Economic Premise

Global Value Chains in the Current Trade Slowdown

Michael J. Ferrantino and Daria Taglioni

Real growth in global trade has decelerated significantly since its sharp recovery in 2010. Year-on-year growth in global real trade[1] decelerated from 13.3 percent at the end of the first quarter of 2010, to 9.9, 3.1, and 0.5 percent at the end of the first quarters of 2011, 2012, and 2013, respectively, while picking back up to 3.9 percent in the year leading up to the fourth quarter of 2013.[2] This aggregate deceleration in global trade includes absolute declines in real trade for many product categories and regions. In the wake of the Great Trade Collapse of 2008–9, understanding of the behavior of trade in slowdowns has improved. Among the many explanations offered for the Great Trade Collapse, including explanations related to uncertainty, trade financing, and new protectionist measures by governments, there has been a significant focus on whether the emergence of global value chains (GVCs) in international trade, and their behavior, are a contributing factor in trade slowdowns.[3]

Relationship between GVCs and Trade Decelerations

GVCs involve trade in goods that have multiple production stages that take place in many different countries (that is, "production fragmentation" or "slicing up the value chain") and in which multiple imports and exports of intermediate goods are necessary to produce a final good, which may also be exported. Since the emergence of the North American GVC in automobiles in the 1960s and the East Asian electronics GVC in the 1970s, the role of GVCs in international trade has become more important and has attracted increasing attention. There are several potential reasons why GVC trade may behave differently.

First, there is a crude statistical argument for a relationship between GVC trade and slowdowns, arising from the fact that there are *more trade flows* in GVC trade than in non-GVC trade. If an exported good is produced entirely within the exporting country, and there is a reduction in demand, then one trade flow disappears. But if the exported good is produced with an imported input, there are two trade flows (the import of the input and the export of the final good), and

thus the same drop in demand for the final good causes two trade flows to disappear. This simple argument turns out to be fallacious (O'Rourke 2009): since there is twice as much trade in a GVC world, then a 1 percent drop in demand leads to a 1 percent drop in both intermediates and final trade, which is not unusual.

However, global trade, in fact, consists of both GVC trade, say, complex goods such as automobiles, whose parts and components are produced in different countries and then assembled in one location, and non-GVC trade, such as exports of bananas that require no further processing. If there is a drop in global demand, and demand for complex goods such as automobiles drops more rapidly than demand for simple goods like bananas, then a *compositional effect* of decelerating demand for goods produced in GVCs (for example, complex consumer goods and capital goods) could cause trade to slow down more rapidly than it would otherwise. Since the world has gradually transitioned over the last several decades to a world in which GVC trade has become more important, there appears to have been a long-run increase in the elasticity of global trade with respect to global income (Escaith, Linden-

berg, and Miroudot 2010). This increase in elasticity reversed itself in the late 2000s. Whether this reversal is due to cyclical factors associated with the recent financial crisis, or to the possibility that the structural transformation associated with the increasing geographical fragmentation of production is now nearly finished, is not yet known. In any case, the fact that demand for the final good is ultimately spread out over demand for intermediates in many countries means that the *transmission of demand shocks* during a slowdown in any one region may be more rapid and greater in a world where GVCs are important.

In addition, different parts of a GVC may behave differently in a downturn. In particular, reductions in final demand may lead to even larger reductions in intermediate demand, so that trade in intermediates declines more rapidly than trade in final goods, the so-called *bullwhip effect* (Altomonte et al. 2012; Zavacka 2012). When demand for final goods slows, exporters of such goods can continue for a while on inventory rather than ordering new intermediate goods for production, so intermediate goods trade declines more rapidly than final goods trade. On top of this, the effect of *uncertainty* is different in the upstream parts of the supply chain, especially for firms that are more peripheral in terms of decision making. Having less information about the drop in demand for final goods, the suppliers of inputs may start avoiding risk, cutting production and trade in intermediate goods even more rapidly than if they had the same information as final-goods producers.

