
Is Full Recovery of Global Production Networks Inevitable?¹

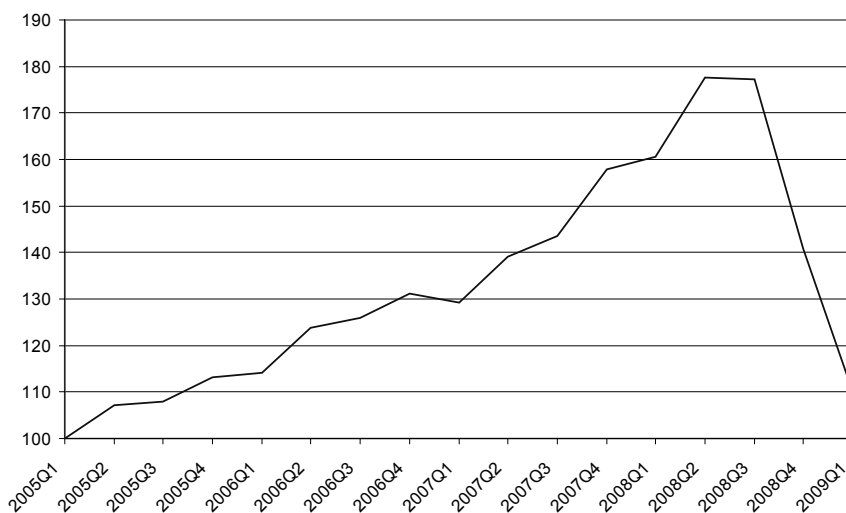
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1. Introduction

Since the start of the current economic crisis, trade has fallen dramatically and rapidly. Figure 1 illustrates this dramatic decline: after a steady increase between 2005 and the third quarter of 2008, world merchandise exports have fallen back to the level of 2005 at the end of the first quarter of 2009. As Yi (2009) shows, there have been considerable reductions in exports in the third quarter of 2008 in the three major exporting nations: the US (-43 percent), Germany (-80 percent) and China (-37 percent). The collapse has involved virtually all countries that trade. Yi (2009) also presents data for South Korea, where exports fell by just over 60 percent in the last quarter of 2008.

Figure 1 Quarterly world merchandise export developments, 2005 - 2009 (2005Q1=100, in current US dollars)



Source: WTO secretariat, available at <http://www.wto.org>

1 The authors are very grateful to Malte Rengel for excellent research assistance.

Partly as a response to the economic crisis, many countries discussed and implemented an array of protectionist measures in order to support local industry in an attempt to fend off the negative consequences of the downturn. The rise of protectionism, even since the G20 summit in November 2008, at which government leaders pledged to eschew protectionist measures, has been forcefully demonstrated in the second Global Trade Alert report *Broken Promises: A G20 Summit Report by the Global Trade Alert* (which was published earlier in 2009.)

This chapter argues that such protectionist measures are likely to be counterproductive, to say the least. The economies of Asia/Pacific, Europe, America and, to a lesser extent, Africa are inextricably linked through the importance of global production networks. These networks crucially depend on the ability to export and import goods relatively frictionless around the globe. Hence, putting up protectionist fences around your country and impeding the flow of such goods, means shooting yourself in the foot. As we show, the global economy relies heavily on this mode of production organization.

To set out this argument, this chapter begins by presenting some evidence on the use of protectionist measures, using information from the Global Trade Alert data base. We then document the importance of global production networks, focusing on East Asia. The final section links the harm done by protectionist measures, to known determinants of outsourcing behaviour, to whether the restoration of global production networks is inevitable following the current crisis.

2. The (re-)emergence of protectionism

The Global Trade Alert Report *Broken Promises* clearly documents the rise in protectionist measures taken by countries since the start of the economic crisis. Evenett (2009) describes and interprets some of the data collected by Global Trade Alert. His conclusion is that "the protectionist juggernaut continues". This assessment is backed up by a whole range of data relating to newly established discriminatory measures against foreign commercial interests, implemented since the November 2008 crisis meeting of the G20. In his paper, Evenett shows that, overall, G20 members implemented 121 discriminatory initiatives that were against foreign commercial interests. However, not only G20 members, but also many other countries jumped on the bandwagon.

