

# Trade Crisis and Recovery

## Restructuring of Global Value Chains

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## Abstract

The recent large and rapid slowdown in economic activity has resulted in even larger and more rapid declines in international trade. As world trade is set to rebound, this paper addresses three questions: (i) Will trade volumes rebound in a symmetric fashion as world economic growth rebounds? (ii) Will the crisis result in a change in the structure of trade, and in particular will it lead to

a reversal of the pattern of more diversified sourcing and thus to a consolidation of global value chains? (iii) 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 global value chains?

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# **Trade Crisis and Recovery: Restructuring of Global Value Chains**

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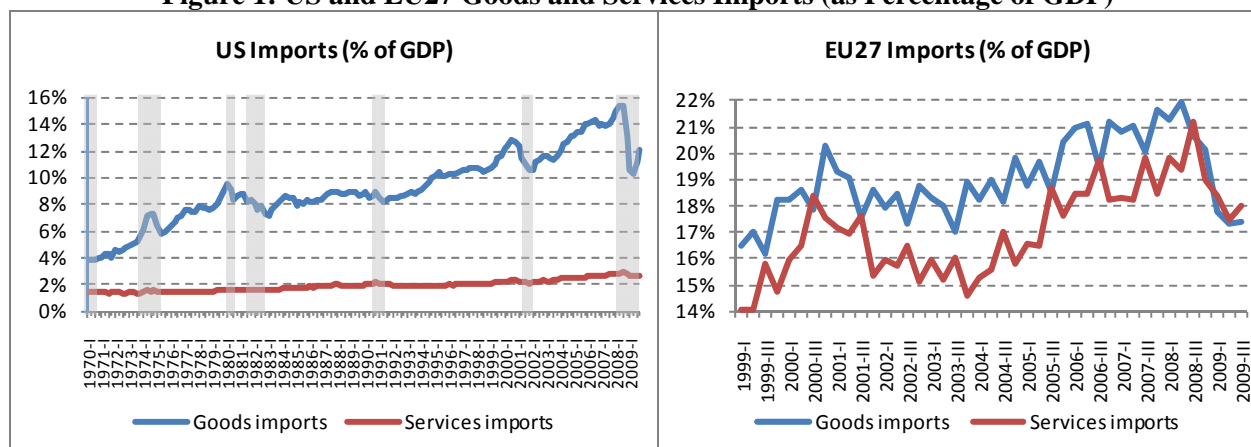
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# 1. Introduction

Global value chains (GVCs), which only recently entered into the purview of economists, are now viewed as at the center of debate over causes and consequences of the 2009 collapse of global trade. Feenstra (1998) noted the prominence of a global “disintegration” of production, but not until Grossman and Rossi-Hansberg’s (2006) essay 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. Before this, trade in intermediates was generally modeled as a refinement of the international division of labor according to principles of comparative advantage (e.g. Arndt and Kierzkowski, 2001). Since the global downturn, GVCs are seen as central to the dramatic collapse of world trade.<sup>1</sup> Well documented, this collapse has been more severe, rapid and persistent than trade collapses experienced in the past, including during the Great Depression. This paper explores the role of GVCs in the trade collapse and the prospects for world trade and its geographic distribution in light of the dynamics of GVCs.

Trade decline has potentially devastating effects on export-oriented developing countries. As shown in *Figure 1* (left-hand panel), the decline in US goods imports in the fourth quarter of 2008 and the first two quarters of 2009 was greater than the decline in US 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 and relative to GDP since 1980 at least. The EU has undergone a similar, if less dramatic, import decline (see Figure 1, right-hand panel). A similar pattern has been observed on a global scale as well. In an ominous sign, the drop in trade in the recent crisis has been found to be even more rapid than the decline in world trade at the beginning of the Great Depression in 1929.<sup>2</sup>

**Figure 1: US and EU27 Goods and Services Imports (as Percentage of GDP)**



Source: Own illustration. Data US: Bureau of Economic Analysis, National Income and Product Accounts Table, Gross Domestic Product, seasonally adjusted at annual rates. Gray bars correspond to US business cycles recessions according to the definition of the NBER. Data EU27: Eurostat, National Accounts, seasonally adjusted and adjusted data by working days. Imports refer to extra-EU27 countries.

Leading up to the recent economic downturn, developed-country imports of goods and services were growing faster than output, as seen in the case of the US and the EU in Figure 1.

<sup>1</sup> See the array of contributions in Baldwin (2009).

<sup>2</sup> Eichengreen and O’Rourke (2009).

This was due to a variety of factors, including the liberalization of trade and capital flows and the decline in the cost 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 who coordinate sometimes elaborate networks of suppliers.<sup>3</sup> 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.

In this paper we address three questions:

- (i) Will trade volumes rebound in a symmetric fashion as world economic growth rebounds?
- (ii) 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 global value chains?
- (iii) 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 global value chains?

Previous research shows that on average over business cycles since 1975 the effect on international trade is (a) larger than the effect on GDP and (b) symmetric, like the movement of GDP. The 2010 International Trade Statistics released by the World Trade Organization (WTO) suggest a similar pattern for the recent crisis: after the sharpest decline in more than 70 years, world trade is set to rebound in 2010 by growing at 9.5%, assuming a 2.9% global GDP growth.<sup>4</sup> However, the recent downturn has been deeper 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 US 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. We therefore suggest that those factors will affect the pace and pattern of trade recovery.

Regarding the second question, we undertake an empirical analysis of the change in the concentration of trade flows, using a Hirschman-Herfindahl index that measures concentration in terms of trade flows by country rather than in terms of market share by firms. We find that consolidation has been more likely in “buyer-led” global value chains and greater dispersion in “producer-led” global value chains. Regarding the third question, we briefly discuss the prospects for developing country fiscal stimulus and for South-South trade expansion. Our preliminary analysis shows that there is promising growth potential for South-South trade based on the experience of the past 20 years, but that this growth too may be limited if global value chains are consolidated, since the largest category of South-South trade is in intermediates.

This paper has six sections. In Section 2 we briefly assess 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. In Section 3 we look in more detail at the role of GVCs in the decline in US and EU import demand between 2008 and the third quarter of 2009, including estimates of the US income elasticity of import demand during the crisis compared to long-run elasticities, and a discussion of the possibility of a shifting V-curve of import demand. In Section 4 we look more closely at the sectoral and developing country impact of the import decline in the US and EU. In Section 5 we propose a theory of vertical and horizontal global value chain (GVC) consolidation. We then present data on changes in the

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<sup>3</sup> For a discussion of global value chains, see Gereffi (1994) and Gereffi et al. (2005).

<sup>4</sup> WTO, Press Release of March 26, 2010.

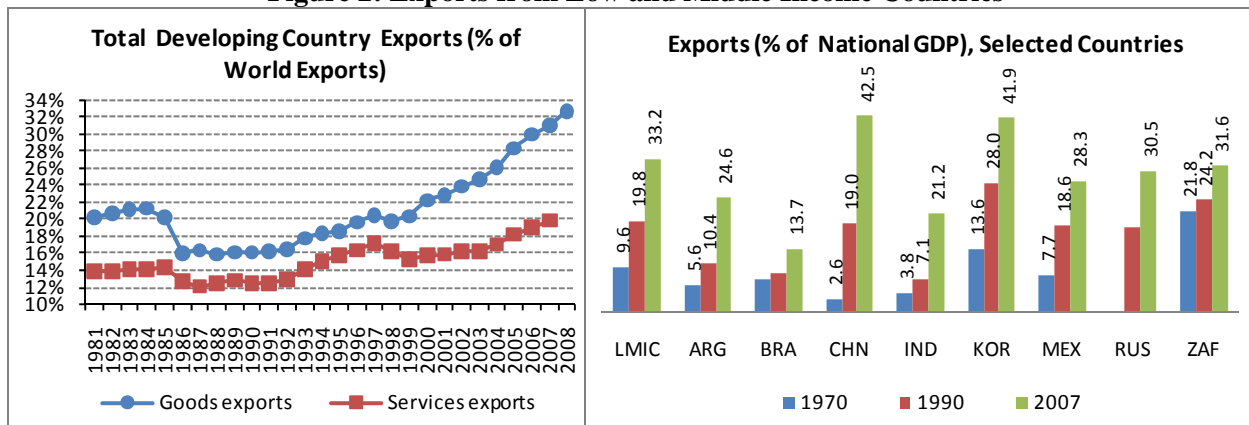
geographic concentration of global exports in detailed product areas. Section 6 begins with a brief discussion of prospects for expanding South-South trade as a substitute for declines in North-South trade that may be long-term both because of the changing structure of world demand and the consolidation of some global value chains.

We end with some policy conclusions, which are necessarily tentative since the recovery is unfolding as we conduct our research. These conclusions focus on the need for a 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 rates of unemployment.

## 2. GVCs and the Export Reliance of Developing Countries

The expansion of global value chains began in the 1980s as developing countries shifted from import substitution strategies to export-oriented development strategies. Developing countries' dramatic export success is evident in *Figure 2* (left-hand panel), which shows that since the early 1980s the export share of low and middle-income countries in world exports of goods and services rose almost steadily over the past 20 years. The goods export share rose from 16% in 1986 to over 30% in 2008, while the services export share grew from 13% to 20% 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 medium-income countries became steadily more export oriented, with exports as a share of GDP growing to 33% in 2007 compared to just 15% in 1980. China's enormous success is well known, and its export reliance went from around 3% of GDP in 1970 to almost 43% in 2007. But the increased export orientation was also dramatic in Mexico, South Korea, Argentina and India, among others (*Figure 2*, right-hand panel). See *Appendix 1* for the export shares by region of origin.

**Figure 2: Exports from Low and Middle Income Countries**



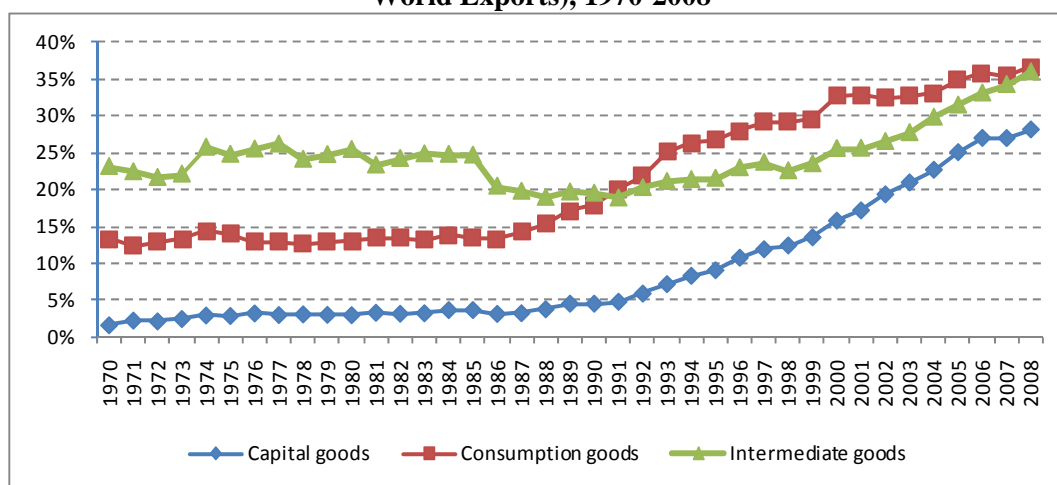
Source: Own illustration. Data: World Development Indicators, World Bank.

NB: Low & middle income countries cover most developing countries.

The increased export orientation of developing economies also involved a change in the structure of international trade due to the expansion of global production networks, also called global value chains. With the expansion of global value chains in the 1980s, trade in inputs grew dramatically as a share of total input use. Figure 3 shows that by 2004, low- and middle-income

countries accounted for 35% 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 the share of US imported inputs of materials and services in total non-energy input use grew at an average rate of 2% and 1.7%, respectively, per annum between 1998 and 2006, reaching levels of over 25% in some sectors, including apparel and motor vehicles by 2006.

