

Chapter 8

Global value chains: Managing the risks

Globalisation has made it easier for local risks to become global risks. Global value chains (GVCs) have recently acted as important channels of contagion, because of their global network character. Local demand and supply shocks that start in one part of the global economy can spread rapidly to the entire world. Global disruptions such as the 2008 financial crisis and the 2011 Japanese earthquake have brought the potential global systemic risks to the attention of policy makers. While firms are the first in line to manage the risks of GVCs, governments also have an important role, since disruptions in GVCs can have major political, economic and security implications for national economies. A multi-stakeholder approach on an international scale will increase the speed and effectiveness of pre-disruption planning and of post-disruption responses.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Globalisation and systemic risk

Globalisation has integrated societies, countries and economies through various channels: international trade (of both goods and services), foreign direct investment (FDI), the international migration of people (including the highly skilled), cross-border knowledge and technology flows, etc. The emergence of global value chains (GVCs) has increased the connectivity and the interdependencies of countries. Global links and geographically concentrated production due to increasing specialisation allow a local event to become a global disruption. National economies have therefore become more vulnerable to so-called systemic risk, i.e. the risk of the breakdown of an entire system.

In a system characterised by strong links¹ the failure of a single entity or cluster of entities may result in cascading disruptions that can bring down the entire system or large parts of it (Schwarcz, 2008). Growing cross-border interconnectivity also increases the risk of shocks spreading quickly worldwide. The OECD (2011a) defines global shocks as “rapid onset events with severely disruptive consequences covering at least two continents” (OECD, 2011a). The financial and economic crisis in 2008 was a full-blown global economic shock and clearly demonstrated that increased interconnectivity and interdependency implies greater vulnerability. While globalisation itself is not the cause of the adverse shock, it may act as a very effective transmission mechanism.

It is not obvious if and when a shock originating in one part of the network will have system-wide effects. Greater connectivity initially decreases individual risk – through risk dispersion and diversification – and increases the overall robustness of the system.² However, beyond a certain threshold, it increases the system’s fragility and thus systemic risk (Battiston et al., 2009; Gai et al., 2007; Watts, 2002). This threshold differs from system to system and is directly affected by a second system characteristic: the degree of redundancy (or back-up) in the system (Elmqvist et al., 2003; Korhonen and Seager, 2008). When diversity decreases and/or system redundancies are eliminated, substitutability (the extent to which other components of the system can provide the same services in the event of a failure) also decreases. The greater the redundancy in the system, the easier it is for other elements to take over in the event of a failure in one part of the system.

Several major disruptions in recent years have increased (policy) attention to global systemic risks, both economic and societal (Goldin, 2010; OECD, 2011a). Some key areas of potential risk are briefly discussed below.

Pandemic risks

Because living creatures have become more mobile, globalisation may increase the likelihood of diseases becoming epidemics or even pandemics. While an epidemic is generally expected to remain restricted to a certain area, a pandemic implies a highly infectious disease that spreads worldwide and may endanger human populations (e.g. a new form of influenza). The rapid diffusion of a virus is facilitated by the rapid rise in the flows of products, people, livestock, etc., often through a relatively small number of infrastructure hubs. Recent data show for example that the world’s top 30 airports process almost half of all international passengers and handle over two-thirds of all international freight (Airports Council International, 2009). In addition the world’s top ten ports handle more than 50% of the global economy’s container traffic (American Association of Port Authorities, 2009).

Pandemics can result in major losses and costs. The economic costs of pandemics are typically due not only to fatalities, hospitalisation and medical treatment (the so-called direct costs), but also to indirect costs such as absenteeism and productivity losses (OECD, 2011a). During a pandemic, supply shocks would also be likely in transport, trade, payment systems and major utilities (IMF, 2006).

Resource risks: The example of food security

Food security³ is increasingly compromised by volatile world prices and reduced domestic food production. The two food commodity price spikes since 2007 have pushed the costs of food above incomes for many poor people, although there were nearly as many malnourished people in 2005 when food commodity prices were at historical lows (OECD, 2011b).⁴ Globalisation is believed by some to contribute to food price volatility and thus endanger food security in certain parts of the world. Others argue that it is not globalisation but barriers to food trade (hence, the *lack* of globalisation) that cause much of the trade-induced volatility (Ghemawat, 2011).

Pressures on food prices are exacerbated by the continuing rise in population and consumption, which fuels global demand. Food security is also affected by the global trend towards standardisation and increasing monoculture, which is reducing biodiversity and increasing systemic risk. Increased productivity and a more sustainable food system will be necessary to improve global food security (OECD/FAO, 2012). There is considerable discussion about whether current levels of investment in agriculture and technology will be able to increase global food production to the levels needed to feed a growing world population (World Bank, 2008; Ridley, 2010; Ghemawat, 2011).

Geopolitical risks

Globalisation has also changed the character of geopolitical risks, as it has given individuals greater power. The communication and transport networks that underpin globalisation can be used for many purposes, such as societal and political protests, but also for terrorism, organised crime and corruption. Civil unrest in one country can trigger a chain of events that quickly affects neighbouring countries as happened in Tunisia and Egypt in 2011.

Global business is directly affected by the increase in geopolitical risks because of the geographical spread of their activities. A survey of board-level directors showed that political violence (including terrorism) led 37% of directors to avoid investment in certain regions, 22% to change their travel policy and 23% to increase their insurance spending (Economist Intelligence Unit, 2007).

Infrastructure risks

In today's global economy, the efficiency and effectiveness of infrastructure is crucial to business and national competitiveness. Infrastructure systems are increasingly concentrated and structured as networks around a limited number of hubs or nodes. Such complex systems can collapse if a disruption occurs in a sufficient number of the system's nodes. For example, the four leading air freight carriers, which account for the majority of global air cargo, have implemented so-called hub-and-spoke networks around hubs in North America, Europe and Asia. When the volcanic eruption in Iceland in 2010 produced an ash cloud over the air space of Europe's major air hubs, many companies were unable to deliver products or key components to markets and production systems both in Europe and across the world (OECD, 2011a).

Because of the increasing global interdependence of critical infrastructure networks (transport, telecommunications, electricity, etc.), a failure in one system may affect other interdependent systems (through cascading failures) and may have far-reaching repercussions. Communication networks increasingly serve as a backbone for critical infrastructure systems as well global business operations. For example, the international co-ordination of activities in GVCs relies heavily on ICT networks. A 2007 survey of 465 businesses showed that 54% were entirely dependent on uninterrupted Internet connectivity (Secure 64, 2007). The increasing reliance on public communication networks makes companies vulnerable to system failures (caused by power failures, technical faults, or even natural disasters) as well as to cyber attacks, which have become increasingly sophisticated.⁵

Financial/economic risks

In the financial/economic crisis of 2008 global linkages, and thus globalisation, facilitated the spread of the crisis (OECD, 2010a). What started as a financial crisis in the United States rapidly became a global economic crisis and led to a dramatic collapse in international trade and FDI, in which GVCs played an important role (see below). Owing to the extent of the contagion across assets, institutions and countries, the financial crisis rapidly acquired a global character (Blanchard, 2009).

Securitisation, the aim of which is to pool assets and distribute risk across a variety of actors, resulted in closer links among financial institutions. In addition, an expanded credit supply and under-assessment of risk, combined with the use of intermediate and often unregulated and non-transparent lenders, further undermined the stability of the financial system. When payment difficulties appeared in the subprime mortgage segment of the US property market, resulting from high mortgages and falling housing prices, financial institutions became unwilling to lend to each other. Households cut back their consumption and started to save. At the same time, access to credit became more difficult and more expensive, thereby lessening corporate investment, especially in small businesses. As a result, the financial crisis reached the real economy, resulting in a drop in stock markets and a deterioration of business and consumer confidence that affected all economic operators.

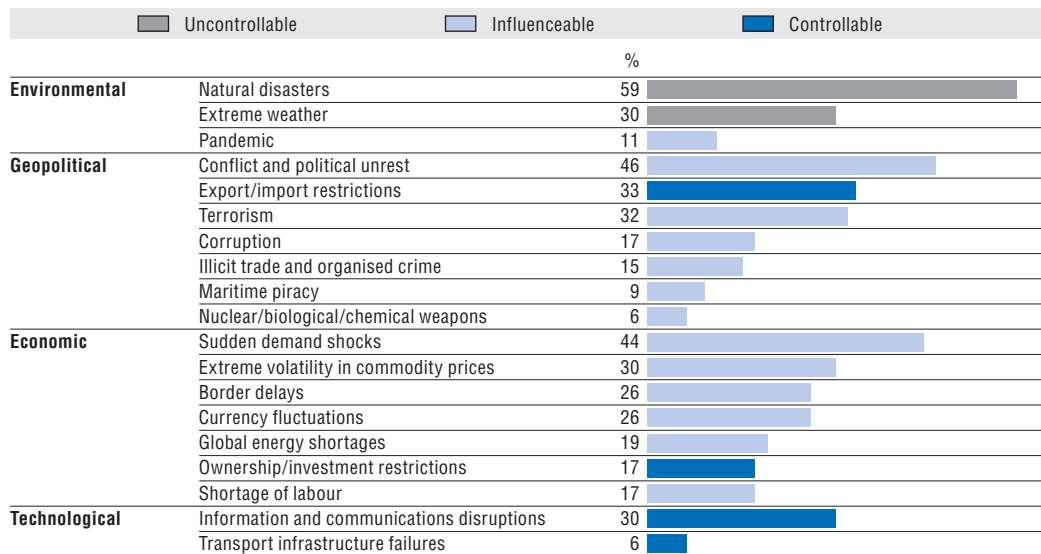
Global value and supply chain risks

GVCs involve interdependent and interconnected networks of firms, industries and economies, and can be considered potential carriers of global contagion. The small margin of error that firms typically build into value chains in order to reduce costs considerably increases the risks. Just-in-time models, lean supply structures and a lack of redundancy mean that a breakdown in one part of the chain may quickly have detrimental effects throughout the value chain. Furthermore, as GVCs have become more complex and extended,⁶ this has generated further risks, but these are not always visible and are therefore less easily controlled by firms. Indeed, management does not always have a clear view of how their value chains are structured on a day-to-day basis.

