



# Global value chains of the EU member states

Policy options in the current debate

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## **JEL-Classification**

F10 – Trade: General

F13 – Trade policy; international organizations

F02 – International economic order and integration

## Executive Summary

In 2020, EU companies imported intermediate products worth 2.4 trillion euros, which made up more than half of total merchandise imports of the EU. Compared to the pre-crisis year 2019, imports of intermediates decreased by 13 percent, partly driven by the lower fuel prices. A detailed analysis of trade in value added shows that in most EU countries more than half of the imported intermediate products come from other EU member states. Extra-EU sources of value added in domestic final demand and exports are particularly important in the smaller economies like Luxembourg and Malta, but also in the biggest EU member states Germany, France, Italy and Spain. Among the Non-EU countries, especially the USA, UK, China, and Russia contribute substantially in terms of value added to the production process of EU member states. The USA are the most important source of value added outside the EU for several countries like Ireland, the Netherlands, Belgium, Germany, France, Spain, etc. The UK is the top non-EU-provider of value added for Cyprus. China delivers the largest share of non-EU value added in some countries from Central and Eastern Europe like Slovenia, the Czech Republic and Poland. Russia is particularly important for the Baltic countries, Bulgaria and Slovakia. Among the EU member states, Germany is the most important source of value added for the domestic final demand and exports in most of the other EU countries – notable exceptions are Belgium and Ireland, where more value added comes from France than from Germany.

The corona crisis has revealed the fragility of global value chains. Industries are increasingly and asymmetrically connected with each other. Value chains were internationalized to achieve efficiency and economies of scale. Outsourcing, offshoring and lean production lines with low inventory stocks, however, have made the European economy vulnerable to disruptions and shortages of supply chains. A disruption caused by an event such as the corona crisis can propagate along supply chains affecting direct and indirect suppliers as well as customers of disaster-stricken firms. Hence, the perceived trade-off between low prices of intermediate products and the increased risk of being dependent on complex global supply chains has gained new attention in the context of the pandemic. European policymakers are thus calling for a larger role of reshoring in some industries. However, the actual size and dimensions of reshoring in Europe and Germany in the past have been limited as this is only one of many possible strategies to increase resilience of value chains. This indicates a misalignment between the perspective of companies and priorities of policy makers.

The design of the value chain network is a matter of economic decision-making and a potential structural change can only be initiated by companies in the course of reassessing the above-mentioned trade-off and of reconsidering the risks of international supply chains. Besides reshoring, other potential measures to increase resilience concern the diversification of supply chains, increasing stockkeeping, or adjusting delivery times. In terms of economic policy, state interventions are only reasonable for industries producing essentials (e.g. certain medicines or personal protective equipment). However, it is crucial that supply chains, which are already disrupted, are not further affected by additional trade conflicts. Protectionist measures covered in the strategy of restructuring supply chains motivated by the current crisis hence entail the danger of reversing the achievements in trade liberalization and specialization of the last decades.

# 1 Introduction

The significant disruption of important global value chains (GVC) in the wake of the Corona crisis has sparked the discussion about resilience of the European economy and its dependence on foreign suppliers and production locations, especially in the field of medicines and medical equipment (European Commission, 2020). While the outsourcing of production steps and the procurement of intermediate products from abroad have been considered a profitable strategy in recent decades (Kolev/Matthes, 2017), the question is now to what extent the associated risks can be justified. These risks were particularly evident at the beginning of the Corona crisis when foreign suppliers had to shut down their plants due to illness or by regulation (Grömling, 2020). The result was a shortage of intermediates that affected domestic production beyond the extent resulting from the virus spreading domestically. But even before the corona pandemic, the dependency on international value chains was questioned for geopolitical and trade policy reasons (O'Dea, 2019). Currently, transport-related challenges, demand-supply mismatches as well as the discussion about the sustainability of international trade and a potential supply chain law at the European level are further topics discussed and related to the pros and cons of international supply chains. This pertains even to Germany, where international specialization is the very fundament of the export-oriented business model of many companies (Kolev, 2020a; 2020b; Kolev/Obst, 2020; Kolev/Neligan, 2021).

The falling trading costs in the two decades after the establishment of the World Trade Organization (WTO) and the rapid development in important emerging countries, especially in China, opened up new opportunities for internationally oriented European companies, both on the export and on the import side. The enlargement of the market and the specialization on a narrower product range has undoubtedly contributed to a substantial part of today's welfare (Feenstra/Kee, 2008; Feenstra, 2010). The high level of competitiveness and the attractiveness of European products for domestic and foreign customers is not only the result of technological progress, but also of a series of strategic internationalization decisions. In addition to the establishment of production facilities in the vicinity of the target markets, this also includes specialization along the value chain and purchasing of less expensive intermediates abroad, thus expanding the supply chains to foreign suppliers of parts and components.

According to Eurostat data, in 2019 the EU member states imported intermediate products valued at 2.7 trillion euros, which is about 55 percent of total merchandise imports. In 2020 the value of imported intermediates decreased to 2.4 trillion euros, with pandemic-related developments and lower fuel prices being the main explanations. Still, intermediates account for about half of EU merchandise exports and the development in the second half of 2020 and in the first months of 2021 shows substantial recovery. In countries like China where the pandemic has been 'left behind' to a large extent, trade with the EU has made a comeback (HKTDC Research, 2021).

While the world is still coping with the health and safety issues raised by the Covid-19 pandemic, it has become apparent that this event will have a lasting impact on the structure, organization and management of international operations and GVC. There seems to be a consensus that the 'global value chain model' as one of the most visible "trademarks" of globalization is being reshaped driven by managerial but also political factors (Barbieri et al., 2020). At the firm level the pandemic and subsequent lockdowns illustrated an unprecedented shock of how disruptive the effects could be in the context of an already troubled environment of trade battles raising the likelihood of protectionist policies. The crisis revealed two critical factors: On the one hand, many countries experienced surging demand for essential products (e.g. masks and medical

products) and in some cases a lack of self-sufficiency to grapple with the crisis. On the other hand, it became evident that the sudden stop of strategic supplies like pharmaceutical items and key industrial goods (e.g. semiconductors) can hurt domestic production and growth prospects in advanced economies substantially. Subsequent calls for more self-reliance in the political debate are increasingly urging policy reforms to protect, strengthen or even reinstate regional or national production of the respective goods. A widely discussed policy strategy is reshoring, which generally implies the reverse of offshoring and has regained a lot of attention due to the outbreak of the pandemic also in academic literature (De Backer et al., 2016; Hilletoft et al., 2019; Barbieri et al., 2020; Kinkel, 2020). Some affected companies, nonetheless, are planning to rather increase buffer stocks and inventory to cope with future demand. However, while GVC play a prominent role in the current public debate, the drivers and policy implications of supply chain disruptions remain unclear (Gereffi, 2020). This is due to considerable variation in supply chain networks in terms of industry, product categories, company internationalization strategies or distribution channels. Moreover, policy implications for a restructuring of supply chains depend on whether the country has a higher exposure to foreign supply or foreign demand shocks (OECD, 2021).