**Figure 3: Goods Exports from Low and Middle Income Countries by Product Category (% of World Exports), 1970-2008**



Source: Own calculations. Data: UN Comtrade.

NB: See Appendix 2 for the definition of the different product categories.

These figures of offshoring measure trade in inputs and 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. We see in Table 1 that Japan and the U.S. now rely heavily on goods imports from low-income developing countries (29% and 23% respectively), which we define as the *narrow measure of goods offshoring*. While the European countries are at much lower levels, all countries have seen more than a doubling of the narrow measure of goods offshoring since 1991 (see CAGR). However, offshore destinations also include developing countries with a higher income level, such as Mexico, Brazil 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%) and the U.S. (54%), while the European countries range from 23% in the U.K to only 13% in Denmark.<sup>5</sup>

Since services import data by regions of origin are not available for our relevant time period, we define a country's import share of 'computer and information services' plus 'other business

<sup>5</sup> The relevant economic groupings of developing countries according to the UNCTAD can be found here: [http://www.unctad.org/sections/stats/docs/gds\\_csirb\\_c&td-2-9\\_en.pdf](http://www.unctad.org/sections/stats/docs/gds_csirb_c&td-2-9_en.pdf)

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. In Table 1 we see 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 of between 1.3% and 5.2%.

**Table 1: Goods and Services Offshoring Intensities, Selected Countries, 1991 vs. 2006**

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

Source: Milberg and Winkler (2010b). Data: OECD National Accounts database, UNCTAD GlobStat Database.

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 been associated also 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. Humphries and Schmidt (2004) describe four types of upgrading in global value chains: product, process, functional and chain. Product and process involve productivity gains while the producer remains largely in the same place in the global value chain. 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.<sup>6</sup> Gereffi (1994) shifts the focus of analysis of GVCs, characterizing global value chains as “buyer-led” or “producer-led” depending on the nature of the lead firm. Large retailers (e.g. Wal-Mart, Sears, JC Penney and K-Mart) and firms with global brands (e.g. Nike, Liz Claiborne) lead buyer-led global value chains 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 (e.g. Ford, Boeing, Apple) lead producer-led chains in which

<sup>6</sup> Williamson (2000) and more recently Grossman and Helpman (2005). For an extension, see Gereffi et al. (2005).



ownership of suppliers (through foreign direct investment) is more likely, and in which supplier contracts are of longer duration.

### **3. The Role of GVCs in the Collapse of World Trade, 2007-2009**

#### **3.1 Cyclical and the “Composition Effect”**

Why did trade volumes collapse so dramatically relative to GDP in the recent downturn? 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, on average, 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% and the growth in trade value turned negative, to -1.0%. In the year leading to the trough of the cycle, she finds the percentage point fall in trade is five times that of world output. By this standard, if world GDP in the recent recession falls by 4.8 percentage points, then world trade will fall by over 20 percentage points. Importantly, Freund (2009) also predicts that the GDP-trade relation is symmetric, i.e. that the rebound in trade is greater than the rebound in GDP and that the recovery of trade is as fast as was the decline in trade. 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, p. 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% 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.<sup>7</sup>

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 “postponeable” 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.<sup>8</sup>

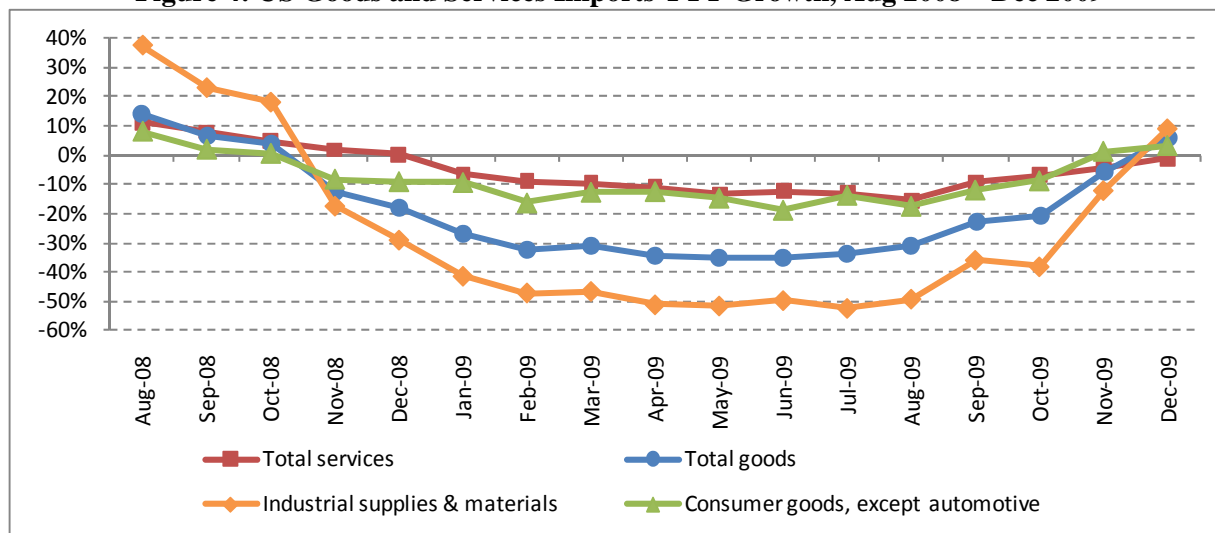
Evidence of the composition effect is confirmed in *Figure 4*, showing the sharp decline in “industrial supplies and materials” in the figure (-49% YTY in August 2009). The decline in consumer goods imports (-17% YTY in August 2009) is much less and the decline in the growth of services imports (-15% YTY in August 2009) 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 (2009) list a number of reasons why the demand for services has contracted less than the demand for goods in the recent crisis, including the non-storability of services and the fact that a larger part of services demand involves outsourced services (e.g. book-keeping) which are “necessities” for producers.

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<sup>7</sup> WTO (2010).

<sup>8</sup> Baldwin (2009).

**Figure 4: US Goods and Services Imports YTY Growth, Aug 2008 – Dec 2009**



Source: Own illustration. Data: Bureau of Economic Analysis, International Accounts Products, quarterly imports of goods, balance of payments-based data, seasonally adjusted.

### 3.2 Globalization in the Long-Run versus “Crisis Elasticities” of Trade

A second explanation of the collapse in world trade in the most recent downturn is that economic globalization has, over decades, resulted 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 since the 1960s, rising from 1.94 in the 1960s to 3.69 in the 2000s. As a result, for 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, which has increased gradually to 3.7 in recent years.

The income elasticity of import demand  $\varepsilon_M$ , for example, is given by:

$$\varepsilon_M = \frac{\partial M / M}{\partial Y / Y} = \frac{\partial M}{\partial Y} \cdot \frac{Y}{M}. \quad (1)$$

Using quarterly GDP and import data, we approximated the US income elasticities of import demand as follows:

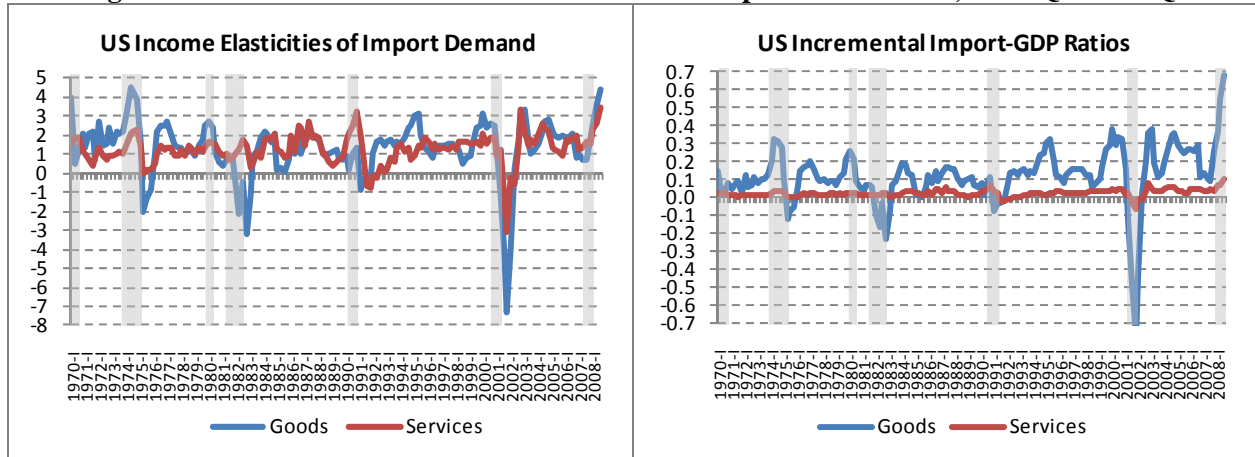
$$\varepsilon_{M,t} = \frac{\Delta M_t}{\Delta Y_t} \cdot \frac{Y_t}{M_t}, \quad (2)$$

where subscript  $t$  denotes the quarter,  $\Delta M_t = M_t - M_{t-4}$ , and  $\Delta Y_t = Y_t - Y_{t-4}$ . *Figure 5* (left-hand panel) confirms the increase in the income elasticity of imports for the US over the last four decades. We did not show the data for 2008:Q4-2009:Q4, 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, it other things equal, a higher import propensity,  $M/Y$ , lowers the

income elasticity of import demand as evident in equation (1).<sup>9</sup> 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 5 (right-hand panel) below shows that the US 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.

**Figure 5: US Income Elasticities and Incremental Import-GDP Ratios, 1970:Q1-2008:Q3**



Source: Own calculations. Data US: Bureau of Economic Analysis, National Income and Product Accounts Table, Gross Domestic Product, seasonally adjusted at annual rates. NB: Gray bars correspond to US business cycle recessions according to the definition of the NBER.

An important issue is whether the recent downturn has resulted in a structural break in historical elasticity patterns. To judge whether that history is a useful guide in the current context, we estimated long-run income elasticities of import demand in the US for 16 countries and compared these to the current experience. We refer to the latter as “crisis elasticities”. The long-term elasticities for goods and services separately were estimated using bilateral, quarterly trade data for the period 1999 to 2008. We apply an autoregressive distributed lag (ARDL) approach 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 et al., 2001). The ARDL approach adds short-run dynamics to a long-run estimation equation as given in (3):

$$\Delta \ln M_t^j = \alpha + \sum_{i=1}^n \beta_i \Delta \ln Y_{t-i} + \sum_{i=1}^n \gamma_i \Delta \ln E_{t-1}^j + \sum_{i=1}^n \delta_i \Delta \ln M_{t-i}^j + \nu_1 \ln Y_{t-1} + \nu_2 \ln E_{t-1}^j + \nu_3 \ln M_{t-1}^j + \varepsilon_t \quad (3)$$

where  $M$  designates real import demand for imports from country  $j$ ,  $Y$  real domestic income, and  $E$  real bilateral exchange rate between the US and country  $j$  at time  $t$ .  $E$  is defined as the amount of units of foreign currency per US Dollar and  $\varepsilon_t$  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. *Appendices 5 and 6* give full details of the estimation procedures, sample and the estimation results. The long-run relations are given by the estimates of  $\nu_3$  in *Table A2* (column 4). Only six countries show significant results, while others miss the 10%-level narrowly. The highest elasticities are for China and India. They imply that a

<sup>9</sup> In fact, there is some debate over Freund’s elasticity estimates. Escaith et al. (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.

1% US income increase is expected to raise goods imports demand for China and India by 8.6 and 8.1%, 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, UK, and Venezuela 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 7.6 and 4.7 %. Given the high absolute value of services imports from India, an elasticity of 2.1% still seems to be very high.

Table 2 shows the long-run income elasticities of US 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 has been 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 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 India and China 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. Our findings supports the results of Levchenko et al. (2009) who find an enormous gap (“wedge”) between predicted US imports based on historical data and the actual drop in US import demand.