Within these patterns, there is substantial regional and sectoral variation. While the above generalizations are useful, not every GVC produces a good whose final demand is unusually sensitive to declining income, and not every GVC exhibits bullwhip behavior at all times. For example, GVCs in more sophisticated value chains, especially those associated with large multinational lead firms making extensive use of high-tech supply chain management tools, may be more adept at managing fluctuations in demand.

Three Representative GVCs: Apparel/Footwear, Electronics, and Motor Vehicles and Related Parts

A focus on trade in three important product groups characterized by GVC-type trade—apparel and footwear, electronics, and motor vehicles and parts—provides a simple picture of the role of GVCs in the current trade slowdown. The goods making up these GVCs, defined in Sturgeon and Memedovic (2011), can be divided into intermediate goods and final goods using BECs (Broad Economic Categories). Together, these goods make up about 20 percent of global trade. However, the GVCs for these goods include more trade than is included in the definitions. A significant amount of primary trade—in metals, chemicals, fossil fuels, electric power, and natural fibers produced in agriculture—is involved in providing inputs for the goods in this analysis. Moreover, GVCs exist for other complex goods, such as capital equipment, precision instruments, and chemical-based consumer goods such as cosmetics and personal care products. It is possible that the three GVCs analyzed here have had behavior similar to other GVCs, but the extent is uncertain.

Overall GVC Trade in Current Slowdown

Figure 1 shows that in the current slowdown, trade in the three GVCs combined has declined more rapidly than global trade.[4] In the Great Trade Collapse, the deceleration was also more rapid. However, during 2008–9, GVC trade collapsed more rapidly than global trade, and then boomed back. The current slowdown in GVC trade, relative to total trade, is more subtle. Arguably, GVC and non-GVC trade have grown at about the same rate since late 2011. However, in four of the last five rolling 12-month windows calculated on quarterly data, GVC trade has grown less rapidly than total trade. In the most

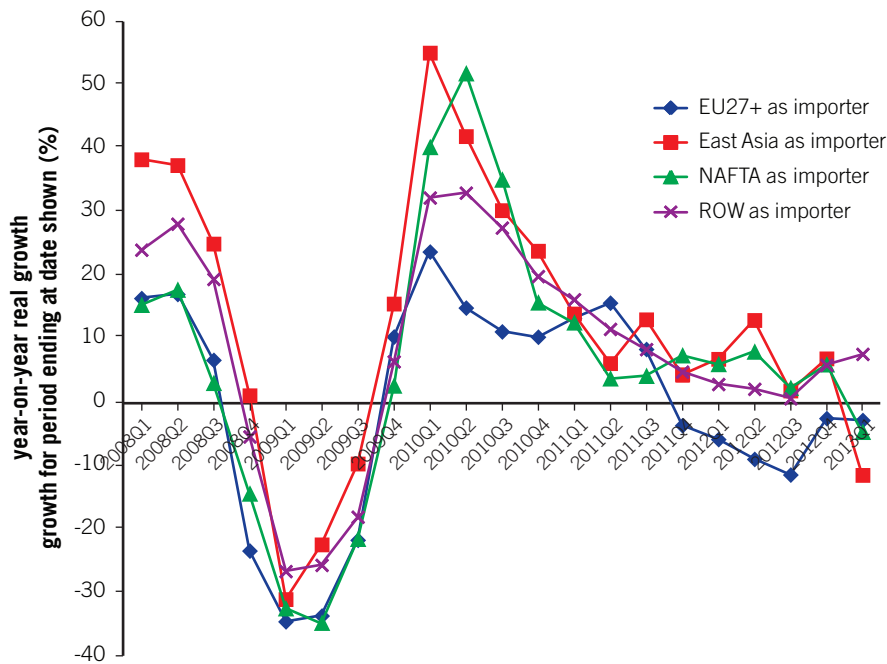**Figure 1. Trade in GVCs Has Decelerated More Rapidly Than Total Trade**
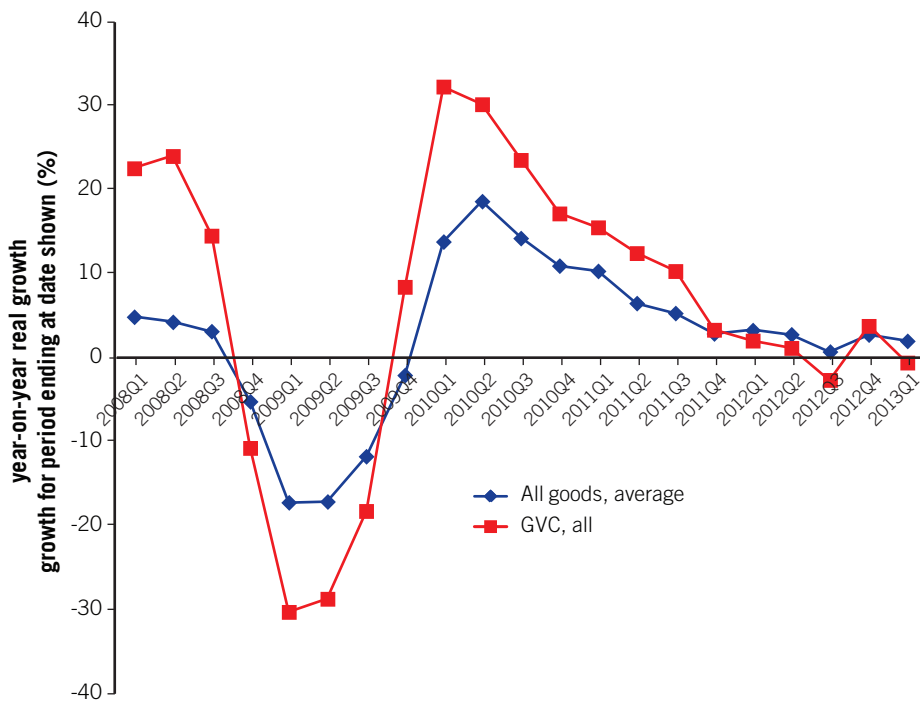
Source: Datastream, International Trade Commission (ITC), World Bank.

