

Kiel Policy Brief

Back to Normal? The Future of Global Production Networks After the Crisis

**Olivier Godart, Holger Görg,
Dennis Görlich**

No. 9 | September 2009



Introduction

The current global economic crisis has again pushed the issue of international trade into the spotlight of public and academic debates. Since the economic downturn started, exports have fallen dramatically and rapidly. Figure 1 illustrates this dramatic decline: at the end of the 1st quarter of 2009, world merchandise exports have fallen back to the level of 2005, after a steady increase between 2005 and the 3rd quarter of 2008.

One may suggest that even though trade volumes have declined during the economic downturn, international trade will pick up again once the crisis is over. Indeed, in a standard economic model, downswings in business cycles reduce the demand for domestic and foreign goods, causing firms to reduce or put on hold their exports. During upturns, conversely, companies start to export again and expand further into foreign markets.

While this line of argument may be appealing in light of the current international crisis, it neglects an important fact. Today's world economy is characterized by high degrees of globalization of production, with firms exporting final goods around the globe and sourcing intermediate inputs from suppliers located in many countries. This is sometimes referred to as global production networks. The need to consider these networks stems from the fact that building foreign trade nodes involves a range of substantial set up costs that are often non-recoverable. They are generally referred to as sunk costs. These might be sunk costs of exporting or sunk costs of foreign sourcing of inputs. The existence of such costs may make it unlikely that international trade relationships will restart as quickly once the economic situation improves again.

The questions this essay attempts to address are: what will happen to global production networks during and after the crisis? Are the predictions of the standard model the most likely outcome of the international crisis in the light of global production networks and sunk costs of building foreign trade nodes?

To examine these questions, we will start with briefly charting the importance of global production networks, or international sourcing as it is also referred to, before the crisis. We then comment on the development during the crisis, and consider what may happen once the world economy leaves the current situation behind and picks up again.

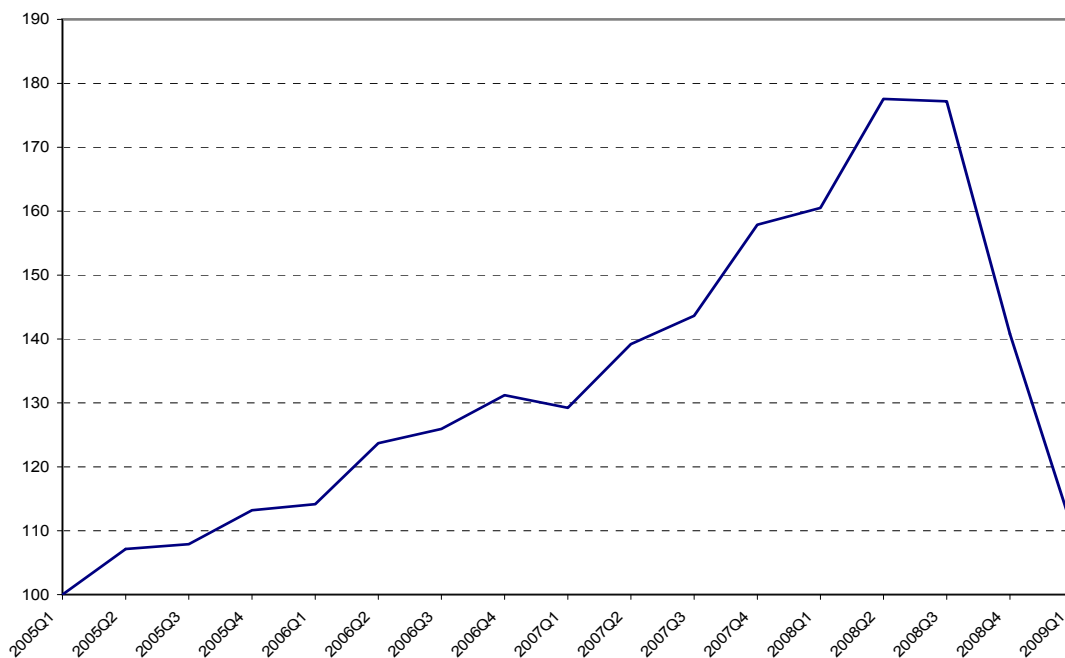


Figure 1: Quarterly world merchandise export developments, 2005 – 2009 (2005Q1=100).
Source: WTO secretariat, available at <http://www.wto.org>.

The Importance of Global Production Networks

Global production networks are an important aspect of the current globalized world economy. This is evident not only from anecdotal evidence on where firms source their inputs, but also from more aggregate statistics on imports of intermediate products and international sourcing behaviour.