**Table 2: “Crisis” vs. Long-Run Income Elasticities of US Import Demand**

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

Source: Own calculations. Data: Bureau of Economic Analysis. NB: n.s. = not significant. Income elasticities Q3:2008-Q4:2008 are calculated based on equation (2), where  $\Delta M_t = M_t - M_{t-1}$ , and  $\Delta Y_t = Y_t - Y_{t-1}$ .

Evidence on services trade is quite different. While there is only one sector with 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 one (that is, very low). Argentina, India and Hong Kong have negative elasticities in the crisis period, reflecting that US 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.

### 3.3 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, p. 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.<sup>10</sup> With vertical specialization, a decline in final demand reduces trade in both final and intermediate goods and services. In a study of the US, Ferrantino and Larsen (2009, p. 177) note the connection between imports and exports: “[T]he drop in US imports for computers and cell phones leads indirectly to a drop in US 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 US demand for Japanese final goods is the decline in demand for intermediate goods aimed for assembly in East Asia for shipment to the US.<sup>11</sup> 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.<sup>12</sup> Scott (2009) notes that an important part of US 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, p. 42) identify the likelihood of such a substitution affect by lead firms in the automobile sector in the US and Western Europe (sourcing in Mexico and East and Central Europe, respectively) if market shares continue to decline.

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<sup>10</sup> Yi (2009).

<sup>11</sup> 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 a 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 et al. (2005) find that double counting of value in trade figures occurs more in manufacturers than in services. For the US in 2000, adjusted exports would be \$198 billion (or 9 percentage points less) than reported in 2000 trade figures. Koopman et al. (2008) calculate value added in Chinese exports in 2002 to be about 51% of total export value. Lindet et al. (2007) show that Chinese value added in its export of the \$143 Apple 30GB video ipod (retail price of \$299) was \$5.

<sup>12</sup> Reported in Friedman (2005). Scott (2009) notes that an important part of US 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, p. 42) identify the likelihood of such a substitution affect by lead firms in the automobile sector in the US and Western Europe (sourcing in Mexico and East 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, is due not to a rise in trade openness but to 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 global value chains 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 that 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 for the risk of demand declines and inventory adjustment to be borne to a greater extent by supplier firms. Innovations in lean retailing, fast fashion and 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 capacity to serve different product lines and even different GVCs.<sup>13</sup> Adding to the speed of adjustment in trade in a downturn is that firms might make use of accumulated inventories first.<sup>14</sup>

In a world of disintegrated production and lean retailing, the GDP downturn like that experienced in 2008-2009 resulted not only to larger declines in trade than previously but also at a more rapid rate. Recent research confirms that the trade collapse was “synchronized” across countries, which Baldwin (2009b) also attributes to the internationalization of the supply chain. Global value chains 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. Credit market problems, which can have a negative international “cascade effect” through global value chains, as the denial of credit to importers in one country can lead to credit problems for sellers in others, reducing their access to credit, affecting in turn their ability to import.<sup>15</sup>

### 3.4 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 (i.e. lead-firms and higher-tier supplier firms in global value chains) indicates that the drop in orders may be more a function of “new credit bottlenecks” than declining final demand *per se*.<sup>16</sup> 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.<sup>17</sup> 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

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<sup>13</sup> Sturgeon (2004).

<sup>14</sup> Freund (2009), Baldwin (2009b).

<sup>15</sup> Escaith and Gonguet (2009).

<sup>16</sup> Auboin (2009). See ICC (2009) for a survey measuring the decline in the volume of trade credit.

<sup>17</sup> Drawn from Chauffour and Farole (2009), Appendix 1.

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. For one, a bottleneck due to lack of credit in one part of the chain can reduce trade for the entire chain. As described by ICC (2009, p. 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."

Second, global value chains 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 lead to credit problems for sellers in others, reducing their access to credit, affecting in turn their ability to import, etc. This is a vicious cycle between the real and the financial sides of the economy.<sup>18</sup> The implication is that the decline in world trade is greater when the credit crunch occurs within a production system organized through global value chains. 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 that we present 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.<sup>19</sup>

### **3.5 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 (if there are, for example, unexpected increases in oil prices, appreciation or depreciation of major currencies, or additional adverse developments in financial market), or overly pessimistic (if, for instance, unemployment rates in developed countries were to drop faster than anticipated).<sup>20</sup> As seen in Figure 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 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 we have noted before. Moreover, the recovery in imports is in the form of smaller percentage quarterly declines. Thus two years from the previous business cycle peak, U.S. imports are still falling at a 10% rate. The V-curve appears to have shifted to the right.

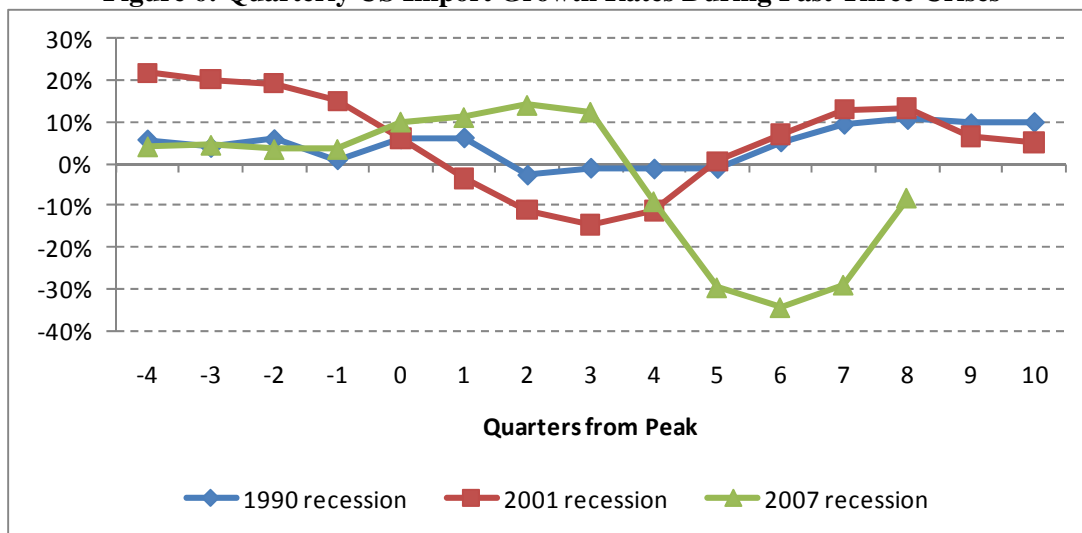
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<sup>18</sup> Escaith and Gonguet (2009), Amiti and Weinstein (2009), Mora and Powers (2009).

<sup>19</sup> Auboin (2009), p.6.

<sup>20</sup> WTO (2010).

**Figure 6: Quarterly US Import Growth Rates During Past Three Crises**



Source: Own illustration. Data US: Bureau of Economic Analysis, National Income and Product Accounts Table, Gross Domestic Product, seasonally adjusted at annual rates. 0 refers to the peak of the US business cycles recessions according to the definition of the NBER.

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 as government spending partly offsets declines in consumption and business investment demand. Consumption expenditure in the US in particular is recovering much more slowly than in previous recoveries.<sup>21</sup> A second, but related factor is China's development trajectory and exchange rate policy, with the renminbi generally considered undervalued vis-à-vis the U.S. dollar. While the renminbi appreciated vis-à-vis the dollar until 2006, it has remained constant since. This has been associated with expanding Chinese market share for many US and EU import products. But pressures for a revaluation remain, and a US recovery at a higher rate of private saving, a higher rate of public dissaving and a weakened dollar, may bring a very different world trade picture, with lower levels of trade and consolidated GVCs.<sup>22</sup> After reviewing the experience of individual countries and sector in the recent period, we turn to analysis of GVC consolidation.<sup>23</sup> We should add that the financial origins of this downturn resulted in a tightening of trade credit, which may contribute to the shift in the V-curve.

<sup>21</sup> Kaplinsky and Farooki (2010), and Ferrentino and Larsen (2009) make a similar argument.

<sup>22</sup> See Kaplinsky and Farooki (2010).

<sup>23</sup> Freund (2009) in fact predicts some worsening of the US current account imbalance based on past experience.



## 4. Country and Product Profile of the Decline in US and EU Import Demand

### 4.1 Product-Based Analysis of US 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 look more closely at the latter, we explore the shifts in import demand in the US and EU over the past 12-18 months in more detail. Figure 4 above showed the US import trends for broad commodity groupings, which showed 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 *Appendix 3*. Total goods imports decreased by 31% in August 2009 on a year-to-year (YTY) basis. In our first analysis of the downturn (Milberg and Winkler, 2009a) for February 2009, US imports fell most in motor vehicles, oil and construction on a YTY basis, and with the smallest declines in food and clothing, two consumer necessities.

The decline in motor vehicle demand in the US has had significant international repercussions, since the US motor vehicle production is more reliant on imported inputs than any other sector of the economy, with over 25% of inputs imported.<sup>24</sup> Our first analysis using February 2009 YTY data showed that rapid declines in imports of various categories of auto and truck parts by dramatic amounts, ranging from a decline in imports of unfinished metals (largely used for motor vehicles) of 55%, automotive vehicles, parts and engines (-54%), of which bodies and chassis for passenger cars (-71%). These declines are the result of a combination of a sudden collapse of consumer demand for new automobiles and the highly developed global value chains developed by US and US-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 (“postponeables” 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.<sup>25</sup> See *Appendix 4* for the detailed services import data.

The sectoral declines in US imports give some indication of the composition of shifts in labor demand. Since it is medium-technology goods whose demand has fallen most, we would expect low-skill manufacturing workers in developing countries to have suffered most in terms of employment and wages. Services workers – 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 EU is similar to that in the US, but less pronounced. EU goods import growth can be found in *Figure 7*. Total goods imports fell by almost 29% in August 2009 on a YTY basis. Manufactured goods showed the biggest decline, reaching more than -40% since the second quarter of 2009. This again supports the finding that the drop of demand fell most strongly for “postponeables”, that is, consumer durables, and investment goods. As in the US, 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 by less.<sup>26</sup>