Figure 2. Trade in Motor Vehicles and Parts Has Led Decline in Current and Previous Slowdowns
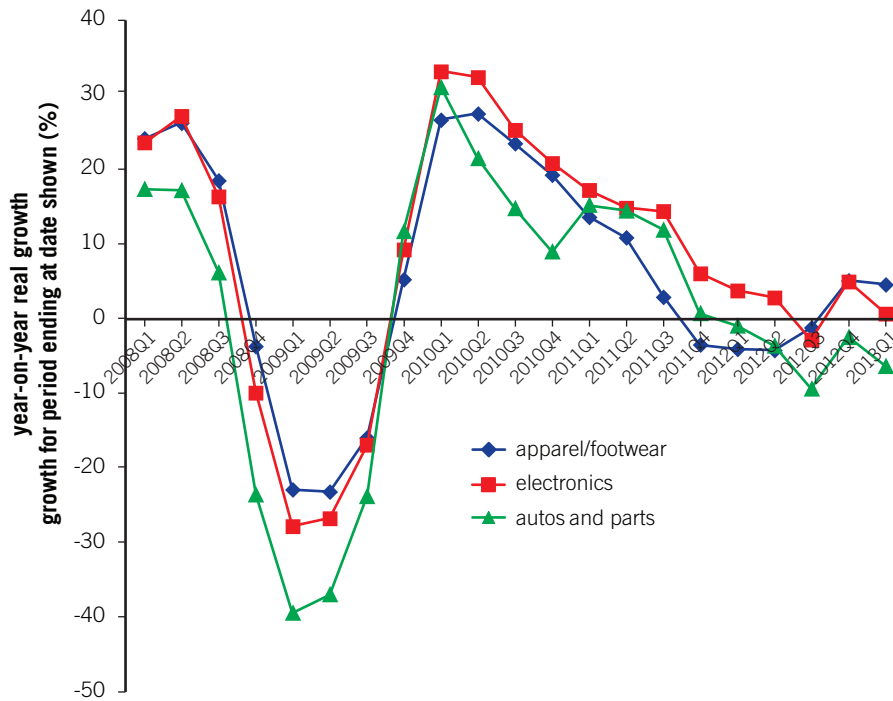
Source: ITC, World Bank.