This paper examines the issue of reshoring – not only how it relates to individual companies but what it implies from an aggregate economic perspective. While the current policy debate focuses on reshoring as a strategy to overcome some type of market failure it leaves untouched the issue of policy failures as well as demand-supply mismatches being potential causes for the shortages of certain goods such as medical products. For example, while the outbreak of the pandemic leads to an abrupt stop in production and severely hindered logistics, GVC were still operational. At the same time intra-European trade was blocked by a unilateral decision of 19 EU member states to close their borders without any coordination on the European level. Such policy decisions would also affect reshored production facilities within Europe. Moreover, the economic case for reshoring remains weak. Whereas it is argued that relocating parts of the value added chain might lead to countries being less exposed to foreign shocks, it can actually lead to the paradoxical result that industries will end up being less able to cushion shocks through trade while facing losses of efficiency gains (OECD, 2021).

The aim of this paper is to provide insights into the role of GVC for EU member states. Section 2 analyzes trade and value-added statistics to identify the relevance of individual trading partners as suppliers of intermediate products. It stresses the significance of the German economy as a hub and driving force of demand and supply of intermediates within the European economy. Section 3 discusses the results in the run-up to the current debate from a trade policy perspective. Section 4 focuses on the reshoring phenomenon, defined as a decision to reallocate manufacturing either back to the home country (backshoring) or to a nearby country that belongs to the same economic area (nearshoring), and discusses policy implications. Section 5 contains some concluding remarks and an outlook regarding the future of GVC.

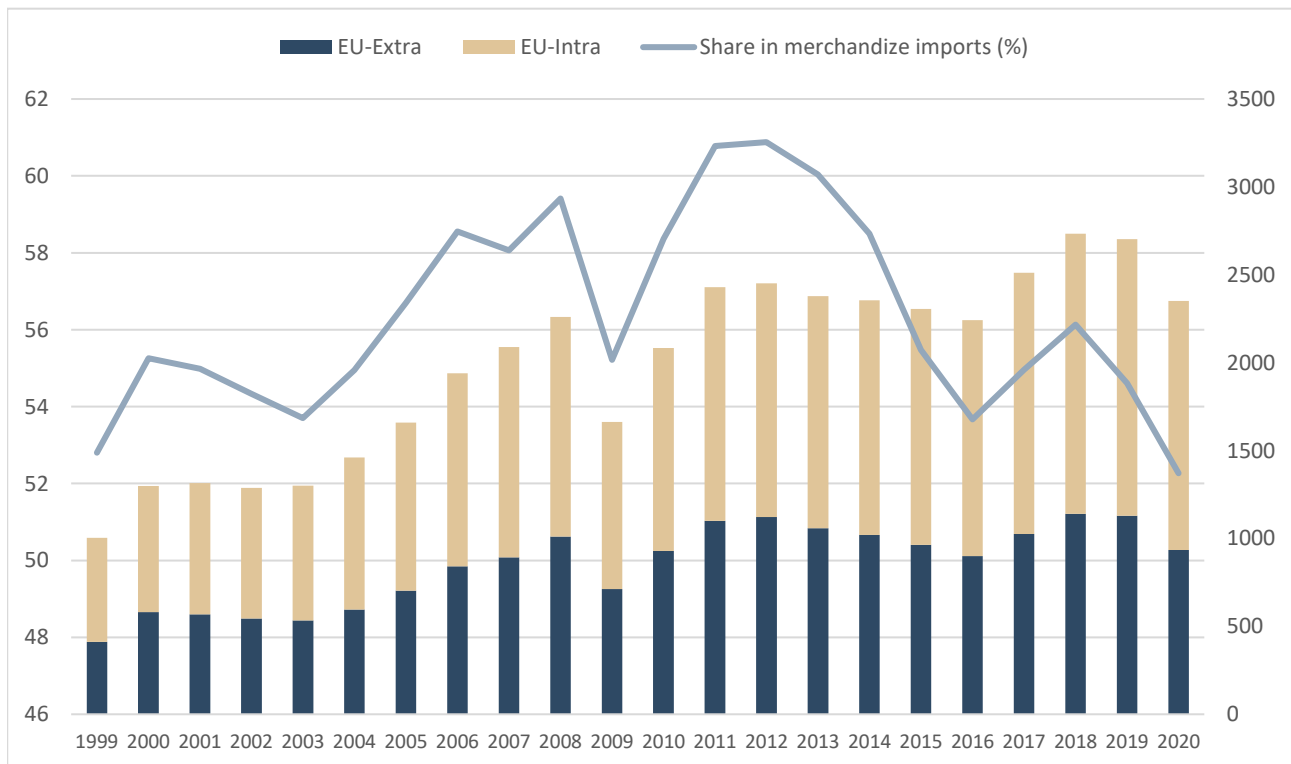
## 2 Intermediates imports of the EU member states: An overview

According to Eurostat trade statistics, EU companies imported intermediate products worth 2.4 trillion euros in 2020. Thus, intermediates accounted for 52.3 percent of the total merchandise imports of the EU member states. In terms of overall economic output, intermediates imports amount to 17.6 percent of the EU-GDP. As shown in Figure 2-1, the value of imported intermediates has more than doubled since 2000, as a result of the overall economic globalization trend. Especially in the years before the great recession in 2009,

European foreign trade experienced rapid development. Trade with intermediate products exhibited a particularly dynamic development during this period and the share of those products in total merchandise imports increased from 52.8 percent in 1999 to 59.4 percent in 2008. After the crisis-related slump in 2009, trade with intermediates recovered and their share increased to 60.9 percent in 2012. In the following years, though, it slowed down – a trend that is often referred to as reshoring (De Backer et al., 2016). The uncertainty triggered by the financial market crisis and the burgeoning protectionism slowed down trade globalization and triggered a review of GVC. The value of imported intermediate products declined slightly in the years 2013 to 2016 and its share in total goods imports fell to 53.7 percent in 2016. After a brief recovery, the trade conflicts between the USA and important trading partners like China and the EU contributed to a further decrease in the share of intermediates imports in 2019. Even before the outbreak of the corona crisis, the share in merchandise imports thus fell more than 6 percentage points between 2012 and 2019. A similar development can also be observed for other countries worldwide.

