally thought to have important effects on trade, the analysis presented in this chapter is one of the first to explicitly include policy-related variables in the gravity model (see also Tamirisa, 1999; and Estevadeordal, Frantz, and Taylor, 2002).[5] The results suggest that trade and balance of payments restrictiveness have negative, large, and significant effects on bilateral trade flows.

The gravity model has proven to be highly successful in explaining bilateral trade flows and has provided "some of the clearest and most robust empirical findings in economics" (Leamer and Levinsohn, 1995). Its popularity has been enhanced by research showing that the gravity equation can be derived from some simple theoretical models of trade (see Anderson, 1979, and Deardorff, 1998). Nevertheless, as with any econometric analysis, the gravity model has some limitations. Most important, the gravity model has the standard econometric problems of endogeneity and multicollinearity, although their effects on the magnitudes and significance of the estimated coefficients tend to be small, as demonstrated by Frankel (1997) or Rose (2000, 2002). In addition, the gravity model is better suited to cross-sectional applications, like the one in this chapter, because it omits relative prices, factor endowments, and the structure of production, which are important in explaining changes in trade patterns over time.[6]

[5]An important general exception concerns the trade effects of regional trade agreements. See Bayoumi and Eichengreen (1997), Frankel (1997), and Soloaga and Winters (2001).

[6]Not only do some coefficients change over time, but the direction of change is sometimes difficult to interpret. For example, many studies have found that the adverse effect of distance on bilateral trade flows has either remained roughly constant or increased over time, in contrast to the frequently voiced optimism about the "death of distance" in a globalized world (Leamer and Levinsohn, 1995; Frankel, 1997; and Boisso and Ferrantino, 1997). Recently, Coe and others (forthcoming) have found some evidence of the death of distance.

trade. Rose (2000) shows that belonging to a currency union more than triples a country's trade with the other members of the union, with no evidence of trade diversion.[20] Rose and Spiegel (2002) find that sovereign defaults also tend to have adverse trade effects.[21]

Multilateral liberalization of trade and balance of payments restrictiveness would have large effects on trade. Table 3.7 presents illustrative calculations of the impact of policy liberalizations in industrial countries, developing countries, and all countries, respectively.[22] If industrial countries reduced their trade restrictiveness to the lowest possible level, trade between industrial and developing countries (North-South trade) would increase by about 14 percent. The trade effects of balance of payments liberalization are generally smaller, given the already low levels of restrictiveness in industrial countries. The full liberalization of both trade and balance of payments policies in all countries would increase trade between industrial countries

[20]In subsequent research based on pooled time series data, Rose found somewhat smaller but still large effects of currency unions on trade (see Glick and Rose, 2001; and Rose, 2002).

[21]Their results indicate that Paris Club debt renegotiations (a proxy for sovereign default) are associated with a decline in bilateral trade between a debtor and its creditors of about 8 percent a year for a period of about 15 years, after controlling for a host of factors that influence bilateral trade flows.

[22]These calculations capture only first-round effects; second-round income and price effects resulting from trade liberalization are likely to be large. However, the effects are overstated as the positive effects of regional preferential trading arrangements would likely disappear. Also, the results are sensitive to the assumption of additivity in the construction of bilateral restrictiveness.

Table 3.7. Trade Effects of Policy Liberalization[1]
(Reduction in points; trade effects in percent of preliberalization potential trade)

Region	Trade Policy[2]		Balance of Payments Policy[3]		Both Policies
	Liberalization[4]	Trade effect	Liberalization[4]	Trade effect	Trade effects
			Liberalization in industrial countries only		
North-North trade	−5.3	30.5	−1.5	7.3	40.0
North-South trade	−2.7	14.4	−0.6	3.1	17.9
			Liberalization in developing countries only		
North-South trade	−3.9	21.4	−2.7	13.7	38.0
South-South trade	−8.0	49.0	−5.4	29.9	93.6
			Liberalization in all countries		
North-North trade	−5.3	30.5	−1.5	7.3	40.0
North-South trade	−6.5	38.9	−3.3	17.2	62.8
South-South trade	−8.0	49.0	−5.4	29.9	93.6

Source: IMF staff calculations based on gravity model estimates shown in Table 3.5.
[1]Effects of reduction in indicators to lowest possible rank scale. Trade effects are given by the coefficient and the reduction in the indicator. The indicators are averages over bilateral trade relations for the period 1997–99 and were constructed under the assumption of additivity.
[2]Indicator variable ranging from 2 to 20, based on restrictiveness indicated by the average tariff rate and the coverage of nontariff barriers.
[3]Dummy variable ranging from 0 to 8 indicating the degree of openness of a country's current account, capital account, the existence of multiple exchange rates for capital account transactions, and the stringency of surrender and repatriation requirements.
[4]Reduction in average rank index value implied by liberalization.

(North-North trade) by about 40 percent, North-South trade by about 63 percent, and trade between developing countries (South-South trade) by about 94 percent.

How Important Is Policy Relative to Other Factors in Explaining Trade?

To put the role of policies into perspective, this subsection compares the effects of trade and balance of payments restrictiveness on trade with those of other key factors, including economic size, level of economic development, and geography. For this comparison, North-North trade is taken as a benchmark, because industrial countries generally have less restrictive policies, especially for manufactured goods, which account for the bulk of trade between industrial countries.[23] This analysis is based on the gravity model that includes policy variables.

The most important reason why the absolute level of trade between industrial countries is much larger than trade between developing countries is that average industrial country GDP is twice as large as average developing country GDP. Using the coefficients from the gravity model, differences in economic size account for 80 percent of the difference in average bilateral trade flows. As economic size has such an overwhelming impact on bilateral trade flows, the results below are adjusted for economic size. Even after this adjustment, bilateral trade flows involving developing countries are smaller than those among industrial countries.

Overall, the results suggest that trade and balance of payments restrictiveness play a significant role in explaining why developing countries trade less per unit of GDP than industrial countries, though economic development and geography are even more important (Figure 3.4). Lower income per capita is the single most important reason why adjusted South-South trade is smaller than adjusted North-North trade, and accounts for about one-fifth of the difference between adjusted North-South trade and adjusted North-North trade. Differences in income per capita matter a lot for trade because richer consumers tend to have a higher demand

[23]However, industrial countries have generally higher trade barriers vis-à-vis developing countries, even for manufactured goods (see IMF, 2001).

for product variety, while the production of differentiated goods remains specialized, leading to intra-industry trade. Geography, especially distance, is the single most important impediment to North-South trade, and accounts for two-fifths of the shortfall in South-South trade.

