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TRADE, CRISIS, AND RECOVERY: RESTRUCTURING GLOBAL VALUE CHAINS

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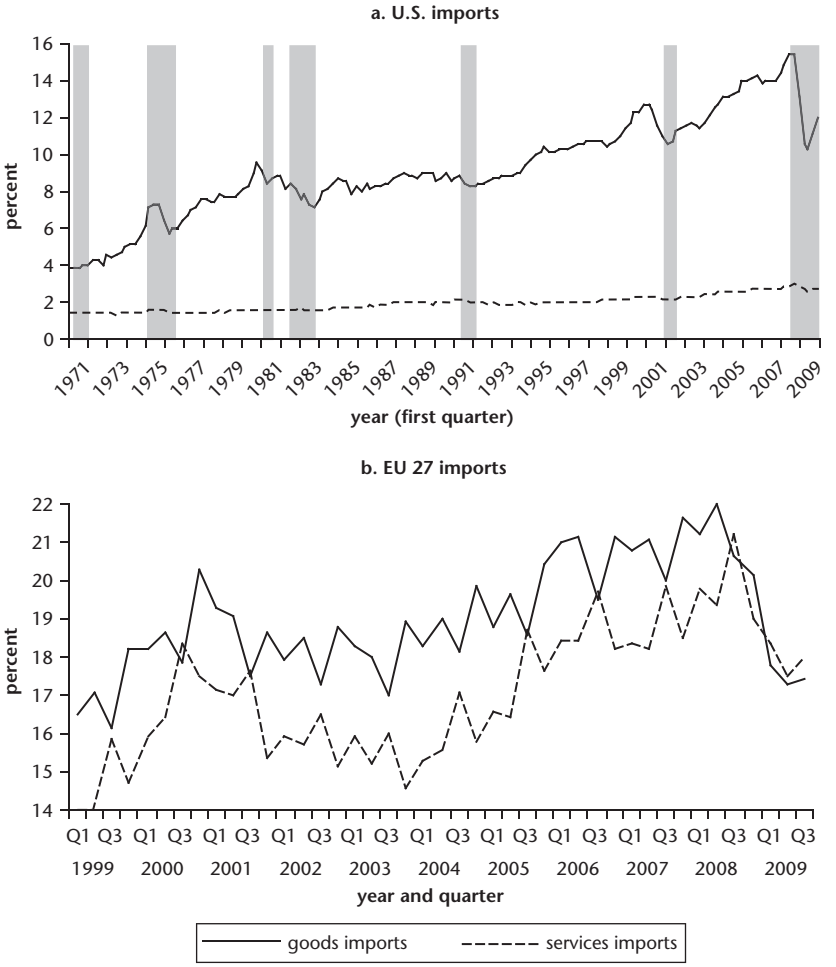
Global value chains (GVCs), which only recently entered into the purview of economists, are now at the center of debate over the causes and consequences of the 2008–09 economic crisis and collapse of global trade. Feenstra (1998) noted the prominence of a global "disintegration" of production, but not until the essay by Grossman and Rossi-Hansberg (2006) on the welfare effects of offshoring was there broad acknowledgment by economists of the extraordinary nature of trade within GVCs—what the authors call "trade in tasks" rather than traditional trade in final goods. Previously, trade in intermediates was generally modeled as a refinement of the international division of labor according to principles of comparative advantage (for example, see Arndt and Kierzkowski, 2001). Since the global downturn, GVCs are seen as central to the dramatic collapse of world trade (see the array of contributions in Baldwin 2009a). Well documented, this collapse has been more severe, rapid, and persistent than trade collapses experienced in the past, including during the Great Depression. This chapter explores the role of GVCs in the 2009 trade collapse and the prospects for world trade and its geographic distribution in light of the dynamics of GVCs.

A trade decline has potentially devastating effects on export-oriented developing countries. As shown in figure 2.1a, the decline in U.S. goods imports in the fourth quarter of 2008 and the first two quarters of 2009 was greater than the decline in U.S. GDP, and the drop in the ratio of imports to GDP over that period represented by far the greatest three quarter decline in imports, both absolutely

Figure 2.1 U.S. and EU 27 Goods and Services Imports
% GDP



Source: Authors' illustration using data for the United States from the U.S. Bureau of Economic Analysis, National Income and Product Accounts Table, Gross Domestic Product, seasonally adjusted at annual rates; data for the EU 27 are from Eurostat, National Accounts, seasonally adjusted and adjusted data by working days.
Note: In part a, the gray bars correspond to U.S. business cycle recessions according to the definition of the U.S. Bureau of Economic Research. In part b, imports refer to extra-EU 27 countries.

and relative to GDP, since 1980 at least. The European Union (EU 27) has undergone a similar, if less dramatic, import decline (see figure 2.1b.). A similar pattern has been observed on a global scale as well. Ominously, the drop in trade in the 2008–09 crisis has been found to be even more rapid than the decline in world trade at the beginning of the Great Depression in 1929 (Eichengreen and O'Rourke 2009).

Leading up to the 2008–09 economic downturn, developed-country imports of goods and services were growing faster than output, as seen in the case of the United States and the European Union in figure 2.1. This was the result of a variety of factors, including the liberalization of trade and capital flows and the decline in the costs of international transportation and, especially, communications. Business strategies have also become increasingly international, and today a significant amount of world trade occurs within global value chains, that is, international systems of production typically governed by lead firms that coordinate sometimes elaborate networks of suppliers (see Gereffi (1994); Gereffi, Humphrey, and Sturgeon (2005). As a result of these factors, changes in the value and volume of trade over the business cycle are greater today than they were in the 1960s.

This chapter addresses three questions:

1. Will trade volumes rebound in a symmetric fashion as world economic growth rebounds?
2. Will the crisis result in a change in the structure of trade; in particular, will it lead to a reversal of the pattern of more diversified sourcing and thus to a consolidation of GVCs?
3. What policies can improve the prospects for developing country growth in the event that trade volumes do not rebound symmetrically and there is a consolidation of some GVCs?

Previous research shows that, on average, over business cycles since 1975, the effect on international trade is (1) larger than the effect on GDP and (2) symmetric, like the movement of GDP. The 2010 International Trade Statistics released by the World Trade Organization (WTO) suggest a similar pattern for the 2008–09 crisis: after the sharpest decline in more than 70 years, world trade is set to rebound in 2010, growing at 9.5 percent, assuming a 2.9 percent global GDP growth (WTO 2010). However, the recent downturn has been deeper than and different from previous downturns, so there is a greater likelihood of a lag in the recovery of the volume of world trade. It has involved a credit crunch, and thus a collapse of trade credit. The crisis might also have brought a structural change in aggregate demand, as U.S. consumption, for example, may settle at a lower rate relative to income, and as the Chinese yuan is revalued relative to the

dollar, further shifting the world pattern of trade. Therefore, it is likely that those factors will affect the pace and pattern of trade recovery.

Regarding the question of changing the structure of trade, this chapter presents an empirical analysis of the change in the concentration of trade flows, using a Herfindahl-Hirschman Index (HHI) that measures concentration in terms of trade flows by country, rather than in terms of market share by firms. This study finds that consolidation has been more likely in "buyer-led" GVCs and greater dispersion more likely in "producer-led" GVCs. The third question is discussed in terms of the prospects for developing country fiscal stimulus and for South-South trade expansion. Preliminary analysis indicates promising growth potential for South-South trade based on the experience of the past 20 years, but suggests that this growth too may be limited if GVCs are consolidated, since the largest category of South-South trade is in intermediates.

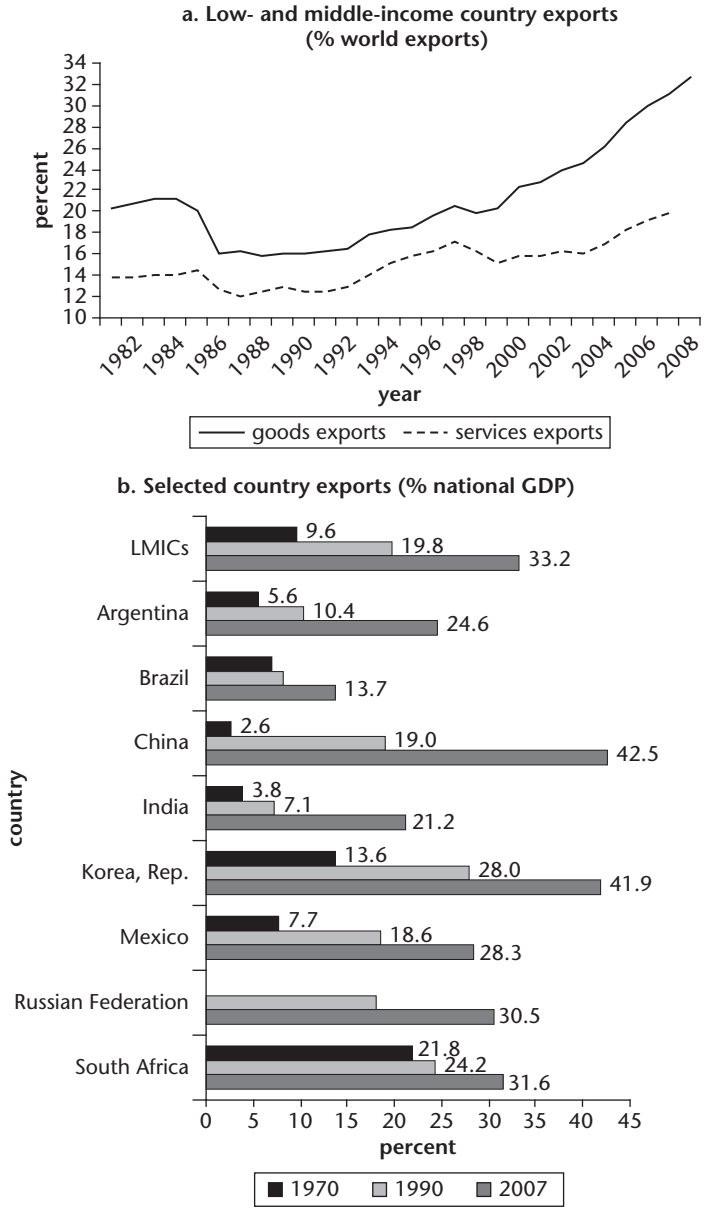
The next section briefly assesses the degree of developing country export success over the past 20 years in both goods and services. This success has created a greater reliance on export revenue in aggregate demand. The third section examines in more detail the role of GVCs in the decline in U.S. and EU import demand between 2008 and the third quarter of 2009, including estimates of the U.S. income elasticity of import demand during the crisis compared to long-run elasticities, as well as a discussion of the possibility of a shifting V-curve of import demand. This is followed by a closer look at the sectoral and developing country impact of the import decline in the United States and European Union. The authors then propose a theory of vertical and horizontal GVC consolidation, and present data on changes in the geographic concentration of global exports in detailed product areas. Following that is a brief discussion of prospects for expanding South-South trade as a substitute for declines in North-South trade that may be long-term both because of the changing structure of world demand and the consolidation of some GVCs.

The chapter ends with some policy conclusions, necessarily tentative, since the recovery is unfolding as the research is being conducted. These conclusions focus on the need for continued support of trade credit by the international financial corporations; the need for developing countries to find other, non-export, sources of demand, or to diversify trade patterns to focus more on trade among developing countries; and the need for developed countries to resist trade protection measures, even in a time of high and persistent unemployment rates.

GVCs and the Export Reliance of Developing Countries

The expansion of GVCs began in the 1980s, as developing countries shifted from import substitution strategies to export-oriented development strategies. Their dramatic export success is evident in figure 2.2a., which shows that since the early

Figure 2.2 Exports from Low- and Middle-Income Countries

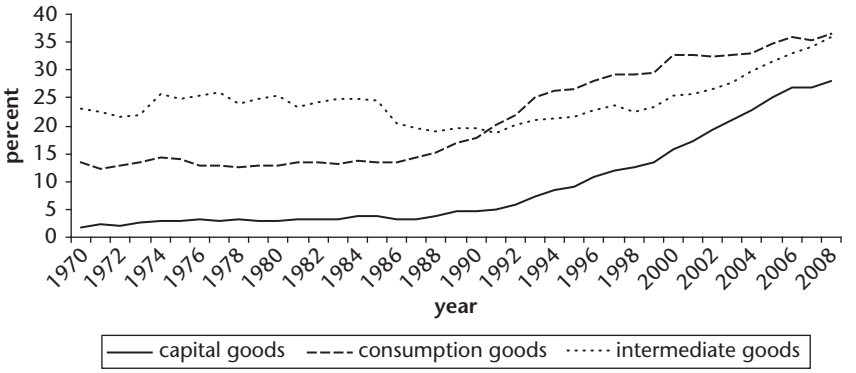


Source: Authors' illustration with data from World Development Indicators, World Bank, 2009.
Note: Low- and middle-income countries covers most developing countries.

1980s, the share of low- and middle-income countries in world exports of goods and services rose almost steadily. The goods export share rose from 16 percent in 1986 to over 30 percent in 2008, while the services export share grew from 13 to 20 percent in 2007. This shift in world trade patterns also means that developing countries are much more reliant on export revenues for final demand. On average, low- and middle-income countries became steadily more export-oriented, with exports as a share of GDP growing to 33 percent in 2007, compared to just 15 percent in 1980. China's enormous success is well known; its export reliance went from around 3 percent of GDP in 1970 to almost 43 percent in 2007. But the increased export orientation was also dramatic in Argentina, India, Mexico, and Republic of Korea, among others (figure 2.2b). (See annex 2A for export shares by region of origin).

The increased export orientation of developing economies also involved a change in the structure of international trade resulting from the expansion of global production networks, also called GVCs. With the expansion of GVCs in the 1980s, trade in inputs grew dramatically as a share of total input use. Figure 2.3 shows that by 2004, low- and middle-income countries accounted for 35 percent of world exports of intermediate goods, with a rapid acceleration in this share in the 2000s. The growth of capital goods and consumption goods exports has remained relatively stable since the late 1980s. Milberg and Winkler (2010a) report that U.S. offshoring intensities, that is, the share of U.S. imported inputs of materials and

Figure 2.3 Goods Exports from Low- and Middle- Income Countries by Product Category, 1970–2008
% world exports



Source: Authors' calculations using data from UN Comtrade, 2009.
Note: See annex 2B for definitions of the product categories.

services in total non-energy input use, grew at an average annual rate of 2 percent and 1.7 percent, respectively, between 1998 and 2006, reaching more than 25 percent in some sectors, including apparel and motor vehicles, by 2006.

Standard offshoring measures capture only measure trade in inputs, thus may understate the magnitude of trade within global supply chains. Global corporations in the major industrialized countries are not strictly involved in assembly. Much of the import activity in global supply chains is in fully finished goods. In fact, the purpose of corporate offshoring, whether at arm's-length or through foreign subsidiaries, is precisely to allow the corporation to focus on its "core competence," while leaving other aspects of the process, often including production, to others. Many "manufacturing" firms now do not manufacture anything at all. They provide product and brand design, marketing, supply chain logistics, and financial management services.