### Figure 2-1: Imports of intermediate products

Value in billion euro (right axis) and share in merchandise imports in percent (left axis)



Sources: Eurostat; German Economic Institute

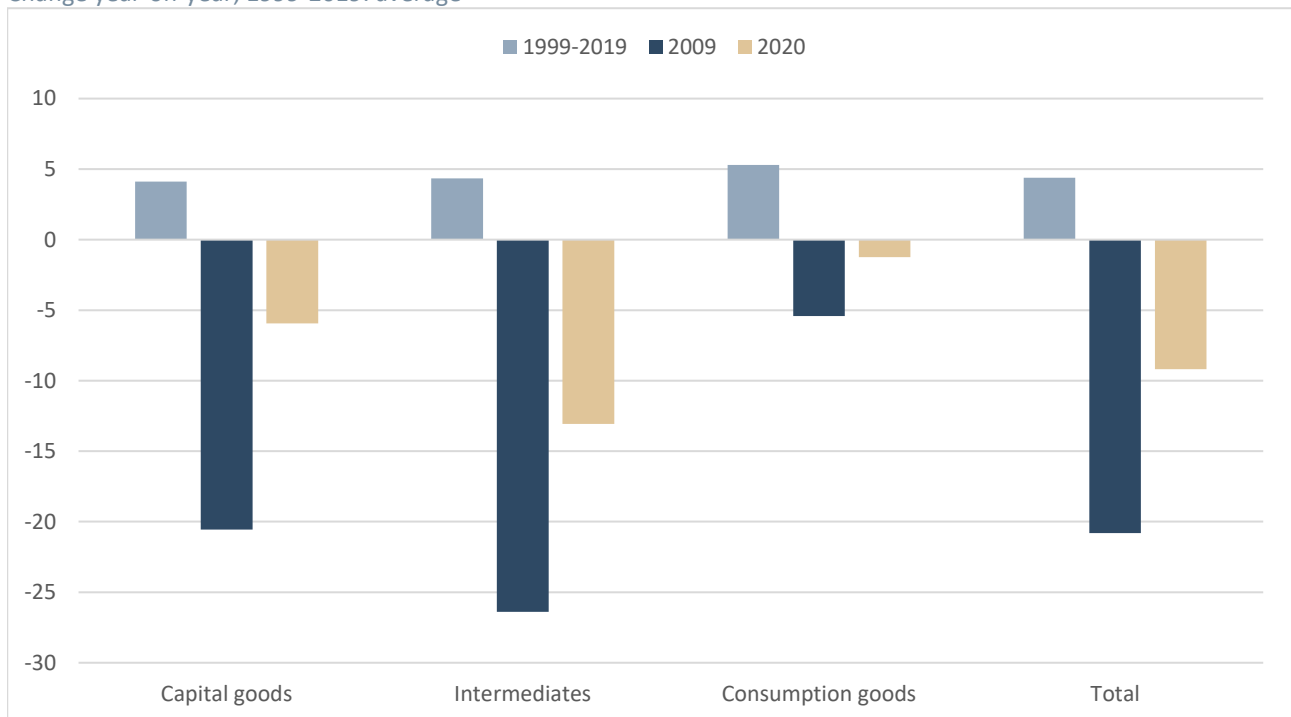
A further slump came during the COVID-19 pandemics as EU imports of intermediate products decreased by 13.1 percent in 2020. The sound recovery in the second half of 2020 compensated to a large extent for the sharp slump in the spring and the total decline of 13.1 percent in 2020 was less than half the decline during the financial crisis in 2009 (Figure 2-2). However, as in 2009, it was more pronounced than in the case of capital and consumption goods. To a certain extent, the drop in the nominal value of intermediates imports was due to the crisis-related decline in the price of raw materials. For instance, the oil price decreased by more than one third both in 2020 and 2009 compared to the preceding year.



However, several factors related to the restrictions in the course of the pandemic affected international trade and trade with intermediates as well. First, border closing and lockdown-related production restraints were particularly important factors especially in the first weeks as well as in the late 2020s, when the second COVID-19 wave reached Europe. Within a few weeks, border closings were no longer an important issue, though; instead, production downtimes both domestically and abroad endangered GVC. And second, the pattern of global demand and supply changed substantially during 2020. At the beginning of the pandemic, the sharp downturn in economic activity led to a subdued demand for intermediate products in traditional industries like the automotive industry. At the same time, the demand for intermediates increased in the field of electronics, since enhanced working and learning from home triggered an acceleration of the process of digitalization. In 2020, global PC shipments exhibited the highest increase in a decade (Gartner, 2021). Therefore, the demand structure for important intermediate products like semi-conductors changed and there was a rapid increase in demand as the recovery process sped up and also traditional buyers ordered again. The supply side was not able to keep up with this trend and a shortage emerged causing a fundamental questioning of industrial policy and dependency on the import of strategically important products.