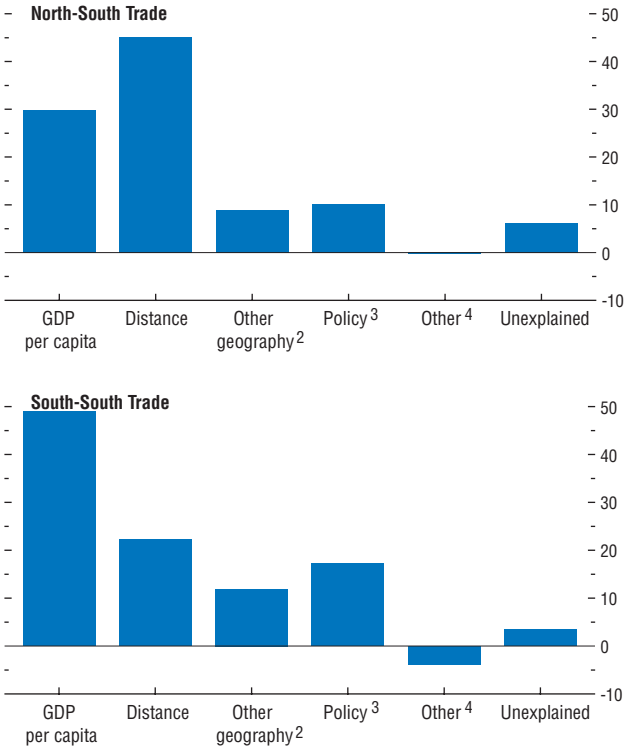
More restrictive trade and balance of payments policies account for about 10–20 percent of the shortfall in adjusted bilateral trade flows. Restrictive policies hurt South-South trade more than North-South trade because developing countries have on average greater restrictions than industrial countries, so their adverse effect is doubled as both trading partners have higher restrictions. Other determinants, like linguistic or historical factors, are much less important because the differences between industrial and developing countries are on average small. Finally, unexplained differences account for only a small part of the shortfall in trading involving developing countries.

The gravity model is less successful at explaining why developing countries in east Asia trade more per unit of GDP than countries in other regions (Figure 3.5). In contrast to the results discussed above, unexplained differences account for much of the excess in east Asia's trade relative to other developing country regions. In terms of the explained differences, east Asian countries have on average higher income per capita and less restrictive policies (both of which tend to increase trade) but are relatively distant from their trading partners (which tends to reduce trade).

The large unexplained difference between trade volumes in east Asia and other developing country regions may be related to increasing vertical specialization in global production (Box 3.4). In recent years, the further slicing up of the production chain has accompanied the substantial expansion of trade. With the expansion of international vertical specialization, trade flows per unit of GDP rise even when all other factors remain unchanged. Indeed, the contribution of increased intra-industry trade to total trade growth, which partly reflects greater vertical specialization, has been higher in east Asia

Figure 3.4. Why Do Developing Countries Trade Less Than Industrial Countries?[1]
(Percent)

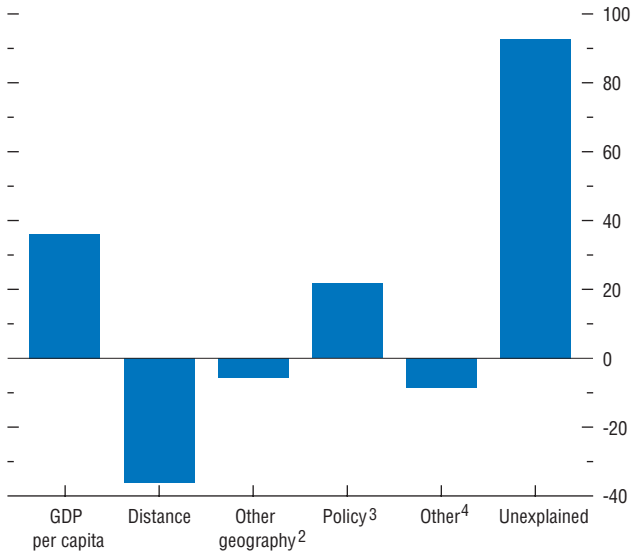
Trade and balance of payments restrictiveness are significant in explaining why trade per unit of GDP is smaller in developing countries than in industrial countries, but economic development and geography are even more important.



Source: IMF staff calculations.
[1]Contribution to explaining shortfall in North-South trade and in South-South trade, relative to North-North trade, after taking account of economic size.
[2]Other geographical factors include land-locked status, common land, border, and island status.
[3]Policy factors include overall balance of payments restrictions, trade policy restrictiveness, and currency union.
[4]Other factors include former colony, common language, and common colonizer.

Figure 3.5. Why Does East Asia Trade More Than Other Developing Regions?[1]
(Percent)

Developing countries in east Asia trade more per unit of GDP than countries in other regions, partly because of higher income per capita and less restrictive policies, but most of the difference is not explained.



Source: IMF staff calculations.
[1]Contribution to explaining why east Asia trades more than other developing regions, after taking account of economic size.
[2]Other geographical factors include land-locked status, common land, border, and island status.
[3]Policy factors include overall balance of payments restrictions, trade policy restrictiveness, and currency union.
[4]Other factors include former colony, common language, and common colonizer.

Table 3.8. Intra-industry Trade[1]
(Percent)

Region	Shares of Total Trade Growth due to Intra-industry Trade Growth		
	1986–90	1991–95	1996–2000
Africa, sub-Saharan	30.0	30.5	13.0
Asia			
East Asia	42.5	46.9	75.0
South Asia	31.2	21.8	34.4
Middle East and North Africa	6.4	5.8	26.1
Western Hemisphere			
Caribbean and Central America	25.9	39.3	34.5
South America	4.6	32.1	34.0

Source: IMF staff calculations based on data from the United Nations Comtrade database.
[1]Average contribution of intra-industry trade growth to total trade growth over five-year periods (at SITC 2-digit level). The methodology is based on Menon and Dixon (1996).

than in other developing country regions (Table 3.8). Also, in the gravity model, the difference between actual and expected trade in east Asia falls once the share of intra-industry trade is taken into account.[24] Thus far, trade flows between industrial countries, and flows with and among east Asian economies, have been most affected by outsourcing, but it is increasingly assuming a global dimension.

The increasing role of vertical specialization in east Asia is consistent with the region's focus on labor-intensive production. Figure 3.6 shows the factor composition of net exports—that is, the embodiment of capital, labor, land, natural resources, and technology—across developing country regions.[25] East Asia is a net exporter of labor-intensive manufactures; sub-Saharan Africa and Latin America are net exporters of agricultural products; and sub-Saharan Africa, Latin

[24]However, more generally, specialization in specific primary commodity products does not help explain over- or undertrading, except for fuel exports. Adding a dummy variable for the fuel exporters reduces undertrading for trade between oil exporters, which affects undertrading for countries in the Middle East and North Africa.
[25]The commodity classification in Figure 3.6 closely follows Leamer (1984). The main difference is that leather manufactures and textile yarns and fabrics were included in the category of labor-intensive products.

America, and the Middle East and North Africa are net exporters of raw materials and fuels. While the share of manufactured goods in total trade has increased over time in many developing countries, the most significant change in the pattern of factor specialization has occurred in east Asia, where net exports of labor-intensive manufacturing products have increased while net exports of agricultural products and raw materials have fallen.

The analysis of developing countries' trading patterns suggests three main points.