Thus, an alternative proxy for offshoring may simply be imports from developing countries. Table 2.1 shows that Japan and the United States now rely heavily on

Table 2.1 Goods and Services Offshoring Intensities in Selected Countries, 1991 versus 2006
percent

Measure	Denmark	France	Germany	Japan	United Kingdom	United States
Goods offshoring intensity (narrow measure)						
1991	2.9	3.8	4.1	14.9	3.0	8.6
2006	6.5	6.3	8.2	29.1	8.2	23.1
CAGR	5.4	3.4	4.7	4.5	7.0	6.8
Goods offshoring intensity (broad measure)						
1991	9.0	15.2	14.6	49.3	14.1	40.1
2006	13.1	16.4	17.0	68.2	22.8	54.1
CAGR	2.5	0.5	1.0	2.2	3.3	2.0
Services offshoring intensity (narrow measure)						
1991	23.1	13.0	20.0	29.2	13.7	10.4
2006	20.0	28.0	26.1	24.3	22.6	18.6
CAGR	–1.0	5.2	1.8	–1.2	3.4	4.0
Services offshoring intensity (broad measure)						
1991	23.1	24.7	22.1	31.6	17.7	18.6
2006	22.3	33.4	31.6	27.0	32.9	22.6
CAGR	–0.2	2.0	2.4	–1.0	4.2	1.3

Source: Milberg and Winkler 2010b, with data from Organisation for Economic Co-operation and Development (OECD) National Accounts database, United Nations Conference on Trade and Development (UNCTAD) GlobStat Database.
Note: CAGR = compound annual growth rate.

goods imports from low-income developing countries (29 and 23 percent, respectively), here defined as the *narrow measure of goods offshoring*. While the European countries are at much lower levels, all countries have seen the narrow measure of goods offshoring more than doubling since 1991 (see annualized growth rates in table 2.1). However, offshore destinations also include developing countries with a higher income level, such as Brazil, Mexico, or South Africa. Thus, the *broad measure of goods offshoring*, including imports from all developing countries, shows that developing country imports constitute over half of total imports by Japan (68 percent) and the United States (54 percent), while the European countries range from 23 percent in the United Kingdom to only 13 percent in Denmark.[1]

Since services import data by region of origin are not available for the relevant time period, this analysis defines a country's import share of "computer and information services" plus "other business services" in total services imports as *narrow measure of services offshoring*. The *broad measure of services offshoring* additionally takes "communication services" and "financial services" into account. Table 2.1 shows that Japan and Denmark saw a small decline in services offshoring between 1991 and 2006, while the other countries experienced compound annual growth rates of services offshoring between 1.3 and 5.2 percent.

Economic development has become increasingly associated with "economic upgrading" or "industrial upgrading" within GVCs, requiring that firms move up through the chain of production of a particular commodity into higher value-added activities. This involves raising productivity and skills through training, mechanization, and the introduction of new technologies. It also requires fitting into existing corporate strategies by linking closely to lead firms. In manufacturing, such upgrading has also been associated with qualitative change, with firms moving from parts production or assembly, to design and more integrated production, to fully integrated production, to original brand design. Humphrey and Schmitz (2002) describe four types of upgrading in GVCs: product, process, functional, and chain. Product and process involve productivity gains, while the producer remains largely in the same place in the GVC. Functional upgrading involves moving into more technologically sophisticated and higher value-added aspects of an existing chain. And chain upgrading implies moving into a new, related value chain that also involves more skills, capital, and value-added.

The economic theory of vertical integration focuses on transactions cost-minimizing behavior by lead firms and distinguishes hierarchical from market-based relations within GVCs (Williamson 2000; more recently, Grossman and Helpman 2005; for an extension, see Gereffi, Humphrey, and Sturgeon 2005). Gereffi (1994) shifts the focus of the analysis of GVCs, characterizing GVCs as "buyer-led" or "producer-led," depending on the nature of the lead firm. Large

retailers (for example, Walmart, Sears, JCPenney, and Kmart) and firms with global brands (for example, Nike, Liz Claiborne) lead buyer-led GVCs and are more likely to work at arm's-length with suppliers and to have supplier contracts of shorter duration. Manufacturers in more high-tech areas, such as automobile, aircraft, and aspects of electronics (for example, Ford, Boeing, Apple Computers) lead producer-led chains in which ownership of suppliers (through foreign direct investment) is more likely and in which supplier contracts are of longer duration.

The Role of GVCs in the Collapse of World Trade

Why did trade volumes collapse so dramatically relative to GDP in the 2008–09 downturn? To answer this question we examines the role of GVCs in the decline in U.S. and EU import demand between 2008 and the third quarter of 2009. In addition to discussing the various effects of the crisis on international trade, including estimates of the U.S. income elasticity of import demand during the crisis compared to long-run elasticities, the possibility of a shifting V-curve of import demand will be raised.

Cyclicality and the 'Composition Effect'

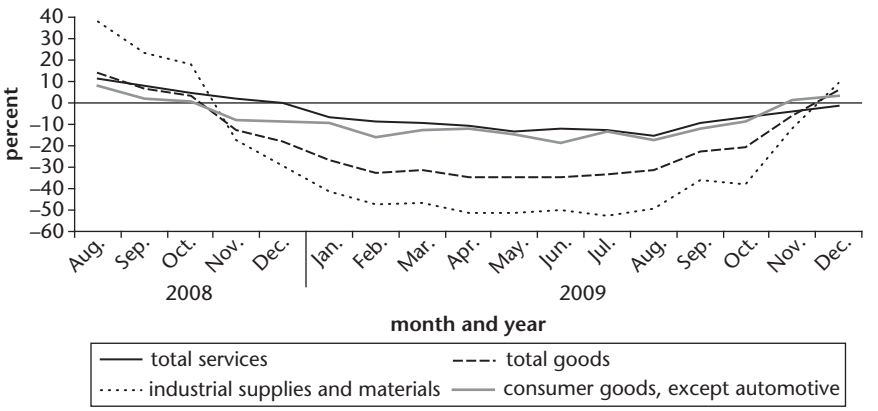
In examining the trade collapse, Freund (2009) shows that historically trade flows are pro-cyclical and follow a more exaggerated cyclical pattern than GDP. She analyzes the effect on the value of international trade of global economic downturns in 1975, 1982, 1991, and 2001, and finds that global economic downturns in the recent past have been associated with declines in the volume of world trade proportionally greater than the change in GDP. On average over these downturns, GDP growth fell to 1.5 percent and the growth in trade value turned negative, to –1.0 percent. In the year leading to the trough of the cycle, she finds the percentage point fall in trade is 5 times that of world output. By this standard, if world GDP in the recent recession fell by 4.8 percentage points, then world trade would have fallen by more than 20 percentage points. Importantly, Freund (2009) also predicts that the GDP-trade relation is symmetric, that is, that the rebound in trade is greater than the rebound in GDP, and that the recovery of trade is as fast as was its decline. Most of the trade rebound occurs the same year as the GDP growth increase, but "it takes about 4 years for trade to pass pre-downturn levels" (Freund 2009, 8). According to the WTO, the 2010 trade rebound should help recover some, but not all, of the 2009 trade losses that occurred when the global crisis prompted a 12.2 percent contraction in the volume of global trade; the WTO forecasts that, should trade continue to expand at its current pace, it would

take at least two years in developing countries, and three years in developed countries, for trade volume to surpass the peak level of 2008 (WTO 2010).

One reason trade reacts more strongly to changes in GDP during a recession than otherwise is the difference in the composition of trade and GDP. In a global downturn, the demand for goods falls more strongly than the demand for services, because goods represent the bulk of trade flows while services make up the bulk of GDP. In particular, the demand for "postponable" goods—consumer durables and investment goods related intermediates, which make up a narrow slice of world GDP but a large percentage of world trade—dropped sharply during the crisis. Thus, the global crisis operated with full force on trade, but with less force on GDP as a whole (Baldwin 2009a).

Evidence of the composition effect is confirmed in figure 2.4, showing the sharp decline in "industrial supplies and materials" (–49 percent year-to-year [YTY] in August 2009). The decline in consumer goods imports (–17 percent YTY in August 2009) is much less, and the decline in the growth of services imports (–15 percent YTY in August 2009) is even less than for goods. Throughout the downturn, services trade, especially of business services, has been relatively unaffected (see Borchert and Mattoo 2009). Borchert and Mattoo list a number of reasons why the demand for services has contracted less than the demand for goods in the 2008–09 crisis, including the non-storability of services and the fact that a larger part of services demand involves outsourced services (for example, bookkeeping) that are "necessities" for producers.

Figure 2.4 U.S. Goods and Services Imports Growth, August 2008–December 2009
% growth year to year



Source: Authors' illustration using data from the Bureau of Economic Analysis, International Accounts Products, quarterly imports of goods, balance of payments-based data, seasonally adjusted.

Globalization in the Long-Run versus 'Crisis Elasticities' of Trade

A second explanation of the collapse in world trade in the recent downturn is that economic globalization has resulted over decades in a steady increase in the income elasticity of world trade, so that the relatively large GDP decline in recent years has been matched by a historic decline in the volume of world trade. Freund (2009) reports estimates showing a monotonic increase in the income elasticity of world trade over successive decades, rising from 1.94 in the 1960s to 3.69 in the 2000s. As a result, an identical percentage drop in GDP now leads to a greater percentage decline in trade than previously. Thus, a 1 percent reduction in real income lowered real trade by around 2 percent in the 1960s, and that has increased gradually to 3.7 in recent years.

The income elasticity of import demand ε_M, for example, is given by:

$$\varepsilon_M = \frac{\partial M/M}{\partial Y/Y} = \frac{\partial M}{\partial Y} \cdot \frac{Y}{M}. \tag{2.1}$$

Using quarterly GDP and import data, the U.S. income elasticities of import demand are approximated as follows:

$$\varepsilon_{M,t} = \frac{\Delta M_t}{\Delta Y_t} \cdot \frac{Y_t}{M_t}, \tag{2.2}$$

where subscript t denotes the quarter, $\Delta M_t = M_t - M_{t-4}$, and $\Delta Y_t = Y_t - Y_{t-4}$. Figure 2.5a confirms the increase in the income elasticity of imports for the United States over the last four decades. The data for 2008:Q4 to 2009:Q4 are not shown, as the drop and subsequent increase were extremely high.

Note that greater economic openness per se—the result of trade liberalization, or technological change, or changing business strategies—does not imply a higher income elasticity of import demand. To the contrary, other things being equal, a higher import propensity, M/Y, lowers the income elasticity of import demand as evident in equation 2.1.[2] However, if the increase in the import propensity is matched by a larger increase in the incremental import–GDP ratio, $\partial M/\partial Y$, then the elasticity will indeed rise. Figure 2.5b shows that the U.S. incremental import–GDP ratio was higher (in absolute value terms) in the last two business cycles than previously and that, during the recent downturn, the incremental import–GDP ratio was larger (again in absolute value) in the past two years than ever since 1970.

An important issue is whether the recent downturn resulted in a structural break in historical elasticity patterns. To judge whether that history is a useful guide in the

Figure 2.5 U.S. Income Elasticities and Incremental Import–GDP Ratios, First Quarter 1970 to Third Quarter 2008

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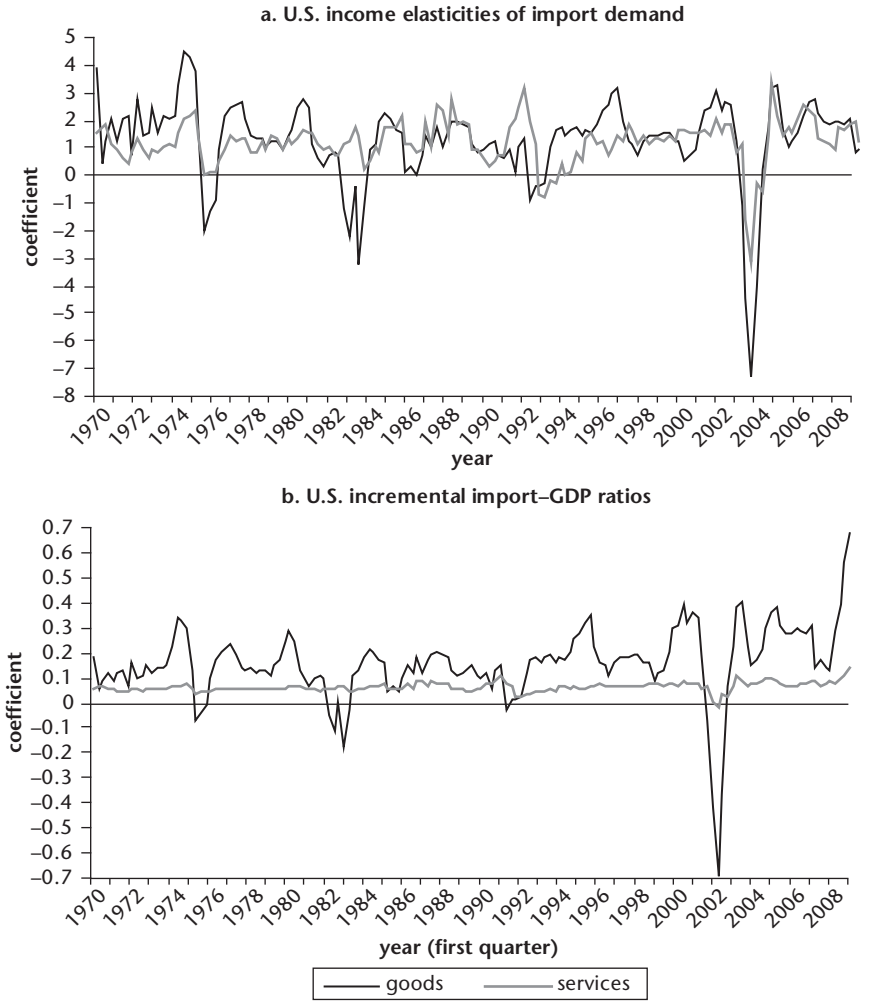


Source: Authors' calculations using U.S. data from the U.S. Bureau of Economic Analysis, National Income and Product Accounts Table, Gross Domestic Product, seasonally adjusted at annual rates.
Note: The gray bars correspond to U.S. business cycle recessions according to National Bureau of Economic Research definition.

current context, the authors estimated long-run income elasticities of import demand in the United States for 16 countries and compared these to the current experience. The latter are referred to as "crisis elasticities." The long-term elasticities for goods and services were estimated separately using bilateral, quarterly trade data for the period 1999–2008. An autoregressive distributed lag (ARDL) approach was

applied to co-integration, which yields consistent estimates of the long-run coefficients, regardless whether the regressors are I(1) or I(0), and thus does not require pre-testing for unit root (Pesaran, Shin, and Smith 2001). The ARDL approach adds short-run dynamics to a long-run estimation equation as given in equation 2.3:

$$\Delta \ln M_t^j = \alpha + \sum_{i=1}^{n} \beta_i \Delta \ln Y_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta \ln E_{t-1}^j + \sum_{i=1}^{n} \delta_i \Delta \ln M_{t-i}^j + \nu_1 \ln Y_{t-1} + \nu_2 \ln E_{t-1}^j + \nu_3 \ln M_{t-1}^j + \varepsilon_t \quad (2.3)$$

where M designates real import demand for imports from country j, Y real domestic income, and E real bilateral exchange rate between the United States and country j at time t. E is defined as the number of units of foreign currency per U.S. dollar, and ε_t denotes the random error term. The lagged level variables constitute the so-called lagged error-correction term, which should be retained or excluded from the equation based on the F-statistics. Annexes 2E and 2F give full details of the estimation procedures, sample, and the estimation results. The long-run relations are given by the estimates of ν_3 in annex table 2E.1 (column 4). Only six countries show significant results, while others miss the 10 percent-level narrowly. The highest elasticities are for China and India. They imply that a 1.0 percent U.S. income increase is expected to raise goods imports demand for China and India by 8.6 and 8.1 percent, respectively. Germany and Brazil show elasticities of 1.9 and 1.2. Interestingly, four Asian and two Latin American countries show negative elasticities, which is significant however only for Hong Kong, China.