**Figure 2-2: Development of merchandise imports in the crises**

Change year-on-year; 1999-2019: average



Sources: Eurostat; German Economic Institute

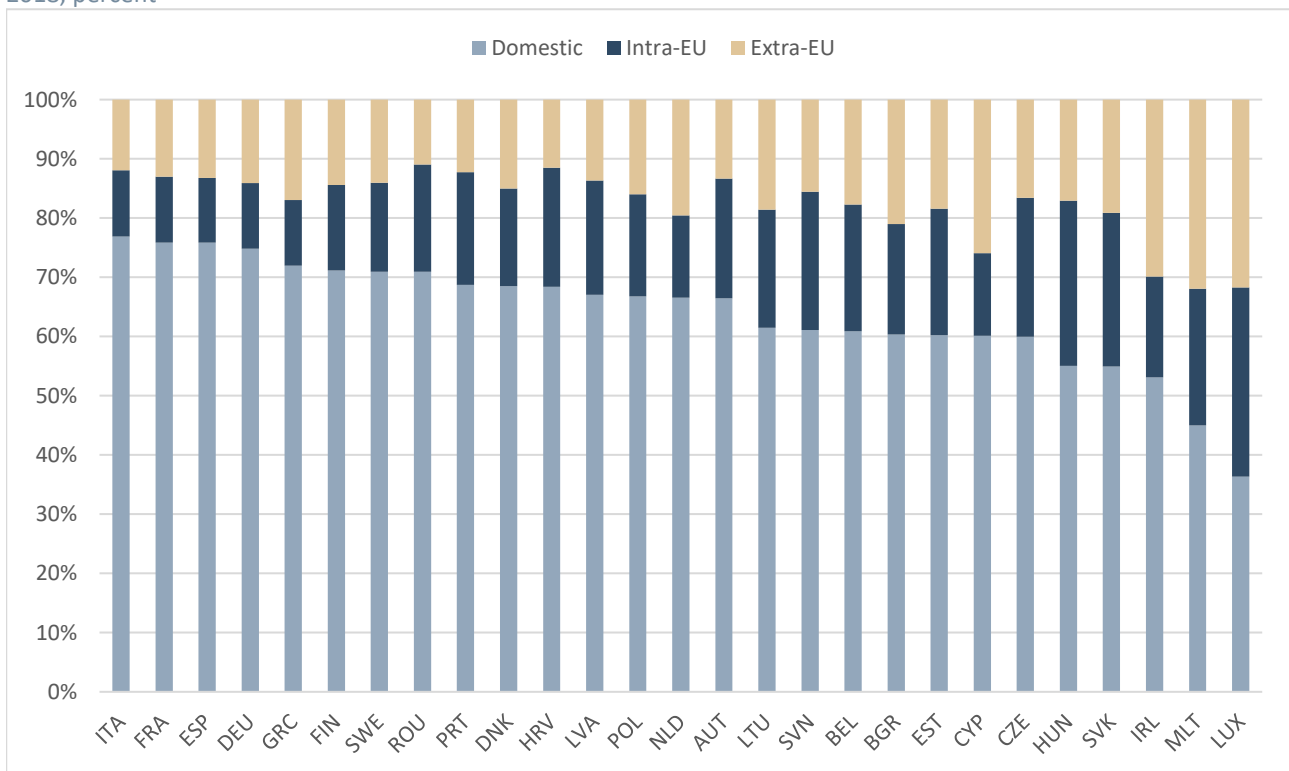
The review of the EU industrial strategy focused on the dependency on individual countries as suppliers of intermediate products. The overall dependency on particular countries can best be described by their share in value added contained in domestic final demand and exports as described by the Trade in Value Added Statistics of the OECD. The disadvantage is that the latest available data are from 2018. However, the data represent a more accurate measurement of the relevance of other countries for the production process in the EU since it explicitly accounts for possible bias due to the fact that some imports listed in the trade statistic contain to a large extent value added from third countries. Furthermore, it covers beyond merchandise

trade also services inputs used in the production and is thus a more accurate and comprehensive reflection of international interdependencies.

As predicted by economic theory, the share of imported value added is higher in smaller countries like Luxembourg or Malta and significantly lower in the big four countries Germany, Spain, France and Italy (Figure 2-3). Imported value added comes mainly from trade partners outside the EU in countries like Ireland, Netherlands and Greece but also in the smaller economies and in the big four. Especially in the EU member states from Central and Eastern Europe Hungary, the Czech Republic, Poland and Slovakia, imported value added comes to a larger extent from other EU member states.