Figure 3. The Europe-Centered GVC Contracted First, Then NAFTA and East Asia

Source: ITC, World Bank.
Note: EU27+ = EU 27 and Morocco, Tunisia, and Turkey; NAFTA = North American Free Trade Agreement; ROW = rest of world.

recent window for which data are available, that ending in the first quarter of 2013, total global merchandise trade increased by 2.0 percent, while GVC trade declined by 0.6 percent.

Sectoral patterns

At the sectoral level, a decline in demand for motor vehicles and parts is leading the current slowdown, as it did during 2008–9. The bust-and-boom behavior of trade in motor vehicles and parts has been associated with the domestic stimulus programs in this sector pursued by many countries in the aftermath of the 2008–9 recession. In turn, the phasing out of these programs may be contributing to the disproportionate slowdown in motor vehicle trade.

Regional patterns in GVCs

GVCs often operate on a regional basis to optimize time and transport costs. To examine the different patterns, GVC trade can be divided into three regional supply chains: EU27+, which includes the 27 members of the European Union (EU27)[5] as well as their GVC partners in Morocco, Tunisia, and Turkey; North American Free Trade Agreement (NAFTA) countries (Canada, Mexico, and the United States); and East Asia (including Japan, China, the Republic of Korea, and other large Asian traders). Each of the regions includes both developed and developing countries. Remaining trade is classified as "rest of the world." For the three sectors analyzed here, over 96 percent of their trade involves one of the three big regional GVCs, either as an exporter or importer.

On a regional basis, the slowdown in EU27 demand is most notable. EU27 imports of GVC goods (including intraregional imports) did not recover as dramatically as imports of other regions, and have been in absolute decline in real terms since 2011. In the most recent 12-month window ending in the first quarter of 2013, real growth in NAFTA and East Asian GVCs is also negative, while GVC imports by the rest of the world have been more resilient (figure 3).

Differences between intermediate and final goods trade

Figure 4 shows one difference between the current trade slowdown and the Great Trade Collapse. Looking at the three sectors together, the strong bullwhip behavior (intermediate trade declining more than final goods

Figure 4. Within GVCs, Trade in Intermediate Goods Has Slowed More Rapidly Than Trade in Final Goods
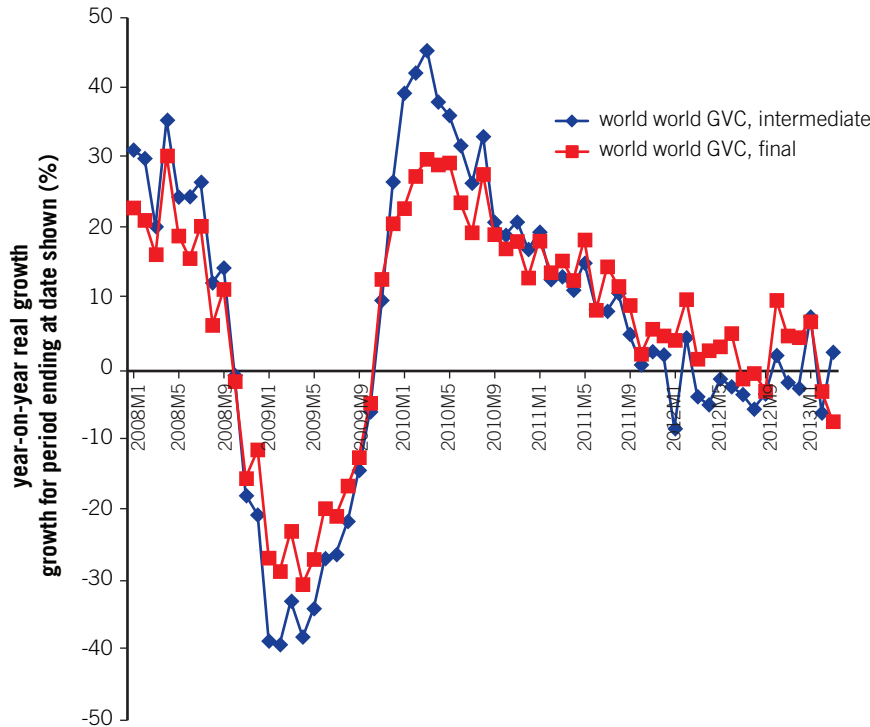
Source: ITC, World Bank.

trade) that characterized 2008–9 does not appear in aggregate GVC trade in the latest slowdown. Trade in intermediate and final GVC goods are currently decelerating at a proportional rate.