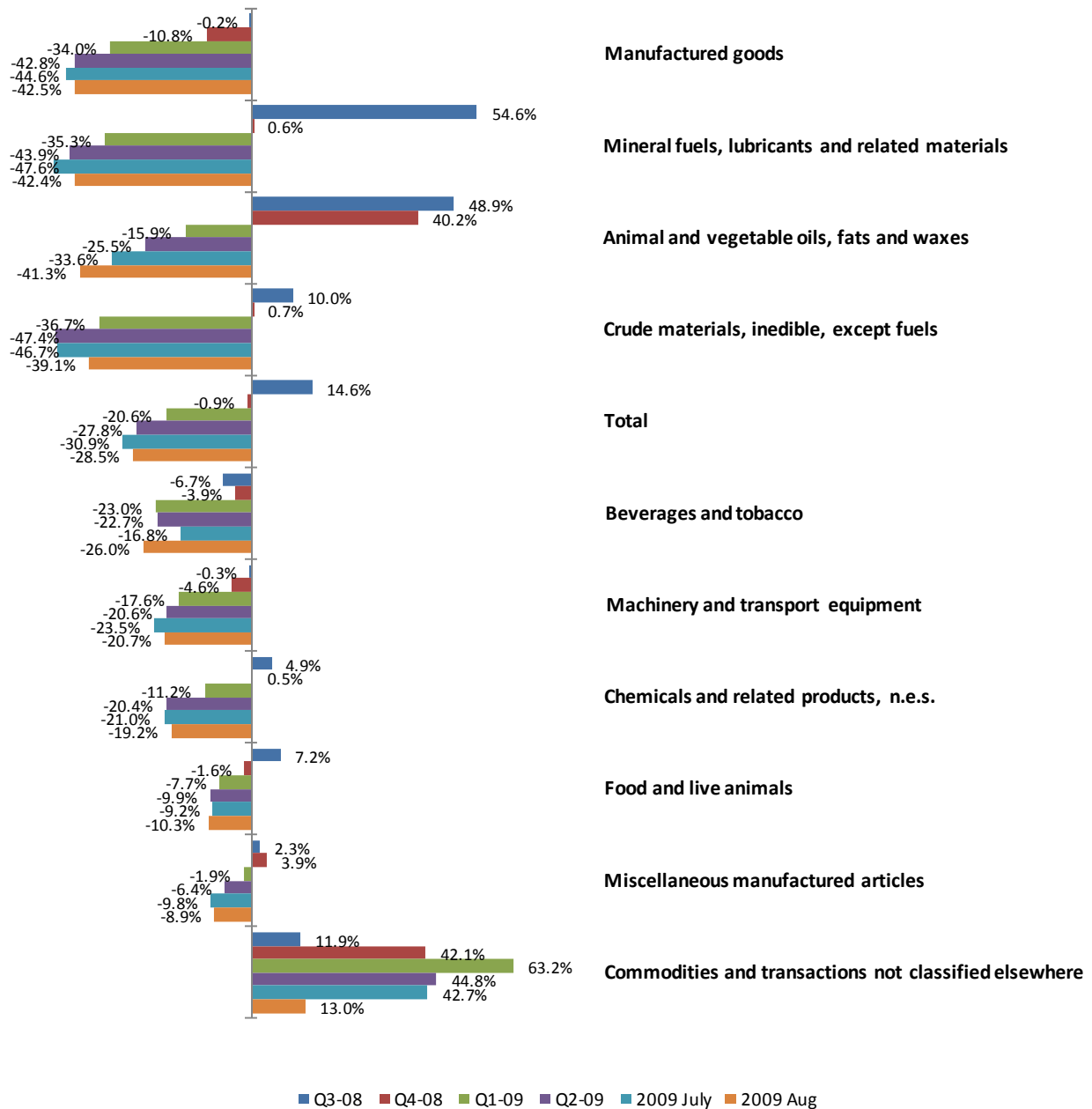
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<sup>24</sup> See Figure 5 above. For a detailed analysis, see Sturgeon and van Biesebroeck (2010).

<sup>25</sup> Borchert and Mattoo (2009) list a number of reasons why the demand for services has contracted less than the demand for goods in the current crisis, including the non-storability of services and the fact that a larger part of services demand involves outsourced services (e.g. book-keeping) which are “necessities” for producers.

<sup>26</sup> Unfortunately, Eurostat does not report trade data for services.

**Figure 7: EU27 Goods Imports by Product Category, Ranked by August 2009 YTY Growth**



Source: Own illustration. Data: Eurostat, External Trade by SITC.

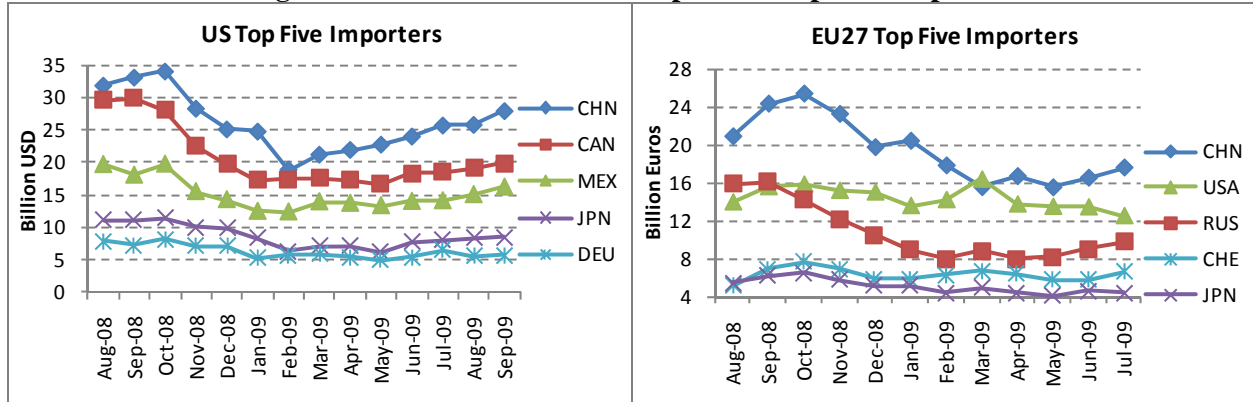
#### 4.2 Regional Analysis of Developing Country Exports

While China's exports to the US declined during the downturn by more than those in other countries (see *Figure 8*, left-hand panel), it is only China among the top five exporters to the US that have seen a significant rebound in trade volume. This implies that China's share of US imports has grown significantly, reaching 20% in September 2009, which represents the highest share since January 2007 besides January 2009. China has gained market share despite the decline in US imports. Canada's import share has fallen between 1 to 2 percentage points since

the outbreak of the crisis, but the top five importers combined have gained market share from 52.6% in August 2008 to 55.4% in September 2009.

A similar pattern holds for the EU import market. While imports from the US have continued to fall through July 2009, Chinese imports were already rising for four consecutive months (see Figure 8, right-hand panel). Since March 2009, Chinese imports have gained market share at the cost of the second biggest importer, the US. China's import share reached 17.6% in July 2009, while the US market share was only 12.4%. The total market share of the top five importers was 50.9% in July 2009, compared to 48.1% in August 2008.

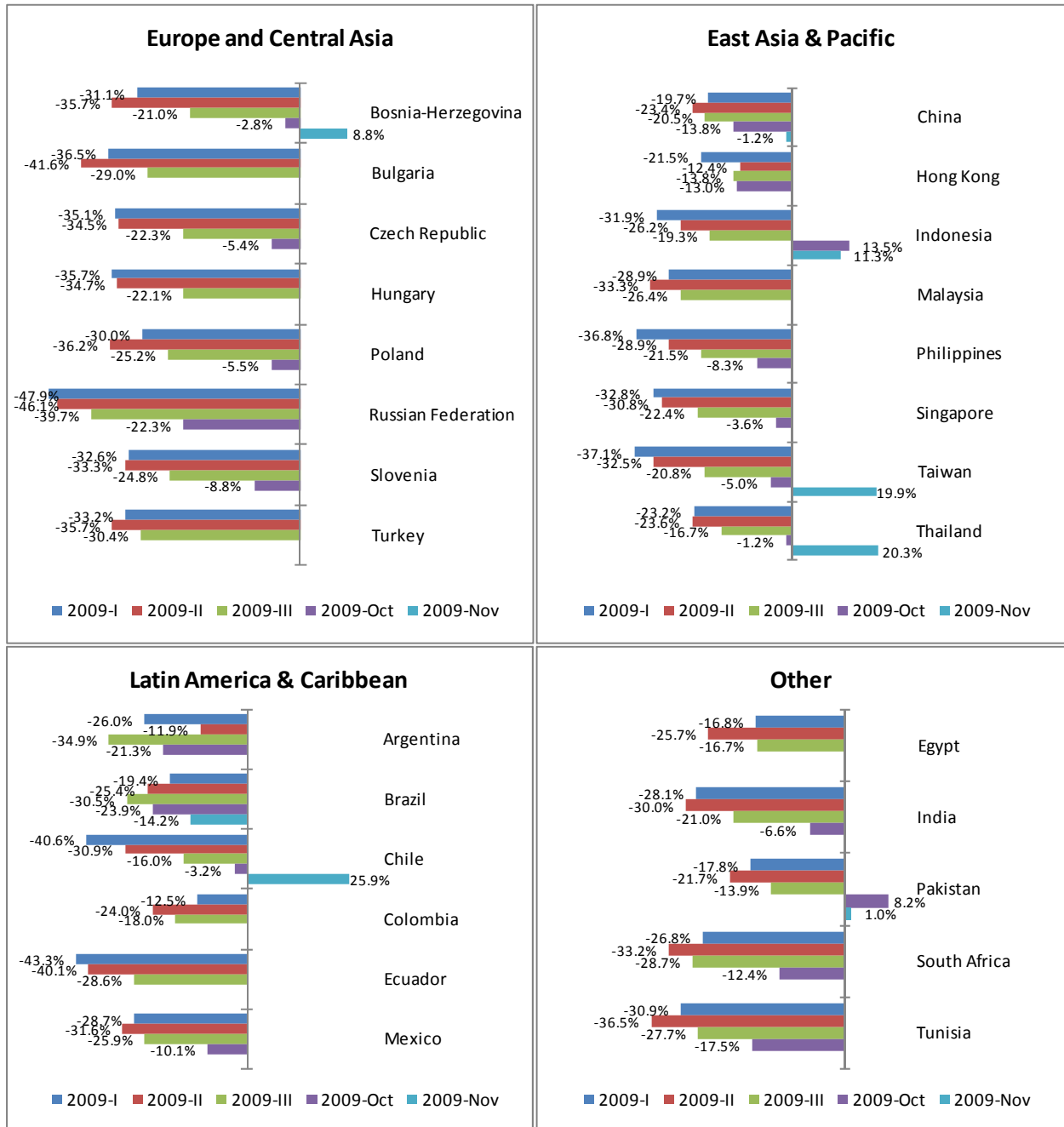
**Figure 8: US and EU27 Goods Imports of Top Five Importers**



Source: Own illustration. Data: US International Trade Commission; Eurostat, External Trade.  
NB: Top Five Imports in August 2008.

China's outstanding performance in US and EU markets appears to have been matched by some other countries in late 2009, as seen in Figure 9 where goods export growth on a YTY basis are compared across all countries for which data were available. While most countries saw smaller declines in exports in Q3 2009 compared to Q2, a small number of countries began to see export increases (on a YTY basis) in November, including Indonesia, Taiwan (China), Thailand, Chile, Bosnia-Herzegovina and Thailand. Still, many countries showed considerable export declines in Q3 2009 of over 25% 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.

**Figure 9: Goods Exports of Low and Middle Income Countries 2009, Percentage Change (YTY)**



Source: Own illustration. Data: EIU Country Data.

## 5. 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 with the services sector and business services of other sectors being among the more recent parts of growing and expanding GVCs. But with the onset of the crisis, there is broader evidence of consolidation of some types of supply chains.

### 5.1 Historical Trends in GVC Structure

Our measure of GVC structure is 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:

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

where  $S_{ij}$  is the share of country  $i$  expressed as a percentage of total world exports of product  $j$ .<sup>27</sup>

The HHI can range between  $1/n \cdot 10,000$ , i.e. all countries have the same share, and 10,000, i.e. 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 US Antitrust Division of the Department of Justice considers HHIs between 1,000 and 1,800 points to be moderately concentrated, and those exceeding 1,800 points to be concentrated.<sup>28</sup> Although this rule of thumb refers to the original HHI, i.e. to firms’ market shares in a particular market rather than to the market shares of exporting countries, it provides a convenient benchmark.