**Figure 2-3: Domestic versus foreign value added in domestic final demand and exports**

2018, percent

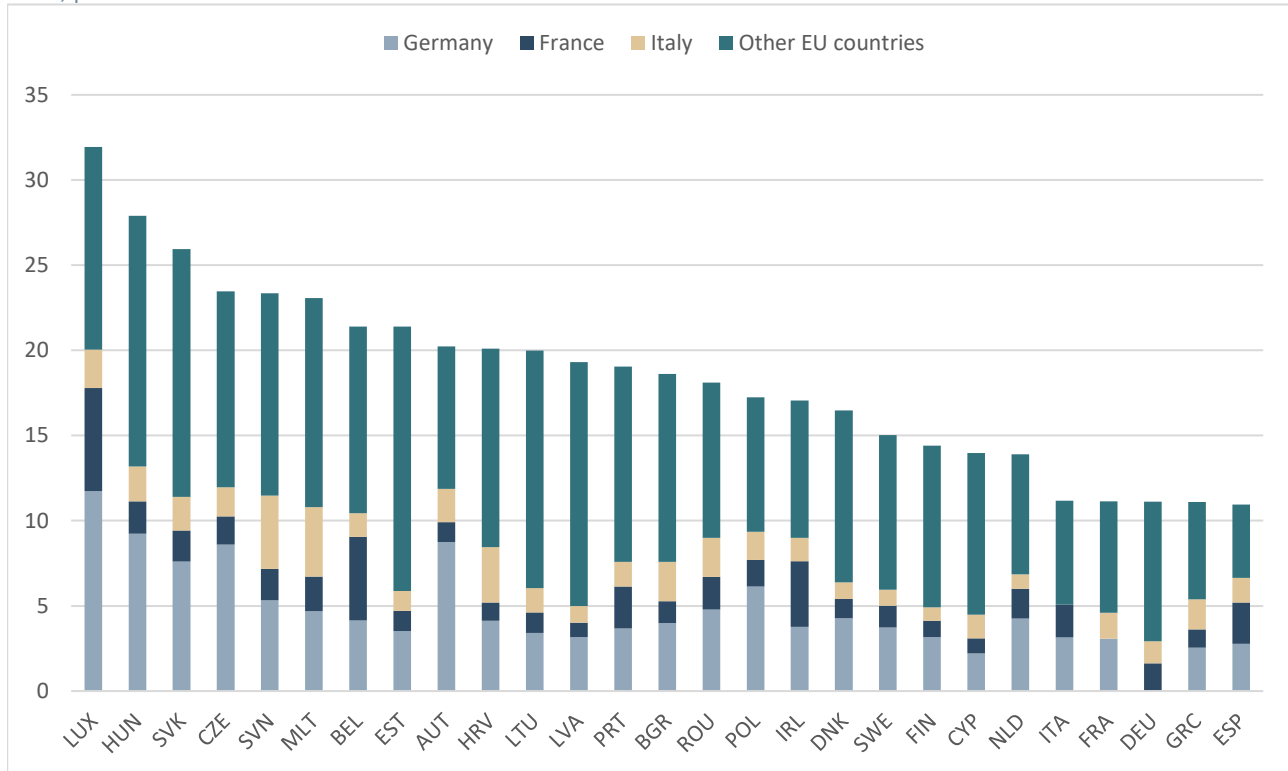


Sources: OECD; German Economic Institute

Among the EU member states there are three countries that appear as the most significant suppliers of intermediate products and value added in other EU countries (Figure 2-4). In the first place, EU member states import value added from Germany. The share of German value added in domestic final demand and exports of other EU member states varies from 2.2 percent in Cyprus to 11.7 percent in Luxembourg. Especially countries from Central and Eastern Europe like Austria, the Czech Republic and Hungary are particularly dependent on Germany as supplier of intermediate products and services. France and Italy are two further countries providing significant shares of value added for final demand and exports of other EU member states. Nevertheless, their share is lower than that of Germany in most of the countries. Two important exceptions are Belgium and Ireland, where the share of value added coming from France is slightly higher than the share coming from Germany.

**Figure 2-4: Value added in domestic final demand and exports coming from other EU member states**

2018, percent



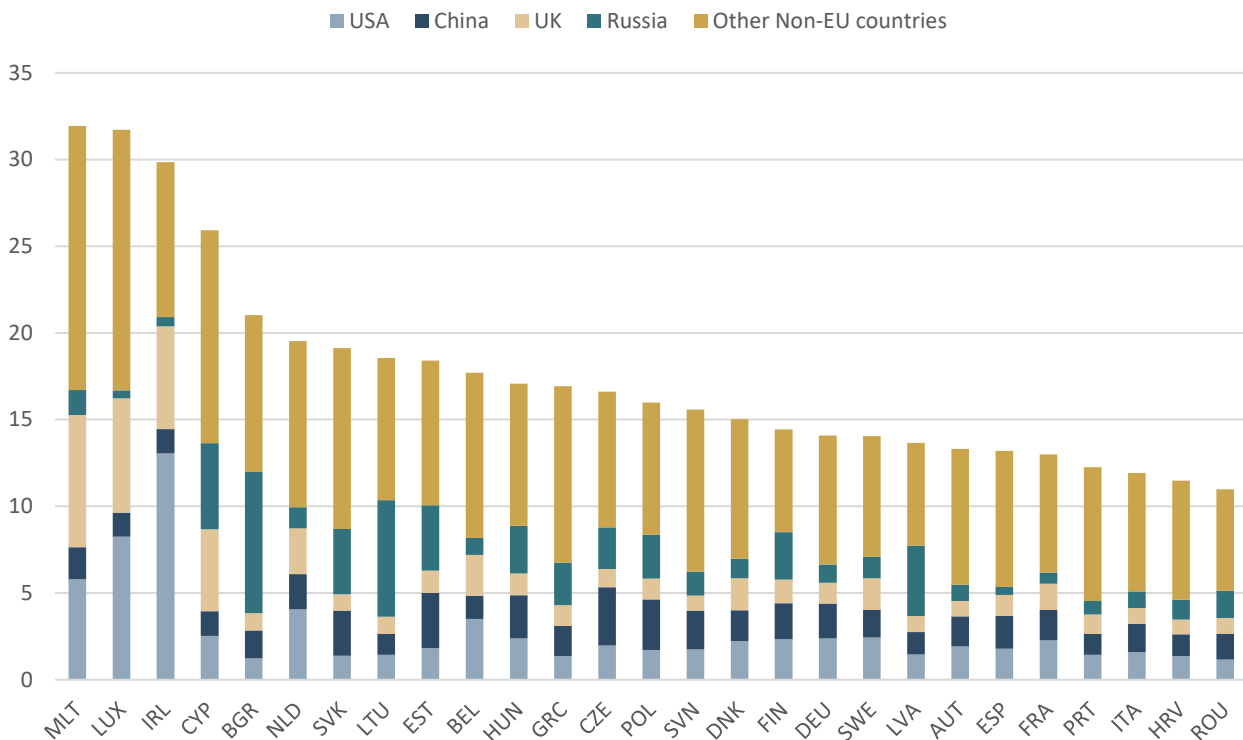
Sources: OECD; German Economic Institute

Considering the non-EU suppliers of value added for the final demand and the exports of the EU member states, four countries in particular stand out: China, USA, Russia and the UK (Figure 2-5). China plays a major role especially in the Czech Republic and in Estonia, where its share of value-added amounts to more than 3 percent. The share of US value added in domestic final demand and exports of EU member states is overall more significant than that of China and particularly high in Ireland (13.1 percent), Luxembourg (8.3 percent) and Malta (5.8 percent), probably due to the high significance of ICT and financial services for these economies. Russia plays an important role as a supplier of intermediate products and services in the Baltic countries, Bulgaria and Cyprus, where the share of value-added provided by the Russian economy ranges between 3.8 percent in Estonia and 8.1 percent in Bulgaria. Last but not least, the British economy delivers a significant share of value added in final demand and exports of Luxembourg, Malta and Ireland, where its share lies between 5.9 and 7.6 percent.

During the COVID-19 pandemic, the debate emerged on the resilience of supply chains and basic services (Raza et al., 2021). Especially the shortage of personal protective equipment (PPE) such as face masks and disinfectants in the first few months after the start of the pandemic, as well as the lack of life-saving mechanical ventilators in many places, made it appear necessary to investigate the dependency on foreign suppliers in key areas. However, government intervention in international supply chains must be well founded. Therefore, a more precise and differentiated look at actual dependencies is necessary.