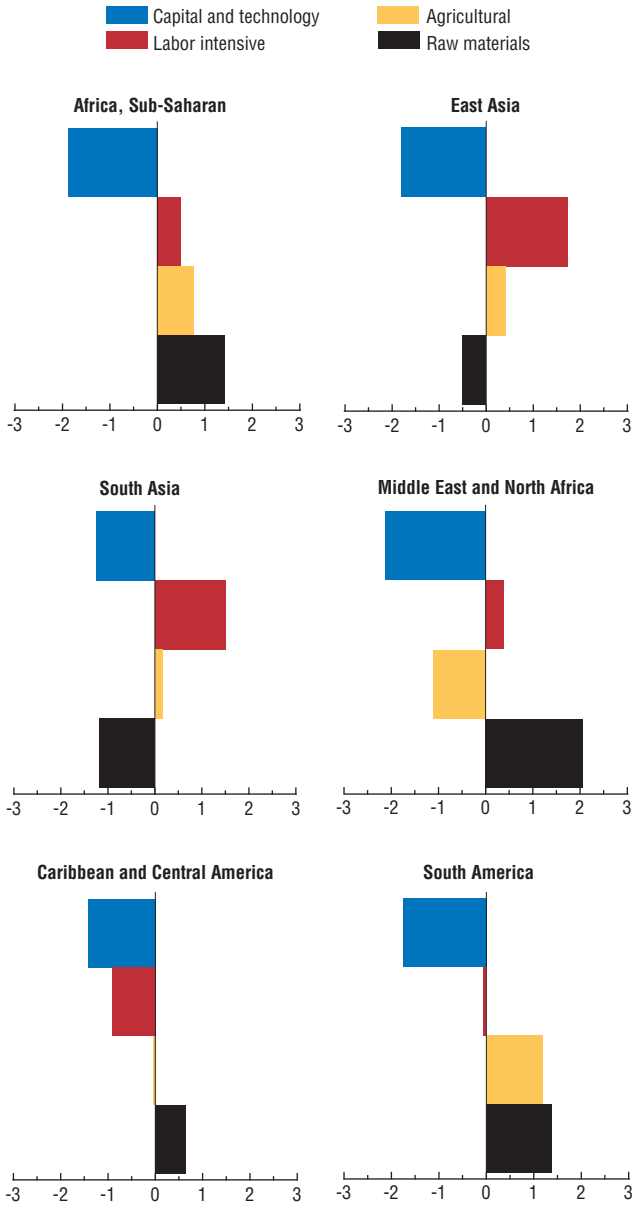
- Undertrading, which reflects the overall impact of artificial barriers to trade in a country's policy and institutional environment, remains a serious problem in many developing countries, especially in the Middle East and North Africa, and south Asia.
- Trade and balance of payments restrictiveness are important reasons why developing countries trade less than industrial countries, though economic development and geography matter even more.
- International vertical specialization has played a growing role in east Asia, where less restrictive trade policies helped create a favorable environment. Vertical specialization is likely to become increasingly important for other developing countries with open trading regimes, abundant labor, and flexible economies.

Consequences of Trade and Financial Integration for Macroeconomic Volatility

This section examines how the interaction between trade and financial integration affects macroeconomic volatility. Volatility is undesirable not only in itself, but also because it is strongly and negatively correlated with output growth (Ramey and Ramey, 1995). Trade and financial integration by themselves each tend to increase an economy's exposure to external shocks: trade openness is on the whole associated with somewhat higher output volatility, while financial openness is related to higher volatility of capital flows, especially short-term

Figure 3.6. Factor Content of Net Exports, 1991–2000
(Ratio of GDP; logarithmic scale; 10-year averages)

In line with the increasing role of vertical specialization in the region, east Asia is a large net exporter of labor-intensive manufactures while most other developing country regions continue to export mainly agricultural products or raw materials.



Source: IMF staff calculations following Leamer (1984), based on United Nations, Comtrade data.

Box 3.4. Vertical Specialization in the Global Economy

The growth of world trade has been accompanied by international vertical specialization. Vertical specialization refers to the slicing up of the production process into distinct steps, allowing specialization across locations (locational decentralization) and firms (outsourcing). Historically, international vertical specialization can be traced to the mid-1960s, when electronics components began to be assembled in Hong Kong SAR, Thailand, Malaysia, and Singapore, and apparel and leather goods in the Dominican Republic and the Philippines. Thus, international specialization has become two-dimensional, with countries specializing both vertically in certain stages of the production processes and horizontally in the production of some categories of final goods.

Rising vertical specialization implies an increasing ratio of international trade to value added, as parts and components are shipped back and forth across national borders for further processing along the production chain. The table shows that the ratio of merchandise trade to merchandise value-added rose sharply between 1980 and 2000 in both industrial countries and emerging market economies, especially in Asia and Mexico. While the increase in the trade-to-value added ratio could also be due to greater trade in final goods, other empirical evidence confirms the growing role of international vertical specialization in international trade.[1] Hummels, Ishii, and Yi (2001) find that increased vertical specialization accounted for one-third of world trade growth between 1970 and 1990, after taking account of inter- and intra-industry linkages.[2] Yeats (2001) finds that the share of components and parts in trade in machinery and transportation equipment among industrial countries rose from 26 percent in 1978 to 30 percent in 1995. Asian exports and imports of components and parts grew even faster than those of most industrial countries between the mid-1980s and the mid-1990s (Ng and Yeats, 1999).

What are the implications of vertical specialization? First, increasing vertical specialization tends to accelerate the global propagation of shocks, as industry-specific shocks are immediately transmitted to countries along the production chain. By contrast, with horizontal specialization, industry-specific shocks tend to initially affect a more limited number of countries. The rising sensitivity of east Asian economies to cyclical

Ratio of Merchandise Trade to Merchandise Value-Added[1]
(Percent)

Country	1980	1990	2000
Major industrial economies	46.2	51.6	76.3
Canada	63.7	70.6	108.8
France	50.6	62.0	90.0
Germany	52.0	63.7	96.7
Italy	45.7	46.9	76.7
Japan	28.7	20.6	24.2
United Kingdom	52.0	62.4	83.5
United States	30.9	35.1	54.6
Emerging market economies			
Asia	93.8	115.6	168.5
China	12.1	23.7	32.9
India	11.3	12.4	21.6
Newly industrialized economies[2]	216.5	259.3	365.5
Other[3]	39.4	52.4	84.3
Western Hemisphere	37.2	42.6	58.6
Argentina	25.3	13.2	29.7
Brazil	19.4	14.6	34.1
Chile	42.8	55.8	60.9
Mexico	22.8	48.3	102.6
Other[4]	44.4	52.3	63.0

Sources: World Bank, 2002; and U.S. Council of Economic Advisers.

[1]This table is an update and extension of Table 2 in Feenstra (1998). Averages are unweighted.

[2]Hong Kong SAR, Korea, Singapore, and Taiwan Province of China.

[3]Bangladesh, Indonesia, Malaysia, Pakistan, the Philippines, and Thailand.

[4]Bolivia, Colombia, Costa Rica, Panama, Paraguay, Uruguay, and Venezuela.

Note: The main author of this box is Thomas Helbling.

[1]It is often difficult to distinguish between final and intermediate goods in trade data, partly because the distinction sometimes depends on circumstances.

[2]Using a similar methodology, Campa and Goldberg (1997) find that the share of imported intermediate inputs in total manufacturing production increased by about one-fourth in Canada and doubled in the United States between 1974 and 1993.

developments in the global information technology industry was discussed in Chapter III of the October 2001 *World Economic Outlook*. Second, vertical specialization allows countries to specialize in the stages of production that best fit their relative factor endowments. Specifically, labor-abundant developing countries can increase their role in global manufacturing by specializing in the production of labor-intensive parts and components or labor-intensive assembly processes. Vertical specialization also likely facilitates the convergence of wages for similar types of labor and other factor prices across countries. Finally, vertical specialization underlines the importance of reducing trade barriers further, as the back-and-forth shipping of goods across borders compounds the effects of even relatively low trade barriers.

Vertical specialization is driven by three main factors.