Given the hypothesized origin of bullwhip behavior in the management of uncertainty and inventories, there are some potential explanations for this difference. It could be that firms in GVCs have learned from 2008–9 and are able to adjust production in the supply chain more efficiently and better anticipate the slowdown. Also, because the current slowdown is more modest, there is less uncertainty in the system overall for firms to react to, thus less bullwhip behavior.

However, breaking down the behavior of final versus intermediate trade by sector and region, it appears that bullwhip behavior is not entirely extinct. Over the last two years, declines in intermediates trade in excess of final goods trade characterized the electronics GVC for most of 2011 and 2012, but have recently moderated. Intra-EU trade in GVCs as a whole has exhibited bullwhip behavior. For the year ending in the first quarter of 2013, real intra-EU GVC trade in final goods increased by 1.3 percent, while intra-EU GVC trade in intermediates decreased by 5.4 percent.

GVCs' Impact on EU Slowdown

Trade is likely to slow down most rapidly in countries exporting to regions where demand has slowed down the most. In

recent years, the most notable slowdown in demand has been in Europe. While world economic activity grew by 4 percent in 2011 and 3.2 percent in 2012, with projections for 2013 at 3.3 percent, in the EU-27, it only grew by 1.6 percent in 2011, and contracted by 0.2 percent in 2012. The euro area seems to have been driving the EU performance, with 1.4 percent growth in 2011 and 0.6 percent contraction in 2012, and a further contraction for 2013 estimated at 0.3 percent.[6]

The slowdown in Europe is having significant spillover impacts on its trading partners in Africa and the Middle East. This point is highlighted by the network representation of world trade (using a Minimal Spanning Tree [MST]) shown in figure 5, which details overall bilateral trade for 2010. MSTs enable at-a-glance visualization of large and dense networks, such as world trade. The lines in the network represent link weights and are proportional to trade flows, while the size of the nodes reflects a country's degree of centrality in global trade. Following the links of the network, it is possible to assess which countries' exports are most likely to be affected by a contraction of activity and demand in the European Union.

World trade appears polarized around three main blocks. China, of course, is the most relevant trade partner for many countries (higher degree of centrality), but so are the United States and Germany. More specifically concerning the European Union, it appears that there are three distinct sub-blocks. One is centered around Germany and comprises mostly countries from the wider European region. The second is centered around France and comprises a mix of Middle Eastern, African, and European countries. The third sub-block centers on Italy and comprises Mediterranean and North African partners.
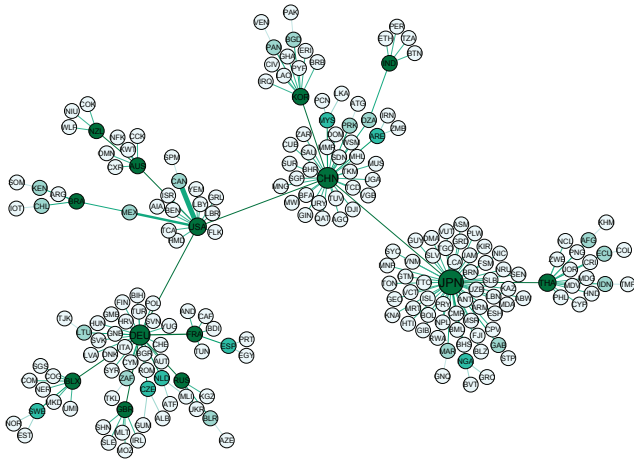
The same representations can be carried out for individual industries. Figures 6–8 provide MSTs of the three GVCs industries discussed here: electronics, motor vehicles (including motorbikes), and apparel (including footwear). For the electronics industry, the clustering broadly follows the main regional blocks. The network centered around EU countries comprises mostly European, Middle Eastern, and North African countries. The European trade network links back to the rest of the world through the United States. Motor vehicle trade is also very regional in scope, but the number of countries clustered around Europe is higher than in the case of electronics, for which Asian countries are most