**Figure 2-5: Value added in domestic final demand and exports coming from non-EU member states**

2018, percent



Sources: OECD; German Economic Institute

Numerous studies show that the shortage of medical products was by no means due to Germany's excessive dependence on manufacturers from abroad, but rather mainly due to the rapidly increasing demand worldwide (Braml et al., 2020; Gereffi, 2020). Instead, data from the WTO confirm Germany's strength as a producer of medical devices. The German economy was the largest exporter of medical and pharmaceutical products even before the pandemic accounting for 14 percent of global exports, ahead of the USA and Switzerland (WTO, 2020). When it comes to medical PPE, Germany is the second largest exporter in the world after China with almost 13 percent. But the very rapidly increasing demand implied that even China, which accounts for almost half of global production, experienced severe shortages, as demand in January 2020 exceeded its own production from the previous month about ten times, according to OECD data (OECD, 2020).

The issue of resilience in supply chains also gained importance in the course of the recovery phase, when shortages in raw materials and intermediate products again became a serious problem for many companies leading to substantial increases in prices (Bardt et al., 2021), the expectations being that the price hike is only temporary and is going to slow down as economic activity normalizes. The price of wood reached its all-time high at the beginning of May 2021 and was around four times higher than before the crisis. The same applies to the copper price, which rose by around two thirds compared to the pre-crisis level. The shortage of semi-conductors also has far-reaching consequences, both in the manufacturing of pure electronic products and beyond, especially for electronic elements in the automotive industry. The current scarcity of these important intermediate products, for example in the automotive industry, is not necessarily the result of insufficient domestic production (as has been sometimes claimed thus calling for policy measures to support building capacities for domestic production). The increased and structurally changed global demand for products that

require semiconductors as key components plays the crucial role here. Data for 2020 show the highest increase in global PC deliveries in ten years, which can be explained not least by the digitization surge in the wake of the pandemic (Gartner, 2021). In addition, the pandemic-related slump in production in spring 2020 initially led to a decline in demand from the sectors affected. All taken together, these developments resulted in a great, albeit only partly temporary, need for adjustments in global semiconductor production and delivery structures. A higher domestic production (e.g. of semiconductors) would not have helped in this situation, because the manufacturers have to meet their delivery obligations and cannot discriminate in favor of domestic customers. Thus, part of the domestic production would not have been available.

As part of the review of the EU industrial strategy, the European Commission has investigated the question of dependency on foreign suppliers for 5,200 important product groups. It classifies products as particularly critical where there is a strong and difficult dependency on only one country, mostly China (European Commission, 2021). The results show that these products make up only 0.6 percent of the total value of EU imports. Specifically, there are merely 34 key products where the EU is heavily dependent on individual countries. This particularly includes raw materials and chemicals for energy-intensive industries and healthcare. Diversification or possible home production in the EU is assessed as difficult here. The dependence on China as a supplier of rare earths, for example, is a risk that should not be underestimated. Especially in Germany, about half of imports of rare earths and rare earth compounds come from China (Bardt, 2019). The dependency is even greater if one takes into account the content of rare earths in other components and products that Germany imports. Rare earths in particular are an example of products that can also be manufactured at other locations around the world (including Germany). This is, however, not applicable to other raw materials (e.g. oil or copper). Moreover, many of the necessary raw materials required for the transformation of the German transportation sector (e.g. cobalt or lithium) depend on stable political and economic environments in the source country. The significant increase in raw materials' prices illustrates another issue: the extraction of raw materials can only slowly adapt to rising demand because tapping new deposits is complex and costly.

Finally, it is important to distinguish between countries that are exposed differently to foreign supply and demand shocks (OECD, 2021). GVC can be categorized into two different types: "Backward" GVC linkages and "Forward" GVC linkages. Whereas the former implies a relatively higher share of foreign value-added from foreign input providers the latter indicates a higher reliance of intermediates exports of the home country on the demand from foreign countries. "Backward" GVC exhibit a higher exposure to foreign supply shocks (e.g. raw materials or intermediates) whereas "Forward" GVC are more exposed to demand shocks due to changes in the demand of the foreign economy. The OECD (2021) measures the degree of exposure (with a range between 0 and 100 percent) to a demand and supply shock of various OECD countries in 2015:

- Connectedness to global markets enable smaller economies to reach a bigger customer base. As expected, small open economies such as Belgium, Ireland or Luxembourg thus show a high degree of exposure to foreign demand shocks (OECD, 2021). These economies export between 65 and 80 percent of the total amount of value added produced domestically (the degree of exposure to a demand shock is computed as domestic value added content in foreign final demand and illustrated in percent of total domestic value added). According to this measure, Germany shows a total exposure of 60 percent to a foreign demand shock, particularly in the EU. The USA as well as China have a total exposure to a demand shock in foreign markets between 20 and 25 percent, which is consistent with economic theory considering the fact that these are the two biggest economies worldwide.

- Germany, Italy, and the USA show a low exposure to foreign supply shocks of just above 20 percent (the degree of exposure is computed as foreign value added in gross output of the sector and presented as a percentage of total foreign value added). However, whereas China is exposed to foreign supply shocks by only roughly 5 percent, the UK, Australia or Norway are exposed by around 60 percent. This can be partly explained by the fact that larger economies such as the European Union, the USA and China provide high portions of foreign inputs used in manufacturing across the world (OECD, 2021). Still, key suppliers of foreign inputs to manufacturing (potential sources of shocks) are distributed relatively more evenly than suppliers to the business services sector. Here, services tend to be sourced mainly from Europe and the USA with lower reliance on Asia.
- However, some countries and industries take a central role in GVC (OECD, 2021). The manufacturing hub in China (e.g. computers and electronics manufacturing, manufacturing of basic metals or machinery equipment) is both a major source and destination of value added. The German and US automotive industry are two of the most central manufacturing hubs globally. As shown before, German industries also play a central role in chemicals and pharmaceutical products. The impact of GVC reshoring on economic growth and stability thus depends on these varying characteristics and on the degree of structural change it would cause to the supply chain network.