There are many causes or drivers of supply chain risks and they have become more varied over time, as a result of the increased importance, length and complexity of GVCs. Supply chain risks are often categorised as “internal to the firm”, “external to the firm but internal to the supply chain network” or “external to the network” (Christopher and Peck, 2004). Based on this, several classifications of GVC risk have been proposed (see Annex 8.A1). A recent World Economic Forum survey of company executives ranks

external events as most likely to have significant global effects on GVCs (Figure 8.1). By distinguishing environmental, geopolitical, economic and technological factors, the close relationship between GVC risks and other categories of global systemic risk becomes clear.

Figure 8.1. Drivers of global supply chain risks



Source: World Economic Forum (2012).

The link between GVCs and global systemic risk: The 2008/09 financial crisis and the 2011 Japanese earthquake

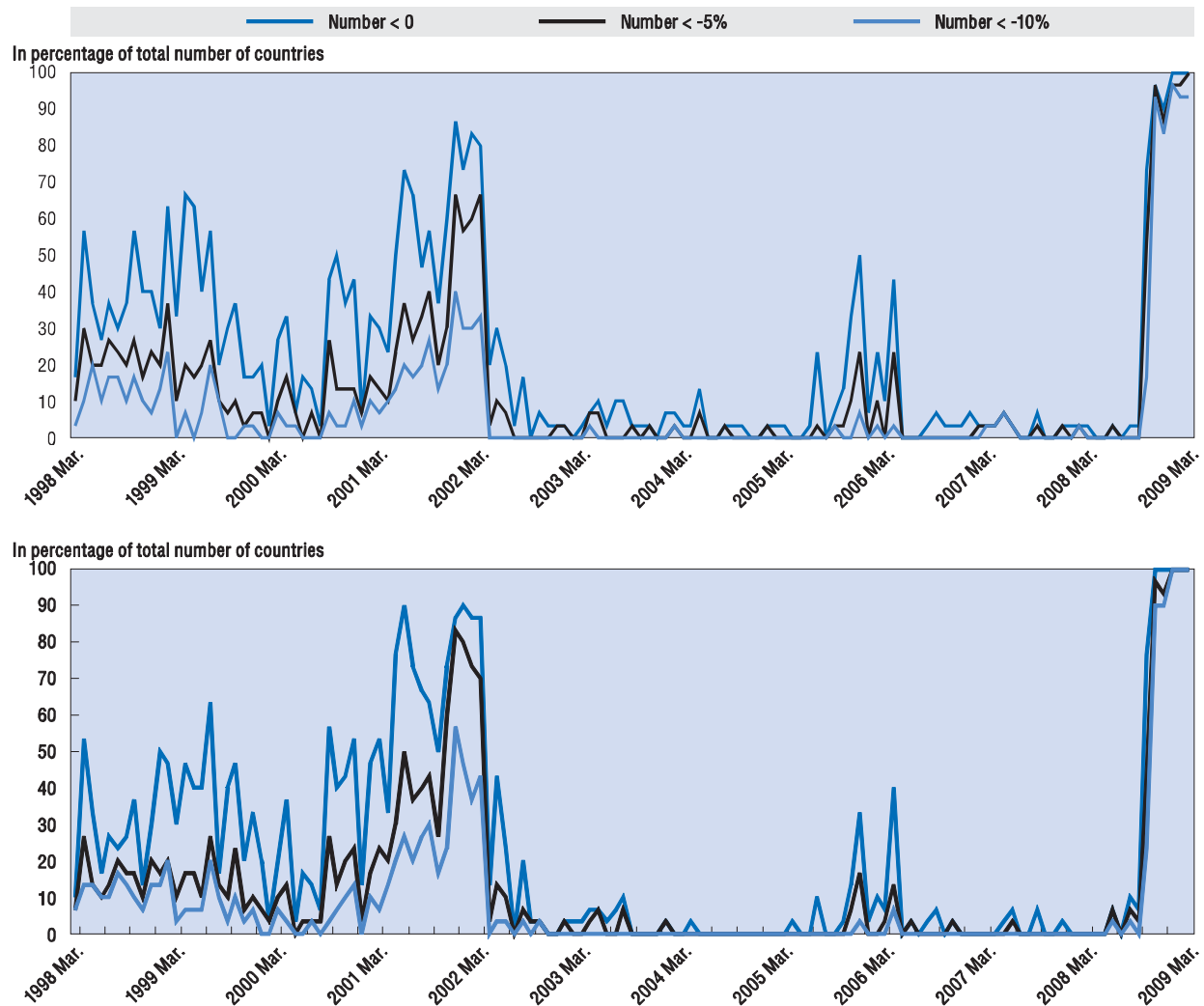
The trade collapse during the financial/economic crisis of 2008

The financial crisis rapidly spilled over to the real economy and triggered a drastic decline in trade across the world between the third quarter of 2008 and the second quarter of 2009. It was the steepest and deepest fall in world trade since the Great Depression (OECD, 2010b) and was described by Baldwin (2009) as “severe, sudden and synchronised”. While the drop at the start of the crisis was similar to past downturns for individual countries, the 2008/09 collapse in trade was the direct result of strongly synchronised, dramatic declines in a large number of countries: by the end of 2008, 90% of OECD countries reported declines in exports and imports of more than 10% (Araujo and Oliveira Martins, 2009). At the end of the first quarter of 2009, this was the case of all OECD countries. The same situation existed on the import side: all OECD countries registered negative growth of imports of more than 10% from January through March 2009 (Figure 8.2).

Figure 8.2. Synchronisation of trade, OECD countries, 1998-2009

Magnitudes of decline in monthly growth rates (year-on-year)

Exports (above), Imports (below)



Source: Araujo and Oliveira Martins (2009).

International trade has been both a casualty of the crisis and one of its main channels of transmission (Esaïth et al., 2010). In fact, trade links between countries may have amplified demand shocks (OECD, 2010a; IMF, 2011). Previous work has demonstrated the importance of international trade in propagating business cycles (Burstein et al., 2008). Countries typically “catch” demand-led recessions from countries to which they export disproportionately and transmit recessions to countries from which they import disproportionately (Ferrantino and Larsen, 2009). These crisis propagation mechanisms were strengthened in the 2008 crisis by the interdependency of trade between countries: the synchronous drop in countries’ trade flows enhanced the decline in trade in individual countries and contributed significantly to the dramatic collapse of trade at the aggregate level (OECD, 2010b).

There is increasing evidence of higher business cycle correlations in countries with stronger GVC linkages (Burstein et al., 2008; Bergin et al., 2009; Ng, 2010; Gangnes et al., 2011). GVCs feature prominently among the reasons put forward to explain the large size and synchronous timing of the collapse of trade in 2008.⁷ However, while GVCs may indeed act as a channel for the international propagation of adverse external shocks, they are not the cause of the shocks themselves.⁸ A number of factors explain the link between GVCs and the 2008/09 collapse in trade.

First, GVCs have intensified trade linkages among countries as the international fragmentation (or division) of production has increased trade in intermediates (in addition to capital and consumption goods/services). Intermediates are exchanged across borders several times and are therefore registered more than once as “international trade” before they are integrated in final products (see Chapter 1). Since GDP is a value added concept whereas trade is expressed in output terms, the drop in trade in 2008/09 rapidly became a multiple of the drop in GDP⁹ (Bems et al., 2009; Levchencko et al., 2009). Moreover, the elasticity of trade to GDP has increased over the last decades, from below 2 in the 1960s to over 3.5 during the recent crisis (Freund, 2009). Instead of reflecting a long-term structural change, Escaith et al. (2010) argue that the high trade elasticities measured during the course of the crisis merely reflect a short-term (up to four years) and transitory overshooting of the responsiveness of trade to GDP.

Second, the large size of the trade/GDP multiplier during the 2008/09 crisis was largely due to a compositional effect, i.e. the fact that the original demand shock was concentrated in so-called postponable goods (Baldwin, 2009; O’Rourke, 2009; OECD, 2010b). The production of postponable goods, such as consumer durables and investment goods, is typically organised in GVCs that cover several countries. As a result, the industries most affected by the crisis were those characterised by international production networks (OECD, 2010a). As these industries represent a larger share in world trade than in world value added (because of the GVCs and trade in intermediates), the drop in demand affected trade much more than it did GDP.¹⁰ The increasing importance of GVCs, in combination with this composition effect, amplified the impact of the business cycle on trade when firms adopted production plans that reflected lower anticipated demand.

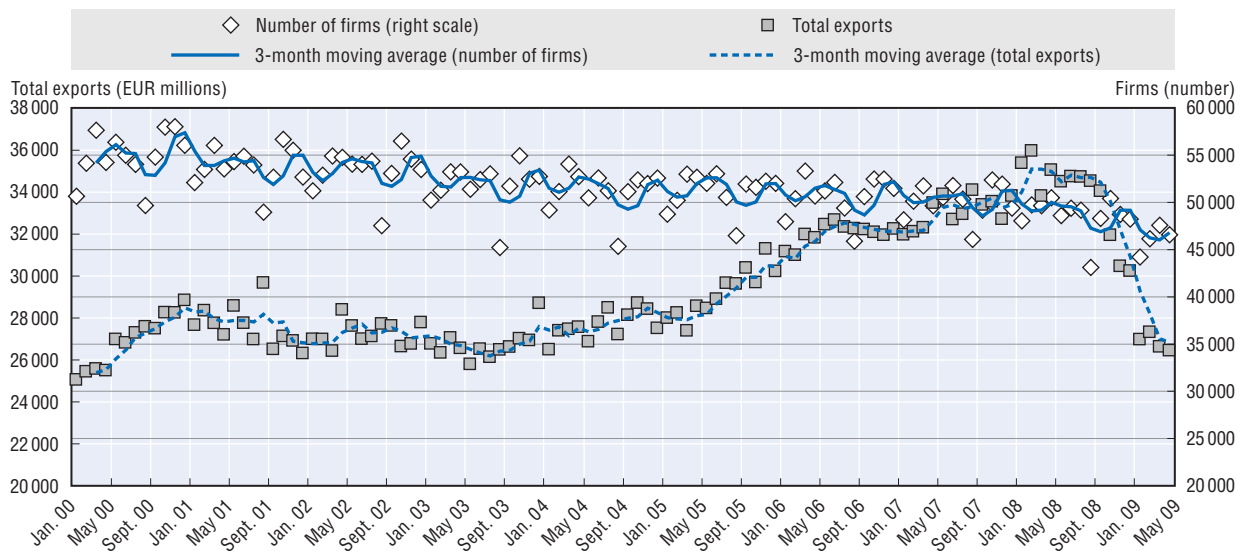
Third, recent research for the United States has shown that inventory dynamics in GVCs also contributed to the strong drop in trade in 2008/09 (Alessandria et al., 2011). Supply chains are characterised by a so-called “bullwhip” effect, whereby even small changes in final demand cause large changes in demand for parts and components higher up the value chain. As information on demand becomes distorted along the chain, the variability in orders is amplified as it moves up the supply chain.¹¹ When a downstream firm encounters a drop in demand for its final products, its first reaction is to run down inventories; therefore, a slowdown in downstream activities leads to an amplified reduction in demand for inputs located upstream. This effect is stronger in an international setting as participants in international trade have more severe inventory management problems (Escaith et al., 2010). In addition, importing firms have inventory ratios that are roughly twice those of firms that only purchase materials domestically, and the typical international order tends to be about 50% larger and half as frequent as the typical domestic order (Alessandria et al., 2011).