Regarding services imports, the estimates become more significant. The F-tests show that only India, República Bolivariana de Venezuela, and the United Kingdom should not include the error-correction term when calculating short-run effects. The long-run elasticities are nearly all positive and significant in 13 countries. Canada, China, France, Hong Kong, and Germany show the largest service import elasticities, which range between 7.6 and 4.7 percent. Given the high absolute value of services imports from India, an elasticity of 2.1 percent still seems very high.

Table 2.2 shows the long-run income elasticities of U.S. import demand for goods (column 1) and the "crisis elasticities," which are derived from data for the last half of 2008 for the major trading partners of the United States (column 3). In many cases, the long-run estimate is many times less than what was experience in the crisis period. For Brazil, for example, the long-run elasticity of 1.24 jumps to 11.6 in the crisis period. For Taiwan, China, it jumps from 0.77 to 7.6 and for

Table 2.2 "Crisis"versus Long-Run Income Elasticities of U.S. Import Demand

	Income elasticities			
	Estimations		During crisis	
	1999:Q1–2008:Q4		2008:Q3–2008:Q4	
Country	Goods	Services	Goods	Services
Argentina	..	2.25	–0.9	–4.6
Brazil	1.24	–0.60	11.6	1.0
Canada	..	7.56	16.3	22.7
China	8.65	6.02	5.5	1.0
France	..	5.41	2.3	10.8
Germany	1.86	4.70	5.4	5.9
Hong Kong, China	2.75	5.50	13.3	–2.0
India	8.06	2.07	6.0	–3.2
Japan	..	1.74	5.0	0.8
Korea, Rep. of	..	0.68	6.7	13.1
Mexico	..	0.79	10.6	2.4
Singapore	..	1.92	7.6	7.0
South Africa	1.21	0.69	28.9	8.6
Taiwan, China	0.77	2.34	7.6	0.4
United Kingdom	..	..	13.1	7.4
Venezuela, R.B. de	..	..	61.3	0.1

Source: Authors' calculations using data from the Bureau of Economic Analysis.
Note: Income elasticities 2008:Q3 to 2008:Q4 are calculated based on equation 2.2, where $\Delta M_t = M_t - M_{t-1}$ and $\Delta Y_t = Y_t - Y_{t-1}$.
Negligible values are indicated by.

South Africa from 1.21 to 28.9. For Mexico, the estimate is statistically insignificantly different from zero in the long-run estimate, jumping to 10.6 in the crisis. In the cases of China and India, the long-run elasticities are not so different from the crisis period, falling slightly in both cases but from already extremely high long-run values. The authors' findings support the results of Levchenko, Lewis, and Tesar (2009) who find an enormous gap ("wedge") between predicted U.S. imports based on historical data and the actual drop in U.S. import demand.

The evidence on services trade is quite different. While only one sector has a negative income elasticity in the long-run analysis, three countries have a negative relation in the crisis period, and three other countries have values lower than 1 (that is, very low). Argentina, Hong Kong, and India have negative elasticities in the crisis period, reflecting that U.S. services imports of some types have increased, even as national income has fallen. Business processing services are part of fixed rather than variable costs and thus are likely to rise, especially when profits are squeezed, while expenditures on variable inputs (imported and domestic) fall with the decline in final goods and services orders.

GVCs: Flexibility and Synchronicity

There is no doubt that the globalization of production has raised the ratio of global imports and exports per unit of output over time. Freund (2009, 6), for example, writes that "an increase in GDP may lead to more outsourcing and much more measured trade, as an increasing number of parts travel around the globe to be assembled, and again to their final consumer." Greater vertical specialization in production means that the import content of exports has also risen (Yi 2009).

With vertical specialization, a decline in final demand reduces trade in both final and intermediate goods and services. In a study of the United States, Ferrantino and Larsen (2009, 177) note the connection between imports and exports: "[T]he drop in U.S. imports for computers and cell phones leads indirectly to a drop in U.S. exports of semiconductors and components." In a study of the recent export decline in Japan, Fukao and Yuan (2009) find that adding to the decline in U.S. demand for Japanese final goods is the decline in demand for intermediate goods intended for assembly in East Asia for shipment to the United States.[3] The point is that such fragmentation contributes both to a rising trade propensity and to a rising incremental import–GDP ratio.

Lead firms with declining profits will seek drastic means to cut costs and thus may substitute cheaper foreign inputs for domestic inputs. This is the "substitution effect" having a positive effect on trade flows of intermediates. There are reports, for example, that with the burst of the dot-com bubble in 2001, IT firms faced a profit squeeze and turned increasingly to offshore sourcing for both hardware and software (reported in Friedman 2005). Scott (2009) notes that an important part of U.S. auto companies' adjustment to their current unprofitable position is likely to be a significant increase in offshoring, especially from Mexico. Sturgeon and Van Biesebroeck (2010, 42) identify the likelihood of such a substitution effect by lead firms in the automobile sector in the United States and Western Europe (sourcing in Mexico and Eastern and Central Europe, respectively) if market shares continue to decline.

This substitution effect is further influenced by the heightened uncertainty of future demand after the crisis, which may encourage firms to externalize further their sourcing in order to increase their flexibility in response to future demand stagnation or volatility. Nonetheless, the large declines in the volume of trade seen in the recent crisis indicate clearly that the demand effect has so far swamped the substitution effect.

The rise in trade elasticities, then, does not result from a rise in trade openness but from the rising sensitivity of trade to changes in GDP, that is, to the nature of GVCs, not to the globalization of production per se. There are at least two reasons why the expansion of GVCs has increased trade openness and raised incremental

import–GDP ratios. The rise in the incremental import–GDP ratio is the result of the magnitude and speed with which adjustments take place when supply chains are well-coordinated by lead firms. An important reason for lead firms to establish global production networks in the first place is the flexibility they provide. GVCs allow adjustment to changes in market demand to occur quickly and enable the risk of demand declines and inventory adjustment to be borne to a greater extent by supplier firms. Innovations in lean retailing, fast fashion, just-in-time inventory management control, and full-package outsourcing, have all been built on GVC governance strategies. Suppliers too have developed in a way that seeks to manage the environment of flexibility-seeking lead firms. Modular production processes give supplier firms the capacity to serve different product lines and even different GVCs (Sturgeon 2002). Adding to the speed of adjustment in trade in a downturn is the fact that firms might make use of accumulated inventories first (Freund 2009; Baldwin 2009b).

In a world of disintegrated production and lean retailing, the 2008–09 GDP downturn resulted not only in larger declines in trade than had occurred previously but also declines that were more rapid. Recent research confirms that the trade collapse was "synchronized" across countries, which Baldwin (2009b) also attributes to the internationalization of the supply chain. GVCs are a channel for the rapid transmission of both real and financial shocks. Shifts in demand for final goods can immediately affect flows of intermediates, especially when supplier contracts are short-term. And credit market problems can cascade throughout the chain; for example, a denial of credit to importers in one country can reduce access to credit for sellers in others, thus affecting their ability to import (Escaith and Gonguet 2009).

Trade Credit Crunch

There are strong indications of an additional factor at work today that has driven down international trade activity: the freezing up of lines of credit for undertaking international trade transactions, also known as trade finance. A survey of multinational buyers (that is, lead firms and higher tier supplier firms in GVCs) indicates that the drop in orders may be more a function of "new credit bottlenecks" than declining final demand per se (Auboin 2009; see ICC 2009 for a survey measuring the decline in the volume of trade credit). Trade finance comprises a number of financial instruments, including letters of credit, pre-export financing, factoring and forfeiting, advance payment guarantees, export credit insurance, and export credit guarantees (drawn from Chauffour and Farole 2009, appendix 1). The slowdown in trade credit provision has come as a result of more stringent bank credit and capital allocation criteria, growing distrust between international banking

counterparts who must cooperate in the provision of trade credit, more stringent requirements on borrowers' invoice and payment systems, and a drying up of the secondary market for trade financing instruments.

A trade credit crunch will put a more severe damper on the volume of international trade when such trade is organized in global value chains. There are two reasons for this. One, a bottleneck resulting from lack of credit in one part of the chain can reduce trade for the entire chain. As described by ICC (2009, 4): "Supply chains have produced undesirable side effects. Exporters in international supply chains are better shielded from financial turmoil because they have access to credit from buyers. However, with their own access to finance drying up, global buyers will become more restrictive in providing finance along their supply chains."

The second reason is that GVCs are potentially a channel for the rapid transmission of financial shocks, in particular through credit markets, which can have a negative international "cascade effect" as the denial of credit to importers in one country leads to credit problems for sellers in others, reducing their access to credit, affecting in turn their ability to import, and so on. This is a vicious cycle between the real and the financial sides of the economy (Escaith and Gonguet 2009; Amiti and Weinstein 2009; Mora and Powers 2009).

The implication is that the decline in world trade is greater when the credit crunch occurs within a production system organized through GVCs. This combination is a unique feature of the recent crisis and thus may account for the break from historical output-demand relations as seen in the elasticity estimates presented in the next section. For this reason, the G20 provision of $250 billion to support trade finance over the next two years is an important step in easing the financial side of the trade collapse (Auboin 2009, 6).

The Shifting V-Curve of Trade

The recent WTO prediction of a rapid trade recovery includes an acknowledgment that its forecasts could be either overly optimistic (for example, if there are unexpected increases in oil prices, appreciation or depreciation of major currencies, or additional adverse developments in financial markets), or overly pessimistic (for instance, if unemployment rates in developed countries were to drop faster than anticipated) (WTO 2010).

As seen in figure 2.1 and in more detail in the elasticity estimates, the decline in trade relative to GDP is greater than the historical pattern would predict, and thus elasticities estimated on data from past cycles are not a reliable guide to future trends.

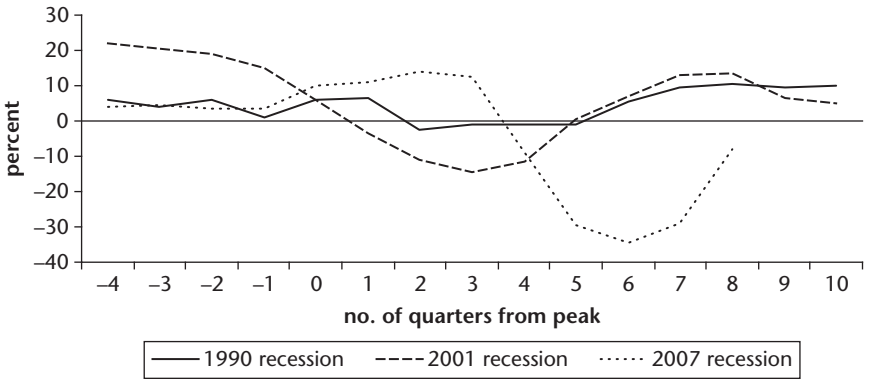
Freund (2009) identifies a distinct V-shaped curve in the volume of world trade over the business cycle, and Baldwin and Taglioni (2009) use the past V-curve to predict a relatively rapid recovery of trade volumes to pre-crisis levels.

To date, this recovery of trade is not following the historical V-curve, as seen in figure 2.6, which compares the historical pattern of the past two U.S. recessions to the recent experience. The import decline is larger and more rapid, as noted earlier. Moreover, the recovery in imports is in the form of a smaller percentage of quarterly declines. Thus two years from the previous business cycle peak, U.S. imports are still falling at a 10 percent rate. The V-curve appears to have shifted to the right.

There are a number of possible explanations for the shift in the V-curve. For one, the recent downturn may involve a macroeconomic restructuring in many industrial countries, as debt burdens are worked off, household consumption is reduced, and government spending partly offsets declines in consumption and business investment demand. Consumption expenditure in the United States in particular is recovering much more slowly than in previous recoveries (Kaplinsky and Farooki 2010 and Ferrantino and Larsen 2009 make a similar argument). A second, but related, factor is China's development trajectory and exchange rate policy, with the renminbi generally considered undervalued compared to the U.S. dollar. While the renminbi appreciated in relation to the dollar until 2006, it has remained constant since then. This has been associated with an expanding Chinese market share for many U.S. and EU import products. But pressures for a revaluation remain, and a U.S. recovery at a higher rate of private saving, a higher

[[AU: OK to change last item in legend to "2008–09 recession" and corresponding date in title?]]

Figure 2.6 Quarterly U.S. Goods Import Growth Rates During the Past Three Crises: 1990, 2001, and 2007
% growth year to year



Source: Authors' illustration using data from the U.S. Bureau of Economic Analysis, National Income and Product Accounts Table, Gross Domestic Product, seasonally adjusted at annual rates.
Note: Zero on the y axis refers to the peak of the U.S. business cycles recessions, as defined by the National Bureau of Economic Research.

rate of public dissaving, and a weakened dollar may bring a very different world trade picture, with lower levels of trade and consolidated GVCs (Kaplinsky and Farooki 2010).

Country and Product Profile of the Decline in U.S. and EU Import Demand

After reviewing how individual countries and sectors fared in the recent economic crisis, this section will analyze GVC consolidation.[4] It should be noted that the financial origins of this downturn resulted in a tightening of trade credit, which may contribute to the shift in the V-curve. The first part examines more closely the country and product profile of the decline in U.S. and EU import demand. It begins with a product-based analysis of U.S. and EU imports, then makes a regional analysis of developing country exports.