*Figure 10* shows the graph of the index of industrial concentration for a selection of three-digit sectors for selected years from 1970-2008. Note that recent data should be interpreted with caution as 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 from Africa and Latin America, but also from smaller East and South Asian countries.<sup>29</sup>

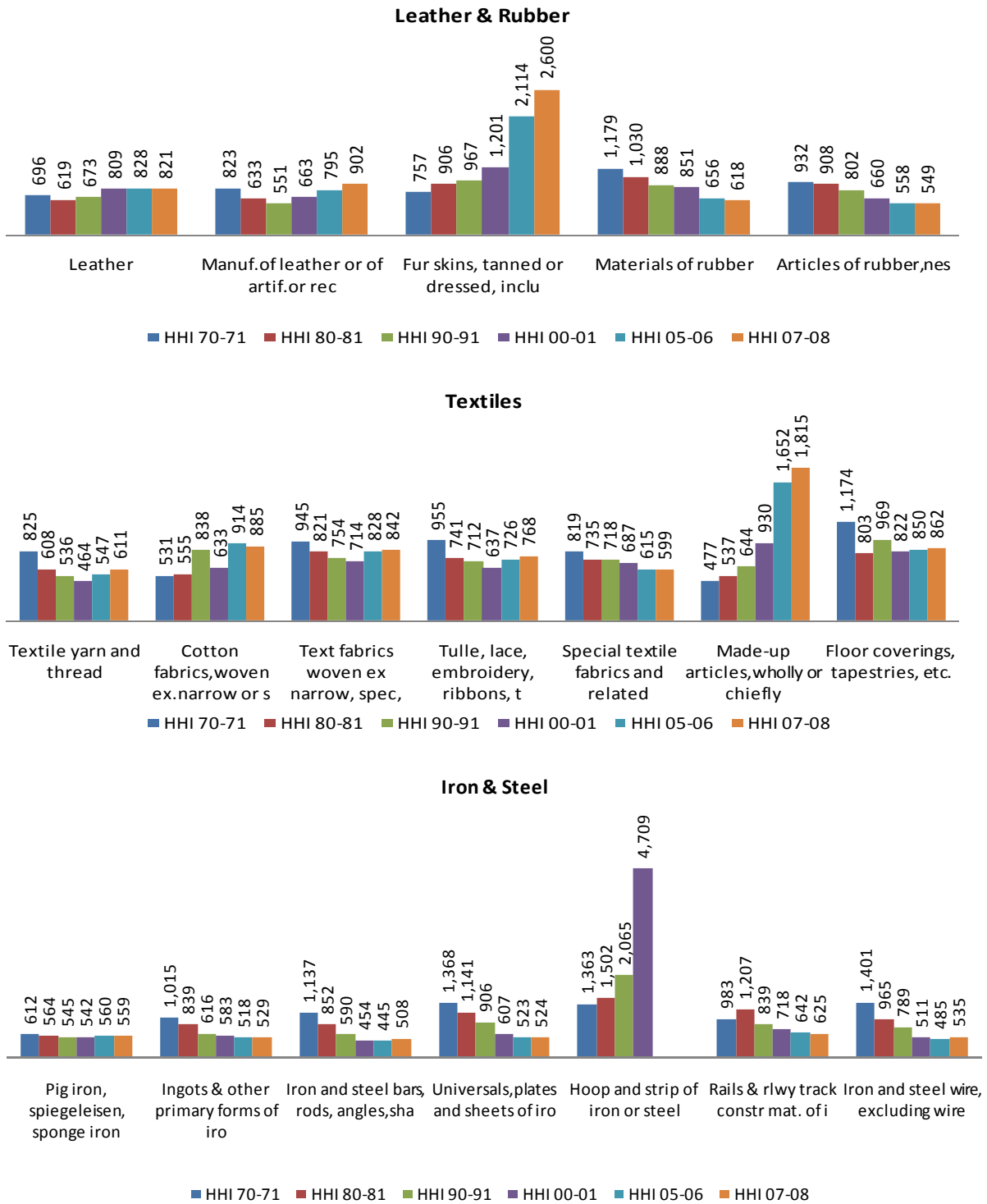
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<sup>27</sup> This measure was used by Mayer et al. (2002) and Milberg (2004).

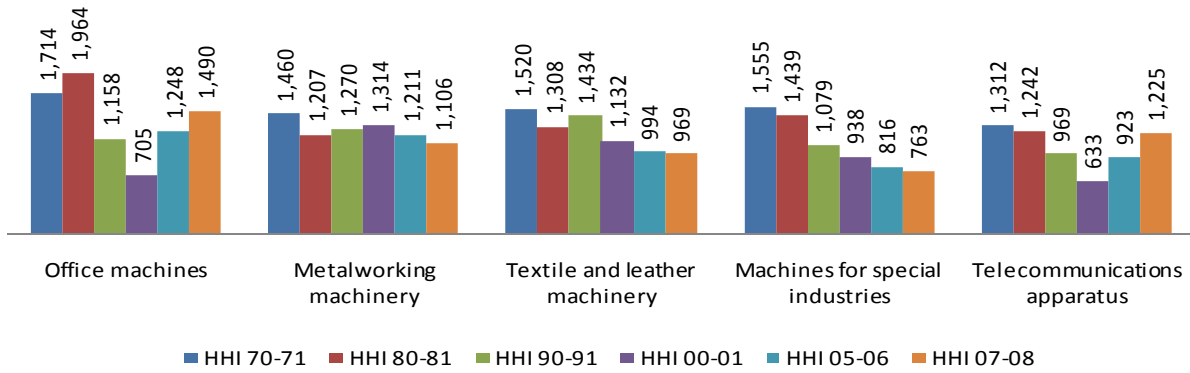
<sup>28</sup> See <http://www.justice.gov/atr/public/testimony/hhi.htm>.

<sup>29</sup> See Gallgher et al. (2008), Kaplinsky and Morris (2008), Wood and Mayer (2009).

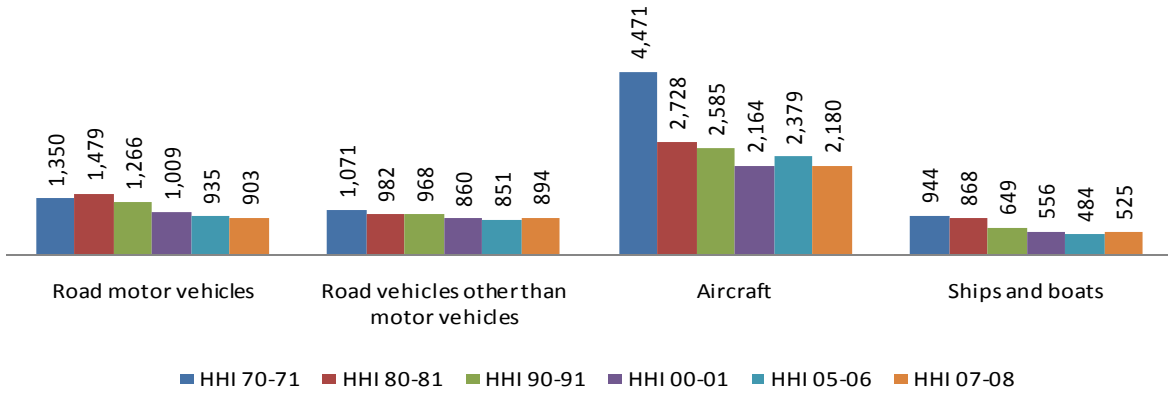
**Figure 10: Hirschman-Herfindahl Index by SITC Rev.1, 1970/71-2007/08**



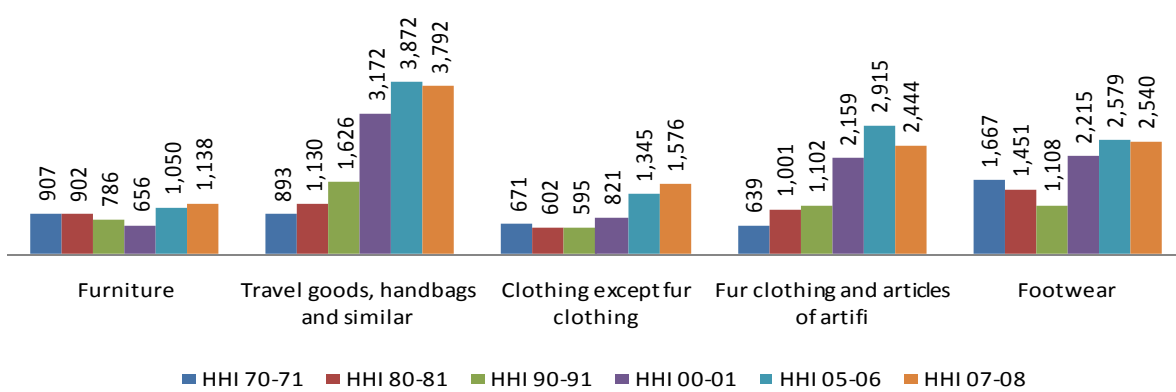
### Machinery



### Transportation



### Furniture, Travel Goods, Clothing



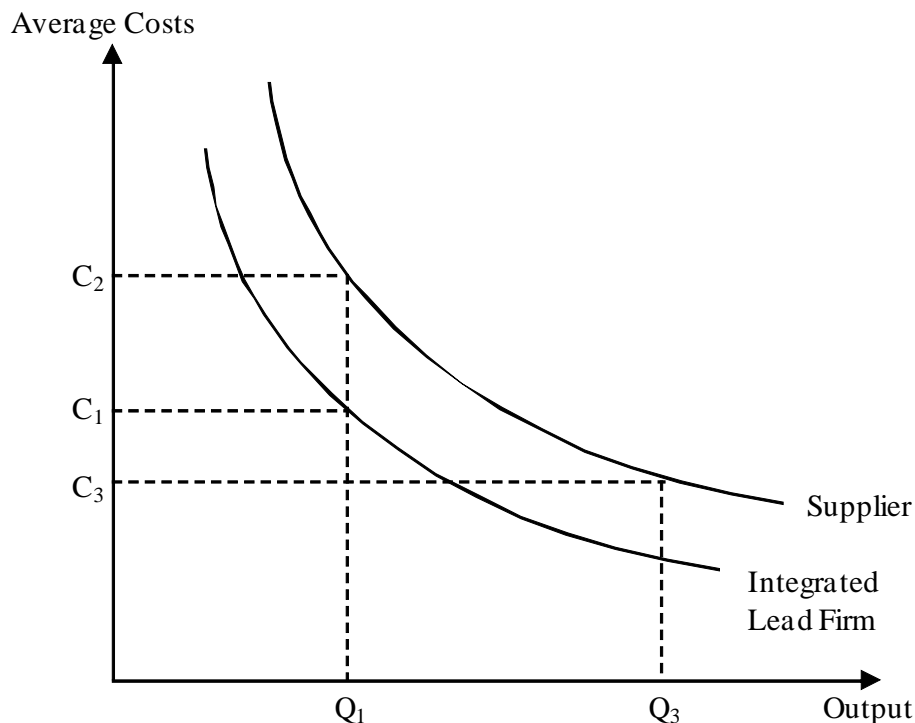
Source: Own calculations. Data: UN Comtrade. Retrieved from: World Integrated Trade Solution.

## 5.2 Downturn, Recovery and GVCs: A Simple Taxonomy of GVC Consolidation

There is not a well-developed theory of the relation between the number of suppliers in a GVC and the level of demand or stage of the business cycle. The expansion of GVCs internationally and in terms of numbers of suppliers has been understood from the perspective of transactions cost considerations, following the insights of Coase (1937) and Williamson (1975). The approach is largely static, independent of underlying demand conditions, since the focus is on the ownership pattern in the vertical production structure. Moreover, the transactions cost model is not typically understood as symmetric, that is applying both to expansion and consolidation of GVCs, since transactions costs are generally viewed as falling monotonically over time as transportation, communication, search and policy (e.g. tariffs) costs fall.<sup>30</sup>

We distinguish two types of consolidation, 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 the 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 integration of the firm. Levy (1984) formalized the process and tested it empirically for the domestic operations of US firms. The logic is depicted in *Figure 11*.