Altomonte et al. (2011) report similar results for French imports and exports, and explain how inventory adjustments within GVCs magnified demand shocks when trade collapsed. They found that MNEs were able to adjust faster to the negative demand shock than small and domestic firms. Because of more limited information asymmetries, intra-group trade in intermediates dropped faster at the start of the crisis but also recovered faster.

Fourth, not only the size but also the synchronisation of trade declines is related to the structural characteristics of GVCs. The just-in-time nature of many GVCs causes a demand shock in final goods in one country to pass almost instantly to suppliers of intermediates in other countries; these cascade effects ensure that the demand shock is felt throughout the entire supply chain. GVCs also lead to simultaneous declines in imports and exports. The dependence of exports on imported intermediate goods implies that a country's exports and imports tend to move in the same direction in response to changes in either domestic or foreign demand (Bems et al., 2009).

Fifth, GVCs also acted as a channel to transmit supply-side shocks across countries during the collapse (Escaith and Gonguet, 2009). The credit crunch that followed the financial crisis lessened the availability of finance and this, in combination with lower demand, forced companies (e.g. suppliers of parts and components) in GVCs to halt their activities. Given that the goods/services produced in GVCs are largely transaction-specific, i.e. specific to clients' needs, this will result in higher production costs or even the total disruption of the value chain if client firms are unable to find substitute suppliers.

Figure 8.3. Total value of French exports and total number of French exporters, January 2000 to April 2009



Source: Bricongne et al. (2012).

Evidence for France (Figure 8.3), Japan and the United States indicates, however, that GVCs were not entirely disrupted by the trade shock (Bricongne et al., 2012; Schott, 2008; Wakasugi, 2009). Most of the collapse involved adjustments along the intensive margin (i.e. a reduction in volume) instead of along the extensive margin (i.e. a reduction in the number of suppliers). This suggests that relationships and trade flows in supply

chains may be relatively resilient to adverse shocks such as the economic crisis, and this may be related to the large sunk costs involved in developing global production networks. Companies also consider alternatives very carefully before taking irrevocable steps to reduce their global value chain (Altomonte and Ottaviano, 2009).

The Japanese earthquake and tsunami of March 2011

The earthquake and tsunami that struck the northeast coast of Japan on 11 March 2011 created enormous human, ecological and economic damage. The direct economic consequences of this natural disaster included injuries and loss of life (which also reduced companies' human resources) and physical damage to factories, buildings and equipment as well as to public infrastructure (transport, telecommunications, electricity, etc.). In addition, for quite some time after the disaster, scheduled blackouts (e.g. in electricity) resulted in significant interruptions of activity.

The economic impact of the earthquake and tsunami rapidly spread to the rest of Japan and the rest of the world. Relatively soon after the disaster, several Japanese firms reported production slowdowns in their affiliates abroad; slowdowns also occurred in foreign industries, such as automotive and electronics, which relied on Japanese inputs. Since direct as well as indirect suppliers were affected by the disaster, the flow of inputs to production in the rest of Japan and in other countries started to dry up and in some cases led to the complete disruption of international supply chains. The impacts were particularly significant because Japan plays a central role in GVCs, notably as a producer of higher value intermediates (e.g. parts and components) that are used in industries across the globe.

Japanese car factories had to shut down production and close (some) plants. These plants produced not only for Japan; some also provided engines and other parts needed by assembly plants around the world. Honda and Nissan plants in the United Kingdom, for example, were forced to cut back production; for models such as Toyota's Prius Hybrid, production shut down completely since Japan was the only source. European and US carmakers that sourced intermediates from suppliers in Japan were also affected. One example is Robert Bosch, a major supplier to almost every car manufacturer in the world; it supplies a broad range of parts (fuel injectors, pumps, hydraulics, electronic control systems, etc.) from its affiliates or independent subcontractors in Japan (What Car?, 2010; Bloomberg Businessweek, 2010).

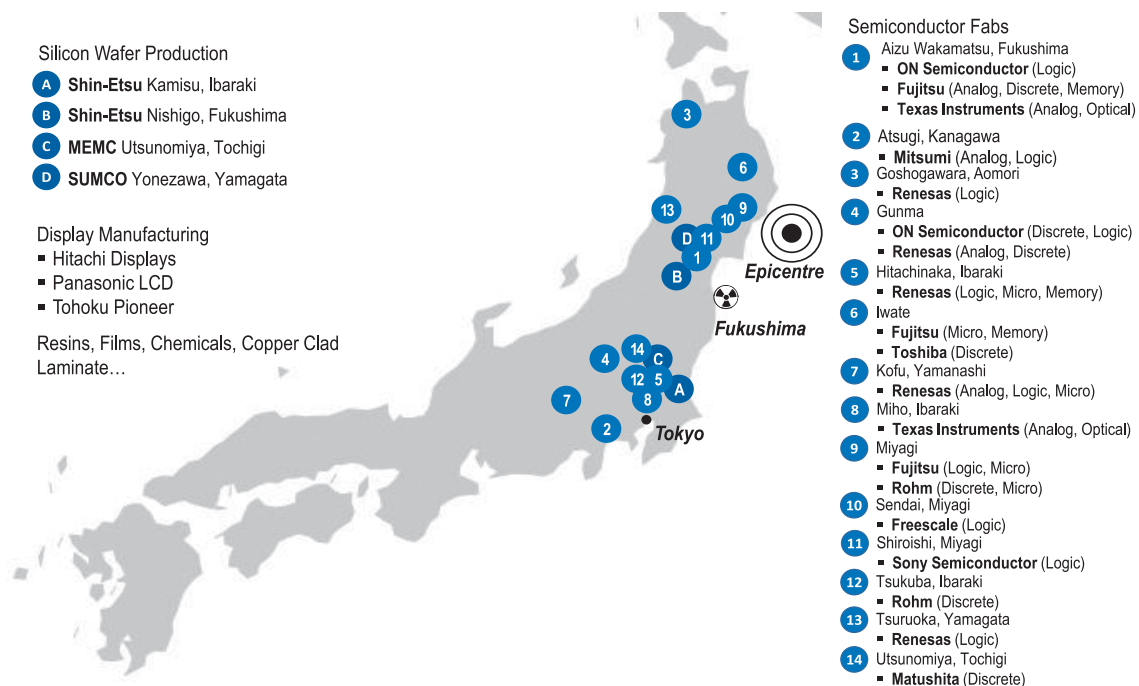
Sourcing from a single source seems to have been an important cause of the disruption in some automotive industry GVCs. Because of the complexity of their GVCs, many car assemblers were surprised to discover that their standard two-supplier rule for critical parts had been circumvented further along the supply chain. Merck KGaA produced 100% of the global supply of the Xirallac pigment used in car paint at a factory in northeast Japan. As a result of the earthquake and tsunami, operations in this plant were suspended until May 2011 and resulted in a major disruption of the supply chains of various car manufacturers (*The Wall Street Journal*, 2011).

Japan is an important producer in the upstream segment of electronics manufacturing, especially of high-technology parts and components: estimates of Japan's share in the supply of world electronics component range from 16% to 30%. IHS iSuppli estimated that Japan accounted for 21% of semiconductors, 49% of optical components, 57% of image sensors, 40% of microcontrollers, 33% of display drivers and 60% of silicon wafers. And, while a large part of the electronics industry in Japan is concentrated in the southeast, several electronics manufactures were seriously affected by the earthquake/

tsunami (Figure 8.4). Given the geographic distribution of these suppliers, automotive electronics were hit particularly hard, while wireless communication and data processing were only mildly affected (IHS iSuppli, 2011).