Overall, the data analyzed by Evenett show that China has been the most frequent target of protectionist measures taken by other countries. On the other side of the coin, however, China has also been one of the top countries in terms of implementing such measures that are harmful to their trade partners. Interestingly, Indonesia is one of the worst offenders against China; it is one of the countries imposing the largest number of harmful measures against China. Hence, this is detrimental to trade relationships within the East Asia region.

A closer look at the country tables in *Broken Promises* shows that China implemented measures that are harmful to the commercial interests of 163 trade partner countries. The equivalent numbers for Indonesia and South Korea are 124 and 88, respectively. Global Trade Alert of course reports on a large number of possible protectionist measures. But the database also allows one to be more specific. For exam-

ple, based on accessing the Global Trade Alert website on 29 November 2009, the data show that China implemented 11 instances of import bans that are harmful to foreign commercial interests and obviously impact directly on trade. These measures affect 42 trade partner jurisdictions and 22 sectors. On the other hand, 8 jurisdictions implemented export taxes or restrictions that harm their trade relationships with China. These affect 19 industrial sectors.

These data give only a very brief overview of what has happened in terms of protectionism. The Global Trade Alert website, as well as reports, provide much more detailed and broader information, which shows that not only East Asian countries, but also in particular American and European countries have not abstained. The negative consequences this may have for the flow of trade in goods and services across the globe are obvious. Protectionist measures hamper trade and put sand in the wheels of commerce. This is particularly worrisome, as trade is not just in final goods destined for the consumer. A large and rising share is in intermediate products, which are shipped from one country to another for further processing. This is what is referred to as global production networks. We describe the importance of these in the next section, focusing in particular on East Asia.

3. The importance of global production networks

Global production networks are an important aspect of the current globalised 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. Two percent of the value of inputs are supplied by Samsung, a Korean company that happens to produce the input in question 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 could not 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 be made in production plants in either the US or Taiwan. This evidence shows 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 harmonised and internationally comparable statistics are available. Still, one can use trade statistics to get an impression of how important global production networks may be. For example, Haddad (2007) analyses data on trade in parts and components (i.e., intermediate goods) for East Asia and concludes that global production networks are at the heart of any attempt to explain the growth of trade in that region over the recent decade. She shows that trade in components rises much faster than trade in "traditional" final goods. Interestingly, she finds that among the reasons for such expanding global production networks are not only low wage costs (compared to industrialised countries) but also, and perhaps more importantly, low trade costs and favourable policy settings for international production (such as liberalisation of international capital flows, protection of intellectual property rights, to mention but two). Obviously, the rise in protectionism works straight against these favourable settings, hence, impeding the successful use of international production sharing.

We can illustrate the importance of global production by looking further at data on trade in parts and components. This is based on trade statistics that distinguish, for certain sectors, trade of components and final goods. The latest data available to us relate to 2007. We follow a much-cited analysis by Ng and Yeats (1999) who also look at the rise of global production sharing in East Asia in the 1990s using similar, but older, data. Table 1 shows the share of parts and components (P&C) imports in total imports in the sector. We have calculated these shares for the whole East Asia region, as well as separately for China as the largest player in the region.²

The data show that, overall, about 22 percent of manufacturing imports in East Asia are parts and components. As to the development over time, we see that the number in 2007 is comparable to that in 1996. However, the share of P&C imports increased somewhat between those two years and then fell back to its 1996 level. What is perhaps more striking is the sectoral information. Here, we see that in all machinery sectors, as well as in telecommunications, imports of P&C have increased substantially over the period. In particular, in Office Machinery, imports of P&C account for well over half of all imports in that sector in 2007. These trends are similar in China, although there they are particularly pronounced in the industrial machinery and metal working sectors.

Table 2 presents the other side of the production networks, namely, exports of parts and components from East Asia and China. As can be seen, these exports have been on the rise over the last decades in almost all sectors listed. This clearly shows the importance of East Asia as a node for production networks, importing and exporting parts and components that are used in international production.

