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Article

Resilience: Easier Said Than Done – But It Can Be Done!

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The globalization of supply chains is both the enabler and the effect of the globalized economy. Recently, it has become clear that the high level of efficiency of tight global supply chains came with a cost as turbulence and resulting supply chain disruptions have become more frequent and common. A greater level of *resilience* in the global supply chain stands out as the main mechanism to mitigate challenges. While achieving resilience without doubt is challenging for companies, we suggest that it can be done and we discuss a selection of initiatives companies can take in this regard.

WHY RESILIENCE IN GLOBAL SUPPLY CHAINS MATTERS

The emergence of global supply chains has fundamentally changed the way we produce goods. Most final products contain inputs from many producers and locations, added at different stages of production and delivered through international supply networks. For example, the Apple 2022 supplier list comprises 204 enterprises spread over 43 countries and six continents (Apple, 2022). In the last couple of decades, companies have created highly efficient and tight value chains where they work more intensively with suppliers and implement just-in-time and lean production methods. The advantage has been significant cost savings and flexibility in the supply chain as they have been taking advantage of specialized and efficient suppliers.

This internationalization of supply chains is both the enabler and the effect of the globalized economy. It was made possible due to myriad factors such as dismantling trade barriers, spreading technological advances, liberalizing investment and the rise of Asia as a center of global production, particularly since China's accession to the WTO in 2001.

In recent years it has become more and more obvious that the interdependence in the tight and efficient global supply chains has come with a cost as turbulence and resulting disruptions in the global supply chains have become more frequent and common (McKinsey, 2020). This is reflected in indices on the status of uncertainty at the global level, such as the IMF World Uncertainty Index and the US Federal Reserve Board's Geopolitical Risk Index that show trends toward increasing uncertainty. During the past decade alone, several events and factors have contributed to a general sentiment of disruption and uncertainty.

The nature of the disruptions varies with some being natural disasters (like flooding, hurricanes and earthquake), some are man-made disasters (like war, terrorism, cyber-attacks, explosions and fires), while others are politically determined crises (like trade wars, Brexit and strikes). They have in common that they are unpredictable and often unavoidable events that might have significant impact on global supply chains (e.g., Mithani, Narula, Surdu, & Verbeke, 2022). Who could foresee that Russia would invade Ukraine? Who could foresee the coming of the COVID-19 pandemic? For instance, Wuhan, the focal point of the COVID-19 outbreak, is a major auto-component manufacturing hub that supplies essential components to global automobile manufactures, such as Volkswagen, General Motors, Hyundai and Toyota.

This has also called for a political reaction as the interdependence or dependence on others also has societal consequences. This was clear during the Covid-19 pandemic where the whole world was depending on a few producers of first facemasks, ventilators and later vaccines (Gereffi, Pananond, & Pedersen, 2022). This policy call to bolster resilience is hardly new. Even before the pandemic, the policy arena featured increasing calls for resilience; now, the chorus has become almost deafening. Recent seminal policy documents in USA and Europe have underscored that resilience and capacity for adaptation will be key to their future success in the geopolitical arena. Policymakers have mainly advocated for increasing domestic capacity through reshoring, nearshoring, and multiplying suppliers. Possible measures to achieve this include subsidies, tax incentives, tariffs and local content requirements, and government investment in strategic sectors, including through public-private partnerships (see, e.g., the US government's review on the importance of building resilient supply chains; The White House, 2021).

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However, it is not the state or countries that build resilience, but the companies that created the global supply chains in the first place. Although the debate about resilience has come to the fore recently, it is worth noting that it is not a new discussion. The role and importance of global supply chain resilience is addressed in the academic literature at least since the beginning of the 2000s (e.g., Christopher, 2000; Christopher & Peck, 2004; Gligor, Gligor, Holcomb, & Bozkurt, 2019).

As we shall discuss later, companies can improve their global supply chain resilience in several ways. However, it is challenging and easier said than done to build global supply chain resilience. First, because the reasons for building the tight global supply chains are still there. As Verbeke (2020) pointed out, the present globalized configurations of many MNCs' value chains exist because they are advantageous and companies are therefore unlikely to change this at a massive scale.

This is also confirmed by recent studies indicating that companies have mainly performed the easy and less costly steps of building resilience, e.g., through expanding the capacity of stocks and adding more suppliers, which is just adding to the existing configuration of the supply chain rather than structurally changing it (Conz & Magnani, 2020; Han, Chong, & Li, 2020; Pedersen & Jensen, 2023). Fewer companies have made significant changes in the configuration of their global supply chains in terms of backshoring or other relocation of their production activities.

The reason is that it is costly to change the value chain configuration if possible at all in the short term. It might be that the competences and the whole eco-system around the activity have moved to a new location, which makes it very hard to re-locate the activity away from the new eco-system as the competences (or industrial commons) might not exist anymore in the original location.