- *Improving service links.* Service links between production locations or producers, including activities like transport, telecommunication, insurance, coordination, and supervision, are critical to the success of vertical specialization. Innovations in transport and communications technology, as well as the deregulation of service provision, have made service links more reliable and less costly (Jones and Kierzkowski, 2001). Economic growth has also helped, as greater demand offsets the fixed set-up costs of services links between locations.
- *Increased customization.* Technological change has increased the scope for the inexpensive customization of generally standardized components and parts, allowing the exploitation of increasing returns to scale in the production of parts and components.[3] The greater attractiveness of outsourcing relative to small-scale in-house production has led to the "commoditization" of some manufactures, especially parts and components for electronics and information technology goods (e.g., memory chips and disk drives).
- *Falling trade barriers.* With back-and-forth shipping across borders, the effects of trade barriers are compounded, so reductions in trade barriers have a more than proportional positive impact on vertical specialization. It is not surprising that vertical specialization has sometimes occurred in the context of special tariff or quota provisions for offshore assembly or regional preferential trade agreements.[4]

Looking forward, vertical specialization is likely to become even more important. The negative impact of the September 11, 2001, terrorist attacks on transport costs (Box 3.2) will probably be more than offset by further innovations in telecommunications technology (which will strengthen services links), expansion of inexpensive customization (especially in the electronics and information technology industries), and trade liberalization (which will reduce the adverse effects of trade barriers more than proportionately). Vertical specialization has so far mostly affected trade in industrial countries, east Asia, and the Caribbean and Central America, but it is increasingly assuming a global dimension.

[3]See Grossman and Helpman (2002) for a discussion of customization and outsourcing.

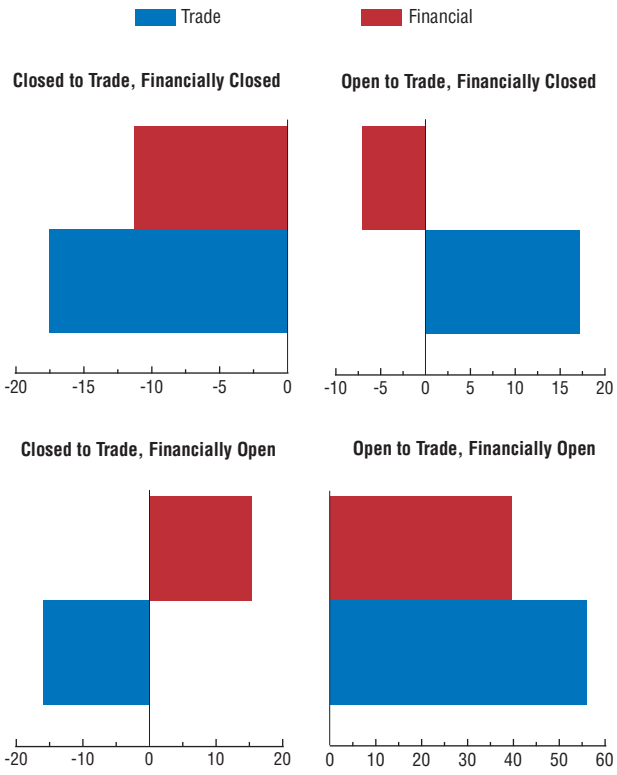
[4]See Graziani (2001) on tariff and quota provisions in the context of offshore assembly of textiles and clothing.

flows. But how does *trade* integration affect *financial* vulnerability, and *financial* integration affect *output* volatility? The first part of the section addresses the impact of trade integration on the frequency of external financial crises, and the second part considers the effect of financial integration on output volatility.

The analysis in this section distinguishes between developing countries that are more and less integrated into the world economy. Along both trade and financial dimensions, developing countries are split into two groups, depending on whether a country's openness is above or below the median. Figure 3.7 shows the average

Figure 3.7. Trade and Financial Openness Across Developing Countries, 1995–99[1]
(Deviation from the median, percentage points)

While countries generally tend to be either closed or open on both dimensions, there are also cases in which trade and financial integration diverge.



Source: IMF staff calculations.
[1]A country is defined as open if its degree of openness is greater than that of the median country. Average degrees of trade and financial openness in each group are expressed in terms of deviations from the median.

level of trade and financial openness (to foreign direct investment and portfolio investment) relative to the median country in each of the four groups, averaged over the last five years (see Appendix 3.1 for details). Across developing country regions, sub-Saharan Africa and east Asia have the highest proportions of countries that are open to trade, whereas south Asia and South America have the lowest proportions (Figure 3.8). By contrast, the Western Hemisphere has the highest proportion of countries that are financially open, while south Asia has the lowest proportion. The Western Hemisphere is the only region where the proportion of countries that are financially open substantially exceeds the proportion that are open to trade.

While the analysis below is based on simple measures of openness, the results are robust to more sophisticated measures and approaches. Specifically, similar results are obtained if trade integration is defined as the *change* in openness, or if openness is *adjusted* for economic size and level of economic development (larger countries tend to be more closed and richer ones tend to be more open, other things being equal). The effects of trade and financial openness on macroeconomic volatility also remain significant after taking into account other determinants using more sophisticated econometric frameworks.

This section complements the extensive twin literatures on the impact of trade and financial integration on economic growth. The evidence that increasing trade integration has a positive impact on growth is strong (Box 3.5). Trade can foster growth through a variety of channels, including improving the allocation of resources across countries, spreading innovation and technology, reducing rent seeking, and promoting progrowth policy reforms. Similarly, increasing financial integration can support growth by raising domestic investment, creating spillovers through technological transfer, and deepening domestic financial markets, as discussed in Chapter IV of the October 2001 *World Economic Outlook*. However, in the context of inconsistent

macroeconomic policies and a weak domestic financial system, increasing financial integration can also lead to excessive and inefficiently allocated financial inflows, possibly resulting in a financial crisis.

A full assessment of the optimal speed and sequencing of trade and capital account liberalization would cover not only the issues discussed in this section and growth effects, but also other structural and institutional reforms.[26] While such an assessment is clearly beyond the scope of this section, the results presented here are consistent with the idea that trade liberalization is essential to reap the full benefits of capital account liberalization. Trade liberalization may lag behind for several reasons: domestic lobbies succeed in impeding reform more than anticipated, returns on investments prove lower than expected due to changing domestic and external factors, and weaknesses exist in the policymaking and institutional environment.

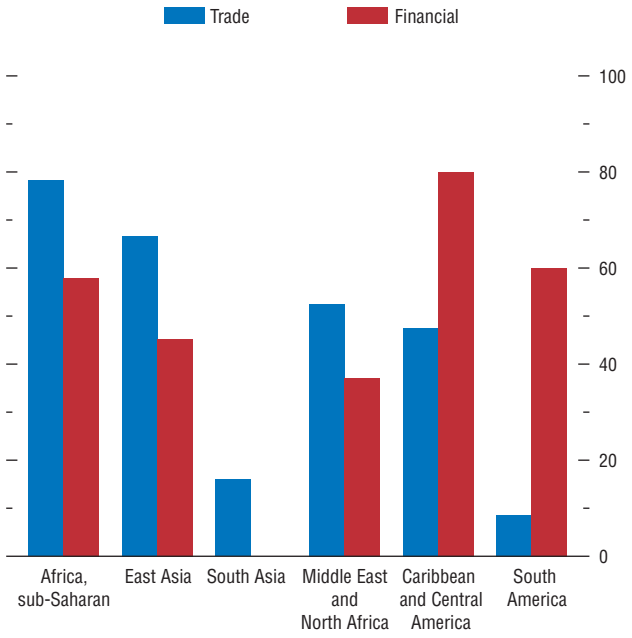
Trade Integration and Vulnerability to Financial Crises

What is the impact of greater trade integration on a country's vulnerability to external financial crises? Two types of external financial crises are considered: debt defaults and currency crashes. A debt default is defined as occurring if there are external arrears to commercial creditors of more than 5 percent of total commercial debt outstanding or if there is a rescheduling or restructuring agreement with commercial creditors, based on Detragiache and Spilimbergo (2001). A currency crisis is defined as an exchange rate depreciation vis-à-vis the U.S. dollar of at least 25 percent and at least double the rate of depreciation in the previous year, as long as the latter is less than 40 percent—to exclude hyperinflationary episodes (Milesi-Ferretti and Razin, 1998).