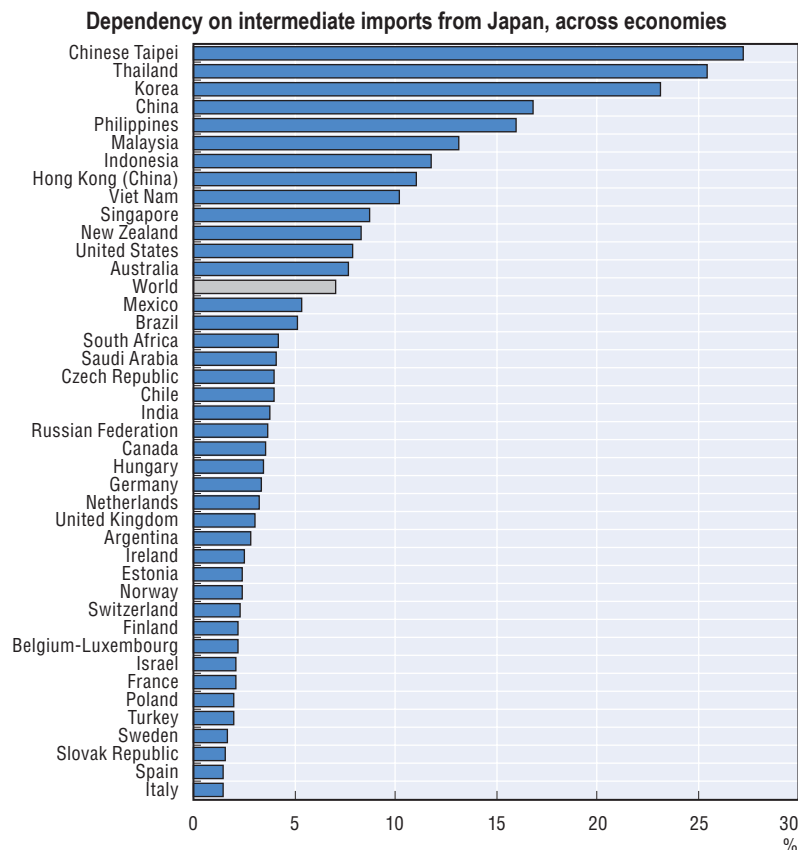
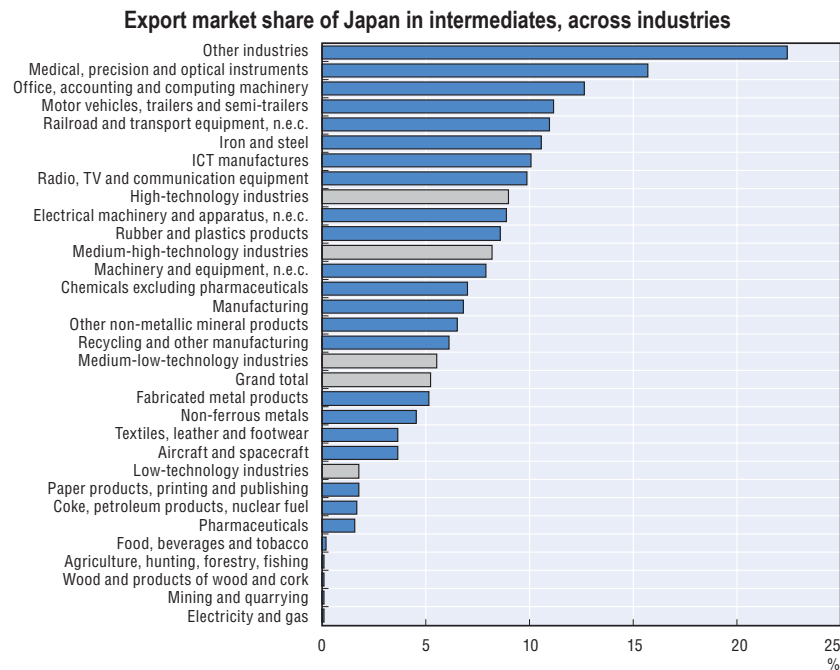
The impact on the automotive and electronics industries¹² following the Tohoku earthquake and tsunami illustrate how supply shocks can propagate rapidly through GVCs.¹³ As production is sequentially organised, with goods produced in a series of stages in different countries by specialised suppliers that ship them further down the chain, adverse shocks are quickly transmitted along the value chain. Because of lean inventories and just-in-time deliveries there is little slack in the system and the disruption of a critical and non-redundant element can cause a system-wide shutdown. Eliminating stocks and reserves in such a system typically increases efficiency when the system works smoothly, but makes it easier for problems to spread (Jervis, 1997).

Figure 8.4. Location of key electronic components/materials manufacturers in northeast Japan



Source: IHS (2011).

Japan's position in the production of electronic and automotive intermediates is illustrated by its exports before the earthquake/tsunami. In 2009,¹⁴ Japan's total market share of manufacturing exports in intermediates was 6.8%, with higher figures in electronics, motor vehicles, and iron and steel industries (Figure 8.5). Owing to the strong regional integration of South-East Asia, the economies of Chinese Taipei, Thailand, Korea, the Philippines and China were particularly dependent on intermediate imports from Japan. (Japan accounted for 15% or more of intermediate imports in these economies.) Other economies depended less on imports from Japan, yet Japan was responsible for close to 8% of all intermediate imports in the United States (Figure 8.5). European countries depend less on imports of intermediates from Japan, and are likely to have been less seriously affected.

Figure 8.5. Importance of Japan in intermediates production, 2009

Note: Export market share of Japan calculated as exports of Japan over world exports; import dependency calculated as imports from Japan over world imports.

Source: OECD calculations based on OECD (2011c), "STAN Bilateral trade database by industry and end-use category", *STAN: OECD Structural Analysis Statistics* (database), doi: [10.1787/data-00599-en](http://dx.doi.org/10.1787/data-00599-en).

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Table 8.1. Sectoral transmission of a supply-driven shock emanating from Japanese industrial sectors, 2008

Percentage increase in sectoral domestic production costs resulting from a 30% rise in the price of intermediate inputs imported from Japan

From Japan to: ¹	China	Indonesia	Korea	Malaysia	Philippines	Chinese Taipei	Thailand	United States	Average ¹ (exported shock)
Chemical products	0.7	0.3	2.2	2.1	1.0	3.2	1.0	0.3	1.4
Petroleum and petroleum products	0.1	0.0	0.0	0.7	0.3	0.1	0.0	0.1	0.3
Rubber products	0.6	0.6	1.7	1.1	1.2	2.6	1.3	0.4	1.3
Non-metallic mineral products	0.5	0.4	0.8	1.3	0.7	1.2	1.2	0.2	0.9
Metals and metal products	1.0	1.4	2.8	4.5	2.2	3.6	2.7	0.4	2.4
Industrial machinery	1.4	4.9	2.9	3.1	2.3	5.0	7.5	0.6	3.5
Computers and electronic equipment	3.6	1.5	3.0	4.3	7.4	5.6	5.7	0.8	3.9
Other electrical equipment	2.3	1.4	3.0	4.3	1.9	5.2	6.3	0.6	3.2
Transport equipment	1.4	1.6	2.9	3.8	2.1	3.4	5.8	1.0	2.8
Other manufacturing products	0.9	1.0	2.7	2.4	1.2	4.2	1.7	0.4	1.8
Average (imported shock)	1.2	1.3	2.2	2.8	2.0	3.4	3.3	0.5	2.2

1. Unweighted average.

Source: Escaith et al. (2011).

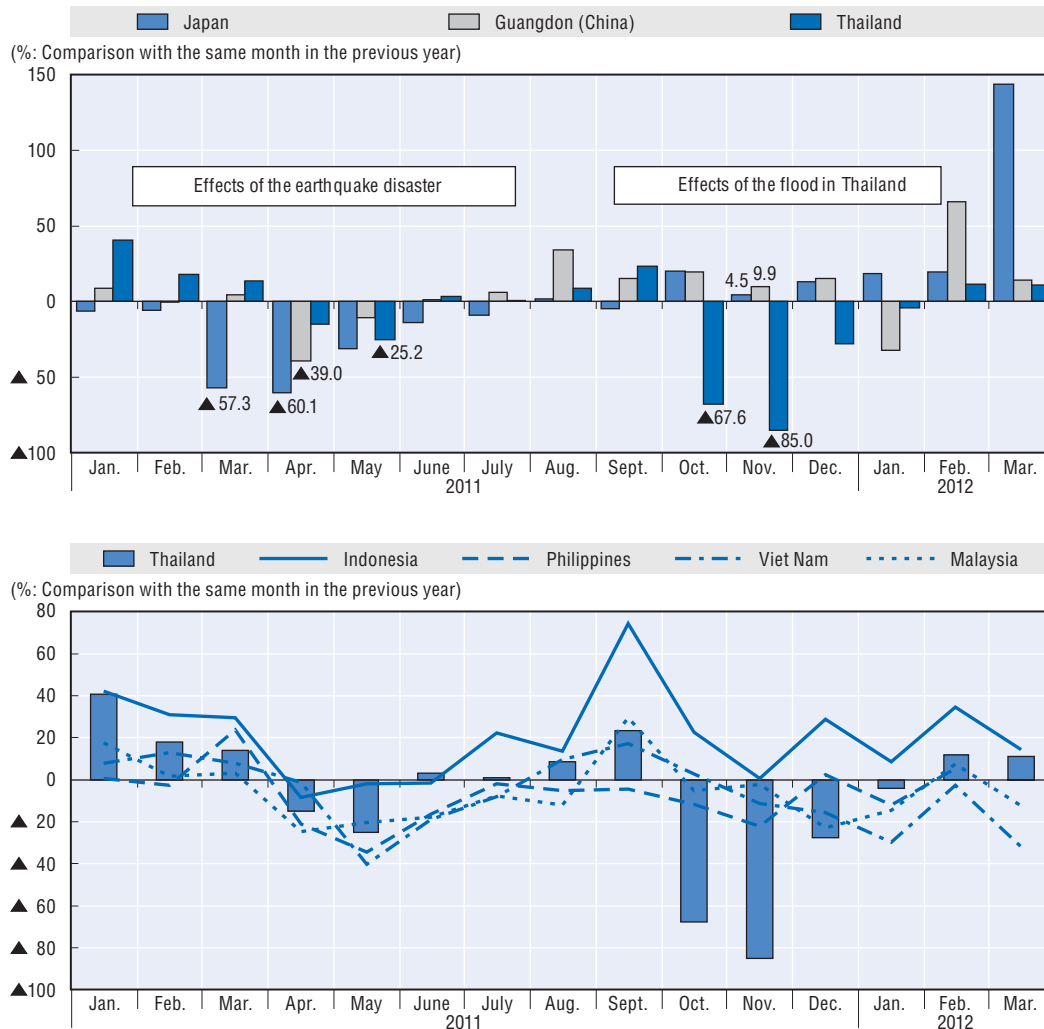
The dependency of South-East Asian economies on Japanese intermediates is especially high in electronics (medical/precision and optical instruments, electrical machinery, radio/TV/communication equipment), and transport equipment (motor vehicles), but also in chemicals, rubber and plastics, and iron and steel. Chinese Taipei has import dependency ratios of over 60% in a number of industries; other Asian economies have ratios of 20% to 30% in these industries (see Annex 8.A2). The central position of Japan in the electronics and automotive industries is visualised in more detail when mapping vertical trade between countries (Asian Development Bank, 2011).