**Figure 11: Vertical Consolidation of Global Value Chains**



Source: Own illustration. Based on Levy (1984, p. 382)

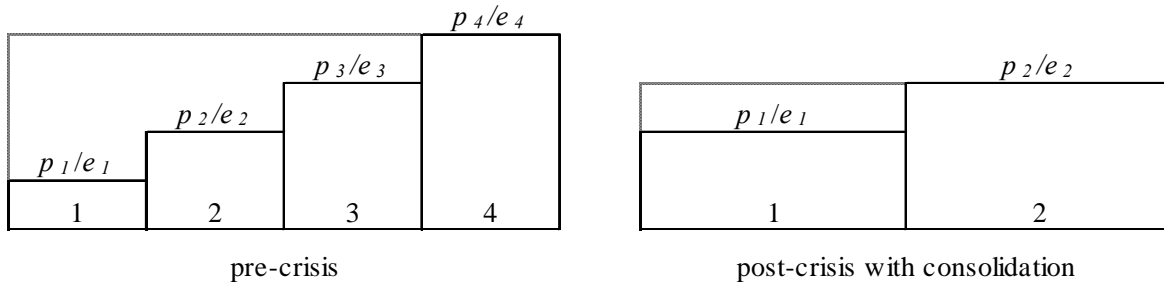
<sup>30</sup> See Langlois (2003), for example. Williamson (1979, p. 260) does address the issue: "As generic demand grows and the number of supply sources increases exchange that was once transaction-specific loses this characteristic and greater reliance on market-mediated governance is feasible."



Assume there are economies of scale and 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, p. 382) writes, "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 logic in reverse would predict 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 et al. (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.<sup>31</sup>

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. This is in contrast to Ricardo's theory of rent, where the issue is the finite resource (land) with diminishing marginal productivity. Consolidation in the number of suppliers occurs in a downturn as marginal suppliers are squeezed out with the decline in demand. Horizontal consolidation might be more likely in buyer-driven global value chains, where supplier contracts are shorter and where lead firm commitments to, and technology sharing with, supplier firms are less. The process is depicted in *Figure 12*. Production costs are indicated in the figure by prices in foreign currency, where  $p_i$  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 or capital or cooperation.

**Figure 12: Horizontal Consolidation of Global Value Chains**



Source: Own illustration.

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? Our focus 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 capture 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 further capture scale economies. Such suppliers may also develop new

<sup>31</sup> In related research, Chung et al. (2008) find that majority-owned subsidiaries of parent firms perform relatively better compared to arm's length suppliers in periods of economic downturn.

production capabilities. At the same time, suppliers forced to shut down during the slump face considerable fixed costs in re-opening 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 shut-down of the 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.

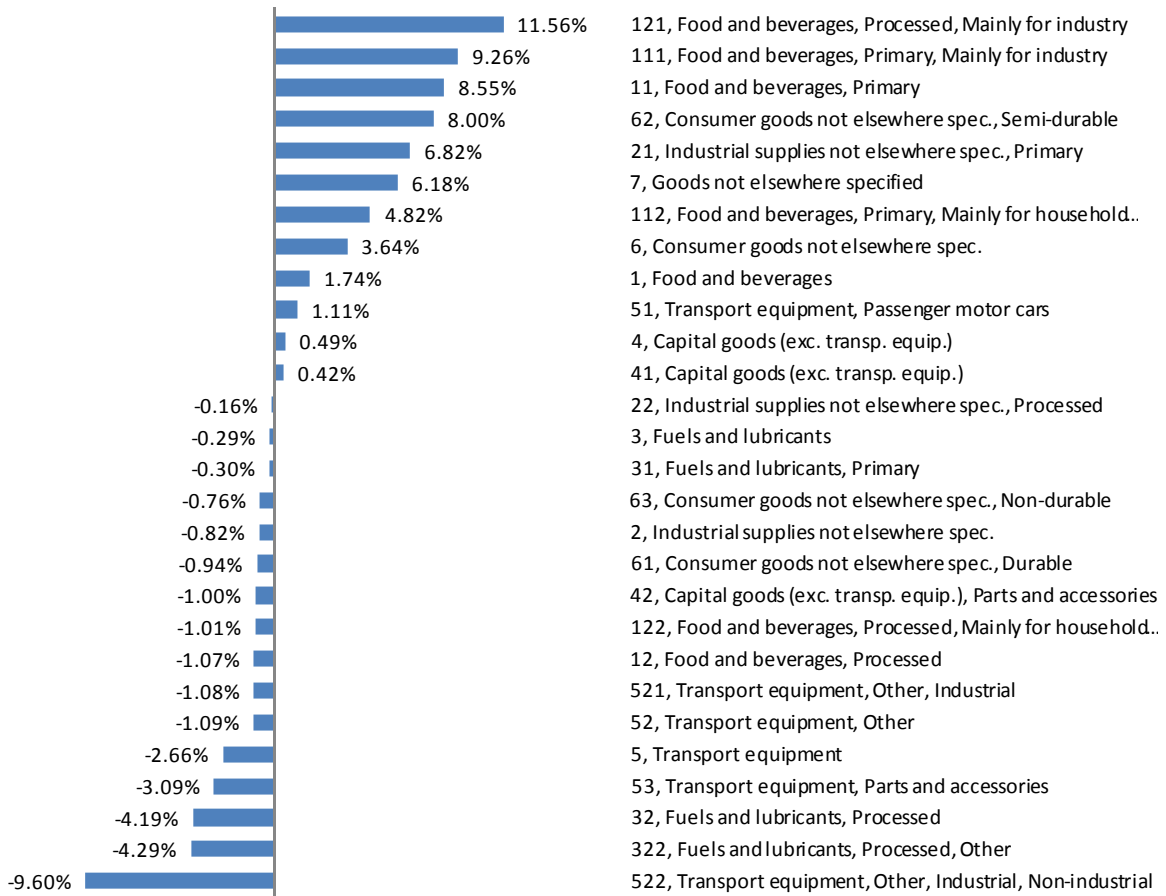
### 5.3 GVC Restructuring in the Crisis

What has been the trend in the HHI over the recent downturn period? We might expect those sectors or products which have seen the greatest decline in trade to exhibit the greatest degree of consolidation according to our HHI measure. But there appears to be no correlation between the percentage decline in trade and the change in GVC structure. This may be due to 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 (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 our 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 we look at consolidation in sectors measured by "Broad Economic Category", which characterizes goods as consumption goods, capital goods and intermediate goods (see Appendix 2 for the definition). The changes in HHI for these product categories between 2007 and 2008 are presented in *Figure 13*. We see that an almost equal number of product areas experienced diversification as experienced consolidation. Consolidation occurs more often in consumption goods sector (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 governance norm. Finally, we find that there is a weak, positive relation between consolidation and export growth, as indicated by the upward sloping line in *Figure 14*.

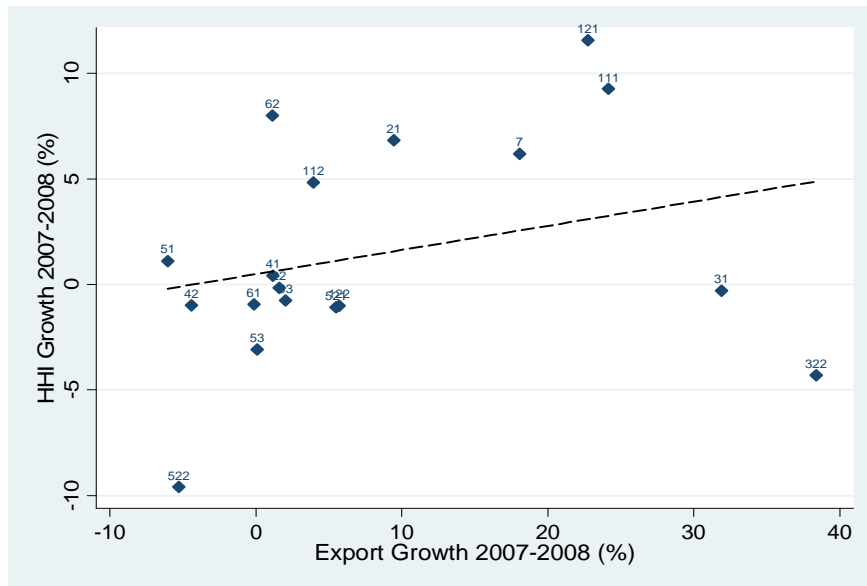
This result is consistent with the fact that in the downturn there have been some significant shifts in product market shares, with China often gaining in US import markets, while smaller East Asian nations have been found to be losing US market share in the US. *Table 3* provides some evidence on how particular countries are faring in particular markets as US imports decline. These selected sectors reveal a pattern of China gaining market share despite the decline in US imports. Other countries also gain depending on the product area. Countries that are losing market share include high-cost producers (e.g. Italy in the handbag market) and low-cost, especially East Asian producers (e.g. Cambodia in apparel, Thailand in rubber products and plumbing and heating fixtures, and Malaysia in telecommunications products). This evidence thus would indicate that the import decline occurring with the economic downturn is creating winners and losers in terms of market share. China's continued success in exports to the US, 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 the surveys by Hurst et al. (2009) of small and medium enterprises in East Asia, who report massive declines in orders and cutbacks in employment across a variety of consumer goods.

**Figure 13: Herfindahl Index by Broad Economic Category, Ranked by 2007-2008 Growth Rate**



Source: Own calculations. Data: UN Comtrade. Retrieved from: World Integrated Trade Solution.

**Figure 14: Export Growth and HHI Growth by BEC, 2007-2008 (%)**



Source: Own illustration. Data: UN Comtrade. Retrieved from: World Integrated Trade Solution.

**Table 3: US Sectoral Import Shares by Top Ten Importers, Jan-Sep 2008 vs. 2009**

<b>62 - RUBBER MANUFACTURES, N.E.S.</b>				<b>65 - TEXTILE YARN, FABRICS, MADE-UP ARTICLES, N.E.S., AND RELATED PRODUCTS</b>			
	Jan-Sep 2008	Jan-Sep 2009	%-Change		Jan-Sep 2008	Jan-Sep 2009	%-Change
China	21.3%	24.4%	3.2%	China	33.7%	35.1%	1.4%
Canada	17.8%	18.4%	0.6%	India	10.2%	10.6%	0.5%
Japan	13.5%	13.6%	0.1%	Mexico	6.9%	7.4%	0.6%
Mexico	7.1%	6.7%	-0.4%	Canada	7.0%	6.9%	-0.2%
Korea	6.6%	6.2%	-0.4%	Pakistan	6.7%	7.6%	0.8%
Germany	4.9%	4.6%	-0.3%	Korea	3.4%	3.4%	-0.1%
Thailand	3.5%	3.3%	-0.2%	Turkey	2.4%	2.1%	-0.3%
Brazil	2.7%	2.7%	-0.1%	Taiwan	2.7%	2.3%	-0.3%
Taiwan	3.4%	2.8%	-0.5%	Japan	2.5%	2.1%	-0.4%
Indonesia	1.5%	1.8%	0.3%	Israel	1.5%	1.7%	0.2%
All other	17.8%	15.6%	-2.2%	All other	22.9%	20.9%	-2.1%

<b>76 - TELECOMMUNICATIONS AND SOUND RECORDING AND REPRODUCING APPARATUS AND EQUIPMENT</b>				<b>81 - PREFABRICATED BUILDINGS; SANITARY, PLUMBING, HEATING AND LIGHTING FIXTURES AND FITTINGS, N.E.S.</b>			
	Jan-Sep 2008	Jan-Sep 2009	%-Change		Jan-Sep 2008	Jan-Sep 2009	%-Change
China	39.6%	40.5%	1.0%	China	54.6%	57.4%	2.8%
Mexico	23.7%	24.1%	0.4%	Mexico	18.6%	19.0%	0.3%
Korea	7.9%	9.6%	1.6%	Canada	8.9%	8.5%	-0.3%
Taiwan	4.6%	4.8%	0.2%	Germany	2.6%	2.5%	-0.1%
Japan	5.6%	4.2%	-1.4%	France	1.0%	1.2%	0.2%
Malaysia	5.0%	4.1%	-0.9%	Taiwan	1.4%	1.0%	-0.4%
Thailand	2.8%	2.5%	-0.3%	India	0.9%	0.9%	-0.1%
Canada	2.8%	2.9%	0.0%	Italy	1.8%	1.3%	-0.5%
Indonesia	0.7%	0.9%	0.2%	Japan	0.7%	0.7%	0.0%
Germany	0.9%	0.7%	-0.2%	Thailand	1.1%	0.9%	-0.2%
All other	6.3%	5.7%	-0.6%	All other	8.4%	6.6%	-1.8%

<b>84 - ARTICLES OF APPAREL AND CLOTHING ACCESSORIES</b>				<b>85 - FOOTWEAR</b>			
	Jan-Sep 2008	Jan-Sep 2009	%-Change		Jan-Sep 2008	Jan-Sep 2009	%-Change
China	33.6%	38.2%	4.6%	China	74.0%	76.3%	2.3%
Vietnam	6.6%	7.3%	0.7%	Vietnam	5.9%	7.5%	1.6%
Indonesia	5.4%	5.9%	0.5%	Italy	5.9%	4.3%	-1.6%
Mexico	5.4%	5.1%	-0.3%	Indonesia	2.0%	2.5%	0.5%
Bangladesh	4.4%	5.1%	0.8%	Brazil	2.7%	2.2%	-0.5%
India	4.2%	4.5%	0.3%	Mexico	1.2%	1.3%	0.1%
Cambodia	3.1%	2.7%	-0.4%	India	1.0%	0.9%	-0.1%
Honduras	3.3%	3.0%	-0.3%	Dominican Rep	0.6%	0.7%	0.0%
Thailand	2.7%	2.5%	-0.2%	Thailand	1.3%	0.9%	-0.3%
Pakistan	2.0%	2.0%	0.0%	Canada	n.a.	0.3%	n.a.
All other	29.3%	23.7%	-5.6%	All other	5.3%	3.1%	-2.3%

Source: Own calculations. Data: US International Trade Commission.