[26]For discussions of the sequencing of economic liberalization in developing countries, see McKinnon (1973, 1993), Brecher and Diaz-Alejandro (1977), Brecher (1983), Edwards (1984, 2001), Hanson (1995), and Arteta, Eichengreen, and Wyplosz (2001).

Figure 3.8. Trade and Financial Integration Across Developing Regions, 1975–99[1]
(Share of open economies; percent)

The Western Hemisphere region is the only one where a greater proportion of countries are open to finance than to trade. This is especially true in South America.



Source: IMF staff calculations.
[1]The average share of countries in each region that are open to trade or financial flows. In each year, a country is classified as open if its degree of integration is greater than the median.

Box 3.5. Trade and Growth

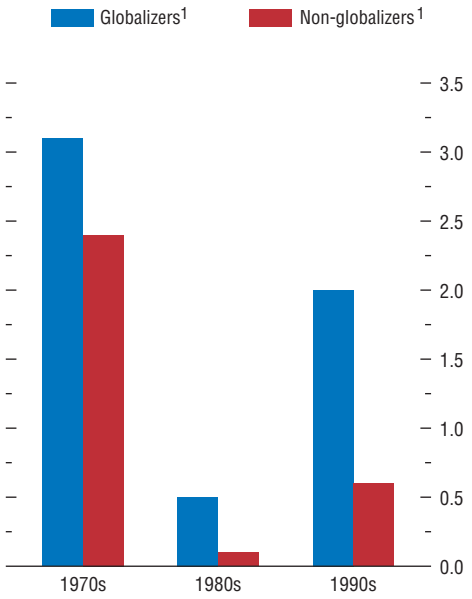
The past two decades have seen a wave of trade liberalization in developing countries. What does this experience show about the relationship between trade openness and growth? The recent literature on trade and growth consists of three main strands: cross-country econometric work, country case studies, and industry- and firm-level analyses. Together, these three types of evidence indicate that trade openness makes an important contribution to higher productivity and income per capita, and that trade liberalization contributes to growth.

Many cross-country econometric studies have concluded that trade openness is a significant explanatory variable for the level or the growth rate of real GDP per capita. One set of studies has found that the large differences across countries in levels of income per capita are systematically and importantly related to openness (see Hall and Jones, 1999; Frankel and Romer, 1999; and Frankel and Rose, 2000). This result remains when a variety of other variables that may explain income are included in the analysis, when the possible feedback from income to openness is taken into account, and across various measures of openness. However, it is difficult to separate the effect of openness on income per capita from that of institutional quality—that is, the rule of law and government effectiveness—because openness and institutional quality are so highly correlated across countries.

Another set of studies has found that the *change* in openness is an important determinant of the *change* in income per capita within countries over time. By focusing on differences over time, this approach avoids the difficulty associated with distinguishing the role of slowly changing institutional factors from that of trade openness. The figure, based on Dollar and Kraay (2001a), shows that developing countries that had the largest increases in trade shares between the late 1970s and the mid-1990s (called "globalizers") experienced on average a much larger increase in income per capita during the 1990s than did non-globalizers. Dollar and Kraay (2002) find that changes in trade volumes are important determinants of changes in growth, even after taking account of a variety of other determinants of growth and of the possibility that growth could cause the increase in trade (reverse causality).

Country case studies have also found important benefits from trade liberalization. Large, multicountry studies of trade liberalization in the 1970s and 1980s (including Krueger, 1978) drew attention to the highly distortionary nature of the import substituting regimes prior to liberalization. Similarly, Papageorgiou, Michaely, and Choksi (1991) and Sachs and Warner (1995) have found that strong and sustained liberalization episodes result in rapid growth of exports and real GDP.

Trade Liberalization and Growth
(Average per capita income growth; percent)



Source: Dollar and Kraay (2001a).
[1]Globalizers consist of those developing countries that had the largest increase in the share of trade in GDP from the late 1970s to the mid-1990s (excluding Chile, Hong Kong SAR, Korea, Singapore, and Taiwan Province of China); non-globalizers are the remaining developing countries.

Note: The main author of this box is Andrew Berg. This box draws on Berg and Krueger (2002).

Industry- and firm-level studies have documented the various channels through which openness contributes to export, productivity, and ultimately income growth (Hallward-Driemeier, 2001, provides a recent survey). Access to imported inputs facilitates the diffusion of knowledge, which contributes to productivity (Coe, Helpman, and Hoffmaister, 1997). Import competition increases not only the exit but also the entry of domestic firms, spurring innovation (Wacziarg, 2001).

Many studies have shown that exporting firms are more productive, and recent work has found unusual increases in productivity after firms begin to export, suggesting that exports lead to higher productivity (Kraay, 1999, and Bigsten and others, 2000). Moreover, Hallward-Driemeier, Iarossi, and Sokoloff (2002) find that firms in east Asia aim at export markets, so that even pre-entry productivity increases are at least in part due to the promise of the export market. Finally, exporting allows highly productive export-oriented firms to grow faster, shifting resources into higher-productivity activities, which increase economy-wide average productivity (Bernard and Jensen, 1999; and Isgut, 2001).

Consistent with the evidence on the benefits of trade for productivity growth, the infant industry argument—the idea that new industries need protection—has consistently failed to find empirical support. Protected industries have tended to grow more slowly than others, reflecting the fact that productivity growth is due not only to learning by doing, which would be helped by protection, but also to active efforts to acquire more sophisticated technologies (Krueger and Tuncer, 1982; and Bell, Ross-Larson, and Westphal, 1984). Also, in developing countries where openness has increased, industrial production has grown relative to agricultural production, in contrast to the prediction of the infant industry argument (Dodzin and Vamvakidis, 1999).

The most important implication of trade openness for poverty reduction is its effect on overall GDP growth, because changes in average income per capita are the main determinant of changes in poverty. The sharp decline in the share of poor people in the world (those with incomes below $2 a day) over the past two decades is almost entirely attributable to growth, not changes in income distribution, because income distribution changes much less over time than does average per capita income. The evidence suggests that growth has no systematic effect on income distribution, regardless of whether growth is trade related or not. Of course, in some countries and in some periods the poor do better than average and sometimes they do worse, but openness itself does not help explain which outcome occurs (Dollar and Kraay, 2001b).