The World Trade Organization (1998, p. 36) provides a good example of the extent of internationally linked production activities when it describes the geographic sources of inputs for the average American car: “30 % of the car’s value goes to Korea for assembly, 17.5 % to Japan for components and advanced technology, 7.5 % to Germany for design, 4 % to Taiwan and Singapore for minor parts, 2.5 % to the UK for advertising and marketing services and 1.5 % to Ireland and Barbados for data processing. Only 37 % of the production value is generated in the United States.”

Another illustration is provided by Linden et al. (2007) who determine the source of inputs for an iPod, sold by the US company Apple. They estimate that the hard-drive, produced by the Japanese company Toshiba using affiliates based in China accounts for 51 % of the cost of all iPod parts. The display module and display driver, produced by Japanese companies in Japan, account for 16 % of input costs. 2 % of the value of inputs are supplied by Samsung, a Korean company producing the input in Korea. The final assembly, accounting for 3 % of the input cost, is carried out by a Taiwanese company in a plant in China. The source of

20 % of inputs cannot be determined by the researchers. This leaves 9 % of input costs that are supplied by US firms, who provide the video/multimedia processor as well as the portal player CPU. The former input is produced, however, in either Singapore or Taiwan, while the CPU may stem from production plants in either the US or Taiwan. This, hence, shows again the importance of global production networks in the assembly of an iPod.

Examining the importance of such production sharing at a more aggregate level is not straightforward, as no harmonized and internationally comparable statistics are available. Hummels et al. (2001) proposed a method that enables them to gauge the magnitude of what they refer to as “vertical specialization”. This is based on the idea that such global production sharing involves that at least one stage of production that relies on imported inputs, and that some share of the production is exported. Applied to Apple’s iPod, consider that China imports many inputs and then assembles the iPod, which is then exported to the US or indeed other countries. From the point of view of the US, Apple imports the final assembled product and then exports the final good (after some marketing) to final customers in Europe and elsewhere.

This logic can be applied to aggregate trade data, and one can measure the importance of imports for exports in a given industry and country. Figure 2 provides some evidence on the imported intermediate input content of exports for a number of European countries, Canada and the United States, calculated using the Hummels et al. (2001) method based on data from national input-output tables.

The data show that vertical specialization is widespread among these industrialized countries. It is also apparent, however, that the magnitude of global production sharing differs across countries. In Ireland, vertical specialization accounts for almost 60 % of exports, while in the US the corresponding figure is around 10 %. It is obvious that it is mainly the smaller countries (Ireland, the Netherlands, Sweden) that engage in more pronounced levels of vertical specialization.

Vertical specialization has grown in some, but not in all countries. For example, from 1990 to 2005, the share of vertical specialization in total German exports has almost doubled, while it remained almost constant in the US. The UK even experienced a slight decrease in this measure over that period. Unfortunately, we cannot calculate these figures for years later than 2005, as the underlying input-output data are not available yet.