Product-Based Analysis of U.S. and EU Imports

The country-level variation in import demand is a function of macroeconomic conditions (foreign demand growth and changes in the real effective exchange rate) and the commodity composition of trade. To get a closer look at the latter, it is necessary to explore the shifts in import demand in the United States and the European Union over the past 12–18 months in more detail. Figure 2.4, illustrating the U.S. import trends for broad commodity groupings, shows that industrial supplies and materials imports fell much more than consumer goods (except autos) and services. These data are aggregated up from the detailed goods import data presented in annex 2C. Total goods imports decreased by 31 percent in August 2009 on a year-to-year (YTY) basis. In the first analysis of the downturn described earlier (Milberg and Winkler 2009a), for February 2009, U.S. imports fell most in motor vehicles, oil, and construction on a YTY basis, and the smallest declines were seen in food and clothing, two consumer necessities.

The decline in motor vehicle demand in the United States has had significant international repercussions, because U.S. motor vehicle production relies more on imported inputs than any other sector of the economy, with over 25 percent of inputs imported (see figure 2.5; for a detailed analysis, see Sturgeon and van Biesebroeck 2010). The first analysis in this chapter, using February 2009 YTY data, showed rapid declines in imports of various categories of auto and truck parts by dramatic amounts: imports of unfinished metals (largely used for motor vehicles) declined 55 percent; automotive vehicles, parts, and engines declined 54 percent, of which bodies and chassis for passenger cars constituted the largest drop at 71 percent decline.

These declines are the result of a combination of a sudden collapse of consumer demand for new automobiles and the highly developed GVCs developed by United States and U.S.-based firms. As discussed above, the fact that the demand drop was concentrated at first in consumer durables and investment goods—such as construction materials ("postponables" in Baldwin's (2009b) terminology)—meant that there was a much more drastic impact on trade than on GDP, since the latter is dominated by services. Borchert and Mattoo (2009) list a number of reasons why the demand for services has contracted less than the demand for goods in the recent crisis, which include the non-storability of services and the fact that a larger part of services demand involves outsourced services (for example, bookkeeping) that are "necessities" for producers. (See annex 2D for the detailed services import data.)

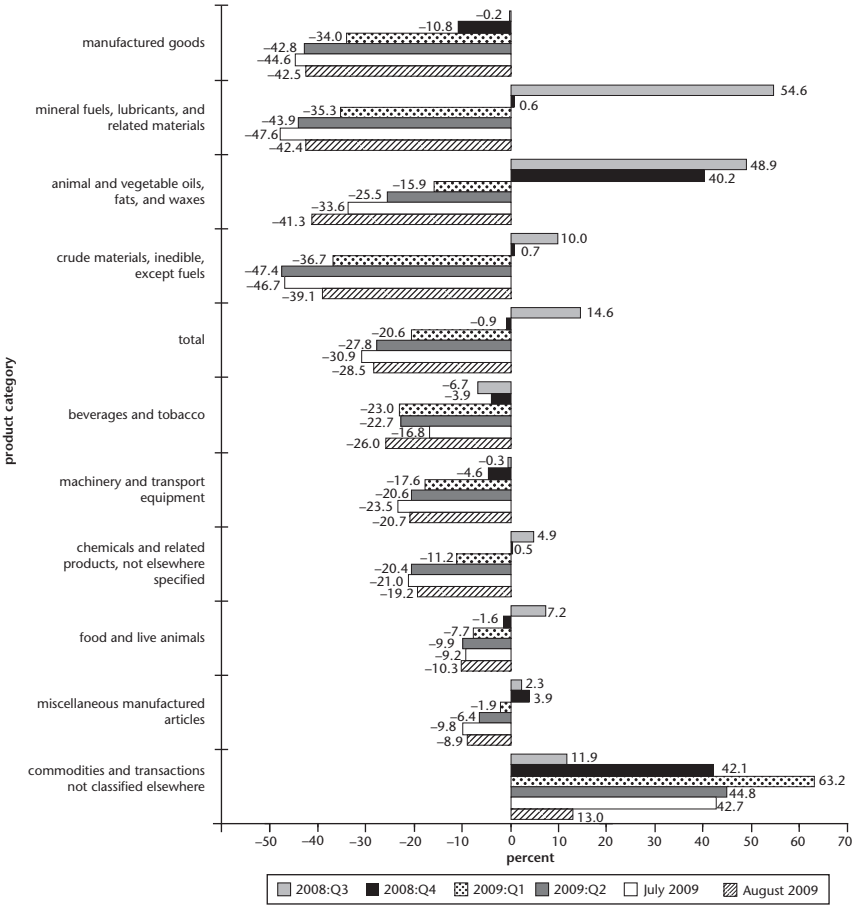
The sectoral declines in U.S. imports give some indication of the composition of shifts in labor demand. Since it is medium-technology goods for which demand has fallen most, it would be expected that low-skill manufacturing workers in developing countries would have suffered most in terms of employment and wages. Services workers—of both low and high skill—have so far been affected less, because private services have continued to grow, and even the most affected services sector (other transportation) has declined considerably less than the average decline for goods.

The pattern of import decline for the European Union is similar to that in the United States, but less pronounced. EU goods import growth is shown in figure 2.7. Total goods imports fell by almost 29 percent in August 2009 on a YTY basis. Manufactured goods showed the biggest decline, reaching more than –40 percent since the second quarter of 2009. This, again, supports the finding that demand fell most strongly for "postponables," that is, consumer durables, and investment goods. As in the United States, the demand for imported industrial supplies and materials (mineral fuels, lubricants, and related materials; animal and vegetable oils, fats, and waxes; crude materials, inedible, except fuels) showed a sharp decline, while more necessary consumer goods, such as food and miscellaneous manufactured articles (including clothing and footwear), dropped less.[5]

Regional Analysis of Developing Country Exports

While China's exports to the United States declined during the downturn more than those in other countries (see figure 2.8a), it is only China among the top five exporters to the United States that has seen a significant rebound in trade volume. This means that China's share of U.S. imports has grown significantly, reaching 20 percent in September 2009, which represents the highest share since January 2007 (except for January 2009). China has gained market share despite the decline

Figure 2.7 EU 27 Goods Imports by Product Category, Ranked by August 2009 Growth
% change year to year

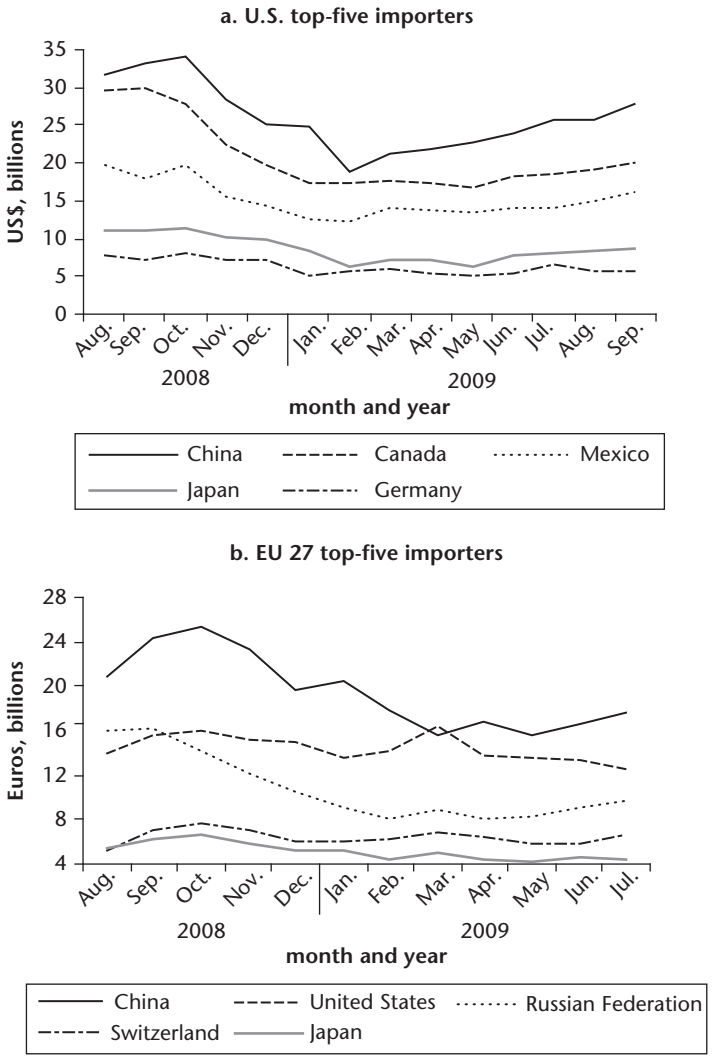


Source: Authors' illustration using data from Eurostat, External Trade by Standard International Trade Classification (SITC).

in U.S. imports. Canada's import share has fallen between 1 and 2 percentage points since the outbreak of the crisis, but the top five importers combined have gained market share from 52.6 percent in August 2008 to 55.4 percent in September 2009.

A similar pattern holds for the EU import market. While imports from the United States have continued to fall through July 2009, Chinese imports were already rising for four consecutive months (figure 8b). Since March 2009,

Figure 2.8 U.S. and EU 27 Goods Imports of Top-Five Importers



Source: Authors' illustration using data from U.S. International Trade Commission; Eurostat, External Trade.
Note: Top-five imports are as of August 2008.

Chinese imports have gained market share at the cost of the second biggest importer, the United States. China's import share reached 17.6 percent in July 2009, while the U.S. market share was only 12.4 percent. The total market share of the top-five importers was 50.9 percent in July 2009, compared to 48.1 percent in August 2008.

China's outstanding performance in U.S. and EU markets appears to have been matched by some other countries in late 2009, as seen in figure 2.9, where goods export growth on a YTY basis is compared across all countries for which data were available. While most countries saw smaller declines in exports in the third-quarter 2009 compared to the second quarter, a small number of countries began to see export increases (on a YTY basis) in November, including Bosnia-Herzegovina, Chile, Indonesia, Taiwan (China), and Thailand. Still, many countries showed considerable export declines in the third-quarter 2009, greater than 25 percent compared to a year earlier. This confirms that even a delayed recovery in world trade is likely to take place at very different rates across countries, again, depending on country specialization patterns and trends in GVC consolidation.

Consolidation of GVCs: Theory and Evidence

Through the 1980s and 1990s, more and more countries entered into global export markets, typically producing intermediate inputs or performing assembly in global value chains. Different GVCs expanded at different rates, with apparel and automobiles expanding in the 1960s and 1970s, in terms of the dispersion and complexity of the supply chain, and the services sector and business services of other sectors falling among the more recent parts of growing and expanding GVCs. But the onset of the 2008–09 crisis brought broader evidence of consolidation of some types of supply chains.

Historical Trends in GVC Structure

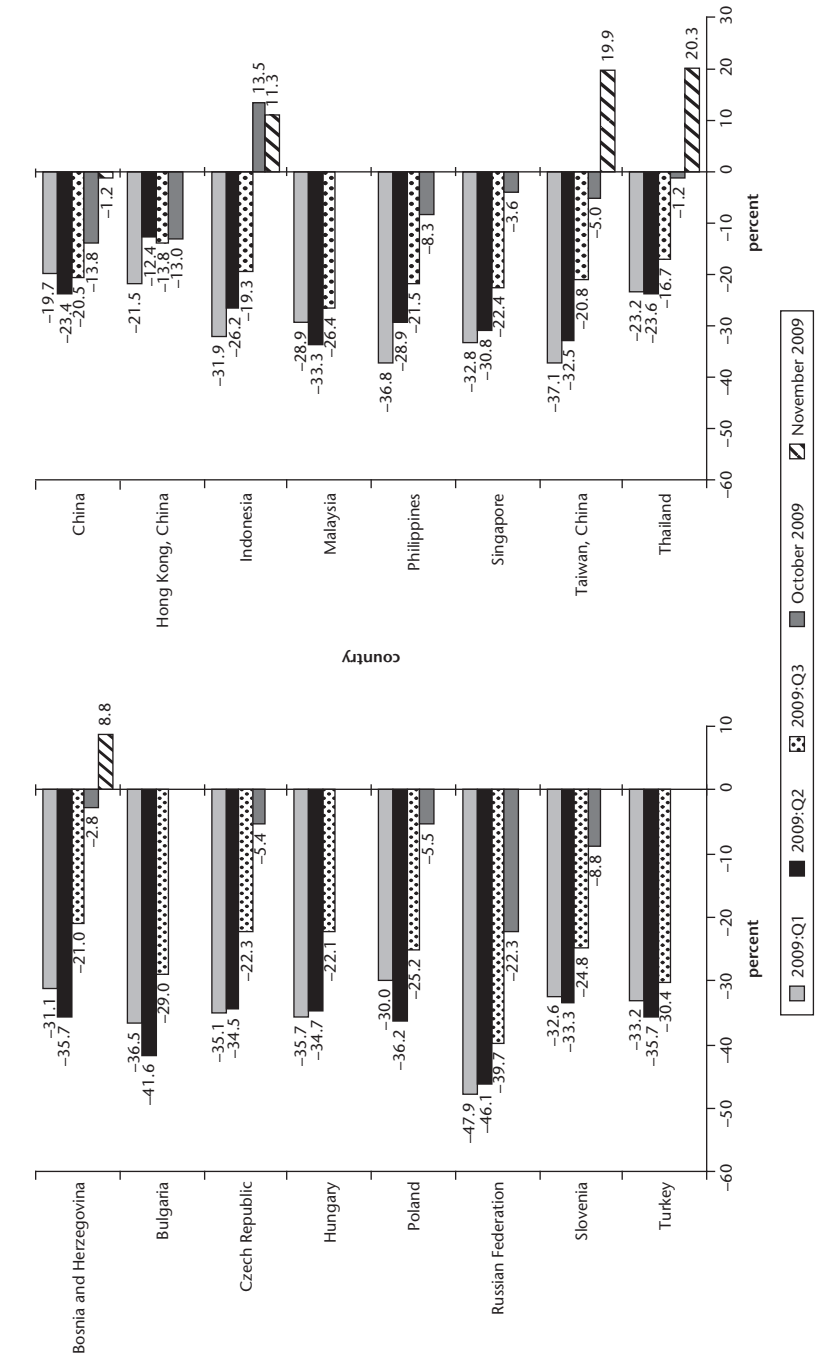
The authors measured GVC structure using a modified version of the Herfindahl-Hirschman Index (HHI) calculated for each product category by taking the total sum of the squared market shares of all countries exporting that product and multiplying the sum by 10,000, thus:

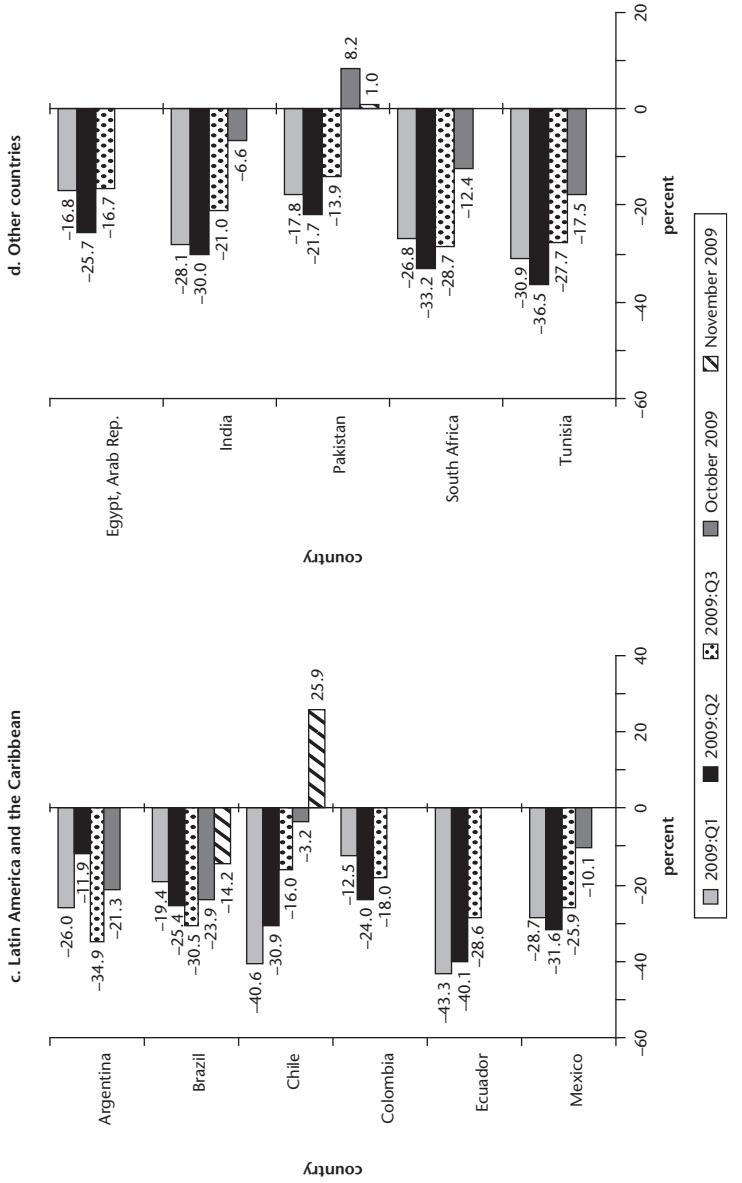
$$HHI_j = \sum_i (S_{ij})^2 \cdot 10{,}000,$$

where S_{ij} is the share of country *i* expressed as a percentage of total world exports of product *j*.[6] The HHI can range between $1/n * 10{,}000$ (if each of the n countries has the same share), and 10,000, if one country exports all, where *n* designates the total number of countries exporting this product. A decline reflects a decrease in "concentration," or, more accurately, a greater degree of spatial dispersion of export sourcing in that sector. The U.S. Department of Justice Antitrust Division considers HHIs between 1,000 and 1,800 points to be moderately concentrated, and those

Figure 2.9 Goods Exports of Low- and Middle-Income Countries, 2009

% change year to year





Source: Authors' illustration using data from Economist Intelligence Unit Country Data.

exceeding 1,800 points to be concentrated.[7] Although this rule of thumb refers to the original HHI, that is, to firms' market shares in a particular market rather than to the market shares of exporting countries, it provides a convenient benchmark for judging export market concentration.

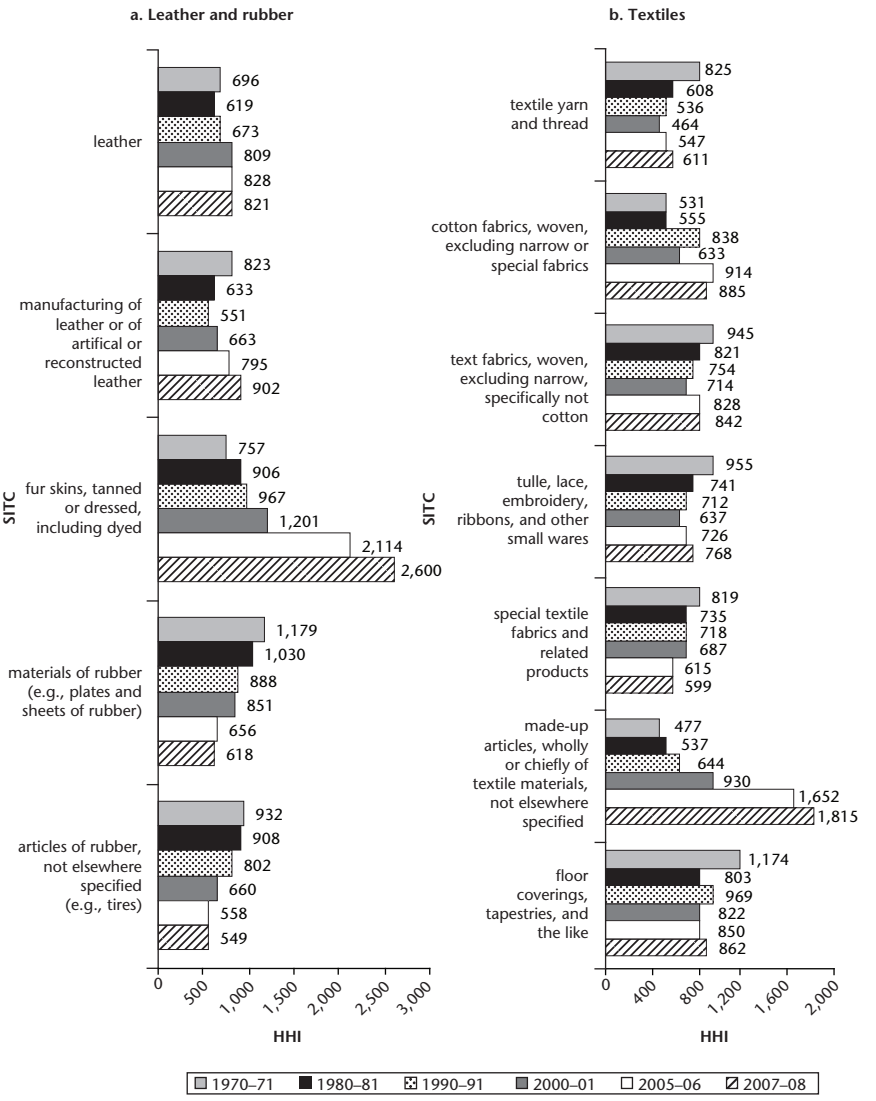
Figure 2.10 shows the graph of the index of industrial concentration for a selection of three-digit sectors for selected years from 1970 to 2008. Note that recent data should be interpreted with caution because export data might not be published yet for all individual countries, which—at a given level of world trade—would overestimate the share of countries for which data are available and thus yield a higher HHI. Most of the product areas experience a dispersion of trade (a decline in the HHI) although there are a number of exceptions. This is most clearly the case in the subsectors of textiles, iron and steel, machinery, and transportation. In some sectors, however, consolidation already began in the 1990s, including handbags, clothing, and footwear. These are sectors in which China made enormous gains in world market share, pushing out competitors, especially those from Africa and Latin America, but also those from smaller East and South Asian countries (Gallagher, Moreno-Brid, and Porzecanski 2008; Kaplinky and Morris 2008; Wood and Mayer 2009).

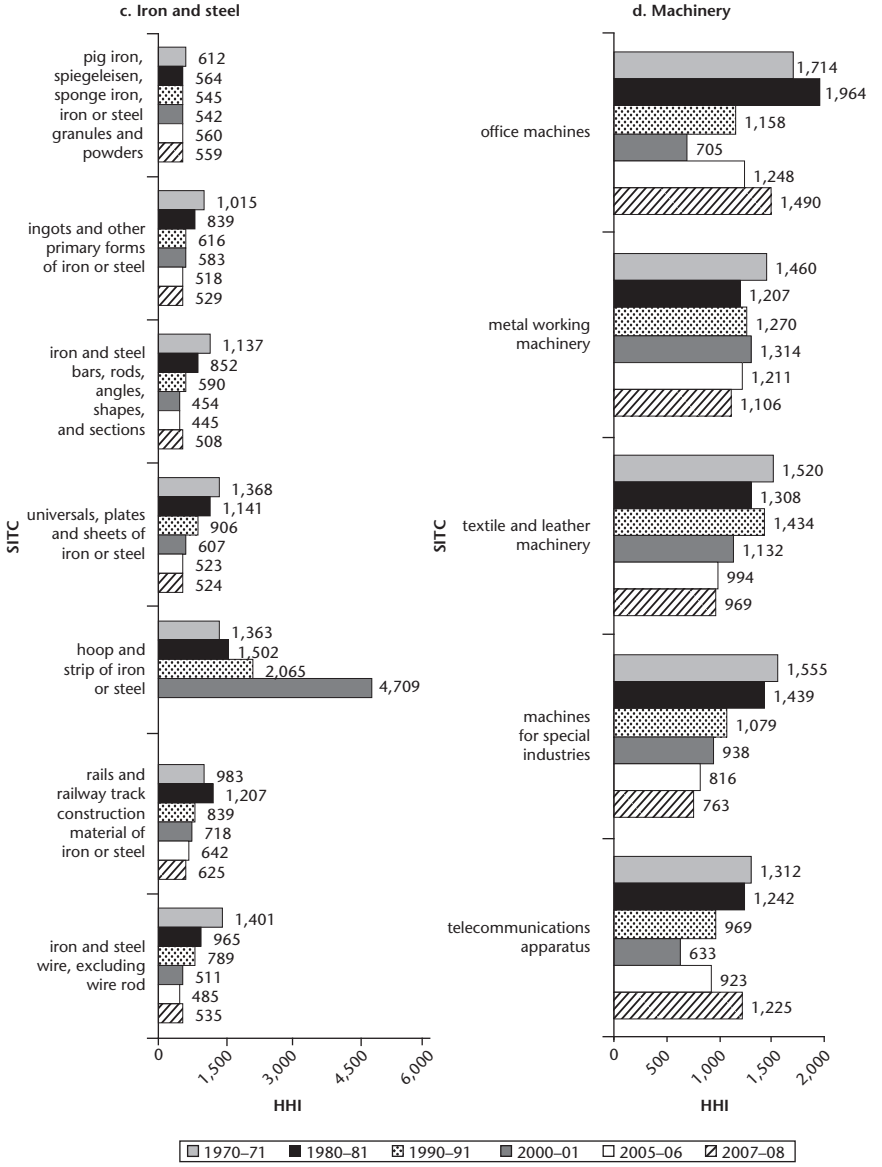
Downturn, Recovery, and GVCs: A Simple Taxonomy of Consolidation

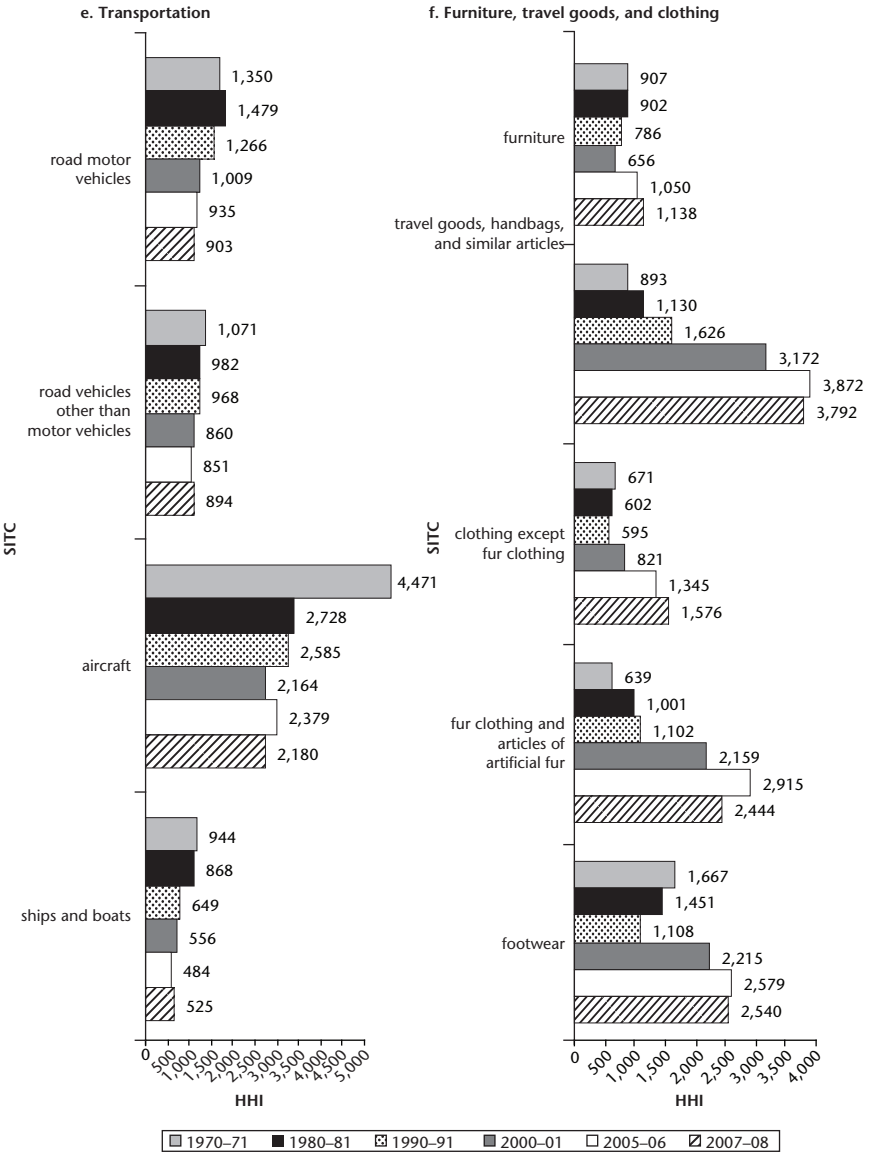
A theory of the relation between the number of suppliers in a GVC and the level of demand or stage of the business cycle has not been completely developed. The expansion of GVCs internationally and in terms of numbers of suppliers has been understood from the perspective of transaction cost considerations, following the insights of Coase (1937) and Williamson (1975). The approach is largely static and independent of underlying demand conditions, since the focus is on the ownership pattern in the vertical production structure. Moreover, the transaction cost model is not typically understood as symmetric, that is, as applying both to expansion and consolidation of GVCs; this is true because transaction costs are generally viewed as falling monotonically over time as transportation, communication, search, and policy (for example, tariffs) costs fall (for example, Langlois 2003; Williamson 1979).[8]

Two types of consolidation are distinguished in this chapter, vertical and horizontal. Vertical consolidation is a reduction in the number of tiers of suppliers. Horizontal consolidation is a reduction in the number of suppliers in a particular tier of a GVC. Vertical consolidation is driven by a shrinking of market size, reducing the rationale for the existing number of tiers of suppliers. This follows Adam Smith's notion that "the division of labor is limited by the extent of the market." Stigler (1951) developed the insight to apply precisely to the degree of vertical

Figure 2.10 Herfindahl-Hirschman Index by Standard International Trade Classification, 1970/71– 2007/08







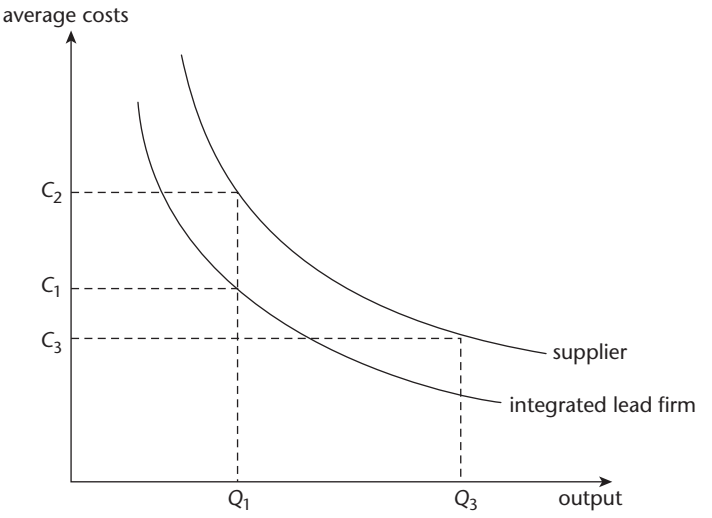
Source: Authors' calculations using data from UN Comtrade, retrieved from World Integrated Trade Solution.
Note: The Standard International Trade Classification used was Revision 1. HHI = Herfindahl-Hirschman Index.

integration of the firm. Levy (1984) formalized the process and tested it empirically for the domestic operations of U.S. firms. The logic for this calculation is depicted in figure 2.11.