Table 3 presents an alternative view on the importance and growth of trade in P&C, and hence, the importance of East Asia's role in global production networks. In this table we focus on the export side and, specifically, show some aggregate summary data on trends in exports in East Asia. The top two rows show the absolute value of exports to the East Asian region (i.e., intra-region exports) and the world, respec-

2 For East Asia we include data for China, Hong Kong, Indonesia, Malaysia, South Korea, Thailand, Japan, Philippines and Singapore.

tively. The following two rows report the corresponding growth rates of exports. Finally, the last row reports the share of intra-region (East Asia) trade in global exports.

What is of most interest here is the last column, which demonstrates the importance of exports of parts and components - i.e., exports of intermediate goods that are shipped abroad for further processing in other countries. As the table shows, the absolute value of exports of parts and components (P&C) to the world increased two-and-a-half fold between 1996 and 2007, from US\$136bn to US\$350bn. Exchange of parts and components within East Asia plays an important part, as it accounts for roughly half of all exports of P&C (US\$175bn) in 2007. The share of intra-region exports is much higher for P&C than for manufacturing overall, as demonstrated in the last row.

Table 1 Relative importance of parts and components imports across sectors

Regional and Product Group (SITC Rev.3)	Share of Parts and Components In Product Group Imports (%)			
	1996	2000	2004	2007
EAST ASIA				
Power Generating Equipment (71)	37.74	41.42	42.01	41.43
Special Industry Machinery (72)	18.16	20.82	19.46	23.99
Metal Working Machinery (73)	16.25	19.73	17.96	21.40
General Industrial Machinery (74)	16.62	19.45	19.23	21.69
Office Machinery (75)	48.23	53.12	55.72	55.37
Telecommunications (76)	38.36	44.16	46.66	48.79
Electric Machinery (77)	15.32	15.08	12.29	9.36
Road Vehicles (78)	34.93	40.57	45.61	42.90
Other Transport Machinery (79)	31.92	35.18	36.30	33.61
Misc. Manufactures (8)	4.41	3.99	3.81	2.85
All above Products	21.85	23.88	23.43	21.67
CHINA				
Power Generating Equipment (71)	34.85	33.23	35.42	33.10
Special Industry Machinery (72)	9.13	11.27	11.40	13.15
Metal Working Machinery (73)	11.29	12.43	14.87	15.48
General Industrial Machinery (74)	12.81	14.85	14.48	17.35
Office Machinery (75)	69.33	54.94	49.05	49.30
Telecommunications (76)	61.50	64.00	72.55	68.99
Electric Machinery (77)	11.38	6.17	4.01	3.14
Road Vehicles (78)	61.28	66.17	58.32	50.01
Other Transport Machinery (79)	16.56	21.83	14.25	16.17
Misc. Manufactures (8)	14.52	10.96	3.48	2.05
All above Products	22.41	23.84	19.29	16.93

Source: Authors' calculations based on UN COMTRADE data, following Table 2 in Ng and Yeats (1999).

Table 2 Relative importance of parts and components exports across sectors

Regional and Product Group (SITC Rev.3)	Share of Parts and Components In Product Group exports (%)			
	1996	2000	2004	2007
EAST ASIA				
Power Generating Equipment (71)	34.96	36.51	38.76	38.42
Special Industry Machinery (72)	15.01	16.57	19.45	22.75
Metal Working Machinery (73)	13.90	14.80	17.81	19.86
General Industrial Machinery (74)	14.88	17.72	19.15	22.14
Office Machinery (75)	39.26	49.11	44.16	38.34
Telecommunications (76)	27.07	30.54	31.66	45.23
Electric Machinery (77)	8.04	6.98	7.28	8.47
Road Vehicles (78)	25.21	21.68	24.10	23.11
Other Transport Machinery (79)	10.95	12.41	12.71	14.96
Misc. Manufactures (8)	2.95	2.63	2.68	2.22
All above Products	16.59	18.15	19.14	20.29
CHINA				
Power Generating Equipment (71)	25.08	21.48	23.25	29.06
Special Industry Machinery (72)	15.87	22.48	23.45	25.09
Metal Working Machinery (73)	23.37	30.22	30.32	35.02
General Industrial Machinery (74)	14.75	21.19	20.20	22.45
Office Machinery (75)	28.41	32.54	28.50	23.31
Telecommunications (76)	24.42	27.97	26.58	25.14
Electric Machinery (77)	4.87	4.81	7.73	6.29
Road Vehicles (78)	29.60	28.66	37.92	39.18
Other Transport Machinery (79)	6.73	17.97	16.10	10.74
Misc. Manufactures (8)	1.51	1.40	1.74	1.81
All above Products	8.06	11.10	15.14	14.47