Figure 5. World Trade Network, 2010
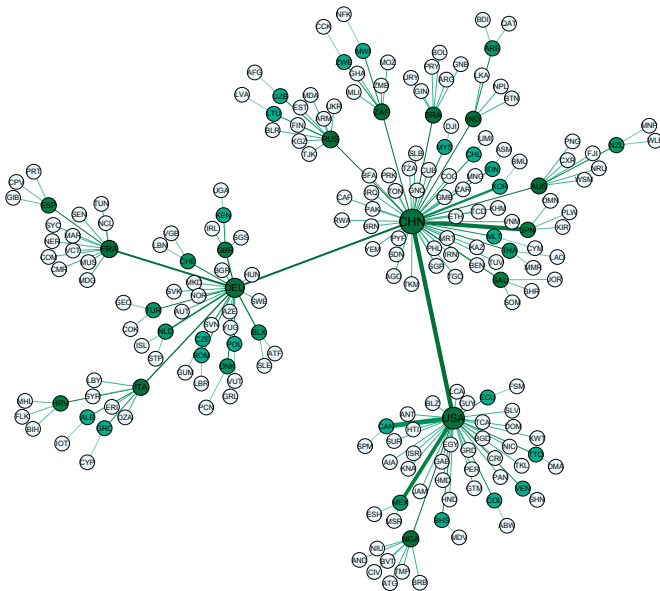
Figure 6. World Trade Network, 2010: Electronics

Figure 7. World Trade Network, 2010: Passenger Vehicles
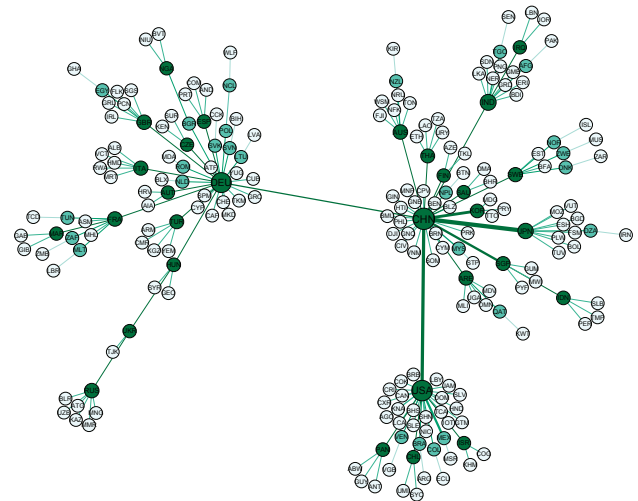
Figure 8. World Trade Network, 2010: Apparel and Footwear

central to the network. The most central EU country for motor vehicles is Germany. Finally for apparel, Italy, France, and Spain represent more central nodes in the global network. Dampened demand, which has concentrated in these countries, may explain the subdued growth of apparel GVCs shown in figure 2.
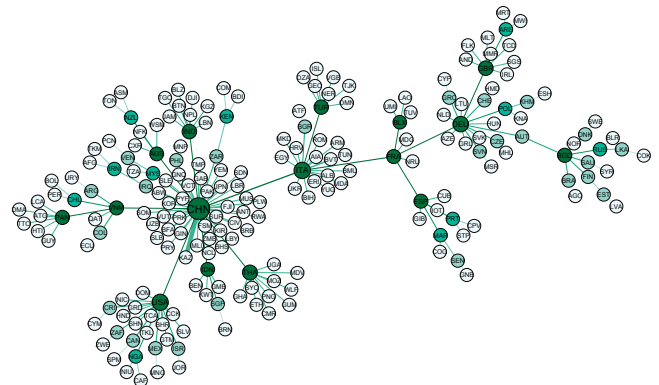
Ongoing financial market friction in the European Union, particularly in the euro area, have also greatly increased uncertainty, leading to delays on investment and expenditure decisions, especially regarding durable goods. Increases in uncertainty can have a dampening effect on trade, as producers scale back investment decisions and inventory accumulation (as discussed above under the bullwhip effect) and consumers postpone purchases. Evidence shows that,

even taking traditional determinants of trade into account, exports to markets experiencing stock market volatility decline by more than expected (Taglioni and Zavacka 2012).