Assume there are economies of scale and that the lower curve represents the cost structure of a vertically integrated lead firm and the higher cost curve represents the costs of a specialized supplier firm. In a small market such as Q_1, the supplier firm is not cost-competitive compared to a vertically integrated lead firm. If the market expands and more firms enter the supplier industry while the lead firm maintains its production, then supplier firms' costs, C_3, are lower than lead firm costs C_1. As Levy (1984, 382) states, "because the specialized [supplier] firm can produce at lower costs than the integrated [lead] firm, the integrated [lead] firm spins off the decreasing cost activity and buys from the specialized firm at a price lower than its average costs." The reverse of this logic predicts that a shrinking market would lead to a vertical consolidation of the GVC, whereby the lead firm can produce at lower cost by remaining integrated. Chung, Lu, and Beamish (2008), in a related study, find that majority-owned subsidiaries of parent firms perform relatively better compared to arm's-length suppliers in periods of economic downturn.

The notion of horizontal consolidation comes from Ricardo's theory of rent, according to which marginal suppliers are driven out of business as the market shrinks. Consolidation in the number of suppliers occurs in a downturn as marginal

Figure 2.11 Vertical Consolidation of Global Value Chains



Source: Authors' illustration based on Levy (1984, 382).

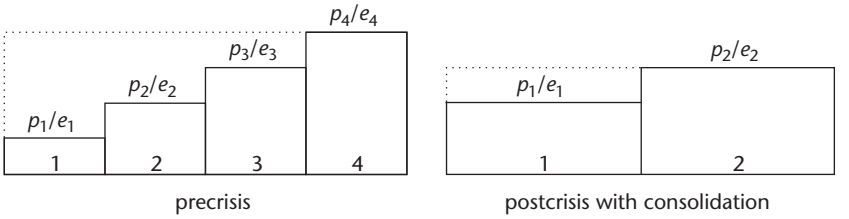
suppliers are squeezed out with the decline in demand. Horizontal consolidation might be more likely in buyer-driven GVCs, where supplier contracts are shorter and where lead firm commitments to, and technology sharing with, supplier firms are less. This process is depicted in figure 2.12. Production costs are indicated in the figure by prices in foreign currency, where *pi* is domestic price and e_i is the exchange rate for country *i*. Lead firms will be more likely to maintain suppliers with whom they have already invested in technology, capital, or cooperation.

Both types of consolidation are logical in a downturn. The central issue here is the reversibility of these processes. Will a rebound in demand generate a reversal of consolidation? The focus in the analysis here is primarily on horizontal consolidation. Is there a rationale for asymmetry or hysteresis in the relation between demand and GVC structure? The answer would seem to hinge on the possibility of surviving suppliers expanding capacity and capturing scale economies, creating new entry barriers for firms that did not survive the downturn. The duration of the economic downturn and speed of the recovery potentially allows surviving suppliers to expand productive capacity and to further capture scale economies. Such suppliers may also develop new production capabilities. At the same time, suppliers forced to shut down during the slump face considerable fixed costs in reopening operations, and thus may be at a further disadvantage even when demand returns to pre-downturn levels. Thus, in the case of GVC consolidation, the shutdown of marginal firms can lead to an asymmetric pattern when demand recovers. The high-productivity suppliers are in a better position to expand when the market rebounds, leading to a consolidation of the GVC.

GVC Restructuring in the Crisis

What has been the trend in the HHI over the recent downturn period? Those sectors or products that saw the greatest decline in trade might be expected to exhibit

Figure 2.12 Horizontal Consolidation of Global Value Chains



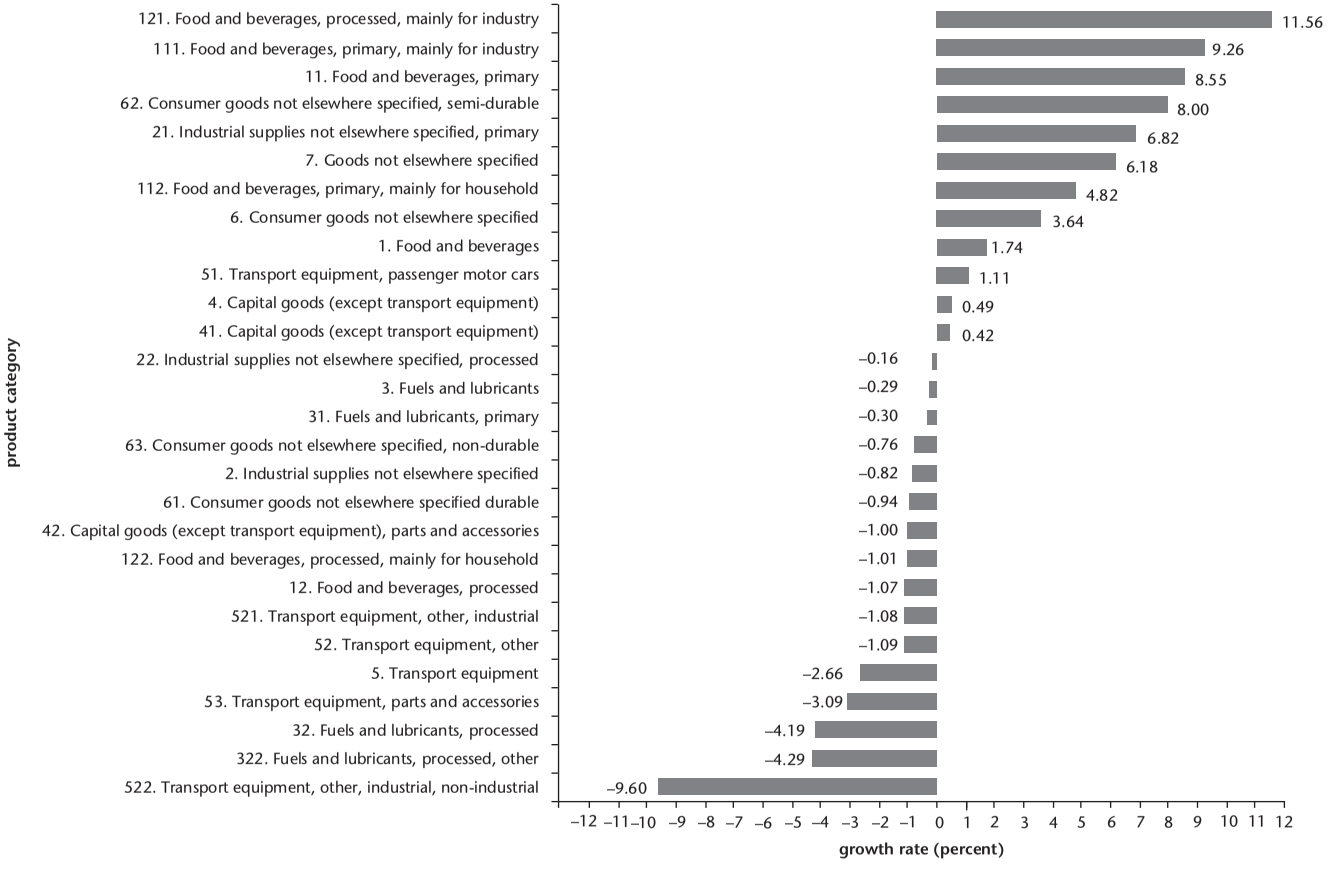
Source: Authors' illustration.

the greatest degree of consolidation, according to the authors' HHI measure. But there appears to be no correlation between the percentage decline in trade and the change in GVC structure. This may a result of the fact that the 2007–08 period does not capture enough of the downturn's effect, since its major impact began in 2008. However, if we recalculate the HHI index for a different grouping of sectors, we do find some regularities. That is, while the volume of trade does not seem correlated, as yet, with consolidation, the type of sector or GVC does seem to matter for the pattern of consolidation and diversification.

The hypothesis that emerges from this brief theoretical consideration of global value chain consolidation is that buyer-led chains will experience the most consolidation and producer-led chains the least. This hypothesis gets some support when considering consolidation in sectors measured by "Broad Economic Category," which characterizes goods as consumption goods, capital goods, and intermediate goods (see annex 2B for definitions). The changes in HHI for these product categories between 2007 and 2008 are presented in figure 2.13. Note that an almost equal number of product areas experienced diversification as experienced consolidation. Consolidation occurs more often in consumption goods sectors (categories 1, 6, and 7, for example), where buyer-led chains are more pervasive, and diversification occurs in intermediates (categories 2 and 5), where producer-led chains are more often the governing norm. Finally, we find that there is a weak positive relationship between consolidation and export growth, as indicated by the upward sloping line in figure 2.14.

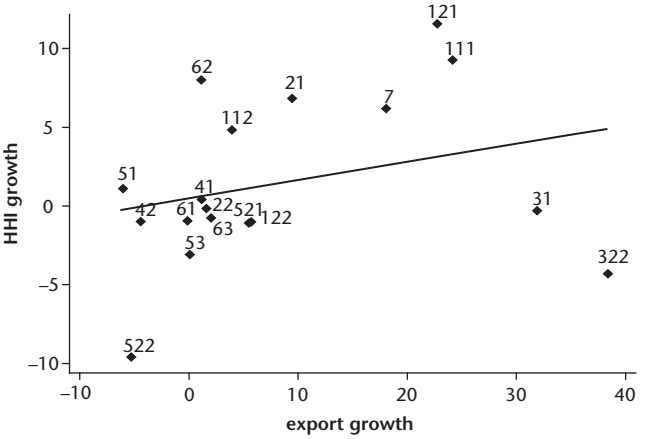
This result of consolidation in buyer-driven GVCs is consistent with the fact that in the downturn there were some significant shifts in product market shares, with China often gaining in U.S. import markets, while smaller East Asian nations were found to be losing U.S. market share in the United States. Table 2.3 provides some evidence of how particular countries have fared in particular markets as U.S. imports declined. These selected sectors reveal a pattern of China gaining market share despite the decline in U.S. imports. Other countries have also gained, depending on the product area. Countries that have lost market share include high-cost producers (for example, Italy in the handbag market) and low-cost, especially East Asian, producers (for example, Cambodia in apparel, Thailand in rubber products and plumbing and heating fixtures, and Malaysia in telecommunications products). Thus, this evidence would indicate that the import decline that occurred with the economic downturn created winners and losers in terms of market share. China's continued success in exporting to the United States, aided no doubt by the adjustable dollar peg, is taking a toll on exporters in both high-cost markets and low-cost markets, the latter especially among smaller East Asian countries. This finding is confirmed by surveys by Hurst, Buttle, and Sandars (2009) of small and medium enterprises in East

Figure 2.13 Herfindahl-Hirschman Index by Broad Economic Category, Ranked by 2007–08 Growth Rate
percent



Source: Authors' calculations with data from UN Comtrade, retrieved from: World Integrated Trade Solution.

Figure 2.14 Export Growth and Herfindahl-Hirschman Index Growth by Broad Economic Category, 2007–08
percent



Source: Authors' illustration using data from UN Comtrade, retrieved from World Integrated Trade Solution.

Asia, which have reported massive declines in orders and cutbacks in employment across a variety of consumer goods.

Conclusions: Alternative Sources of Demand and Policy Responses

Joseph Stiglitz (2009) has noted that the 2008–09 downturn was the first economic crisis in the era of globalization, in that the crisis was felt globally (rather than in just some regions) and spread in part as the result of the globalized nature of financial markets.[9] But his characterization also holds true for the production and trade sides of the economy. This has been the first economic crisis since the globalization of production (the expanded use of global value chains) became extensive and sophisticated. It occurred since highly export-dependent developing countries have been participating in the world economy largely through these global value chains. The authors' analysis of the effects of the economic crisis on export-oriented developing countries confirms that the economic crisis that began in the United States in 2007, and quickly evolved into a large drop in demand for exports from developing countries, has had a magnified effect on trade because of the prominence of GVC-based trade. Trade volumes had risen much more rapidly than GDP for 25 years, and the reverse occurred in the recent

Table 2.3 U.S. Sectoral Import Shares by Top-10 Importers, January–September 2008 versus January–September 2009
percent

	Jan.–Sep.		
Economy	**2008**	**2009**	**Change**
62. Rubber manufactures, n.e.s.			
China	21.3	24.4	3.2
Canada	17.8	18.4	0.6
Japan	13.5	13.6	0.1
Mexico	7.1	6.7	–0.4
Korea, Rep.	6.6	6.2	–0.4
Germany	4.9	4.6	–0.3
Thailand	3.5	3.3	–0.2
Brazil	2.7	2.7	–0.1
Taiwan, China	3.4	2.8	–0.5
Indonesia	1.5	1.8	0.3
All other	17.8	15.6	–2.2
65. Textile yarn, fabrics, made-up articles, n.e.s., and related products			
China	33.7	35.1	1.4
India	10.2	10.6	0.5
Mexico	6.9	7.4	0.6
Canada	7.0	6.9	–0.2
Pakistan	6.7	7.6	0.8
Korea, Rep.	3.4	3.4	–0.1
Turkey	2.4	2.1	–0.3
Taiwan, China	2.7	2.3	–0.3
Japan	2.5	2.1	–0.4
Israel	1.5	1.7	0.2
All other	22.9	20.9	–2.1
76. Telecommunications and sound recording and reproducing apparatus and equipment			
China	39.6	40.5	1.0
Mexico	23.7	24.1	0.4
Korea, Rep.	7.9	9.6	1.6
Taiwan, China	4.6	4.8	0.2
Japan	5.6	4.2	–1.4
Malaysia	5.0	4.1	–0.9
Thailand	2.8	2.5	–0.3
Canada	2.8	2.9	0.0
Indonesia	0.7	0.9	0.2
Germany	0.9	0.7	–0.2
All other	6.3	5.7	–0.6

(continued)

Table 2.3 U.S. Sectoral Import Shares by Top-10 Importers, January–September 2008 versus January–September 2009 (*continued)*

	Jan.–Sep.		
Economy	**2008**	**2009**	**Change**
81. Prefabricated buildings: sanitary, plumbing, heating and lighting fixtures and fittings, n.e.s.			
China	54.6	57.4	2.8
Mexico	18.6	19.0	0.3
Canada	8.9	8.5	–0.3
Germany	2.6	2.5	–0.1
France	1.0	1.2	0.2
Taiwan, China	1.4	1.0	–0.4
India	0.9	0.9	–0.1
Italy	1.8	1.3	–0.5
Japan	0.7	0.7	0.0
Thailand	1.1	0.9	–0.2
All other	8.4	6.6	–1.8
84. Articles of apparel and clothing accessories			
China	33.6	38.2	4.6
Vietnam	6.6	7.3	0.7
Indonesia	5.4	5.9	0.5
Mexico	5.4	5.1	–0.3
Bangladesh	4.4	5.1	0.8
India	4.2	4.5	0.3
Cambodia	3.1	2.7	–0.4
Honduras	3.3	3.0	–0.3
Thailand	2.7	2.5	–0.2
Pakistan	2.0	2.0	0.0
All other	29.3	23.7	–5.6
85. Footwear			
China	74.0	76.3	2.3
Vietnam	5.9	7.5	1.6
Italy	5.9	4.3	–1.6
Indonesia	2.0	2.5	0.5
Brazil	2.7	2.2	–0.5
Mexico	1.2	1.3	0.1
India	1.0	0.9	–0.1
Dominican Republic	0.6	0.7	0.0
Thailand	1.3	0.9	–0.3
Canada	n.a.	0.3	n.a.
All other	5.3	3.1	–2.3

Source: Authors' calculations using data from U.S. International Trade Commission.
Note: Top-10 importers as of September 2009 by SITC category. n.e.s = not elsewhere specified

recession. And this reverse effect has been more pronounced and the upturn more delayed in the recent downturn.