Source: Authors' calculations based on UN COMTRADE data, following Table 2 in Ng and Yeats (1999).

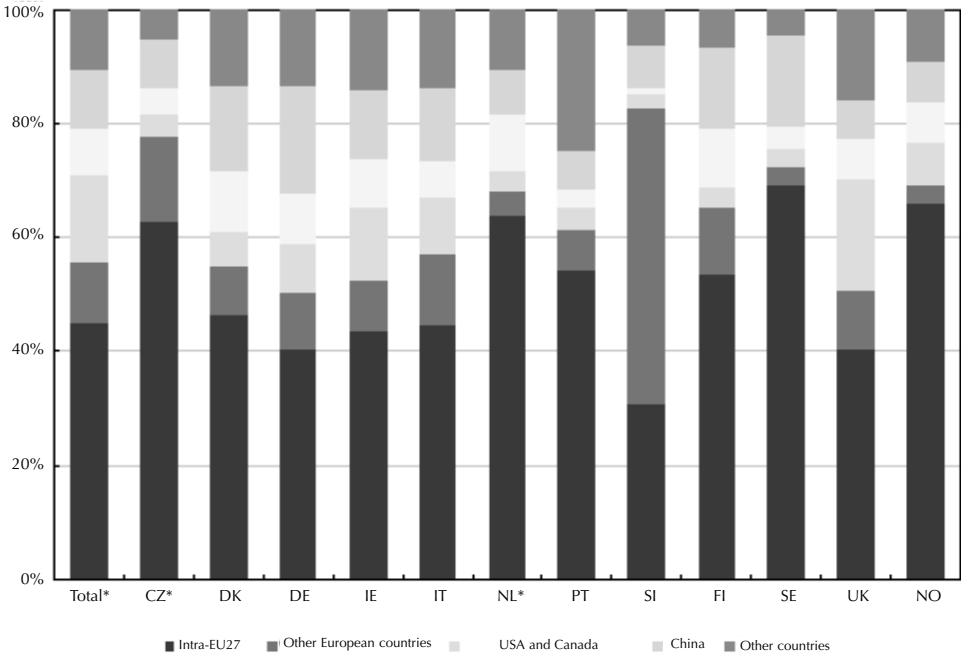
Table 3 East Asian Global and Regional Trade Trends for parts and components and other major product groups

Year	All Items	All Manufactures	Of which:		
			Chemicals	Transport & Machinery	Other Manufactures
			Value of exports to East Asia in terms of US\$ million		
1996	539,235	349,181	39,588	237,332	72,261
2000	625,292	437,843	49,735	304,058	84,051
2004	1,005,658	731,206	83,308	522,221	125,677
2007	1,501,822	1,084,315	128,219	778,166	177,929
			Value of exports to the world in terms of US\$ million		
1996	1,204,079	894,959	71,041	610,374	213,543
2000	1,511,004	1,170,955	92,430	814,480	264,045
2004	2,214,069	1,707,675	152,096	1,203,329	352,251
2007	3,449,149	2,590,185	244,000	1,805,940	540,245
			Annual growth rate of exports to East Asia (%)		
2004-2007	14.30%	14.04%	15.46%	14.22%	12.29%
2000-2007	13.33%	13.83%	14.49%	14.37%	11.31%
1996-2007	9.76%	10.85%	11.28%	11.40%	8.54%
			Annual growth rate of exports to the world (%)		
2004-2007	15.92%	14.90%	17.06%	14.49%	15.32%
2000-2007	12.51%	12.01%	14.87%	12.05%	10.77%
1996-2007	10.04%	10.14%	11.87%	10.36%	8.80%
			Share of East Asian intra-trade in total exports of groups (%)		
1996	44.8%	39.0%	55.7%	38.9%	33.8%
2000	41.4%	37.4%	53.8%	37.3%	31.8%
2004	45.4%	42.8%	54.8%	43.4%	35.7%
2007	43.5%	41.9%	52.5%	43.1%	32.9%
					Parts & Components
					62,278
					88,976
					159,716
					175,863
					136,075
					193,886
					293,776
					348,803
					3.26%
					10.22%
					9.90%
					5.89%
					8.75%
					8.93%
					45.8%
					45.9%
					54.4%
					50.4%