Clearly, these average dependencies do not give a complete picture of economies' vulnerability to adverse shocks, since a disruption in the supply of one specific product (especially a critical and non-redundant input) could result in the complete breakdown of a GVC. Bilateral trade flows of intermediates on the product level can give a more detailed appreciation. Thailand, for example, has import dependency ratios of above 70% with Japan in several product categories (HS 6-digit classification) in the electronics industry; at a more detailed product level, the dependency is likely to be even greater (in terms both of the number and size of the import dependencies).

The risk of breakdowns in GVCs forces companies to look for alternative suppliers. Disruptions to supply chains are not always easy to address, however, and may take some time to rectify. Intermediates are often transaction-specific so that shifting to other suppliers implies higher costs (search, adaptation, switch, etc.). The supplier may be on

the other side of the world and a just-in-time business model does not factor in quick substitution of alternative suppliers. Escaith and Gonguet (2011) estimated the costs of the disruptive supply shock due to the natural disaster in Japan on GVCs in Asia;¹⁵ the results show that it led to higher production costs, particularly in Chinese Taipei and Thailand. This is in line with the above results on import dependency. Small open Asian economies strongly integrated in GVCs seem to have suffered most; China and Indonesia seem to have been less affected (Table 8.1).

Figure 8.6. Effect of Thai floods and the Japanese earthquake/tsunami on automotive production in Asia, 2011



Note: The trend for Guangdong in January-February 2012 is influenced by a seasonal factor; the Vernal Equinox Day was in February in 2011, but in January in 2012. Figures for Thailand, Indonesia and Malaysia are based on the volume of production. Figures for the Philippines and Viet Nam are from the automotive production index. The figures for the Philippines in March 2011 have not been disclosed.

Source: White Paper on International Economy and Trade 2012, Japanese Ministry of Economy, Trade and Industry

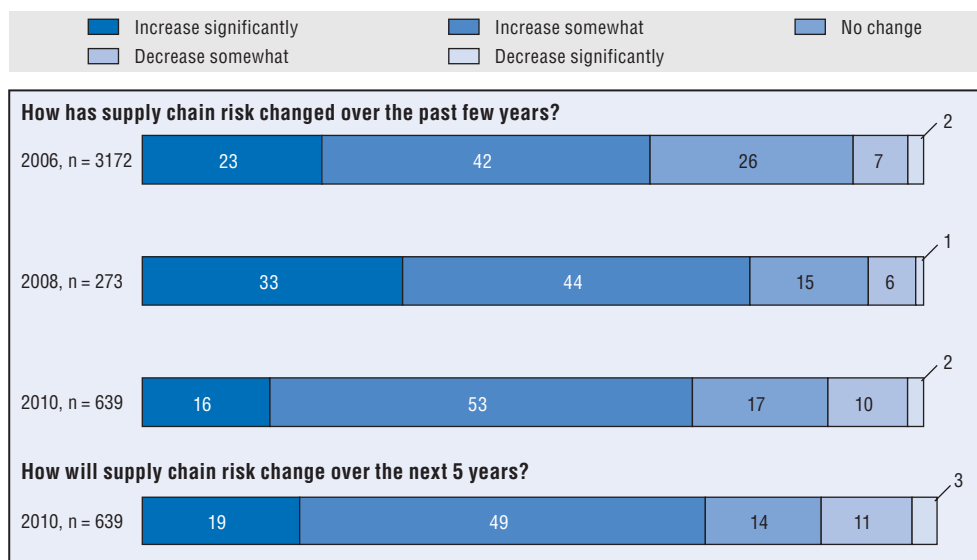
Other natural disasters have also affected GVCs over the past decade and have made consumers, companies and governments realise the fragilities inherent in today's international production and supply networks. The most visible examples are probably Hurricane Katrina, which affected the United States in August 2005, the Christchurch earthquake in New Zealand in February 2011, and the flooding in Thailand in November 2011. Depending on the position of the affected area in GVCs, the resulting production disruptions may affect the regional, national or global level. Floods in Thailand, for example, inundated areas that accounted for 45% of the world's manufacturing capacity of computer hard disk drives and led to global disruptions not only in the computer but also in the automotive industry. Figure 8.6 compares the impact of the Thai floods to the Japanese earthquake/tsunami on automotive production in neighbouring Asian countries and again shows Asia's strong regional integration.

Policy implications for the management of GVC risks

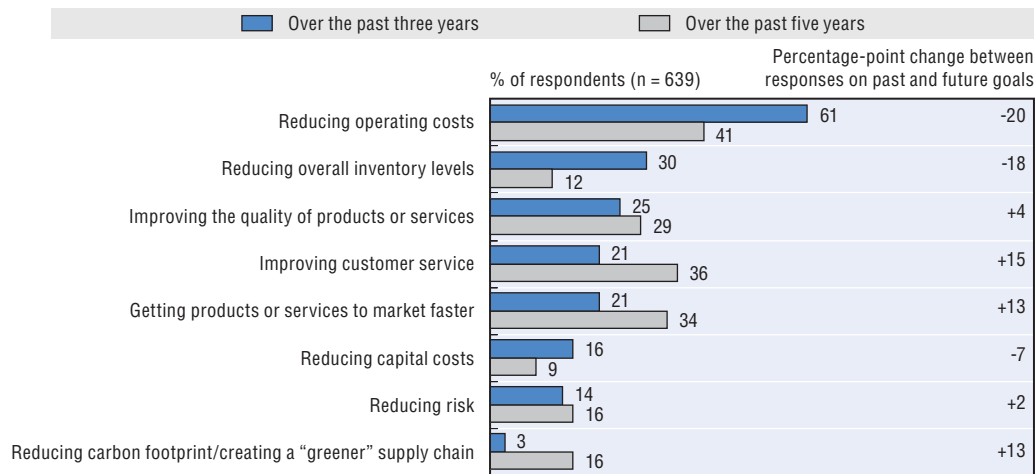
Companies' management of supply chain risks

Because breakdowns in GVCs can have detrimental effects on companies, efforts are made to be prepared for risks to their supply chains. Surveys of company executives indicate that the size and frequency of supply chain shocks have increased in recent years and are expected to continue to do so (Figure 8.7; McKinsey & Company, 2010). A 2011 survey found that 85% of company respondents had suffered at least one significant supply chain disruption in the previous 12 months (Business Continuity Institute, 2011). While not all, or even most, of GVC disruptions are likely to result in global and cascading failures, company executives consider that their companies' ability to mitigate and manage supply chain risks is sometimes limited (The McKinsey Quarterly, 2006). This is most likely due to the variety of potential supply chain risks. While a supply chain risk that is internal to the company or its GVC can often be largely addressed through effective organisation, external supply chain risks are typically less easily controlled or influenced by individual companies (see also Figure 8.1).

Figure 8.7. GVC risk on the rise



Source: Exhibit from "The Challenges ahead for Supply Chains", McKinsey & Company (2010).

Figure 8.8. Companies' top two goals in supply chain management

Source: Exhibit from "The Challenges ahead for Supply Chains", McKinsey & Company, 2010.

The focus in GVC management has traditionally been on enhancing efficiency and cost reduction. For example, a 2010 survey, taken before the earthquake/tsunami in Japan, found that risk management had relatively low priority (Figure 8.8). Just-in time-business models, minimum inventories and lean manufacturing have significantly reduced the overall robustness of GVC networks, and traditional buffers in the supply chain have been removed. In addition, GVCs are increasingly complex and sometimes quite rigid, since companies rely on several suppliers in different locations.

The global disruptions in the aftermath of the Japanese earthquake/tsunami (and other natural disasters) are expected to reinforce the search for less vulnerable GVCs.¹⁶ Firms are also likely to reorient their sourcing strategies towards more risk diversification. While this may not lead to the least-cost option, it would help safeguard organisations' profitability and viability (McKinsey & Company, 2010). In a global world characterised by uncertainty, companies increasingly try to complement "just-in-time" with "just-in-case" strategies by adjusting supply chains to enable them to withstand a variety of shocks. For example, companies increasingly look at how concentrated their supply chains are in terms of numbers of suppliers but also their geographical concentration in order to evaluate their capacity to handle unforeseeable events such as natural disasters, geopolitical risks (e.g. terrorists attacks), etc. They seek a trade-off between efficiency and cost reduction on the one hand and risk diversification and redundancy on the other by holding larger (critical) inventories, stimulating suppliers to spread their production facilities geographically, switching parts of orders to (smaller) second-source suppliers, or "splintering" GVCs into shorter and less complex chains (Malik et al., 2011). A 2009 survey of logistics providers revealed that nearly one-quarter of their North American and European clients had taken steps to shorten their supply chains during the previous year (Lieb and Lieb, 2009; Ghemawat, 2011).

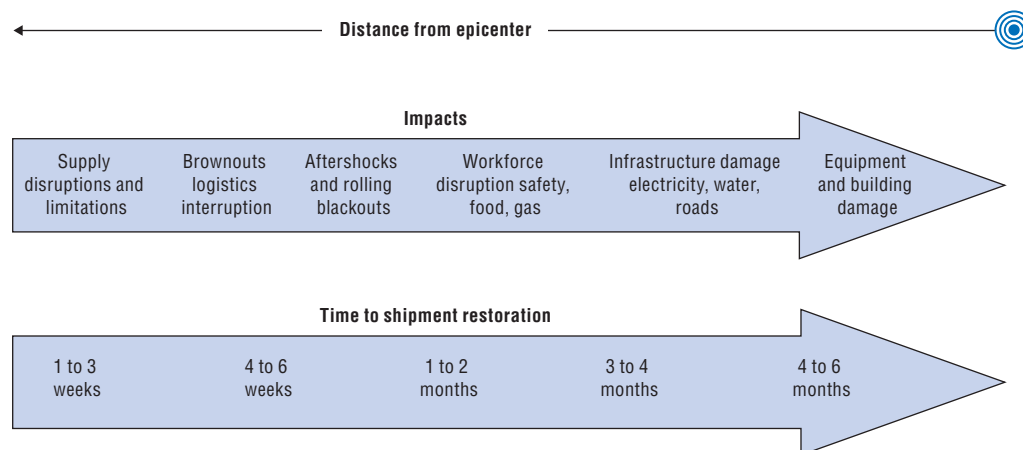
The recent trend towards "back-shoring" or "near-shoring" is also motivated by company strategies to balance cost savings and risk dispersion in GVCs. A number of companies (especially in the United States) have been reported to consider bringing activities they had offshored back to the United States (see Chapter 6). In order to diversify the risks inherent in their supply chains, companies sometimes consider shorter and alternative GVCs for the same product, often close to their major markets. Other

important motivations for back-shoring activities are the sometimes rapidly rising costs of production in emerging economies and the greater operational flexibility it offers companies for adjusting to changing demand.