### 3 Strategic implications for supply chains

The rise of GVC has transformed the global manufacturing landscape in recent decades. The case for GVC has been well argued. Supply chains were internationalised to achieve productivity gains through specialisation and economies of scale. As theory predicts, increasing the production possibility frontier beyond national boundaries leads to knowledge spillovers and higher output. Global networks leveraged the advantages of spatial flexibility, proximity to resources and new markets, access to well-trained labor, increasing speed and efficiency of global logistics providers (Gereffi, 2020). Since the 1990s, GVC have thus been optimised to increase efficiency. In fact, a recent study (Felbermayr et al., 2019) confirms that participation in a rule-based trade system like GATT or WTO has led to a significant increase in global exports as well as higher growth in the respective member states. The integration of emerging economies in worldwide value-added chains has, however, also led to a shift in economic and political power. The ‘traditional’ dominance of the western world – measured as the relative share of GDP of the G7 states in worldwide output – has decreased significantly from 65 percent at the beginning of the 1990s to 40 percent in 2019 (Felbermayr et al., 2019). More recently, the systemic macroeconomic risk of GVC, particularly when they are more complex, has gained increased attention (Acemoglu/Tahbaz-Salehi, 2020).

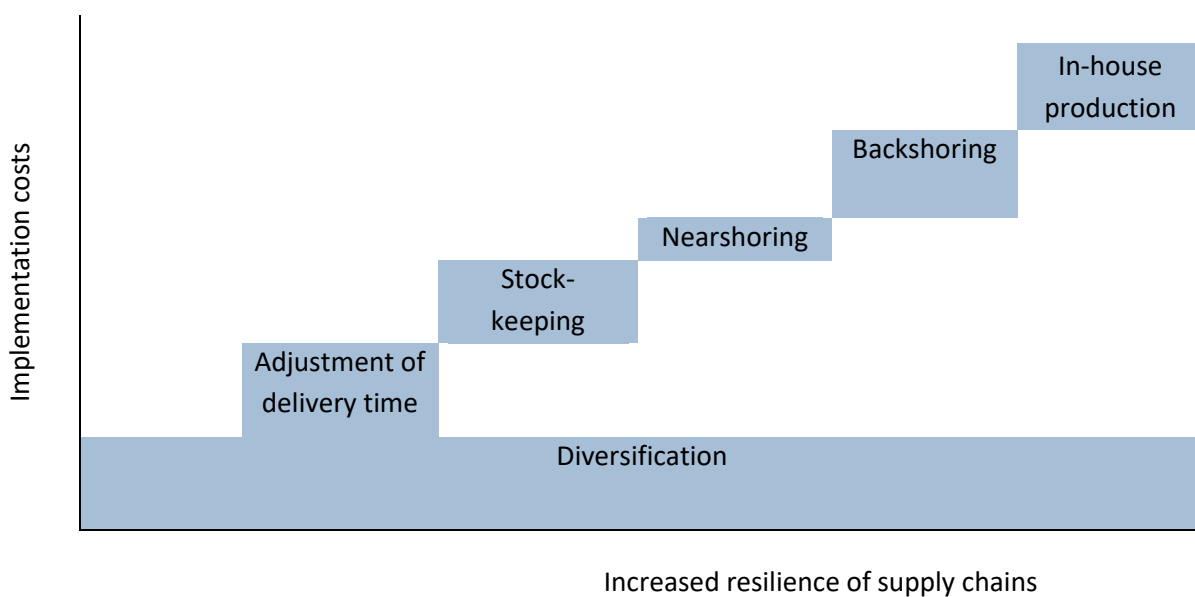
After the outbreak of the Corona virus worries are growing that supply chains have become a source of vulnerability. Academics and policy makers are debating whether governments should employ tools to “relocate” GVC. The aim is to reduce dependencies on foreign suppliers and thus improve resilience of the domestic economy to future crisis (Felbermayr et al., 2021). It is also argued that in the current economic environment businesses must completely rethink their GVC to overcome bottlenecks and avoid supply chain disruptions, including sizeable reshoring decisions bringing production back home or to a neighboring state (for a brief overview of the concept of reshoring, see Section 4). Before the different types of reshoring are outlined, a broader picture of the different strategies companies can choose to deal with pandemic related supply chain shocks is illustrated.

Since the outbreak of the Corona virus in 2019, several strategies to tackle the pandemic-related supply chain disruptions have been proposed (vbw, 2021). Figure 3-1 illustrates different strategies along two dimensions:

- the time it requires to implement the strategy and
- the degree to which it increases the resilience and self-reliance of the respective supply chain network.

Among the more prominent proposals are diversification of the supply chain networks or stockkeeping. Compared to more far-reaching options like reshoring, diversification can help to retain scale economies, reasonable cost structures and innovation opportunities. Moreover, it increases competition and prevents monopolistic market structures. Expanding the number of international manufacturing sites avoids overreliance or even dependence on only one or two suppliers. Nevertheless, diversification might not be a suitable strategy for small and medium-sized enterprises since it incurs higher administrative costs and more administrative effort. The representation in Figure 3-1 refers to the case where diversification can be easily pursued. This is mainly the case for large highly internationalised companies with existing broad supply chain networks.