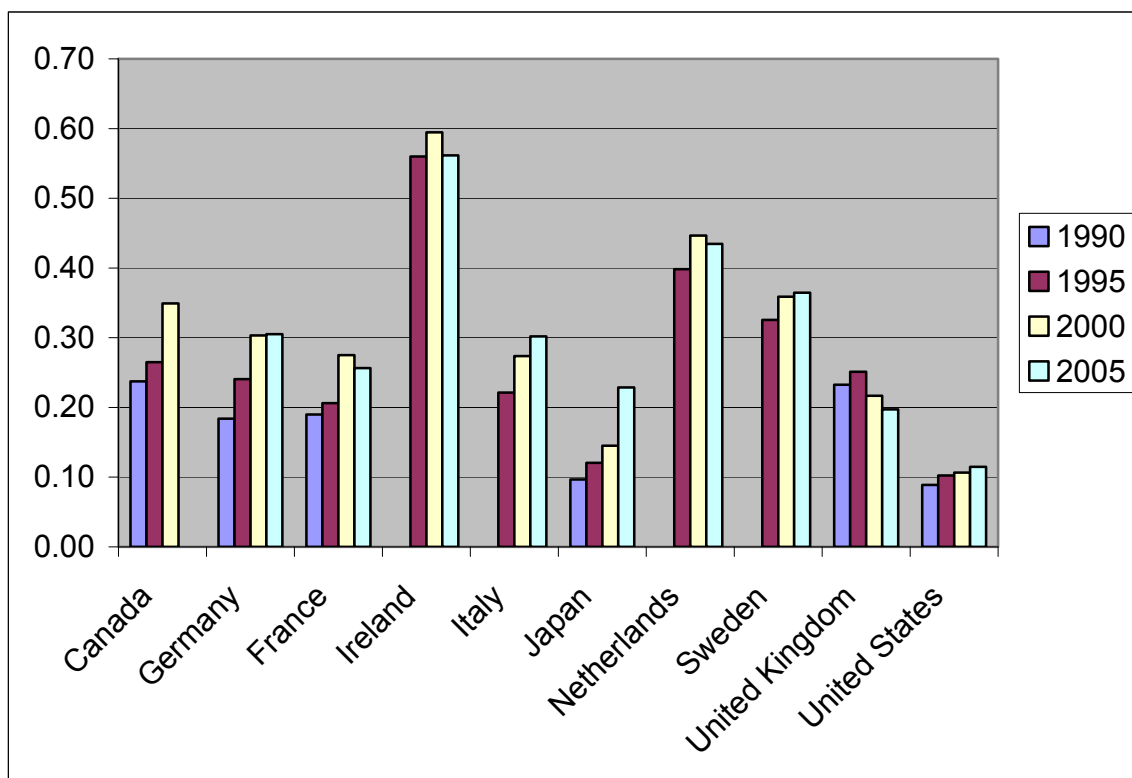
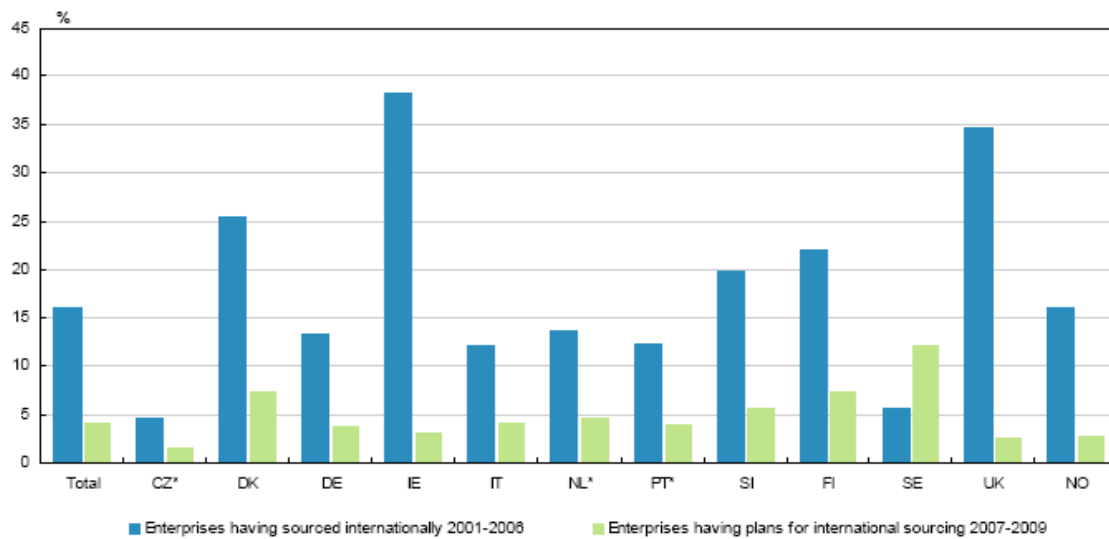


Figure 2: Vertical specialization share in total exports. Source: Authors calculations based on countries' input-output tables (OECD).

An alternative indicator of global production sharing is provided by Eurostat, using results from a survey on international sourcing behaviour of European firms with more than 100 employees. Figure 3, taken from their publication, shows in the blue columns the share of surveyed firms having sourced inputs internationally during the period 2001 to 2006. (We will come back to the other column in the discussion below.) It shows again that international sourcing is important for European firms, although the magnitude of the phenomena differ across countries. Most importantly, and in line with our findings above, Irish firms are the most prolific “outsourcers” in the European comparison. The survey also shows that international sourcing is highly important for British firms. While this may seem at odds with Figure 2, it is important to point out that Figure 3 shows the incidence of international sourcing, i.e., the number of firms engaged in the activity, rather than the level of outsourcing. In Germany, only roughly 15 % of firms source their inputs abroad.



Source: Eurostat, SBS

* CZ, PT: provisional data; NL unreliable data for enterprises having international sourcing plans 2007-2009.

Note: Enterprises with plans for 2007-2009 only include enterprises not having sourced internationally in the previous period 2001-2006.