Companies have been aware of the need for risk management and contingency planning in their activities for a long time.¹⁷ However, the complex web of interdependent GVC relationships with suppliers requires a focus on risk management that extends beyond the individual company. Because of the many potential sources of risk in different parts of the GVC, the first steps in risk management are risk identification and risk assessment/evaluation (i.e. assessing the likelihood and consequences of specific risks) throughout the chain. It is necessary to understand the sources and impacts of risks in order to establish responsibility for risk management, as the sources and the casualties may not be the same (Manuj and Mentzer, 2008). Once a company has identified and prioritised the risks it may face, it can develop and implement risk strategies. In general, companies may undertake actions both to mitigate the exposure to supply chain risk and/or to mitigate the consequences of the risk in question (Lessard, 2012).

The overall objective of supply chain management is shifting to increase GVCs' robustness (i.e. the ability to quickly regain stability after a shock), flexibility (i.e. the ability to change according to a set of predefined contingency scenarios), agility (i.e. the ability to change when/if scenarios fail), and resilience (i.e. the ability to reinvent the chain when the necessary conditions no longer hold). In spite of the clear need for better risk management in GVCs from end to end, the evidence presented above demonstrates that GVCs have shown a certain level of resilience to shocks. In the financial/economic crisis, overall breakdowns in GVCs were limited as a major part of the adjustments took place along the intensive margin (i.e. firms reduced volumes). Following the 2011 earthquake/tsunami in Japan, several GVCs actually broke down, but companies were able to shift to other suppliers after some time, albeit at higher cost. IHS iSuppli estimated that the entire electronics industry had recovered by the end of the third quarter of 2011; the duration of production disruptions varied depending on the distance from the earthquake epicentre (Figure 8.9). The affected companies farthest from the epicentre took only one to two weeks to restore production, while the companies closest to the disaster took as long as four to six months to return to normal (IHS iSuppli, 2011).

Figure 8.9. Supply chain impact and recovery – earthquake/tsunami in Japan, 2011



Source: IHS (2011).

A multi-stakeholders approach to managing GVC risks

The role of government in managing supply chain risks appears rather limited, as decisions regarding the length of the chain and the number of alternative suppliers are entirely company matters. It is for example hard to envisage governments prescribing minimum levels of critical inventories or minimum numbers of suppliers across different geographical entities for the day-to-day management of companies. However, governments increasingly need to understand, and in some cases to manage, risk to GVCs, as these now constitute the backbone of the global economy. Disruptions in GVCs can have major political, economic and security implications for national economies. From a national security point of view, security of supply plays a role if a country risks becoming entirely dependent on one (or a limited number of) foreign supplier(s) in an area considered of strategic importance. In such cases, governments may consider developing a minimum stock or inventory, as is currently the case with oil supplies.

Because disruptions in GVCs may seriously damage national economies, governments will benefit from better insight into their countries' position in GVCs. Countries downstream in a GVC (i.e. closer to final consumers) are relatively more vulnerable to adverse supply shocks higher up the value chain that may endanger the secure supply of imports (of final as well as intermediate goods). In addition to the above-mentioned indicators on (direct) import dependency, network analysis¹⁸ based on bilateral trade data can be used to analyse a country's "supply vulnerability" in order to take account of possible disruptions throughout the value chain. Countries' direct and indirect dependencies can thus be assessed, given that their production and exports of goods and services depend heavily on the imports of intermediates produced in previous stages of the GVC (see Chapter 1).

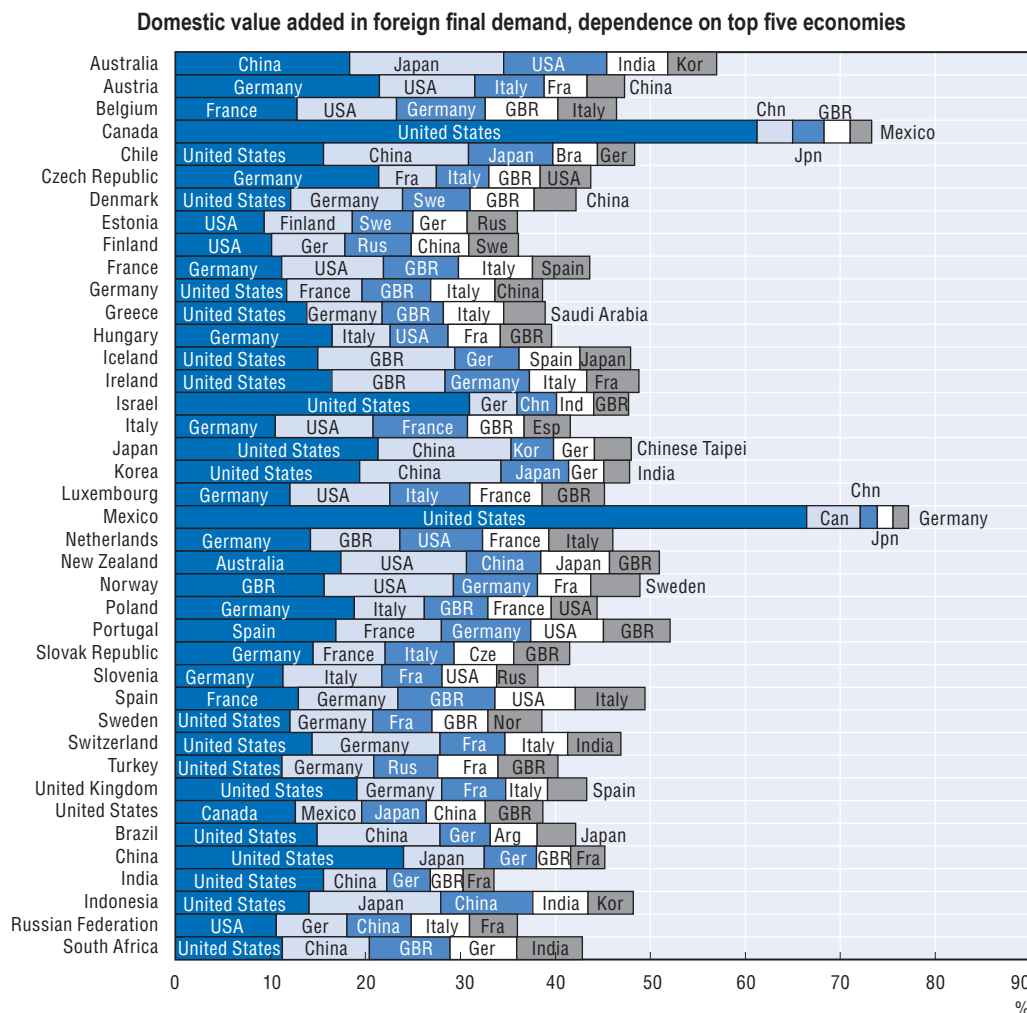
Countries higher up in the value chain (i.e. farther away from final consumers) typically import negative demand shocks through their exports to countries further down the chain. Depending on where countries are positioned in GVCs (see above), companies' inventory adjustments in GVCs may amplify these adverse shocks. Some early insight into "demand vulnerability" can be gained from the new OECD-WTO Trade in Value Added (TiVA) Database; Figure 8.10 shows where countries' domestic value added is found in the final demand of other countries and how concentrated it is. The idea is that, other things being equal, a higher concentration means greater vulnerability to demand shocks from abroad. Mexico and Canada display relatively high demand vulnerability, as 70% of their value added exports go to five countries and are strongly oriented towards the United States. Demand shocks in the United States will not only affect these two countries but also risk having important effects through GVCs in countries such as, Israel, China, the United Kingdom, Ireland and Japan.¹⁹ The top five (final) destination countries typically represent around 40% of domestic value added for most exporting countries.

Individual companies on their own cannot manage the global and cascading consequences of GVC disruptions. Systemic risk calls for a high level of collaboration between the private sector (businesses, professional bodies, suppliers, customers, etc.) and the public sector (World Economic Forum, 2012). Sharing of information and experience can help to identify the vulnerabilities in GVCs and to increase the resiliency of these transnational networks; private-public collaboration will increase the speed and effectiveness of pre-disruption planning as well as post-disruption responses. In addition, co-operation and information exchange can help raise awareness of GVC risks (e.g. for Small and Medium-sized Enterprises (SMEs), help explore different scenarios, develop

appropriate solutions and assign different responsibilities, ensure that the regulatory and planning environment reflects the key risks, etc.

One outcome of public-private co-operation could be codes of conduct that articulate mechanisms and rules for preventing and mitigating GVC risk. They could be inspired by global initiatives such as the OECD Guidelines for Multinational Enterprises, which contains a set of voluntary principles and standards for responsible international business conduct.²⁰ While not legally binding, all multinational enterprises headquartered in adhering countries are bound to comply with these guidelines and adhering governments are required to deal with allegations of violations.²¹

Figure 8.10. Vulnerability to demand shocks in GVCs, by economy, 2009



Source: OECD/WTO (2013), OECD-WTO: Statistics on Trade in Value Added, (database), doi: 10.1787/data-00648-en (accessed April 2013).

StatLink  <http://dx.doi.org/10.1787/888932835176>

The United States launched in January 2012 a National Strategy for Global Supply Chain Security to promote the efficient and secure movement of goods and to foster a resilient supply chain. The strategy plans to update threat and risk assessments, align programmes and resources, build resilient infrastructures and engage government, the private sector and international stakeholders (United States White House, 2012).

Global systemic risk related to GVCs, as well as the other risks discussed above, increasingly requires a multi-stakeholder approach in which governments, the business sector, international organisations, academia, etc., work together across national borders. Based on expert views from various fields and sectors, foresight (instead of pure forecasting) exercises could provide various scenarios about the future that take into account the complexity and uncertainty of emerging risks and shocks. For some categories of systemic risks, the objective will be to reduce vulnerability to such risk. For others, particularly those that are least probable and unforeseeable, the question will be less about mitigation than about flexible and resilient systems that can respond effectively and manage the consequences. The development of institutions, infrastructures and resources for the “during” and “after” phases of such crises needs to be carefully planned (Casti et al., 2011). Domestic actions and policies can help to enhance the flexibility and thus resilience of economies to future shocks linked to GVCs.