NB: Top ten importers as of September 2009 by SITC category.

## 6. Conclusion: Alternative Sources of Demand and Policy Responses

Stiglitz (2009) has noted that the recent downturn was the first economic crisis of 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. But his characterization holds true also 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) has become extensive and sophisticated. It occurs with highly export-dependent developing countries participating in the world economy largely through these global value chains. Our analysis of the effects of the economic crisis on export-oriented developing countries confirms that the economic crisis that began in the US in 2007 and quickly translated 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 rose much more rapidly than GDP for 25 years and the reverse occurred in the recent recession. The reverse effect has been more pronounced and the upturn more delayed in the recent downturn.

While this magnified effect is observed across sectors, there appears to be considerable variation based on recent US import data. Motor vehicles and parts imports and construction materials imports were falling by over 50% at an annual rate, while apparel and food imports have fallen by 10% or less and professional services imports continue 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 value chains (buyer or producer-driven) and on the net effect of the forces of import demand and substitution.

We have argued that because of structural changes occurring in this recession, there are reasons to be concerned about the possibility of a longer recovery of trade than previously. Moreover, the recession has occurred at a moment when global value chains are expansive and are subject to consolidation. We have found evidence that some consolidation of global value chains 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, since the consolidation in the downturn will lead to a longer period of time for surviving suppliers to expand capacity and raise productivity.

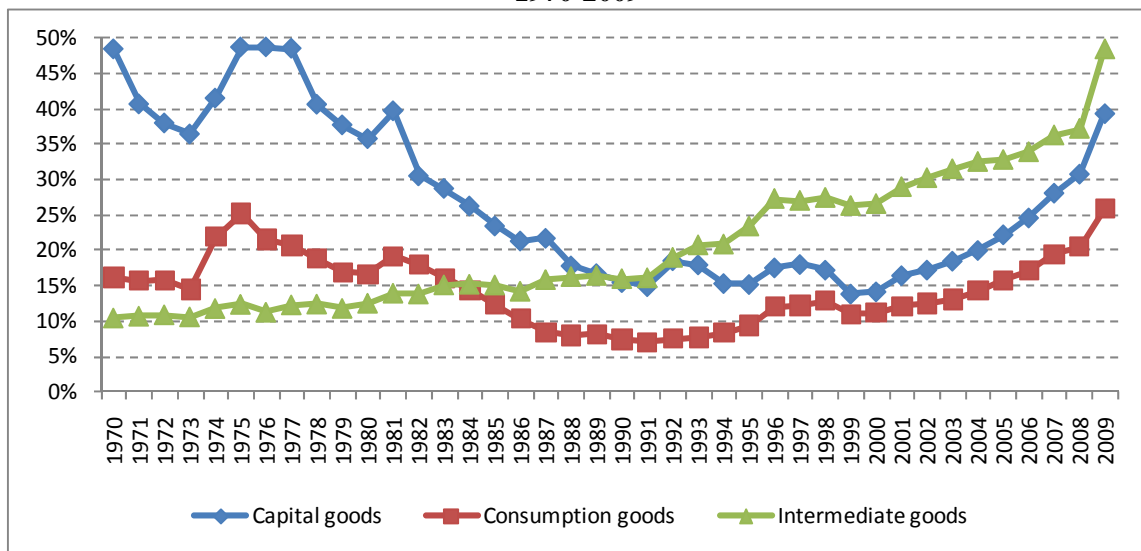
Three policy conclusions emerge from our preliminary analysis:

(1) 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 IMF should also be tapped quickly and with reduced conditionality.

(2) 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 its reserve accumulation 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 embedment in global value chains also appears in the structure of developing countries' imports. *Figure 15* below shows low- and middle-income country exports to other low- and middle-income countries (i.e. South-South trade) by broad economic category as 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 a 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.

**Figure 15: South-South Trade by Product Category (% of Total Exports by Product Category), 1970-2009**



Source: Own calculations. Data: UN Comtrade. NB: Figures are exports from Low- and Middle-Income Countries to other Low- and Middle-income countries by Broad Economic Category.

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%. Capital and consumption goods, however, are increasingly exported to developing countries as well, reaching pre-crisis shares of 30% and 20%, respectively. But here again, the structure of world trade according to GVCs may create an obstacle in the short run to South-South trade growth. Figure 15 showed that the greatest growth potential of developing countries' exports over the past decade has been in intermediates. This indicates that South-South trade also is to some extent molded by global value chains 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.

(3) A final policy conclusion is about trade politics in industrialized countries during a time of severe economic downturn. Because of the extent of global value chains, developed country firms – generally the lead firms in the global value chains – depend on imports for their inputs and profitability<sup>32</sup> and thus these firms are less inclined to support trade protection than they were in

<sup>32</sup> For some econometric-based evidence, see Milberg and Winkler (2009b).

earlier periods of steep economic decline (e.g. the Smoot-Hawley tariff adopted by the US in 1930 which raised US import tariff rates to 60%). Nonetheless, there remains popular sentiment for protectionism in developed countries. Resisting such a move will be very important for developing countries as the world economy recovers from the crisis.

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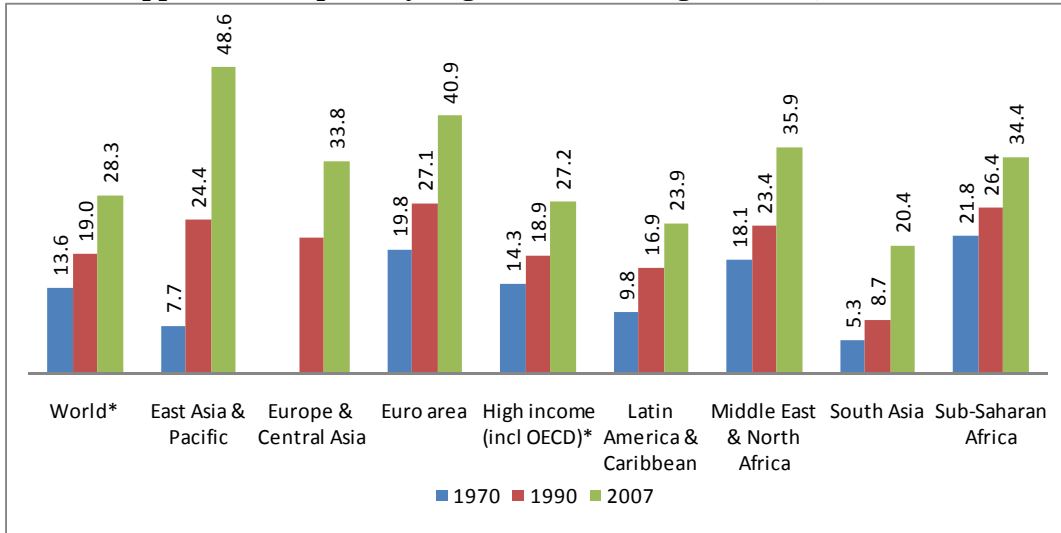


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## Appendices

**Appendix 1: Exports by Region (as Percentage of GDP), 1970-2007**



Source: Own illustration. Data: World Bank, World Development Indicators, National Accounts (1970-2000).  
\*2006 figure.

## Appendix 2: Final vs. Intermediate Goods

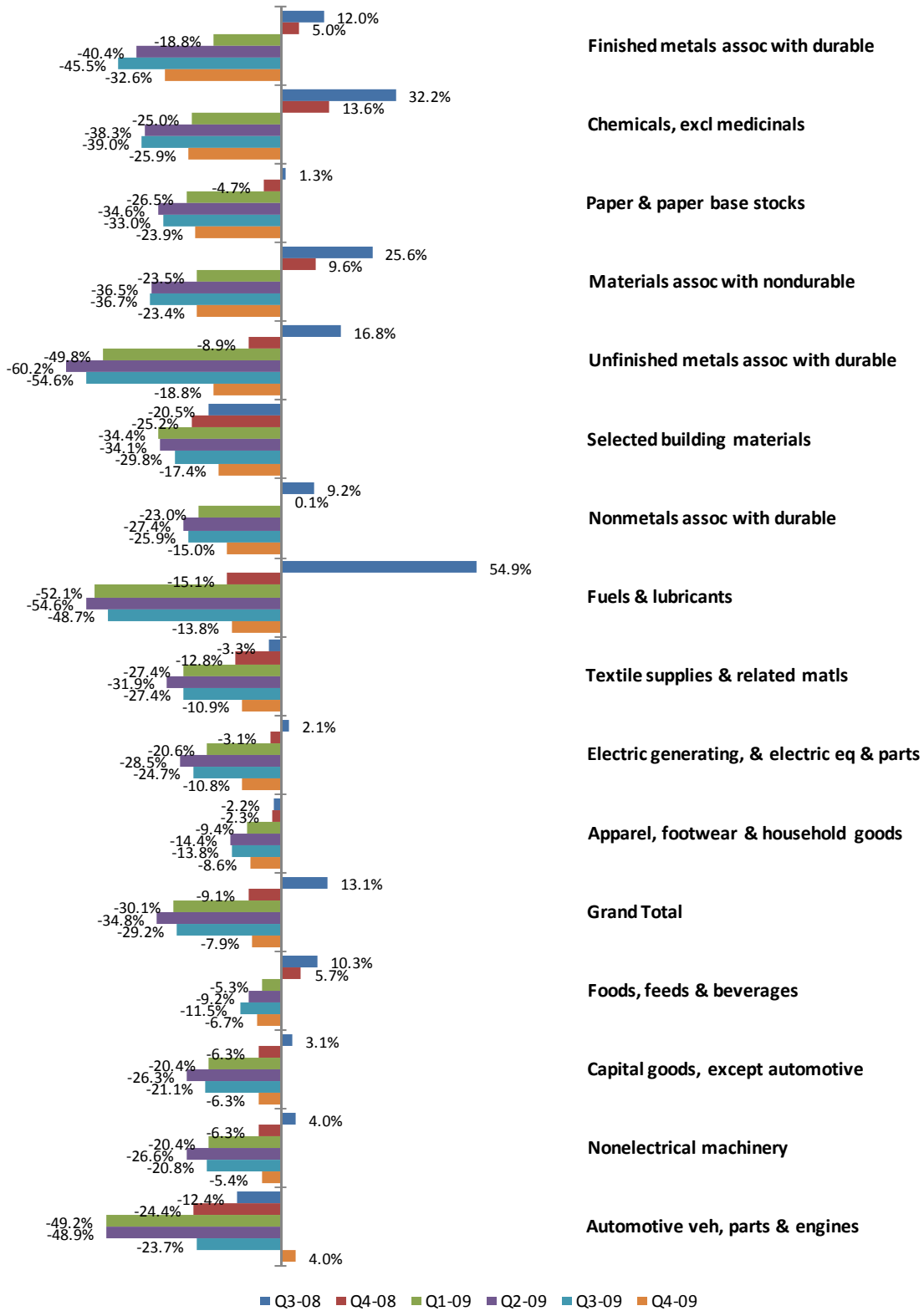
The broad economic category (BEC) classification, as defined by the UN, consists of 19 basic categories which are assigned to the final use of the good, namely capital good, consumption good, and intermediate good (see Table below). Two categories (motor spirit, passenger motor cars, and goods not elsewhere specified) are not assigned to these categories. We would suggest to classify 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 A1: 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 (exc. transp. equip.)	
41 Capital goods (exc. transp. equip.)	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