A recent survey covering 368 managers features that a majority of the companies intend to change their sourcing strategy because of the increasing global uncertainty (Reuters, 2023). However, when asked about "What are currently the biggest barriers to changing your sourcing strategy?" not less than 66% list "Finding reliable partners" as the biggest challenge. The following challenges are "Cost implications of changes" mentioned by 47% and "High difficulty in reducing existing partnership and supply chains" by 29%. The results provide evidence to the challenges in changing the supply chain, as there typically has been significant learning and mutual adaptation when building up the existing network of suppliers. Companies now have to build this costly learning process with new partners.

Companies have typically built up strong common understanding and trust with their (first-tier) suppliers. The supplier has an intimate understanding of the requirements and needs of the customer, created through many years of collaboration and interactions. Such an integrated supplier cannot easily be substituted, since it is not offering a standard, off-the-shelf solution. Therefore, it can be very costly to switch away from such an integrated supplier.

CHANGING THE GLOBAL SUPPLY CHAIN CONFIGURATION IS NOT EASY

In the following, we summarize examples to illustrate some of the challenges involved in building resilience as well as strategies that can mitigate the impact of external risks and strengthen global supply chain resilience. The first example involves a Danish MNC in the electronics industry (anonymized due to confidentiality) and it illustrates how a company strategically can respond to disruptions in the global supply chain. However, it also shows that while changes in the configuration of the global supply chain can address some disruptive risks, new challenges follow in the wake of the changes.

The company has outsourced its manufacturing to a range of electronics suppliers, which are mainly located in the urban areas around Dongguan and Shenzhen in the Guangdong province in China. The collaboration with the supplier network evolved gradually during the past two decades, with more suppliers added over the years. Generally, the Danish company appreciates the long-standing collaboration with suppliers. Nevertheless, the company has in recent years increasingly focused on the disruptive risks of locating the majority of its manufacturing activities in one relatively concentrated geographical area: First, earthquakes occur in the area. Although this has not yet disrupted production and the supply chain, it is a risk under consideration. Secondly, in the wake of the Covid-19 pandemic in China, suppliers' production has in periods slowed down and operations in the port in Shenzhen, from which bulk products are shipped, have either been under lockdown or indirectly affected. The combination of these factors resulted in significant delays in production delivery and transportation. As an immediate response to the transportation bottleneck, the company managed to find alternative means and routes to ship the products. A more long-term strategic approach to mitigate location risks and dependency on suppliers in China is the undertaking of measures to enhance resilience in the supply chain. Thus far, this includes two main elements. One is to increase the stockpile of components with approximately 10 percent to create a safety buffer that can cover fluctuations in supply, at least in the short term. Another measure is to expand the number of suppliers and in this way widen the geographical spread of the location of component production. In fact, the company has experienced that it is better to increase the capacity, e.g., through multi-sourcing (as it might not be the right components they have on stock even when increasing the stockpile).

The latter initiative will entail a marked change from a situation where 90 percent of the suppliers are located in China to increase this share in other locations, for example in Europe. The company has begun the implementation of this change process and has encountered some challenges from the outset. Aside from the difficulty of identifying capable suppliers in a specialized part of the electronics industry, the implementation of the multiple sourcing concept faces problems in practice. Even though two suppliers work according to the exact same (component) specifica-

tions, the outcomes are not always identical, but will often vary a bit on critical parameters as mutual learning and alignment is important for effective supplier relationships. This creates delays and when it occurs, it poses a problem for the defined quality standards of the products. Moreover, even though the company is now making a serious effort to engage with suppliers outside of China, it turns out that different tiers of suppliers in the industry in other countries are frequently connected to, and equally dependent on, Chinese suppliers. Consequently, the desired independence from the Chinese context is difficult to achieve, since the ecosystem of companies in the electronics industry is vast and has Chinese companies placed centrally in it. In this industry (as in many other industries), a significant part of the materials, chemicals and components comes from China. In sum, while the objective of increased global supply chain resilience is clear for the company, the strategy comes with less supply chain efficiency, more costs and operational challenges.

Apple is another case in point as they have a clear intention of moving their assembly processes away from China and opening factories in India and Vietnam. However, as highlighted in Wall Street Journal (2022) moving production out of China is a complicated process that will take a long time. The manufacturing infrastructure and large cheap labor force that China offers is hard to find elsewhere, and will need to be built up gradually over time to meet iPhone scale demands.

Interestingly, the example of Nissan, the Japanese automobile manufacturer and its handling of the powerful earthquake and resulting tsunami that occurred in Japan in March 2011, is acknowledged as being very effective and demonstrating remarkable supply chain resilience (Aggarwal & Srivastava, 2016). Nissan had implemented strategies prior to the disaster (e.g., a contingency plan was in place, employees were trained in regular drills and simulations), and it benefited from a cross-functional organization that equipped Nissan with flexibility to switch production between different plants. In combination, a broad range of measures allowed Nissan to resume production only approximately one month after the disaster, faster than its competitors. In the wake of the disaster, Nissan evaluated the response in collaboration with its supplier network and identified vulnerable parts of the supply chain, e.g., too high dependency on one or few tier-2 and tier-3 suppliers. The post-event evaluation led to changes in contingency planning and in the supply chain configuration.