Figure 3: Level of international sourcing of enterprises during 2001-2006 and planned international sourcing 2007-2009. Source: Eurostat: International Sourcing in Europe, Statistics in Focus 4/2009.

Global Production Networks During the Crisis

Unfortunately, it is difficult to measure with any precision what happens to the extent of global production networks when adjustments to the crisis are still ongoing. Furthermore, there are no consistent up-to-date data available that would, for example, enable us to calculate measures of vertical specialization as done in Figure 2. There are, however, some sound economic reasons for why one would expect that vertical specialization has fallen as a result of the crisis. We discuss two in turn.

The first reason is the fall in exports. The financial crisis has translated into a world-wide drop in consumer spending. Since consumers demand not only locally produced goods but also exports, this has led to a quite substantial decrease in export activity in world exports, as shown above in Figure 1, especially in North America, Europe and the far East. For example, Yi (2009) reports that exports in the US fell by an annual rate of 43 % during the fourth quarter of 2008. The corresponding figure for Germany is a drop by just over 80 %. Given the existence of vertical production chains, or global production networks described above, a fall in exports of final goods also implies lower demand for intermediate inputs, and hence a decrease in the value of vertical specialization. Indeed, a number of economists, for example Yi (2009), have recently voiced their opinion that the rapid decline in exports is partly due to the importance of vertical specialization, where the drop in demand for the final good induces a domino effect on to intermediate inputs. Hence, the strong collapse in exports in the recent month is at least partly driven by the same forces that allowed global trade to expand much faster than global GDP in the last two decades, i.e. global production networks.

The second reason concerns availability of financing instruments related to trade. Access to services in general, and financial services in particular, are vitally important for exports and imports. Firms need access to available bank loans in order to finance imports of intermediate goods that will only after some value adding and sale translate into revenues. Furthermore, exporters are dependent on access to finance in order to bridge the gap between the date of invoice and the receipt of the payment, which may only happen with a substantial delay when interacting with customers abroad. Furthermore financial instruments like letters of credit play an important role as insurance against default of the buyer or any risk in international transactions.

Due to the financial crisis banks in need of liquidity in an uncertain environment, tend to be much more reluctant to provide such credit easily. This implies that exporting and importing are additionally constrained: a further reason to expect that some global production networks are hurt during the financial crisis.

Some anecdotal evidence illustrates the potential severity of the problem. The *Financial Times*, for example, has recently announced that Sony plans to halve its supplier networks in an effort to cut costs in order to deal with the slump in sales. Specifically, Sony plans to reduce its current network of roughly 2,500 suppliers to about 1,200 by March 2011 with the expectation of cutting its procurement costs by roughly \$ 5.3bn as a result. Ford is also quoted by the *Financial Times* as engaging in a similar exercise. They have cut back from more than 3,000 suppliers to around 2,000, with a target of reducing this further to 750. Indeed, Ford's procurement chief is quoted as saying that he expects "more stress in the supply base in the short term, not less". For the *International Herald's Tribune*, Hiroko Tabuchi reports that Japanese small and midsize exports of intermediate components are the most vulnerable to the global downturn. They supply many firms abroad and are at the "heart of the economy".

If these cases are anything to go by, then international sourcing and global production networks may become somewhat less important as a result of the financial crisis. Moreover, the value of foreign nodes in global international networks should be lost for all participants of these networks.

Back to "Business as Usual" After the Crisis?

If some global production networks do in fact decline during the crisis, the important question becomes: what will happen afterwards? There are two views on this: one, things will be back to business as usual, as suggested by the standard economic model directly applied to the current situation. The other view is that, no it will not – or at least not so easily and so quickly. Let us discuss these two views in turn.

Proponents of the first view would argue that during the financial crisis exports have fallen so dramatically because of the existence of global production sharing and the associated domino effect – lower exports of final goods also imply fewer imports of intermediate products. This has dire implications for international sourcing during the crisis, but there is an optimistic ending. The argument goes that, once the crisis is over and global demand picks

up again, exports of final goods will rise again and with it global production networks. Export producers will need to source inputs, and they will source them, as before the crisis, from suppliers world-wide. If the domino effect works adversely in the time of crisis, it works positively in the time after the crisis.