The deterioration of financing conditions in the European Union also pose a problem. Inadequate financing constrains working capital, which affects firms' investment decisions and limits funds, particularly for small and medium enterprises, which are the backbone of the EU economy. The prolonged financial crisis in the European Union likely has had a significantly negative impact on firms, which in turn has affected the exports of their foreign suppliers.

Conclusion

The recent slowdown in global merchandise (2010–early 2013) confirms some of the lessons learned during the Great Recession. Trade in complex products organized in GVCs has once again been more sensitive to global downturns than has trade in simple products, particularly for motor vehicles. For motor vehicles, the start-and-stop nature of incentives in

many countries may have added to the volatility. Conversely, trade in simpler products appears once again to be more resilient to global downturns. Although evidence is still accumulating, this suggests that the preference often expressed for countries to go "up the value chain" by specializing in more and more complex products may need to be qualified. While diversification is one way to manage risk associated with export portfolios, focusing on simpler products less associated with GVCs may be another way, and there is likely to be a tradeoff between these two strategies. Continued monitoring and research in this area is warranted.

Acknowledgments

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Notes

1. Unless otherwise specified, the trade data used in this note represent the average of import and export data to smooth out the effect of short-run discrepancies in the two series.
2. World Bank's Datastream, maintained by DEC.
3. Baldwin (2009) reviews the explanations for the Great Trade Collapse offered by economists in mid-2009, including the role of GVCs.
4. Due to lagged reporting of monthly figures at the product level, data for this analysis are only available through the first quarter of 2013. Nominal GVC trade has been deflated using sector-specific import price deflators for the United States, taken as a rough proxy for the global market.
5. In June 2013, Croatia joined the European Union, becoming the 28th member. However, since this analysis covers the period up to mid-2013, the analysis includes only the EU-27.
6. See the International Monetary Fund's World Economic Outlook (April 2013, http://www.imf.org/external/pubs/ft/weo/2013/01/).

References

Altomonte, Carlo, Filippo Di Mauro, Gianmarco Ottaviano, Armando Rungi, and Vincent Vicard. 2012. "Global Value Chains During the Great Trade Collapse: A Bullwhip Effect?" European Central Bank Working Paper Series No. 1412.

Baldwin, Richard, ed. 2009. *The Great Trade Collapse: Causes, Consequences and Prospects*. London: Center for Economic Policy Research and VoxEU.org.

Escaith, Hubert, Nannette Lindenberg, and Sébastien Miroudot. 2010. "International Supply Chains and Trade Elasticity in Times of Global Crisis." Economic Research and Statistics Division Staff Working Paper ERSD No. 2010-08, World Trade Organization, Geneva.

O'Rourke, Kevin. 2009. "Collapsing Trade in a Barbie World." http://www.irisheconomy.ie/index.php/2009/06/18/collapsing-trade-in-a-barbie-world/.

Sturgeon, Timothy J., and Olga Memedovic. 2011. "Mapping Global Value Chains: Intermediate Goods Trade and Structural Change in the World Economy." United Nations Industrial Development Organization, Development Policy and Strategic Research Branch Working Paper 05/2010, Vienna.

Taglioni, Daria, and Veronika Zavacka. 2012. "Innocent Bystanders: How Foreign Uncertainty Shocks Harm Exporters." World Bank Policy Research Working Paper No. WPS 6226, Washington, DC.

Zavacka, Veronika. 2012. "The Bullwhip Effect and the Great Trade Collapse." European Bank for Reconstruction and Development Working Paper No. 148.