Work is currently under way, at the OECD and elsewhere, to examine what governments should/could do about new forms of systemic risk and the global consequences. The G20/OECD framework for disaster risk assessment and financing provides risk assessment tools that help governments to adopt cost-effective policies to prevent and manage risk in partnership with the private sector and civil society. In addition, the OECD Principles on Country Risk Management, to be delivered in 2014, aims to frame the international policy dialogue and support countries’ efforts to prepare for and respond to global risks. This indicates that crisis responses will increasingly need to be co-ordinated across governments, particularly for cases of catastrophic risk (the so-called “Black Swan” events).

Action should be taken to build up global capacity to understand and assess systemic risks before they occur. Databases on global interconnections and models that identify vulnerable hubs in systems (including critical infrastructure) are first steps in determining the likelihood of events that could disrupt entire systems. Given that these shocks happen very infrequently, a broad range of data will be needed to estimate the probability of such events. In addition, estimates of the costs of these global shocks, including their direct and indirect effects, are needed to guide government action (OECD, 2011a).

Capacity building in governments and in the private sector may also require training and greater awareness of the risks of GVCs. The growing complexity and interconnectedness of the global economy make it increasingly difficult for policy makers and analysts to understand fully the operation of their economies and the critical features of the connections involved.

The benefits and costs of (re-)regulation have been much debated in (global) policy circles in the aftermath of the financial crisis of 2008. It is very difficult to develop effective regulation for preventing systemic risk resulting in global crises. Such crises are non-linear events (they occur without much warning), are not easy to detect, and even more difficult to prove (Spence, 2010). Opponents of regulation argue that lack of information will make regulation prone to error and largely counter-productive. However, doing nothing can be very costly. More positive views of regulation point to the potential benefits of prudential measures such as “alarms, breakers and cushions” (Ghemawat, 2011). The monitoring of risks includes the implementation of alarms, i.e. surveillance and early warning systems to detect the exposure of countries to global systemic risk at an early stage. Breakers curb contagion and prevent different parts of the system from falling like dominos when the shock occurs. If alarms and breakers are insufficient, cushions can

soften the blow to the system by holding strategic reserves. Adequate contingency planning and proportionate precautionary measures can help countries mitigate contagion.

Finally, an option discussed in some quarters is to (try to) push back globalisation in order to curtail potential global channels of contagion. This proposal ignores, however, the many benefits of globalisation for millions of people across the world in terms of economic growth, rising incomes, employment, etc. Furthermore, globalisation helps to reduce risk as it allows countries and firms to diversify away from individual unsystematic risks. Economic integration has led to an increase in the number of customers/suppliers in different countries, thereby spreading countries' and firms' exposure. The downside to reduced vulnerability to domestic shocks may be increased external vulnerability. Globalisation does have certain negative side effects, including potential global systemic risks. It is clear that further work is needed on ways to reduce these negative consequences while safeguarding the benefits of globalisation.

Notes

1. Globalisation is of course one important source of these increased linkages and interdependencies. Panic behaviour can be a source of contagion, in particular in financial systems. For example, bank runs may occur if people believe there will be a crisis.
2. The larger a system, the more space for individual actors to diversify and reduce (unsystematic) risk; in contrast, diversification does not alleviate systemic risk.
3. Food security refers to “a situation that exists when all people, at all time, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 2003).
4. The policy challenge for improving food security in the medium to longer term is to find an effective, coherent mix of policies that: i) promote food production, in particular through productivity growth; ii) foster trade and the functioning of markets; and iii) address the wider development and social dimensions of food insecurity (OECD, 2011b).
5. See OECD (2011a) on cyber attacks, including their incidence, impacts and economic effects. The OECD’s Committee for Information, Computer and Communications Policy is working on issues including critical information infrastructure and cyber security.
6. Manufacturing and sourcing strategies increasingly involve more complexity, in terms of technological requirements (e.g. growing numbers of intermediate inputs produced by multiple suppliers in different locations) and customer requirements (e.g. different varieties of a specific product).
7. Other reasons are composition effects, the credit crunch, “murky” (hidden) protectionism and fiscal stimulus programmes that provided relatively strong support to non-tradable sectors (e.g. construction, infrastructure).
8. In 2008, the origin of the shock was uncertainty in financial markets, which led to a sharp drop in demand as consumers, firms and investors increasingly postponed purchases and investments.
9. For a given reduction in income, trade declined “not only by the value of the finished product, but also by the value of all the intermediate trade flows that went into creating it” (Yi, 2009).
10. In addition, services count for a large share of GDP and a smaller share in trade.
11. The bullwhip effect is the result of rational behaviour on the part of economic agents confronted with distorted information. The causes are related to lack of co-ordination and communication in the chain, differences in delays for information and material flows, the size of order batching, etc.

12. Electronics and the automotive industry were not the only industries directly affected by the disaster. Industries such as chemicals also suffered because of the lack of intermediates but the effects seem to have been smaller.
13. Similar consequences were reported in the aftermath of the 9/11 terrorist attacks.
14. Data for 2009 were used as detailed 2010 bilateral trade data are not yet available for a number of economies.
15. The analysis is based on international supply-use tables that measure the intensity of forward linkages across economies using so-called Gosh matrices to estimate the effect on production costs. The 30% impact on the cost of resourcing inputs imported from Japan after the supply was disrupted is based on the low possibility of substitution (Armington elasticity) among suppliers of intermediate products, at least in the short-term.
16. Similarly, companies in the electronics industry learned important lessons about GVC management from the collapse of the semiconductor industry in 2001.
17. Proactive risk management can become a competitive advantage as greater resilience may allow companies to stay in the market while competitors are out, or alternatively may help companies to enter the market more rapidly and at a lower (recovery) cost (Zurich, 2012).
18. Network analysis is used to evaluate the position of actors in a system, taking into account the direct and indirect links between them.
19. This indicator does not quantify the actual effect of a negative demand shock abroad on the domestic economy, it only signals the dependence of the domestic economy on final demand abroad.
20. In areas such as employment and industrial relations, human rights, environment, information disclosure, combating bribery, consumer interests, science and technology, competition, and taxation.
21. These guidelines increasingly have a GVC perspective. The 2011 guidelines apply not only to the enterprise's own operations, but also to those of its suppliers. MNEs are bound to conduct "due diligence" to ensure the firms they deal with abide by the OECD guidelines.

References

- Airports Council International (2009), *World Report 2008*.
- Alessandria, G., J.P. Kaboski and V. Midrigan (2011), “US Trade and Inventory Dynamics”, *American Economic Review*, Vol. 101 (3), pp. 303-307.
- Altomonte, C. and G.I.P. Ottaviano (2009), “Resilient to the Crisis? Global Supply Chains and Trade Flows”, in R. Baldwin (ed.), *The Great Trade Collapse: Causes, Consequences and Prospects*, www.voxeu.org.
- Altomonte, C., F. Di Mauro, G. Ottaviano, A. Rungi and V. Vicard (2011), “Global Value Chains During the Great Trade Collapse: A Bullwhip Effect?”, mimeo.
- American Association of Port Authorities (2009), *Annual Report*.
- Araujo, S. and J. Oliveira Martins (2009), “The Great Synchronisation: Tracking the Trade Collapse with High-Frequency Data”, www.voxeu.org.
- Asian Development Bank (2011), *Asian Development Outlook 2011 Update: Preparing for Demographic Transition*, ADB, Philippines.
- Baldwin, R. (2009), “The Great Trade Collapse: What Caused it and What Does it Mean?”, in R. Baldwin (ed.) *The Great Trade Collapse: Causes, Consequences and Prospects*, www.vox.eu.org.
- Battiston S., D. Delli Gatti, M. Gallegati, B. Greenwald and J.E. Stiglitz (2009), “*Liaisons Dangereuses*: Increasing Connectivity, Risk Sharing and Systemic Risk”, www3.unicatt.it.
- Bems, R., R.C. Johnson and K.M. Yi (2009), “The Collapse of Global Trade: Update on the Role of Vertical Linkages”, in R. Baldwin (ed.), *The Great Trade Collapse: Causes, Consequences and Prospects*, www.vox.eu.org.
- Bergin, P., R. Freenstra, R.C. Hanson and H. Gordon (2009), “Offshoring and Volatility: Evidence from Mexico’s Maquiladora Industry”, *American Economic Review*, Vol. 99, pp. 1664-1671.
- Bloomberg Businessweek* (2011), “Automakers May Lose 600,000 Vehicles as Quake Hits Parts”.
- Bricongne, J.C., L. Fontagné, G. Gaulier, D. Taglioni and V. Vicard (2011), “Firms and the Global Crisis: French Exports in the Turmoil”, *Journal of International Economics*, Vol. 87, pp. 134-146.
- Burstein, A., C. Kurz and L. Tesar (2008), “Trade Production Sharing and the International Transmission of Business Cycles”, *Journal of Monetary Economics*, Vol. 55, pp. 775-795.
- Business Continuity Institute (2011), *Supply Chain Resilience 2011, 3rd Annual Survey*, November 2011.