The second view is somewhat more pessimistic. Recent work in international economics, using both theoretical analysis and careful evaluation of firm level data tells us that “sunk costs matter”. This means, in a nutshell, that export and the setting up of global production networks involve substantial set up costs, which can to a large extent not be recouped once a firm leaves the export market or terminates its international customer-supplier relationships. Examples of this are costs for market research, searching for adequate suppliers abroad, setting up foreign distribution and sourcing networks, paying for lawyers versed in the law of the foreign country, etc. While setting up a global production network means that the firm has covered these costs and got the knowledge, the value of this knowledge tends to depreciate rather quickly once the firm leaves the export market, or stops international sourcing.

The empirical relevance of this argument is illustrated forcefully in a study on Colombian exporters by Roberts and Tybout (1997), showing the response of exporters to changes in the Colombian peso exchange rate. The study shows that there was substantial exit of exporters during an appreciation of the Peso lasting up to 1984. A following much stronger depreciation of the currency, after 1984, however, only led to a much lower rate of re-entry into export markets. In other words, firms that were out of the export market were reluctant – or unable – to get back in. That study also carefully quantifies the importance of sunk costs. A firm was 60 percent more likely to be an exporter if it also was one in the previous period. However, once a firm quitted the export market for longer than one year, it was just as likely as a domestic firm that never exported before, to re-enter the export market. This points at how important it is for a firm to stay in the export market.

While there is no equivalent study for global production networks, it is very likely that a similar mechanism would be at work. As pointed out above, both exports and international sourcing involve substantial sunk costs of a similar nature. Once out of the sourcing market, much of these costs would have to be borne again by a firm wishing to re-enter after a pause. Let us assume that sunk costs are as important for international sourcing as they are for exporting. This would imply that, as in the Colombian case, firms that drop out of their international sourcing network for more than one year, are as likely to re-establish global production networks as are firms that never engaged in international sourcing before. This brings us back to Figure 3 above. Interestingly, the survey on which this figure is based also includes firms that did not do any international sourcing before. These firms were asked how many of them were planning to do so in the future. The green column in Figure 3 reports the percentage of firms that were planning to start international sourcing. This is below five percent in most cases.¹ So among those firms that never engaged in any international sourcing, the probability of starting to do so is definitely quite low. This probability may be

¹ This survey was undertaken in 2006, before the crisis started. Were it taken today, one may expect even lower numbers wishing to start international sourcing.

similarly low for firms that did do some international sourcing before, but quitted it for a year or more.

What does this imply? If, as a result of the international crisis, demand for exports falls dramatically and a firm stops sourcing inputs internationally, then re-entrance into international sourcing will be seriously hampered, even if foreign demand picks up again. So, once a firm stops, the concern is that it is going to be hard to re-establish foreign trade nodes and get back in. A firm may be likely to decide not to re-establish global production networks again, or, at least, it is likely to take some time before it is able to do so. Hence, the international crisis may have consequences that go well beyond the prediction of a standard economic model, when the presence of global production networks and sunk costs of building foreign trade nodes are taken into account.

References

- Hummels, D., J. Ishii and K.M. Yi (2001), "The nature and growth of vertical specialization in world trade", *Journal of International Economics*, 54, 75-96.
- Linden, G., K.L. Kraemer and J. Dedrick (2006), "Who captures value in a global innovation system? The case of Apple's ipod", Working Paper, Personal Computing Industry Center, University of California, Irvine.
- Roberts, M.J. and J.R. Tybout (1997), "The decision to export in Colombia: An empirical model of entry with sunk costs", *American Economic Review*, 87, 545-564
- Tabuchi, H. (2009), "Japan's small exporters are hit hardest", *International Herald's Tribune*, March 26.
- World Trade Organization (1998), *Annual Report 1998*, Geneva, World Trade Organization
- Yi, K.M. (2009), "The collapse of global trade: the role of vertical specialization", in Baldwin R. and S. Evenett (eds.), *The collapse of global trade, murky protectionism, and the crisis: Recommendations for the G 20*. Available at www.voxeu.org

Imprint

Publisher: Kiel Institute for the World Economy
Duesternbrooker Weg 120
D – 24105 Kiel
Phone +49 (431) 8814-1
Fax +49 (431) 8814-500

Editorial team: Rita Halbfas
Helga Huss
Prof. Dr. Henning Klodt
(responsible for content, pursuant to § 6 MDStV)
Dieter Stribny

The Kiel Institute for the World Economy is a foundation under public law of the State of Schleswig-Holstein, having legal capacity.

Sales tax identification number DE 811268087.

President: Prof. Dennis Snower, Ph.D.

Vice President: Prof. Dr. Rolf J. Langhammer

Supervisory authority: Schleswig-Holstein Ministry of Science,
Economic Affairs and Transport

© 2009 The Kiel Institute for the World Economy. All rights reserved.