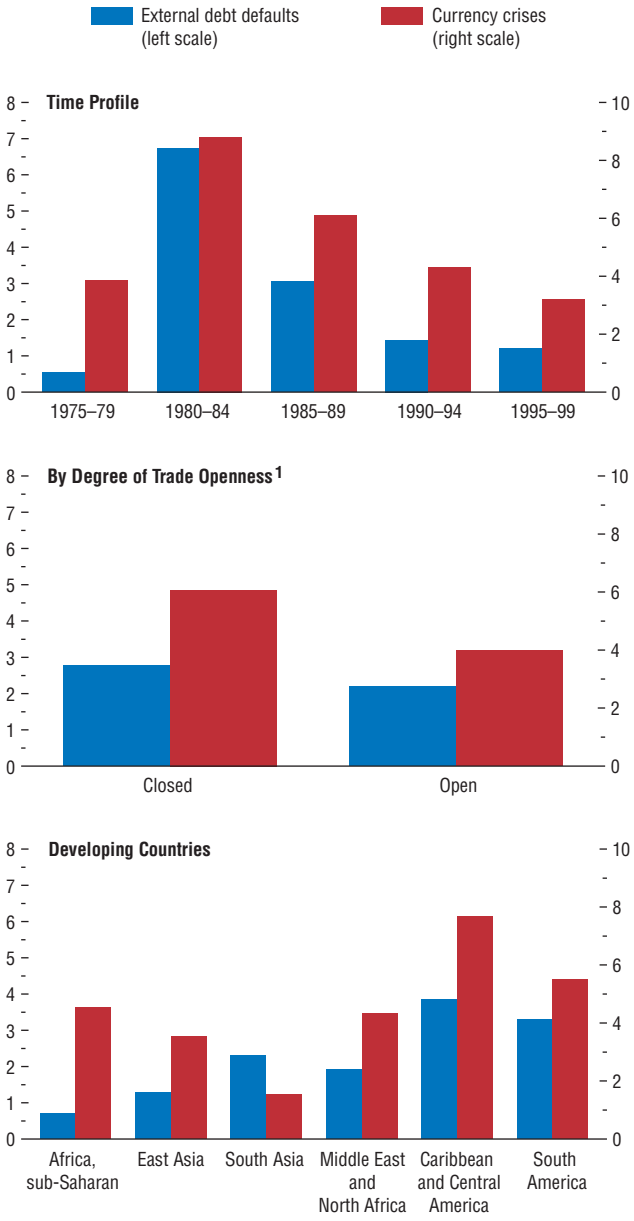
The fact that the effect of trade openness on growth is difficult to separate from that of institutional quality, or from the effects of other reforms that were implemented at the same time, is an econometric problem but a policy opportunity. Specifically, the correlation of trade liberalization with other reforms highlights the advantages of making openness a primary part of the reform package. Trade openness has important positive spillovers on other aspects of reform. For example, competition with foreign firms can expose inefficient industrial policies, and trade raises the marginal product of other reforms (in that better infrastructure, telephones, roads, and ports translate into better performance of the export sector). Trade liberalization also changes the political dynamics of reform by creating constituencies for further reform. Finally, openness seems to encourage institutional reform and reduce corruption (Ades and Di Tella, 1999).

While trade openness is not a "magic bullet" (much else matters for growth and poverty reduction), the evidence clearly suggests that trade openness is a particularly important component of reform. There is little evidence that there are other reforms that must precede an effective trade reform, though there are many reforms that are complementary. The strength of the association between openness and institutional quality should give long pause to any policymaker contemplating the adoption of a novel (or tested and failed) development strategy that does not center around trade openness.

Figure 3.9. Frequency of External Financial Crises in Developing Countries

(Share of countries in crises; percent a year)

External debt defaults and currency crises have been more frequent in those countries that are less integrated into the global trading system.



Source: IMF staff calculations.
[1]Based on a country's degree of trade openness relative to the median.

The upper panel of Figure 3.9 shows the frequency of debt defaults and currency crises by five-year periods between 1975 and 1999. The two types of external financial crises have similar time profiles throughout the entire period, including peaks during the early 1980s.

External financial crises have been more frequent in countries that are less integrated into the global trading system (middle panel of Figure 3.9). Over the past quarter century, less integrated countries have been on average about one-fifth more likely to suffer a debt default, and one-third more likely to have a currency crisis than the average developing country. Across developing country regions, the Western Hemisphere has been significantly more vulnerable to episodes of financial turmoil than any other region (lower panel of Figure 3.9), as highlighted in Chapter II of the April 2002 *World Economic Outlook*. The benefits also turn out to be largest for countries that already have open capital markets.

The inverse relationship between trade integration and external financial crises remains statistically significant in a multivariate econometric framework. Sgherri (2002) shows that the relationship is robust to alternative definitions of external financial crises and after taking account of the conventional determinants of crises, including a country's economic fundamentals, its solvency position, foreign exchange reserves, and external macroeconomic conditions. In addition, the result remains significant after incorporating—in a bivariate probit framework—two crucial supplementary relationships: the fact that trade openness may be related to the same factors that affect the frequency of financial crises, and the fact that the frequency of external financial crises and trade openness may both be affected by factors not included in the empirical framework.[27] This result is consistent with other analyses of the determinants of

[27]This result is in line with the empirical literature on the impact of trade openness on the interaction between international financial liberalization and exchange rate instability. Edwards (1989) finds that capital controls are generally intensified before a currency crisis. Alesina,

crisis frequency, including Klein and Marion (1997) and Milesi-Ferretti and Razin (1998), although Detragiache and Spilimbergo (2001) find that recently trade openness has tended to increase the likelihood of financial crises.[28]

Trade integration reduces a country's financial fragility by increasing both the ability and willingness to service external obligations. A higher ratio of exports to GDP implies that exchange rate depreciation will provide a greater boost to a country's ability to earn foreign exchange, which is essential to service foreign currency–denominated debt. In this way, a greater export ratio decreases the likelihood of a sharp reversals of capital flows, as the country is considered to be more able to service its foreign currency–denominated debt. This reassurance is especially important in developing countries, where domestic financial markets are shallow and economic and policy prospects are generally more uncertain than in industrial countries.[29] In addition, trade openness serves as an incentive to meet external obligations by making a country more vulnerable to creditors' sanctions in case of default (Bulow and Rogoff, 1989).[30]

In summary, higher trade integration tends to reduce the frequency of external financial crises. One interpretation of this result is that trade integration provides an important buffer for the inherent volatility associated with financial integration. A possible implication is that countries that are already financially open could see a decline in the frequency of external financial crises by increasing trade openness.

Financial Integration and Output Volatility

What is the impact of openness to foreign direct investment and portfolio investment on output volatility? Output volatility is defined as the unconditional standard deviation of the growth rate of real GDP per capita over the period 1975–99. The upper panel of Figure 3.10 shows that output volatility in developing countries is roughly double that in industrial countries, and that—among developing countries—output volatility in small countries (those with populations between ½ million and 1½ million) is about one-third greater than average. Developing countries that are relatively more integrated into global capital markets tend to have lower output volatility on average than financially closed countries (lower panel of Figure 3.10). This is true for the period as a whole, but not in the early 1980s and late 1990s, when global financial shocks were especially large.

In particular, the output volatility among financially open small developing countries is about one-third lower than among their financially closed counterparts.[31] This result is consistent with the empirical literature on the macroeconomic performance of small econo-

Grilli, and Milesi-Ferretti (1994) report evidence that economies that are relatively closed to international trade are more likely to restrict capital flows. Montiel and Reinhart (1999) examine the impact of financial controls on the volume and composition of international financial flows. Glick and Hutchison (2000) analyze the joint causality between the likelihood of a currency crisis and the imposition of financial controls.

[28]In addition, there is an ongoing debate about the role of trade linkages in transmitting financial crises across countries. See Baig and Goldfajn (1998), Masson (1998), Eichengreen and Rose (1999), Glick and Rose (1999), Forbes (2000, 2001), Harrigan (2000), Kaminsky and Reinhart (2000), and Van Wincoop and Yi (2000).