- Casti, J., L. Ilmola, P. Rouvinen and M. Wilenius (2011), *Extreme Events*, Helsinki.
- Christopher, M. and H. Peck (2004), “Building the Resilient Supply Chain”, *International Journal of Logistics Management*, Vol. 15, No. 2, pp. 1-13.
- Economist Intelligence Unit (2007), “Under Attack? Global Business and the Threat of Political Violence”, in I. Goldin (ed.), *Lloyds 360 Risk Insight*.
- Elmqvist, T., C. Folke, M. Nystrom, G. Peterson, J. Bengtsson, B. Walker and J. Norberg (2003), “Response Diversity, Ecosystem Change and Resilience”, *Frontiers in Ecology and the Environment*, Vol. 1, pp. 488-494.
- Escaith, H., R. Teh, A. Keck and C. Nee (2011), “Japan’s Earthquake and Tsunami: International Trade and Global Supply Chains Impacts”, www.voxeu.org.
- Escaith, H., N. Lindenberg and S. Miroudot (2010), “Global Value Chains and the Crisis: Reshaping International Trade Elasticity”, in O. Cattaneo, G. Gereffi and C. Staritz (eds.), *Global Value Chains in a Post-Crisis World*, The World Bank, Washington, DC.
- Ferrantino, M.J. and A. Larsen (2009), “Transmission of the Global Recession through US Trade”, in R. Baldwin (ed.), *The Great Trade Collapse: Causes, Consequences and Prospects*, www.vox.eu.org.
- Freund, C. (2009), “The Trade Response to Global Downturns”, in R. Baldwin (ed.), *The Great Trade Collapse: Causes, Consequences and Prospects*, www.vox.eu.org.
- Food and Agriculture Organization (FAO) (2003), *An Introduction to the Basic Concepts of Food Security*, Rome.
- Gai, P., N. Jenkinson and S. Kapadia (2007), “Systemic Risk in Modern Financial Systems: Analytics and Policy Design”, *The Journal of Risk Finance*, Vol. 8 (2), pp. 156-165.
- Gangnes, B., A.C. Ma and A. Van Assche (2011), “Global Value Chains and the Transmission of Business Cycle Shocks”, mimeo.
- Ghemawat, P. (2011), *World 3.0, Global Prosperity and How to Achieve it?*, Harvard Business Review Press, Boston, MA.
- Goldin, I. (2010), “Globalisation and Risks for Business – Implications of an Increasingly Interconnected World”, *Lloyd’s 360 Risk Insight*.
- IHS (2011), “Electronics Supply Chain to Fully Recover from Japan Disaster in Q3”, www.isuppli.com.
- International Monetary Fund (IMF) (2006), *The Global Economic and Financial Impact of an Avian Flu Pandemic and the Role of the IMF*, The Avian Flu Working Group 1, Washington, DC.
- International Monetary Fund (IMF) (2011), *Changing Patterns of Global Trade*, Internal Working Paper.
- Jervis, R. (1997), *System Effects: Complexity in Political and Social Life*, Princeton University Press, Princeton, NJ.
- Korhonen, J. and T. Seager (2008), “Beyond Eco-Efficiency: A Resilience Perspective”, *Business Strategy and the Environment*, Vol. 11, pp. 411-449.

- Lessard, D. (2012), “Uncertainty and Risk in Global Supply Chains”, working paper prepared for Global Value Chain Dialogue, November, Singapore.
- Levchenko, A.A., L.T. Lewis and L.L. Tesar (2009), “The Collapse of Global Trade: In Search of the Smoking Gun”, in R. Baldwin (ed.), *The Great Trade Collapse: Causes, Consequences and Prospects*, www.vox.eu.org.
- Lieb, R.C. and K.J. Lieb (2009), Executive Summary and Regional Comparisons 2009 3PL CEO Surveys, www.geopenske.com.
- Malik, Y., A. Niemeyer and B. Ruwadi (2011), “Building the Supply Chain of the Future”, *The McKinsey Quarterly*, January.
- Manuj, I. and J.T. Mentzer (2008), “Global Supply Chain Risk Management”, *Journal of Business Logistics*, Vol. 29, No. 1, pp. 133-155.
- McKinsey & Company (2010), “The Challenges Ahead for Supply Chains”, in McKinsey & Company (2011), *McKinsey on Supply Chain: Select Publications*, McKinsey & Company, Chicago.
- McKinsey Quarterly (2006), “Understanding Supply Chain Risk: A McKinsey Global Survey”.
- Ministry of Economy, Trade and Industry, Japan (2012), White Paper on International Economy and Trade 2012.
- MIT Center for Transportation and Logistics, Global SCALE Network (2009), Supply Chain Survey.
- Ng, E. (2010), “Production Fragmentation and Business Cycle Comovements”, *Journal of International Economics*, Vol. 82(1), pp. 1-14.
- OECD (2010a), *Measuring Globalisation: OECD Economic Globalisation Indicators 2010*, OECD Publishing.
doi: [10.1787/9789264084360-en](https://doi.org/10.1787/9789264084360-en).
- OECD (2010b), *Trade and Economic Effects of Responses to the Economic Crisis*, OECD Trade Policy Studies, OECD Publishing.
doi: [10.1787/9789264088436-en](https://doi.org/10.1787/9789264088436-en).
- OECD (2010c), “STAN Bilateral Trade Database 2010”, STAN: OECD Structural Analysis Statistics (database).
doi: [10.1787/data-00028-en](https://doi.org/10.1787/data-00028-en).
- OECD (2011a), *Future Global Shocks: Improving Risk Governance*, OECD Publishing.
doi: [10.1787/9789264114586-en](https://doi.org/10.1787/9789264114586-en).
- OECD (2011b), “Global Food Security – Trends, Economic Determinants and Policy: Scoping Paper”, internal working document, OECD, Paris.
- OECD (2011), “STAN Bilateral trade database by industry and end-use category”, *STAN: OECD Structural Analysis Statistics* (database).
doi: [10.1787/data-00599-en](https://doi.org/10.1787/data-00599-en).
- OECD/Food and Agriculture Organization of the United Nations (2012), *OECD-FAO Agricultural Outlook 2012*, OECD Publishing.
doi: [10.1787/agr_outlook-2012-en](https://doi.org/10.1787/agr_outlook-2012-en).
- O’Rourke, K. (2009), “Collapsing Trade in a Barbie World”, www.irisheconomy.ie.

- Pettit, T.J., J. Fiksel and K.L. Croxton (2010), “Ensuring Supply Chain Resilience: Development of a Conceptual Framework”, *Journal of Business Logistics*, Vol. 31 (1), pp. 1-21.
- Ridley, M. (2010), *The Rational Optimist: How Prosperity Evolves*, HarperCollins, New York.
- Secure 64 (2007), “New Study Shows Most Internet-Dependent Business Losing Costly Battle Against DNS Attacks”, www.secure64.com.
- Schott, P.K. (2009), “US Trade Margins During the 2008 Crisis, in R. Baldwin (ed.), *The Great Trade Collapse: Causes, Consequences and Prospects*, www.vox.eu.org.
- Schwarcz, R. (2008), Systemic Risk, *Duke Law Legal Studies Paper* No. 163.
- Spence, M. (2010), Can Ee Regulate Systemic Risk? www.project-syndicate.org.
- Supply Chain Risk Leadership Council (2011), “Supply Chain Risk Management: A Compilation of Best Practices”.
- United States White House (2012), *National Strategy for Global Supply Chain Security*, The White House, Washington, DC.
- Wakasugi, R. (2009), Why Was Japan’s Trade Hit so Much Harder?, in R. Baldwin (ed.), *The Great Trade Collapse: Causes, Consequences and Prospects*, www.vox.eu.org.
- Wall Street Journal (2011), “Japan’s Quake Still Rattles Suppliers”, 30 September.
- Watts, D.J. (2002), A Simple Model of Global Cascades on Random Networks, *Proceedings of the National Academy of Sciences*, Vol. 99(9), pp. 5766-5771.
- What Car? (2011), UK Car Factories Hit by Tragedy in Japan, www.whatcar.com.
- World Bank (2008), *World Development Report: Agriculture for Development*, The World Bank, Washington, DC.
- World Economic Forum (2012), *New Models for Addressing Supply Chain and Transport Risk*, Geneva.
- Yi, K.M. (2009), “The Collapse of Global Trade: The Role of Vertical Specialisation”, in R. Baldwin and Evenett (eds.), *The Collapse of Global Trade, Murky Protectionism and the Crisis: Recommendations of the G20*, CEPR, London.
- Zurich (2012), “Supply Chain Risk Insights: Protecting Your Value Chain”, *Insights*, Issue 2012.

Annex 8.A1

Classification of GVC risk

POTENTIAL RISKS TO AN ORGANISATION AND ITS SUPPLY CHAIN

External, end to end risks

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> - Natural disasters - Sabotage, terrorism, crime, war - Labour unavailability - Lawsuits | <ul style="list-style-type: none"> - Accidents - Political uncertainty - Market challenges - Technological trends |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|

Supplier risks

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> - Physical and regulatory risks - Financial losses and premiums - Upstream supply risks | <ul style="list-style-type: none"> - Production problems - Management risks |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|

Distribution risks

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> - Infrastructure unavailability - Labour unavailability - Warehouse inadequacies | <ul style="list-style-type: none"> - Lack of capacity - Cargo damage or theft - IT system inadequacies or failure |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|

Internal enterprise risks

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> - Operational - Demand variability - Design uncertainty - Financial uncertainty - Testing unavailability - Supplier relationship management | <ul style="list-style-type: none"> - Enterprise underperformance - Political uncertainty - Personnel availability - Planning failures - Facility unavailability |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Source: Supply Chain Risk Leadership Council (2011).

Categories of GVC risks

Turbulence	Environment characterised by frequent changes in external factors beyond your control	Natural disasters Geopolitical disruptions Unpredictability of demand Fluctuations in currencies and prices Technology failures Pandemic
Deliberate threats	Intentional attacks aimed at disrupting operations or causing human or financial harm	Theft/piracy Terrorism/sabotage Labour disputes Industrial espionage Special interest groups Product liability
External pressures	Influences not specifically targeting the firm, that create business constraints or barriers	Competitive innovation Social/cultural change Political/regulatory change Competitive price pressures Corporate responsibility Environmental change
Resource limits	Constraints on output based on availability of the factors of production	Supplier capacity Production capacity Distribution capacity Raw material availability Utilities availability Human resources
Sensitivity	Importance of carefully controlled conditions for product and process integrity	Complexity Product purity Restricted materials Fragility Reliability of equipment Safety hazards Visibility of disruption to stakeholders Symbolic profile of brand Concentration of capacity
Connectivity	Degree of interdependence and reliance on outside entities	Scale/extent of network Reliance upon information flow Degree of outsourcing Import/export channels Reliance upon specialty sources
Supplier/customer disruptions	Susceptibility of suppliers and customers to external forces or disruptions	Supplier reliability/trust/loyalty/relations Customer disruptions

Source: Pettit et al. (2010)



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