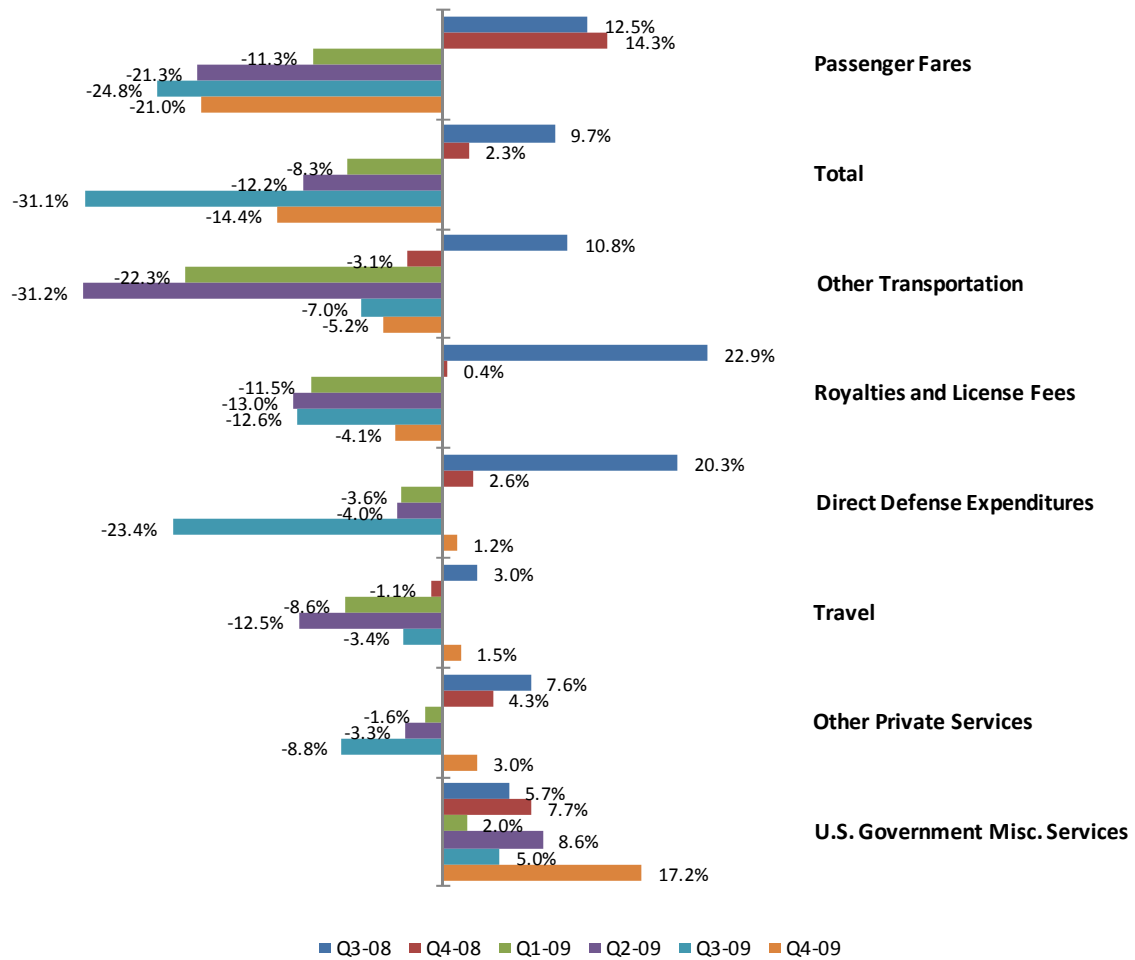
Source: UN, 2002

**Appendix 3: US Goods Imports by Product Category, Ranked by Q4:2009 YTY Growth**



Source: Own illustration. Data: Bureau of Economic Analysis, International Accounts Product, monthly and quarterly imports of goods, balance of payments-based data, seasonally adjusted.

**Appendix 4: US Services Imports by Service Category, Ranked by Q4:2009 YTY Growth**



Source: Own illustration. Data: Bureau of Economic Analysis, International Accounts Product, Monthly imports of services, balance of payments-based data, seasonally adjusted.

## Appendix 5: Income Elasticity Estimates

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

$$\ln M_t^j = \alpha + \beta \ln Y_t + \gamma \ln E_t^j + \varepsilon_t \quad (a)$$

where  $M$  designate real import demand for imports from country  $j$ ,  $Y$  real domestic income, and  $E$  real bilateral exchange rate between the US and country  $j$  at time  $t$ .  $E$  is defined as the amount of units of foreign currency per US Dollar and  $\varepsilon_t$  denotes the random error term. Appendix 6 describes the data used in the regressions. We hypothesize  $\beta$  to be positive, i.e. higher income is related to higher import demand.  $\gamma$  is also expected to be positive, i.e. an appreciation of the US Dollar is associated with a higher import demand.

We apply an autoregressive distributed lag (ARDL) approach to cointegration, 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 et al., 2001). The ARDL approach adds short-run dynamics to a long-run estimation equation as given in (a):

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

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 et al. (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 is greater than the upper critical value bound. In such a case, the lagged level variables are cointegrated.

*Table A2* reports the income and price elasticities, differentiating between goods imports (columns 1 to 4) and services imports (columns 5 to 8). Column 1 shows the F-statistics for goods imports based on the optimal number of lags (column 2) which we 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% significance level the critical value bounds for the F-statistics are 3.17 and 4.14 (Pesaran et al., 2001). Column 1 shows that only Argentina, China, India, Korea and the UK 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). We do not report these results, as they are mostly insignificant.

**Table A2: US Import Elasticities, 1999-2008 (Quarterly Data)**

	Long-run income and price elasticities of import demand									
	US goods imports					US services imports				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	F-Statistics <sup>1)</sup>	Lags <sup>2)</sup>	Durbin's test <sup>3)</sup>	Income elasticities <sup>4)</sup>	Price elasticities	F-Statistics <sup>1)</sup>	Lags <sup>2)</sup>	Durbin's test <sup>3)</sup>	Income elasticities <sup>4)</sup>	Price Elasticities
Argentina	15.07	5	Prob>X <sup>2</sup> =0.54	-0.5528 (0.109)	-0.1318* (0.071)	4.80	6	Prob>X <sup>2</sup> =0.73	2.2540** (0.034)	-0.5155 (0.426)
Brazil	2.87	3	Prob>X <sup>2</sup> =0.41	1.2441** (0.018)	-0.0898 (0.255)	5.70	2	Prob>X <sup>2</sup> =0.45	0.2577 (0.515)	-0.5986*** (0.006)
Canada	0.13	5	Prob>X <sup>2</sup> =0.74	0.0488 (0.956)	-0.0569 (0.932)	9.44	6	Prob>X <sup>2</sup> =0.21	7.5568*** (0.000)	3.2146*** (0.006)
China	4.19	4	Prob>X <sup>2</sup> =0.20	8.6450*** (0.006)	1.8407*** (0.007)	8.39	1	Prob>X <sup>2</sup> =0.72	6.0187*** (0.000)	0.2330 (0.534)
France	1.61	1	Prob>X <sup>2</sup> =0.24	0.4724 (0.294)	-0.0615 (0.663)	3.29	5	Prob>X <sup>2</sup> =0.14	5.4116** (0.012)	1.0838 (0.132)
Germany	3.34	2	Prob>X <sup>2</sup> =0.89	1.8615*** (0.007)	-0.0774 (0.617)	5.21	4	Prob>X <sup>2</sup> =0.65	4.7037*** (0.003)	0.4846 (0.121)
Hong Kong	3.69	3	Prob>X <sup>2</sup> =0.79	-2.7530** (0.011)	0.3589 (0.544)	4.02	2	Prob>X <sup>2</sup> =0.46	5.4964** (0.012)	-1.9867* (0.052)
India	11.96	6	Prob>X <sup>2</sup> =0.48	8.0550*** (0.000)	0.9567* (0.093)	1.94	2	Prob>X <sup>2</sup> =0.53	2.0745** (0.039)	-0.0496 (0.930)
Japan	2.07	4	Prob>X <sup>2</sup> =0.30	-0.1623 (0.582)	0.2765 (0.188)	3.65	3	Prob>X <sup>2</sup> =0.78	1.7411** (0.011)	-0.0555 (0.658)
Korea, Rep. of	8.89	4	Prob>X <sup>2</sup> =0.66	-0.1243 (0.759)	-0.2833 (0.247)	7.17	1	Prob>X <sup>2</sup> =0.93	0.6843** (0.037)	-0.2796 (0.143)
Mexico	0.91	1	Prob>X <sup>2</sup> =0.16	0.2330 (0.277)	0.1021 (0.627)	5.32	4	Prob>X <sup>2</sup> =0.93	0.7879*** (0.004)	-0.1401 (0.784)
Singapore	1.91	1	Prob>X <sup>2</sup> =0.85	-0.1663 (0.444)	0.1832 (0.516)	3.57	3	Prob>X <sup>2</sup> =0.25	1.9245** (0.032)	0.0829 (0.838)
South Africa	2.16	1	Prob>X <sup>2</sup> =0.94	1.2101 (0.104)	0.1832 (0.516)	3.26	1	Prob>X <sup>2</sup> =0.53	0.6918* (0.094)	-0.1552 (0.446)
Taiwan	2.69	6	Prob>X <sup>2</sup> =0.59	0.7715* (0.082)	-0.7135 (0.281)	4.14	1	Prob>X <sup>2</sup> =0.51	2.3392*** (0.004)	0.2649 (0.356)
United Kingdom	4.53	2	Prob>X <sup>2</sup> =0.73	-0.1623 (0.655)	0.5044** (0.026)	1.36	4	Prob>X <sup>2</sup> =0.74	0.5222 (0.405)	0.3048 (0.477)
Venezuela	0.23	2	Prob>X <sup>2</sup> =0.95	-0.1587 (0.766)	-0.0146 (0.948)	0.55	5	Prob>X <sup>2</sup> =0.38	-1.1244 (0.514)	-0.0248 (0.960)

Source: Own calculations. p\*<0.1, p\*\*<0.05, p\*\*\*<0.001 (p-values in parentheses).

1) 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.

2) The optimal lag structure is determined by Akaike's Information Criterion for specifications with no autocorrelation.

3) 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.

### Appendix 6: Data Description and Sources

For the regressions, we used quarterly data for 16 countries for the period Q1:1999-Q4:2008. US imports by country of origin are available from the Bureau of Economic Analysis (BEA), US International Transactions Accounts Data (Release Date: March 18, 2009). We calculated real imports using the US consumer price index (CPI) as deflator (2000=100). We retrieved real GDP data 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 US CPI as price deflators, i.e.  $E_r = E_n \cdot (P^{US} / P^j)$ . 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 EIU Country Data).