While this magnified effect has been observed across sectors, there appears to be considerable variation based on recent U.S. import data. Motor vehicles and parts imports and construction materials imports bell by over 50 percent at an annual rate, while apparel and food imports fell by 10 percent or less and professional services imports continued to expand. The effect to date on developing countries thus depends on their export profile, that is, on their role in global value chains, on the nature of the GVCs (buyer or producer-driven), and on the net effect of the forces of import demand and substitution.

The authors argue that because of structural changes that occurred in this recession, there are more reasons than previously to be concerned about the possibility of a longer recovery of trade. Moreover, the recession occurred at a time when GVCs are expansive and are subject to consolidation. The authors found evidence that some consolidation of GVCs occurred in 2008, especially in buyer-led chains. China's expanded market share across a spectrum of product categories, which seems to have come at the expense of other East Asian countries' exports, supports this finding. Producer-led chains appear to be continuing the longer-term trajectory of diversification.

If trade volumes do not rebound symmetrically with the economic recovery, then the consolidation of GVCs is more likely, because the consolidation that occurred with the downturn will lead to a longer period of time for surviving suppliers to expand capacity and raise productivity.

The analysis presented in this chapter leads to three policy conclusions:

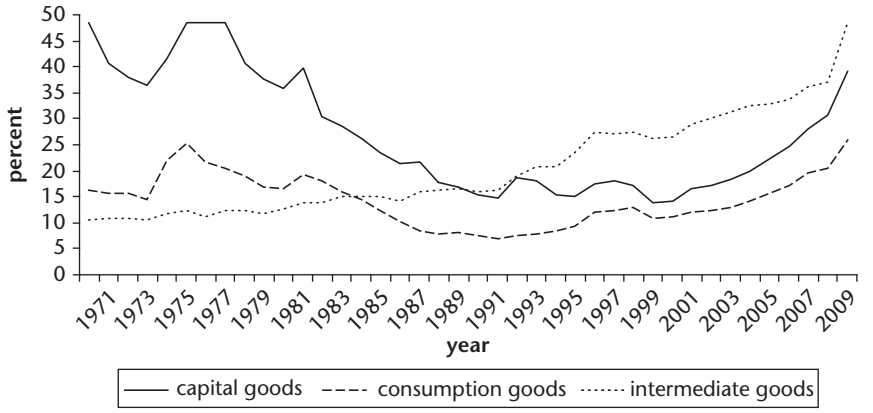
[[**AU: The recommendation "the provision of ..." should come first, as it is the "policy conclusion."**]]

- Declines in export demand translate immediately into declines in foreign exchange reserves. In an environment where developing country foreign exchange reserves are growing more slowly or declining, the provision of $250 billion in trade credit by the G-20 is a useful stopgap measure and should be allocated quickly. The expanded resources of the International Monetary Fund should also be tapped quickly and with reduced conditionality.
- Countries need to find other, non-export sources of demand, or to diversify trade patterns to focus more on trade among developing countries. One source is expansionary fiscal policy. China's large stimulus package is a prime example, and China's growth has picked up following a large increase in unemployment from the initial shock to world trade. But China's success in domestic stimulus in some ways points out the difficulty of drawing any general conclusions about the possibilities for stimulus across the developing world. Capacity for stimulus depends to a great extent on the prior accumulation of foreign exchange reserves. China is, of course, exceptional in that it has accumulated

substantial reserves over the past 15 years. Most developing countries have very small reserve stocks.

- The other prospect is to expand other sources of export demand. South-South trade is often cited as a potential source of growth in developing countries. This deep embedding in GVCs also appears in the structure of developing countries' imports. Figure 2.15 shows low- and middle-income country exports to other low- and middle-income countries (that is, South-South trade) by broad economic category (BEC) as a percentage of total exports of BEC. During the past two decades, the export shares to other developing countries have been continuously growing for capital goods, consumption goods, and intermediates. This reflects the growing importance of South-South trade. By definition, high-income countries have absorbed a declining percentage of exports from developing countries. Preliminary data for 2009 indicate a strong increase of South-South trade, indicating that this is a potentially promising source of demand growth in the future.
- Regarding the composition of South-South trade, more than a third of developing countries' exports of intermediates went to other developing countries in 2008. The preliminary 2009 data even indicate a jump to almost 50 percent. Capital and consumption goods, however, are increasingly exported to developing countries as well, reaching pre-crisis shares of 30 percent and 20 percent, respectively. But here, again, the structure of world trade according

Figure 2.15 South-South Trade by Broad Economic Product Category, 1970–2009
% total exports



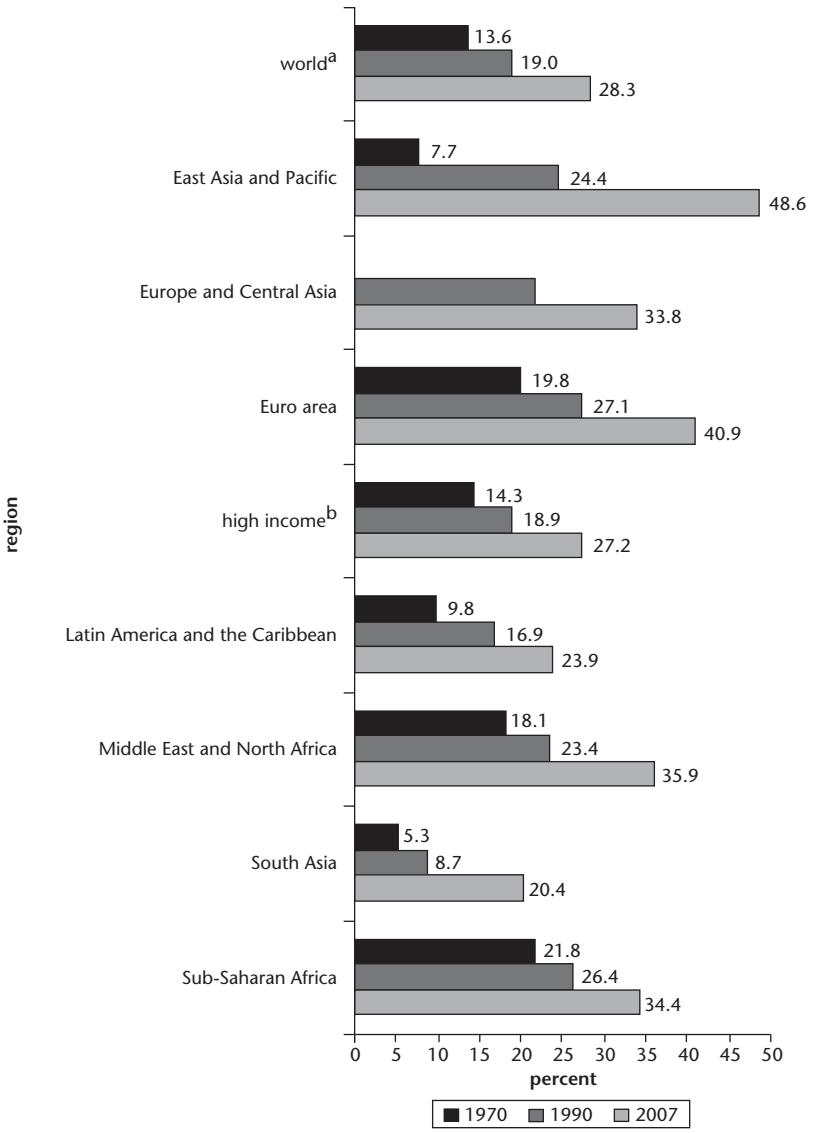
Source: Authors' calculations using data from UN Comtrade.
Note: Figures are exports from low- and middle-income countries to other low- and middle-income countries by Broad Economic Category.

to GVCs may create an obstacle in the short run to South-South trade growth. Figure 2.15 shows that the greatest growth potential of developing countries' exports over the past decade has been in intermediates. This indicates that South-South trade is also molded to some extent by GVCs and the processing of intermediates to serve these chains. In this sense, the expansion of South-South trade depends still on the functioning of GVCs.

- A final policy conclusion has to do with trade politics in industrialized countries during a severe economic downturn. Because of the extent of global value chains, firms in developed countries—generally the lead firms in the GVCs—depend on imports for their inputs and profitability (for some econometric-based evidence, see Milberg and Winkler 2009b); thus, these firms are less inclined to support trade protection than they were in earlier periods of steep economic decline (for example, when the Smoot-Hawley tariff adopted by the United States in 1930 raised U.S. import tariff rates to 60 percent). Nonetheless, popular sentiment remains in developed countries for protectionism. Resisting such a move will be very important for developing countries as the world economy recovers from the crisis.

Annex 2A: World Exports by Region from 1970 to 2007

Figure 2A.1 World Exports by Region, 1970–2007
% GDP



Source: Authors' illustration using data from World Bank, World Development Indicators.
a. Data are from 2006.
b. Data are from 2006, and this category includes members of the Organisation for Economic Co-operation and Development.

Annex 2B: Classification of Sectors by Broad Economic Category

The broad economic category (BEC) classification, as defined by the UN, comprises 19 basic categories that are assigned to the final use of the good, namely capital good, consumption good, and intermediate good (see table 2.B). Two categories (motor spirit, passenger motor cars, and goods n.e.s. [not elsewhere specified]) are not assigned to these categories. Authors suggest classifying motor spirit as intermediate goods and passenger motor cars as consumption goods, while the assignment of goods that are not specified elsewhere cannot be done.

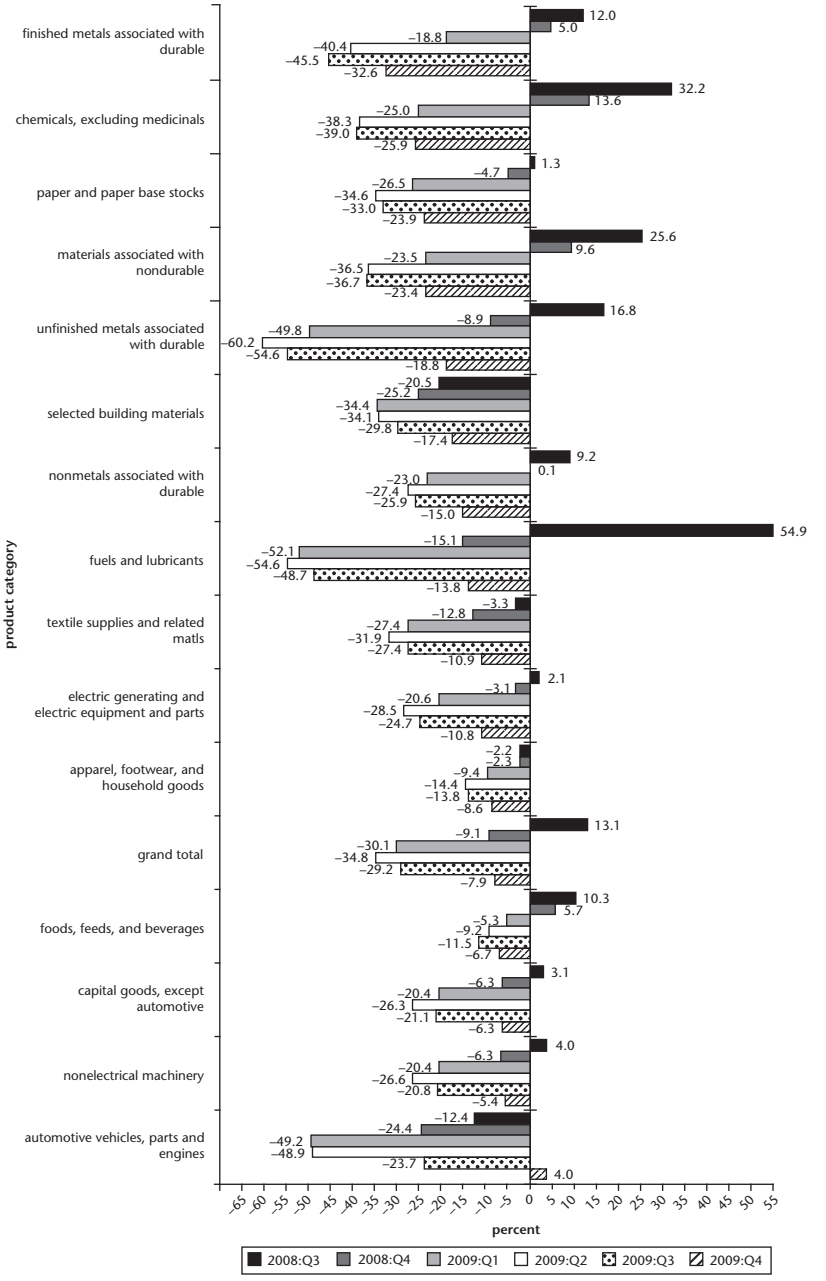
Table 2B.1 Classification of Sectors by Broad Economic Category

Broad economic category	Final use
1 Food and beverages	
11 Primary	
111 Mainly for industry	Intermediate goods
112 Mainly for household consumption	Consumption goods
12 Processed	
121 Mainly for industry	Intermediate goods
122 Mainly for household consumption	Consumption goods
2 Industrial supplies not elsewhere s	
21 Primary	Intermediate goods
22 Processed	Intermediate goods
3 Fuels and lubricants	
31 Primary	Intermediate goods
32 Processed	
321 Motor spirit	Intermediate and consumption goods
322 Other	Intermediate goods
4 Capital goods (except transport equipment)	
41 Capital goods (except transport equipment)	Capital goods
42 Parts and accessories	Intermediate goods
5 Transport equipment	
51 Passenger motor cars	Intermediate and consumption goods
52 Other	
521 Industrial	Capital goods
522 Non-industrial	Consumption goods
53 Parts and accessories	Intermediate goods
6 Consumer goods not elsewhere spec.	
61 Durable	Consumption goods
62 Semi-durable	Consumption goods
63 Non-durable	Consumption goods
7 Goods not elsewhere specified	Intermediate, consumption, and capital goods

Source: UN "Classification by Broad Economic Categories," 2002.