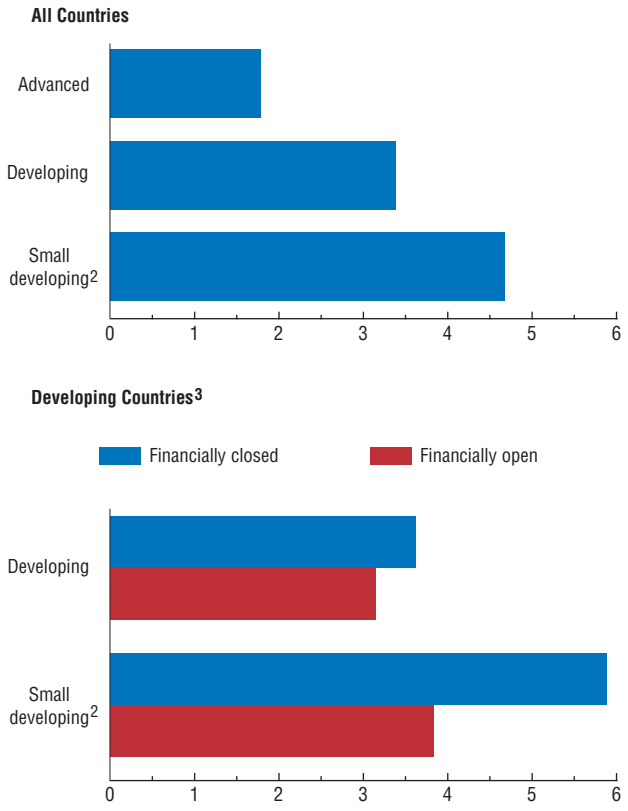
[29]Romer (1993) finds that international openness tends to be associated with lower inflation rates, that in turn may reduce macroeconomic volatility. Catão and Sutton (2002) stress the role of volatility as a key determinant of sovereign debt defaults, while breaking down aggregate volatility into its external and domestic components.

[30]Also, countries that are more open to trade are likely to experience less dramatic drops in real growth and much quicker rebound in the aftermath of a currency crisis (Milesi-Ferretti and Razin, 1998; and Gupta, Deepak, and Sahay, 2000). Rapid export growth helped bring Asian economies out of recession following the 1997–98 crisis, while automatically generating tax revenues needed to meet external debt payments. This did not happen in Latin American markets during the 1980s, despite similarly sharp devaluations. Instead, Latin American countries, partly as a result of such lack of trade openness, witnessed a persistent increase in their ratio of external debt service to export revenues (Catão, 2002).

[31]This result is not obvious, as greater financial integration could lead to greater specialization in production, leading to higher output volatility.

Figure 3.10. Output Volatility, 1975–99[1]
(Percent)

Greater financial openness is associated with lower output volatility, especially among small open economies.



Source: IMF staff calculations.
[1]Standard deviations of the growth rate of real GDP per capita, are calculated for five-year periods and then averaged.
[2]Small developing economies are those with populations between 0.5 and 1.5 million.
[3]Over each five-year period, countries are divided into those that are financially open and those that are not, according to their degree of openness relative to the median country.

Table 3.9. Volatility of Output and Other Macroeconomic Indicators[1]
(Percent, unless otherwise indicated)

	Developing Economies	
	Financially open[2]	Financially closed[2]
Volatility of output	3.2	3.6
Trade openness[3]	67.4	40.9
Volatility of trade flows	6.5	4.4
Volatility of changes in terms of trade	5.7	4.9
Financial openness[3]	28.4	6.4
External debt ratio[3]	62.4	50.6
Volatility of external assets and liabilities	5.0	1.5
Volatility of real exchange rate changes	8.8	10.5
Volatility of inflation rate	6.9	11.8
Volatility of fiscal balance	2.1	1.9

[1]Based on five-year periods over 1975–99.
[2]Based on a country's degree of financial openness relative to the median.
[3]In percent of GDP.

mies, which suggests that the benefits from financial deepening may be substantial (Easterly and Kraay, 2000).

Financial openness appears to be associated with lower output volatility through two channels: the magnitude of inflation and exchange rate shocks is lower, and the impact of all shocks on output is dampened. Financially open countries—which are also more open to trade and have slightly higher debt ratios—experience larger external shocks, as measured by the volatility of the terms of trade, trade flows, and financial flows (Table 3.9). However, financially open countries have somewhat more stable real exchange rates and much more stable inflation rates (the volatility of fiscal balances is similar in financially open and closed countries). The lower volatility of inflation and exchange rates in financially open countries may reflect a disciplining effect of international financial markets or a facilitation of the transfer of international best practices in macroeconomic policymaking.[32]

[32]Kim (2000) finds that international financial integration leads to a significant decrease in the fiscal deficit. Rodrik (2000) and Acemoglu and others (2002) study the relationship between international financial liberalization and institutional quality. Wei (2000) looks at the linkages between trade openness and governance.

Table 3.10. Correlations with Output Volatility[1]

	Developing Economies	
	Financially open[2]	Financially closed[2]
Trade openness[3]	—	—
Volatility of trade flows	0.26	0.46
Volatility of changes in terms of trade	0.10	0.45
Financial openness[3]	—	–0.09
External debt ratio[3]	0.14	0.16
Volatility of external assets and liabilities	—	0.09
Volatility of real exchange rate changes	0.15	0.37
Volatility of inflation rate	—	0.28
Volatility of fiscal balance	—	0.39

[1]Based on five-year periods over 1975–99. "—" indicates that the correlation is not significantly different from zero at the 5 percent level.
[2]Based on a country's degree of financial openness relative to the median.
[3]In percent of GDP.

However, it may also reflect causality running in the opposite direction—from sounder macroeconomic policymaking to greater integration.

Financial integration also seems to be associated with lower output volatility because the impact of shocks on output is dampened. Output volatility is significantly correlated with inflation rate volatility and fiscal balance volatility in financially closed economies, but not in financially open countries (Table 3.10). Similarly, the correlations between output volatility and the volatility of external shocks—including terms of trade volatility, trade flow volatility, and real exchange rate volatility—are significantly lower in financially open economies. Strikingly, although financially closed economies experience less volatile capital flows, this lower volatility is significantly correlated with output volatility. Moreover, in countries that are more financially closed than average, greater financial openness is associated with lower output volatility. In other words, it appears that financial integration helps to smooth the effects of shocks on output, not only by comparing financially open to financially closed countries, but also among financially closed countries.

It is important to distinguish the association between greater openness to foreign direct investment and portfolio investment and lower output volatility from that of external debt. Financially open countries have somewhat higher external debt ratios, and external debt ratios are positively correlated with output volatility in both financially open and financially closed countries. External debt may exacerbate output volatility as balance sheet effects magnify the impact of shocks, especially if domestic financial systems are not yet well developed. However, on average, the indirect effect of financial openness in raising output volatility (through a higher external debt ratio) appears to be smaller than the direct impact in lowering output volatility.

The contribution of financial openness to reducing output volatility remains significant in a more sophisticated econometric framework, which accounts for the endogeneity of financial openness and the heteroscedasticity of shocks across countries (Sgherri, 2002). These results are broadly consistent with the theoretical and empirical literatures. Theoretical models of the international business cycle suggest that global financial diversification may be the right response to terms of trade shocks (Razin and Rose, 1994; Heathcote and Perri, 2002; and Kose, Prasad, and Terrones, forthcoming).[33] Empirical work by Bekaert, Harvey, and Lundblad (2002) finds that equity market liberalization is associated with lower volatility of output and consumption. Kim, Kose, and Plummer (forthcoming) show that the amplitude of economic fluctuations in east Asia has fallen over time as countries have become more open. Kraay and Ventura (2001) find that countries use foreign assets as a buffer stock as they try to smooth consumption and investment.