Source: Authors' calculations based on UN COMTRADE data, following Table 3 in Ng and Yeats (1999).

To provide a different angle from which to examine global production networks, we can look at Europe's international sourcing of intermediate inputs. Here, Eurostat, using results from a survey on international sourcing behaviour of European firms with more than 100 employees over the period 2001 to 2006, provides some illuminating data. Figure 2, taken from their publication, shows the destinations of sourcing partners for European firms. While, not surprisingly, the majority of sourcing relationships are with partners in Europe, the importance of Asia is also clear. For example, in the UK, roughly 30 percent of sourcing is with countries other than America or Europe, and half of that again is with India and China specifically. This number is even higher for most other countries. For example, in Germany, about 30 percent of sourcing is with partners in China and India (20 percent alone with China).

Figure 2 Destinations for international sourcing by European enterprises



Notes: Information is based on an ad-hoc survey of enterprises in 12 European countries, covering the period 2001 - 2006 *CZPT: provisional data; Total, NL: unreliable data. The percentages are calculated on the basis of the number of times the enterprises have mentioned the countries and/or country groups as a definition for international sourcing.

Source: Eurostat: International Sourcing in Europe, Statistics in Focus 4/2009

Hence, from the above data, it is clear that global production networks are at the heart of East Asian trade growth. These networks are not only important for trade between industrialised countries (such as Europe) and East Asia, but also, and perhaps even more so, for trade within the region. In particular for East Asian regions, the free flow of intermediate goods is important to fuel the international production networks that exist and that are growing. This is strongly impeded by countries taking up protectionist measures, in particular within the region.

4. The future of global production networks

Global production networks are likely to have been significantly harmed during the current financial crisis. While data on this are still hard to get, there are two sound economic reasons for this expectation.

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 East Asia. Given the existence of global production networks, a fall in exports of final goods also implies lower demand for intermediate inputs, and hence a decrease in the value of vertical specialisation. Indeed, a number of economists, for example Yi (2009), have recently voiced the opinion that the rapid decline in exports is partly due to the importance of vertical specialisation, where the drop in demand for the final good induces a domino effect onto 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 the 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 reported 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.³ 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".⁴ 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".

3 *Financial Times* (2009a).

4 *Financial Times* (2009b).

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. Raising protectionist fences would be another nail in the coffin of global production networks. These networks not only exist because of the potential for exploiting differential factor costs abroad, but they depend crucially on low transport and trade costs, and on a generally positive institutional environment that is conducive to trade and investment. Therefore, implementing import tariffs, for example, raises the costs of trading within the global production network and may outweigh any factor cost savings available through trade. If this were the case, the network may be discontinued, as the anecdotal evidence above suggests. This shows that protectionist measures throw sand in the wheels of commerce and hinder the use of global production networks.