Annex 2C: U.S. Goods Imports Ranked by Fourth-Quarter 2009 Growth

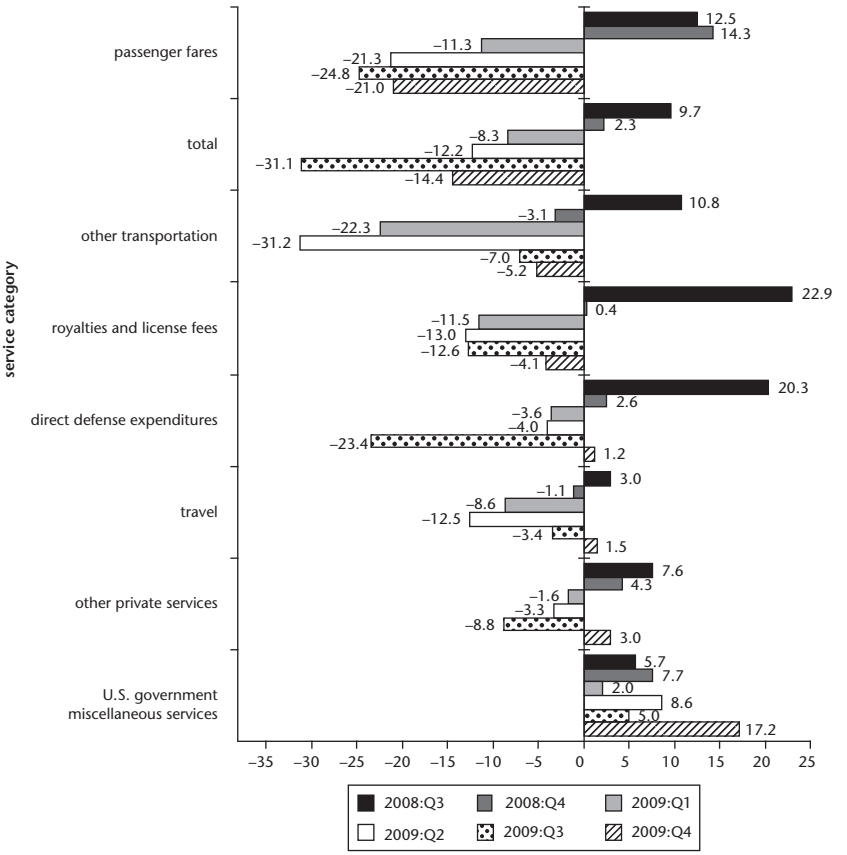
Figure 2C.1 U.S. Goods Imports by Product Category, Ranked by Fourth Quarter 2009 Growth
% change year to year



Source: Authors' illustration using data from Bureau of Economic Analysis, International Accounts.
Note: Product, monthly and quarterly imports of goods, and balance of payments–based data are seasonally adjusted.

Annex 2D: U.S. Services Imports Ranked by Fourth Quarter 2009 Growth

Figure 2D.1 U.S. Services Imports by Service Category, Ranked by Fourth-Quarter 2009 Growth
% change year to year



Source: Authors' illustration using data from Bureau of Economic Analysis, International Accounts.
Note: Product, monthly imports of services, and balance of payments–based data are seasonally adjusted.

Annex 2E: Income Elasticity Estimates

Following Bahmani-Oskooee (2005) and others, U.S. import demand is assumed to be the following:

$$\ln M_t^j = \alpha + \beta \ln Y_t + \gamma \ln E_t^j + \varepsilon_t \qquad \text{(E.1)}$$

where M designates real import demand for imports from country j, Y real domestic income, and E real bilateral exchange rate between the United States and country j at time t. E is defined as units of foreign currency per U.S. dollar, and ε_t denotes the random error term. Annex 2F describes the data used in the regressions. We hypothesize β to be positive, that is, higher income is related to higher import demand. γ is also expected to be positive, that is, an appreciation of the U.S. dollar is associated with a higher import demand.

An autoregressive distributed lag (ARDL) approach to cointegration is applied, which yields consistent estimates of the long-run coefficients, regardless of whether the regressors are I(1) or I(0) and thus does not require pre-testing for unit root (Pesaran, Shin, and Smith 2001). The ARDL approach adds short-run dynamics to the long-run estimation as given in equation E.1:

$$\Delta \ln M_t^j = \alpha + \sum_{i=1}^{n} \beta_i \Delta \ln Y_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta \ln E_{t-1}^j + \sum_{i=1}^{n} \delta_i \Delta \ln M_{t-i}^j + \nu_1 \ln Y_{t-1} + \nu_2 \ln E_{t-1}^j + \nu_3 \ln M_{t-1}^j + \varepsilon_t \quad \text{(E.2)}$$

The lagged level variables constitute the so-called lagged error-correction term, which should be retained or excluded from the equation based on the F-statistics. Pesaran, Shin, and Smith (2001) provide lower and upper critical value bounds and show that the null hypothesis of $\nu_1 = \nu_2 = \nu_3 = 0$ is rejected if the calculated F-statistics are greater than the upper critical value bound. In such a case, the lagged level variables are cointegrated.

Table 2E .1 reports the income and price elasticities, differentiating between goods imports (columns 1–4) and services imports (columns 5–8). Column 1 shows the F-statistics for goods imports based on the optimal number of lags (column 2), which were determined using Akaike's information criterion. Due to the limited number of quarters, we restricted the maximum lag to be six. We also tested for autocorrelation using Durbin's alternative test (column 3). In case the specification showed autocorrelation, we used the second best lag structure. We consider the error correction model with an unrestricted intercept and no trend. At the 10 percent significance level the critical value bounds for the F-statistics are 3.17 and 4.14 (Pesaran, Shin, and Smith 2001). Column 1 shows that only Argentina, China, India, Korea, and the United Kingdom exceed the critical level. Germany's and Hong Kong's F-statistics fall within the band, which leads to inconclusive results. Following Bahmani-Oskooee and Brooks (1999), the error-correction term should be retained in such a case. The short-run effects of income on import demand are determined by the coefficient estimates of the first differenced income variables (with or without the error correction term). These results are mostly insignificant so are not reported here.

Table 2e.1 U.S. Import Elasticities, 1999–2008

	Long-run income and price elasticities of import demand									
	U.S. goods imports					*U.S. services imports*				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Economy	F-Statistics[a]	Lags[b]	Durbin's test[c]	Income elasticities	Price elasticities	F-Statistics[a]	Lags[b]	Durbin's test[c]	Income elasticities	Price elasticities
Argentina	15.07	5	Prob> X^2 = 0.54	–0.5528 (0.109)	–0.1318* (0.071)	4.80	6	Prob> X^2 = 0.73	2.2540** (0.034)	–0.5155 (0.426)
Brazil	2.87	3	Prob> X^2 = 0.41	1.2441** (0.018)	–0.0898 (0.255)	5.70	2	Prob> X^2 = 0.45	0.2577 (0.515)	–0.5986*** (0.006)
Canada	0.13	5	Prob> X^2 = 0.74	0.0488 (0.956)	–0.0569 (0.932)	9.44	6	Prob> X^2 = 0.21	7.5568*** (0.000)	3.2146*** (0.006)
China	4.19	4	Prob> X^2 = 0.20	8.6450*** (0.006)	1.8407*** (0.007)	8.39	1	Prob> X^2 = 0.72	6.0187*** (0.000)	0.2330 (0.534)
France	1.61	1	Prob> X^2 = 0.24	0.4724 (0.294)	–0.0615 (0.663)	3.29	5	Prob> X^2 = 0.14	5.4116** (0.012)	1.0838 (0.132)
Germany	3.34	2	Prob> X^2 = 0.89	1.8615*** (0.007)	–0.0774 (0.617)	5.21	4	Prob> X^2 = 0.65	4.7037*** (0.003)	0.4846 (0.121)
Hong Kong, China	3.69	3	Prob> X^2 = 0.79	–2.7530** (0.011)	0.3589 (0.544)	4.02	2	Prob> X^2 = 0.46	5.4964** (0.012)	–1.9867* (0.052)
India	11.96	6	Prob> X^2 = 0.48	8.0550*** (0.000)	0.9567* (0.093)	1.94	2	Prob> X^2 = 0.53	2.0745** (0.039)	–0.0496 (0.930)
Japan	2.07	4	Prob> X^2 = 0.30	–0.1623 (0.582)	0.2765 (0.188)	3.65	3	Prob> X^2 = 0.78	1.7411** (0.011)	–0.0555 (0.658)

(continued)

Table 2e.1 U.S. Import Elasticities, 1999–2008 *(continued)*

	Long-run income and price elasticities of import demand									
	U.S. goods imports					*U.S. services imports*				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Economy	**F-Statistics[a]**	**Lags[b]**	**Durbin's test[c]**	**Income elasticities**	**Price elasticities**	**F-Statistics[a]**	**Lags[b]**	**Durbin's test[c]**	**Income elasticities**	**Price elasticities**
Korea, Rep. of	8.89	4	Prob> X^2 = 0.66	–0.1243 (0.759)	–0.2833 (0.247)	7.17	1	Prob> X^2 = 0.93	0.6843** (0.037)	–0.2796 (0.143)
Mexico	0.91	1	Prob> X^2 = 0.16	0.2330 (0.277)	0.1021 (0.627)	5.32	4	Prob> X^2 = 0.93	0.7879*** (0.004)	–0.1401 (0.784)
Singapore	1.91	1	Prob> X^2 = 0.85	–0.1663 (0.444)	0.1832 (0.516)	3.57	3	Prob> X^2 = 0.25	1.9245** (0.032)	0.0829 (0.838)
South Africa	2.16	1	Prob> X^2 = 0.94	1.2101 (0.104)	0.1832 (0.516)	3.26	1	Prob> X^2 = 0.53	0.6918* (0.094)	–0.1552 (0.446)
Taiwan, China	2.69	6	Prob> X^2 = 0.59	0.7715* (0.082)	–0.7135 (0.281)	4.14	1	Prob> X^2 = 0.51	2.3392*** (0.004)	0.2649 (0.356)
United Kingdom	4.53	2	Prob> X^2 = 0.73	–0.1623 (0.655)	0.5044** (0.026)	1.36	4	Prob> X^2 = 0.74	0.5222 (0.405)	0.3048 (0.477)
Venezuela, R.B. de	0.23	2	Prob> X^2 = 0.95	–0.1587 (0.766)	–0.0146 (0.948)	0.55	5	Prob> X^2 = 0.38	–1.1244 (0.514)	–0.0248 (0.960)

Source: Authors' calculations.
Note: The table represents quarterly data. The *p* values are in parentheses.
a. We consider the error correction model with an unrestricted intercept and no trend. At the 10% significance level, the critical value bounds for the F-statistics are 3.17 and 4.14. F-statistics are based on the optimal lag structure.
b. The optimal lag structure is determined by Akaike's Information Criterion for specifications with no autocorrelation.
c. We used Durbin's alternative test to test for serial correlation in the disturbance. This test does not require that all the regressors be strictly exogenous.
*$p < 0.1$ **$p < 0.05$ ***$p < 0.001$.

Annex 2F: Data Description and Sources

For the regressions, quarterly data for 16 countries for the period 1999:Q1–2008:Q4 were used. U.S. imports by country of origin are available from the Bureau of Economic Analysis (BEA), U.S. International Transactions Accounts Data (release date: March 18, 2009). Real imports were calculated using the U.S. consumer price index (CPI) as deflator (2000 = 100). Real GDP data were retrieved from the BEA National Economic Accounts Data in order to match the income variable. As real exchange rates were not available, we corrected the bilateral nominal exchange rates for price differences using the foreign and U.S. CPI as price deflators, that is, $E_r = E_n \cdot (P^{us}/P^{j})$. CPI was used instead of PPI, as the latter was not available for all countries. Nominal exchange rates and CPIs were retrieved from the IMF International Financial Statistics database except for China and Taiwan (from Economist Intelligence Unit Country Data).

Notes

1. For relevant economic groupings of developing countries according to UNCTAD see: http://www.unctad.org/sections/stats/docs//gds_csirb_c&td-2-9_en.pdf

2. In fact, there is some debate over Freund's elasticity estimates. Escaith, Lindenber, and Miroudout (2010) find that trade elasticities rose in the 1990s compared to the previous decade, but then were lower in the 2000s compared to the 1990s.

3. Note that this does not mean there is more value-added in international trade, but simply that there is more trade per unit of output and likelihood of a greater change in the volume of trade for a given change in real output. There is some double counting of value-added in GVC-based trade, as the value of imported inputs is included in the value of exports. The greater import content of exports (vertical specialization) accounts for a significant amount of the measured growth in world trade. Chen, Kondratowicz, and Yi (2005) find that double counting of value in trade figures occurs more in manufacturers than in services. For the United States in 2000, adjusted exports would be $198 billion, or 9 percentage points less than reported in 2000 trade figures. Koopman, Wang, and Wei (2008) calculate value-added in Chinese exports in 2002 to be about 51 percent of total export value. Linden, Kramer, and Dedrick (2007) show that Chinese value-added in its export of the $143 Apple 30GB video iPod (retail price of $299) was $5.

4. Freund (2009), in fact, predicts some worsening of the U.S. current account imbalance based on past experience.

5. Unfortunately, Eurostat does not report trade data for services.

6 This measure was used by Mayer, Butkevicius, and Kadri (2002) and Milberg (2004).

7. See http://www.justice.gov/atr/public/testimony/hhi.htm.

8. Williamson (1979, 260) thus addresses the issue: "As generic demand grows and the number of supply sources increases, exchange that was once transaction-specific loses this characteristic and greater reliance on market-mediated governance is feasible."

9. Blog posting by Joseph Stiglitz in 2009.

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