In summary, greater international financial integration is associated with lower output volatility, though this association is generally only realized over the longer term. Output

[33]For a more extensive analysis of the transmission of external shocks to developing countries, see the October 2001 *World Economic Outlook*.

volatility also depends on other factors, including macroeconomic policy stability, domestic financial development, and institutional quality. Greater financial integration appears to be associated with smaller inflation and exchange rate shocks, and a reduced impact of all shocks on output. A possible implication is that economies with less diversified production structures, including small economies, which tend to be very open to trade, could see a decline in output volatility by opening up to financial flows.

Conclusion

Trade integration and international financial integration are largely complementary, both over time and across countries. In recent decades, trade openness and international financial openness have been highly correlated across both industrial and developing countries. Countries that are more open to trade are also more integrated into global financial markets, as evidenced by lower saving-investment correlations. While global economic integration was driven primarily by technological improvements during the previous major episode of globalization (1870–1914), integration since World War II has been driven mostly by policy liberalization. This underlines the importance of paying close attention to the interaction between the trade and financial aspects of globalization.

While developing countries have generally become more integrated into the world trading system over the past two decades, the degree of integration has been uneven across countries. The full, multilateral liberalization of trade and capital account restrictions would have a large, positive effect on trade flows. However, economic development is the single most important factor in accounting for the shortfall in developing countries' trade per unit of GDP relative to that of industrial countries. At the same time, trade openness has a large and significant positive effect on economic development. In other words, globalization is not only a source of growth, it is a natural outcome of it.

The interaction between the trade and financial aspects of globalization is evident in the incidence of external financial crises and the volatility of output. While external financial crises are related to a host of factors, trade openness by itself tends to reduce the likelihood of an external financial crisis, by improving a country's external solvency. Similarly, while low output volatility depends on macroeconomic policy stability, domestic financial development, and institutional quality, it is also associated with openness to foreign direct investment and portfolio investment, as financial openness is related to lower policy volatility and the dampening of shocks. The implications are that countries where trade integration is already high (like small economies) could reduce output volatility through further financial integration, while countries where financial integration is already high (like many countries in Latin America) would reduce the risk of external financial crises by increasing trade integration.

Appendix 3.1. Definitions, Data Sources, and Country Coverage

This appendix defines terms, provides data sources, and specifies country coverage.

Trade openness is defined as the sum of exports and imports of goods and services (from balance of payments statistics), divided by GDP. The source is the WEO database. The country coverage is the same as that for the analysis of bilateral trade patterns listed below.

Trade restrictiveness is defined in two ways, given data limitations. The IMF's index of overall trade regime restrictiveness (IMF, 1998), which is only available for 1997–2001, is used in the analysis of trade patterns. The country coverage is the same as that for the analysis of trade patterns listed below. For Figure 3.1, which shows developments over three decades, trade restrictiveness is defined as the ratio of import duties to imports. Import duties are from the IMF's *Government Finance Statistics* and imports are from the IMF's *International Financial Statistics*. These data are available for a smaller

number of countries than the aforementioned index.[34]

Financial openness is defined as the sum of external assets and liabilities of foreign direct investment and portfolio investment, divided by GDP. Other external financial stocks, including bank lending, are not included because these stocks are much more volatile. The source is Chapter IV of the October 2001 *World Economic Outlook*. The data were originally constructed by Lane and Milesi-Ferretti (1999), who accumulated the corresponding flows and made valuation adjustments. The country coverage is the same as that for the analysis of the interaction between trade and financial integration listed below.

Financial restrictiveness is defined as the index of balance of payments restrictions, based on the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*. The index does not differentiate across types of restrictions within a category or capture the effectiveness of the restrictions. The data through 1995 are from Chapter IV of the October 2001 *World Economic Outlook* and were originally constructed by Grilli and Milesi-Ferretti (1995), who created a zero-one indicator variable reflecting the existence of various restrictions on international capital flows. The country coverage is the same as that for financial openness. In 1996, a more refined reporting system for balance of payments restrictions was introduced, which is not backwardly compatible with the earlier categories. The new categorization is the basis for the restrictiveness measure constructed by Mody and Murshid (2002) and used in the analysis of trade patterns. The country coverage is the same as that used in the analysis of trade patterns.

The countries that are included in the econometric analyses reported in this chapter are listed below. The analysis of trade patterns covers many more countries than the analysis of the interaction between trade and financial integration, because data on external assets and liabilities are not available for a large number of countries.[35] Conversely, Cambodia and Zimbabwe are not included in the analysis of trade patterns, because data on income per capita are missing for 1995–99. In the list below, countries that are included in only the analysis of trade patterns are not marked at all; countries that are included in both analyses are marked with a star; and countries that are included in only the analysis of the interaction between trade and financial integration are marked with a dagger.

Industrial Countries

Australia,* Austria,* Belgium,* Canada,* Denmark,* Finland,* France,* Germany,* Greece,* Iceland, Ireland,* Italy,* Japan,* Netherlands,* New Zealand,* Norway,* Portugal,* Spain,* Sweden,* Switzerland,* United Kingdom,* and the United States.*

Developing Countries

Africa, Sub-Saharan

Angola, Benin, Botswana,* Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Equatorial Guinea, Ethiopia, Gabon, Gambia,* Ghana, Guinea, Guinea-Bissau, Kenya,* Lesotho,* Madagascar, Malawi, Mali, Mauritius,* Mozambique, Namibia,* Niger, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa,* Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.†

[34]Austria, the Bahamas, Bahrain, Bangladesh, Botswana, Burundi, Cameroon, Canada, Colombia, Costa Rica, Cyprus, Dominican Republic, Egypt, El Salvador, Ethiopia, Fiji, Finland, France, Greece, Grenada, Guatemala, Iceland, India, Indonesia, Iran, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea, Kuwait, Madagascar, Malta, Mauritius, Mexico, Morocco, Myanmar, New Zealand, Nicaragua, Norway, Oman, Pakistan, Panama, Peru, the Philippines, Sierra Leone, South Africa, Spain, Sri Lanka, Swaziland, Sweden, Switzerland, Thailand, Tunisia, the United States, Uruguay, Venezuela, and Zambia.

[35]In addition, the analysis of the interaction between trade and financial integration excludes countries with populations of less than ½ million, highly indebted poor countries, and transition economies, reflecting the country coverage in Chapter IV of the October 2001 *World Economic Outlook*.

Asia, East

Cambodia,† China,* Hong Kong SAR, Indonesia,* Korea,* Lao PDR, Malaysia,* Papua New Guinea,* the Philippines,* Samoa, Singapore,* Solomon Islands, Thailand,* Tonga, and Vanuatu.

Asia, South

Bangladesh,* Bhutan, India,* Nepal,* Pakistan,* and Sri Lanka.*

Middle East and North Africa

Algeria, Egypt,* Iran, Israel,* Jordan,* Mauritania, Morocco,* Saudi Arabia, Syrian Arab Republic,* Tunisia,* Turkey,* and Yemen.

Western Hemisphere, Caribbean, and Central America

Antigua and Barbuda, Barbados, Belize, Costa Rica,* Dominica, Dominican Republic,* El Salvador,* Grenada, Guatemala,* Guyana, Haiti,* Honduras, Jamaica,* Mexico,* Nicaragua, Panama,* St. Kitts and Nevis, St. Lucia, Suriname, and Trinidad and Tobago.

Western Hemisphere, South America

Argentina,* Bolivia, Brazil,* Chile,* Colombia,* Ecuador,* Paraguay, Peru,* Uruguay,* and Venezuela.

Countries in Transition

Armenia, Bulgaria, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, Mongolia, Poland, Slovak Republic, Slovenia, and Ukraine.

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