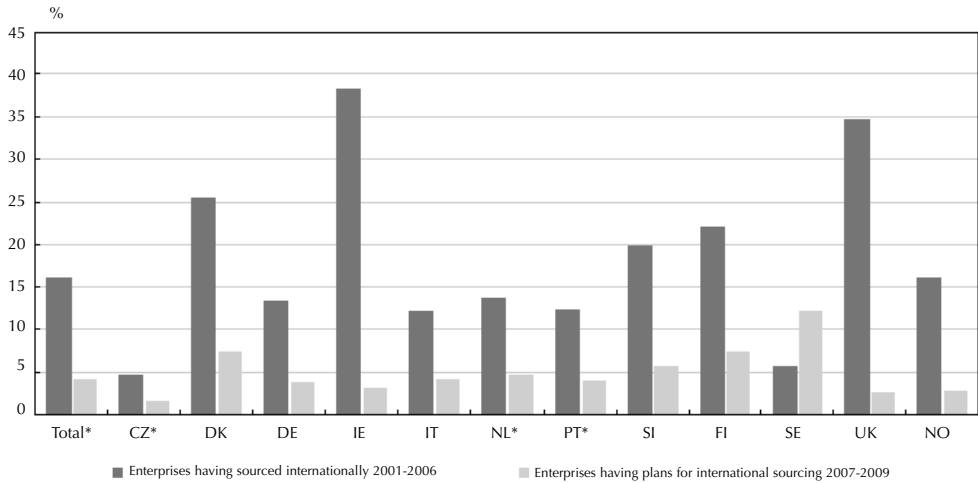
One may argue that such protectionist measures are only short-term defences against the implications of the current crisis, and that they would be removed again in the foreseeable future. Leaving aside the issue of whether that would be politically feasible, the question is whether production networks, once severed, would re-establish themselves. The answer is: maybe, but probably not - or at least not so easily and so quickly.

Why this pessimistic view? 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 the setting up of global production networks and exporting involves substantial set-up costs which cannot be fully recouped once a firm terminates its international customer-supplier relationships. Examples of this are: costs for market research: searching for adequate suppliers or customers 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 stops international sourcing.

The empirical relevance of this argument is illustrated in a number of empirical studies of export decisions of firms. These studies show that firms are more likely to export in a given year if they were also export-active the year before. What this also implies is that if firms are out of the export market it is very difficult for them to get back in. A study for Colombia by Roberts and Tybout (1997), for example, calculates that a firm was about 60 percent more likely to be an exporter if it also was one in the previous period. However, once a firm has left an export market for longer than one year, it was just as likely as a domestic firm, that has never exported before, to re-enter the export market. This indicates how important it is for a firm to stay in the export market.

It is likely that a similar mechanism would be at work for global production networks. After all, producers that are part of a global production network import and export intermediate goods. Both exports of final goods 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

Figure 3 Level of international sourcing of enterprises during 2001-2006 and planned international sourcing 2007-2009



Notes: Information is based on an ad-hoc survey of enterprises in 12 European countries, covering the period 2001 - 2006 *CZPT: provisional data; Total, NL: unreliable data for enterprises having international sourcing plans 2007-2009. Enterprises with plans for 2007-2009 only include enterprises not having sourced internationally in the previous period 2001-2006.

Source: Eurostat: International Sourcing in Europe, Statistics in Focus 4/2009

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 previously engaged in international sourcing.

Figure 3, which is also taken from the Eurostat survey of European firms as described above, presents some interesting statistics in this respect. The figure reports the percentage of firms that engaged in international sourcing over the period analysed, but, more to the point of our argument, also includes firms that did not previously conduct any international sourcing.. 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.⁵ 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 similarly low for firms that did do some international sourcing before, but ceased doing so for a year or more.

What does this imply? If, as a result of protectionist measures, firms stop sourcing inputs internationally, then re-entrance into international sourcing will be seriously hampered, even if the measure is revoked. 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 would be likely to take some time before it is able to do so.

Of course one could argue that it may not be so problematic if firms exit global production networks and stop exporting. After all, the government can simply use addi-

⁵ 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.

tional protectionist policies and subsidise these firms in the future, and then they would be able to start to link into the network again and resume exporting. Leaving aside the argument of whether this subsidisation would be good economics (or politics for that matter), the more serious concern is that it is unlikely to work. There are a number of recent studies using firm-level data for various countries, among them China (Girma et al., 2009) that have looked in detail at whether government subsidies can help firms to start exporting. The answer is generally: no! These studies clearly show that subsidies do not help firms to start exporting, if they have not been exporting before.

This brings us to the final punch line: What global production networks certainly do not need in order to re-establish themselves after the current crisis, is protectionism, which hampers trade and puts 'sand in the wheels' of commerce.

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