WHAT CAN COMPANIES DO? STRATEGIC MEASURES TO STRENGTHEN GLOBAL SUPPLY CHAIN RESILIENCE

What lessons can we derive from these examples and from the literature? Overall, they add some perspective and give a more nuanced understanding of the opportunities, challenges and limitations that companies face when striving for greater resilience in their global supply chains. Companies fall victim to external disruptions, which they cannot control, but they can be more or less prepared internally for these disruptions. The literature on the operation of global supply chains has provided a long list of potential mitigation or resilience strategies that are available to companies in order to prepare for disruptions. Fiksel, Polyviou, Croxton and Pettit (2015), Gligor et al. (2019), Conz and Magnani (2020) and Han, Chong and Li (2020) are all recent and comprehensive reviews of this substantial literature. The presented cases as well as the literature highlight that the proper resilience strategy will vary with the nature of the disruption that the company might be facing. Here we can distinguish between local natural disasters (e.g., flooding, hurricane and earthquake) as in the cases of Nissan and the Danish electronics company, and man-made political conflicts (e.g., trade-war or territorial conflicts) as in the cases of Apple and the Danish electronics company. In the latter category, both companies assessed they were too exposed to China in a situation where the political environment is changing. Local natural disasters might have a more short-term nature and as such companies tend to change the global reconfiguration less radical, i.e., mainly by adding more capacity and agility to the existing value chain and thereby provide more options in a case of disruptions (as illustrated in the Nissan-case). These are cheaper and less fundamental options that provide greater global supply chain resilience if the disruption is short-term in nature. Adding more capacity (either own capacity or multi-sourcing) is highlighted to be more effective (than increasing stocks) as it provides more flexibility and agility in responding to the specific disruption. The political conflicts will often have a longer-term perspective, which will promote more structural changes and reconfiguration of the global supply chain. The examples of the Danish electronics company and Apple illustrated that both worked on relocating activities away from locations in China.

Table 1, which we base on the literature, summarizes examples of disruptive factors, strategies that potentially can address the resulting challenges, and the implications of the strategies. We stress that the table portrays a non-exhaustive list of examples of disruptive factors and strategies to address these (see e.g., Conz & Magnani, 2020; Fiksel et al., 2015; Gligor et al., 2019; and Han, Chong, & Li, 2020; for a more comprehensive list of resilience strategies).

In addition to outlining the expected positive impact of a strategy, we also note potential associated costs and non-monetary disadvantages. This leads to a main point, namely that a specific strategy in isolation can lead to more resilience but must be weighed against costs and risks. A company's ex-ante assessment of a resilience strategy is situation- and company-specific, it depends on the company's risk propensity, and it should specify the value of positive gains and negative implications as much as possible. Using the example of the relocation option for the Danish MNC as illustration, relocation from China could entail both positive and negative implications. While relocation and replication of supply chain activities could give a higher degree of resilience, there is also a potential "dark side", at least in the short to medium term. This includes, firstly, the risk of uprooting long-standing and well-functioning relations to suppliers in China. Second, the

Table 1. How can companies address disruptions? Resilience strategies, their expected impact and associated costs

External disruptions (examples)	Resilience strategies (examples)	Expected impact of strategies	Costs and Disadvantages
Local natural disasters (e.g., flooding, hurricane and earthquake) Case-illustration: Nissan and Danish electronics company	1. Diversify locations of production in order not to get overexposed to one location 2. Multiple suppliers 3. Safety stocks 4. Back-up sites	1. Reduced exposure to local risks; increased flexibility across locations 2. Increased flexibility across suppliers; reducing lock-in and dependency on one supplier 3. Decreased interdependence between tasks in production process 4. Establishment of buffer to safeguard against supply swings and supply disruption	1. Increased management and coordination costs; differences in output and quality standards 2. Potential loss of benefits gained from close collaboration with single suppliers 3. Tied-up capital due to slack resources (stock and capacity) 4. Similar to 3), due to excess capacity
Political conflicts (e.g., China-US trade conflict, territorial conflicts and Brexit) Case-illustration: Apple and Danish electronics company	1. Local production activities rather than cross border trade 2. Early warning strategies, tracking and monitoring central indicators 3. Tracking and monitoring of supply chain	1. Ability to circumvent trade barriers by operating within "trade walls" 2. Improved readiness to foresee and respond to disruptions in extended supply chain 3. Similar to 2), plus a stronger, integrated relationship and information flow with suppliers	1. Establishment costs (can be significant); reduced economies of scale; fewer synergy effects from globally concentrated activities 2. Costs of design and development of monitoring system 3. Similar to 2)

difficulty of making a multiple sourcing strategy work in practice. Third, the continued dependency on the interconnected industrial ecosystem in a specialized industry, and finally the one-off costs of relocation plus the ongoing increase in cost, attention, and time needed for managerial and coordination tasks.

In conclusion, we suggest that although achieving global supply chain resilience is challenging, and arguably easier said than done, there are strategies companies can employ to improve resilience. However, the attractiveness and feasibility of a given strategy is not a one-size-fits-all and it must be determined in a specific examination.

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