**Figure 3-1: Strategies for entrepreneurs concerning international supply chains**



Source: Own illustration based on vbw, 2021

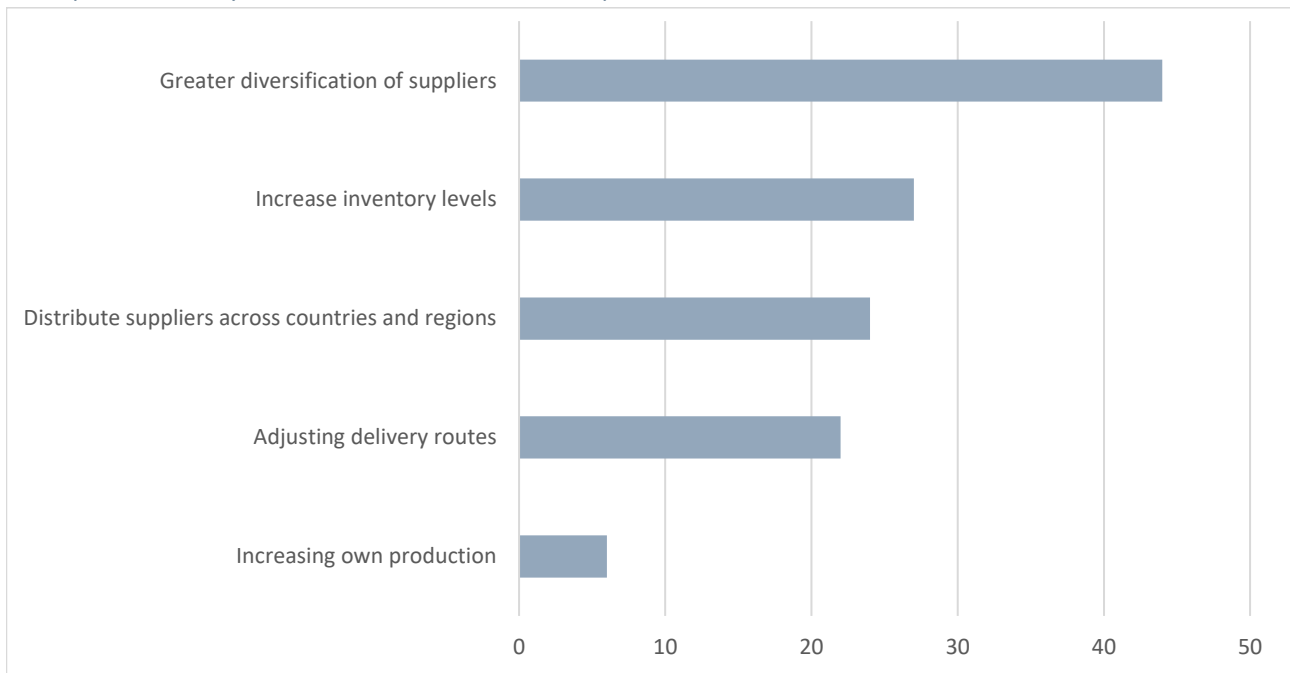
Stockkeeping can help companies that do not want to live without the benefits of specialisation and international division of labor but want to overcome short term transitory bottlenecks in the supply chain. Nearshoring and backshoring can help to increase resilience of GVC. Relocating manufacturing steps back to the home country or neighboring EU member states can minimise risks associated with international transport routes (e.g. the Suez Canal blockage affected the global shipping industry in March 2021) and strengthen the intra-EU economic relations. It could also reduce delivery times and increase sustainability of the GVC network. However, it would require more time to relocate production sites and require substantial investments and sunk costs of adapting supply chains. Similar points apply to in-house production. By relocating stages of production back home, companies might be able to prevent failures of external suppliers, but this entails high costs, because it permanently foregoes the advantages of specialisation and production in low-cost locations as well as it leads to considerable one-off expenses of building up one's own production capacities.

At the same time it might not lead to the desired cushion effects, e.g. isolating production from international shocks in GVC.

A reliable forecast for the future of GVC is currently hardly possible. However, surveys of German companies show which measures have already been taken to increase the resilience of their supply chains. As a recent survey by the ifo Institute in Germany indicates, most companies want to keep their global focus (Flach et al., 2021). To cope with current supply chain disruptions, companies rather prefer an enhanced monitoring process, diversification of suppliers as well as retaining an increased inventory stock. Only in the industrial sector 7 percent of the surveyed firms aim to foster insourcing and 11 percent want to shorten supply chains by focusing on European suppliers. Hence, in contrast to the current policy debate of intense restructuring of value chains by businesses (or even of political intervention) to reduce dependency on GVC, affected companies intend to keep their international focus.

### Figure 3-2: Measures implemented by German companies that have planned or are about to adjust their supply chains

2021, percent; survey of more than 4,500 German companies with branches and subsidiaries in over 70 countries



Source: DIHK/AHK, 2021

Furthermore, the World Business Outlook from spring 2021, for which more than 4,500 German companies with branches and subsidiaries in over 70 countries were surveyed, points out that 71 percent of the companies surveyed have already adjusted supply chains or are planning to do so (DIHK/AHK, 2021). Figure 3-2 shows the relevant measures taken. With around 44 percent, most companies are relying on greater diversification of their supplier structure through new suppliers – around 24 percent want to distribute their suppliers across several countries and regions. 27 percent of companies are aiming to increase inventory levels, while 22 percent want to adjust their delivery routes. Only 6 percent of the companies that want to redesign their supply chain are planning to increase their own production. This is also broadly in line with the results of the survey presented by Flach et al. (2021).



In the following the focus will be on one of the strategies in particular – the role of reshoring. The policy proposal has been discussed extensively (Raza et al., 2021) and hence takes a prominent role among the calls for more self-reliance and resilience of supply chains (OECD, 2021).

## 4 Reshoring as a viable long-term strategy?

Supply chains have not only become more global, but they have also become increasingly dependent on key exporting economies (e.g. China), along with the just-in-time business model that was optimized to minimize costs and inventories (Gereffi, 2020). As discussed in the previous sections, the crisis has exposed risks that stem from outsourcing and offshoring of production processes and the manufacturing of input goods abroad. Outsourcing aimed at reducing the vertical range of manufacturing and hence to save wage costs as well as to focus on core activities at home. “Lean” production, connected with low inventory stocks, however, has made the European manufacturing sector vulnerable to interruptions of supply chains and subsequent supply shortages. Hence, there is a trade-off between lower prices of input goods and the increased risk of being dependent on GVC networks. In the context of the Corona pandemic, the idea of reshoring thus seems not only to increase costs of production but also to offer some potential advantages such as increasing resilience of supply chains.

### 4.1 What is reshoring?

The term ‘reshoring’ is employed quite loosely in the public debate to describe a heterogenous process. It refers to the process of bringing back industries and value creation activities (Raza et al., 2021). Different terms such as reshoring, backshoring or nearshoring are often used interchangeably adding confusion surrounding the policy debate. However, further distinctions can be made between backshoring and nearshoring. Backshoring is the decision by the parent company to relocate manufacturing activities back to the home country (Kinkel, 2020). Nearshoring relocates previously offshored activities not necessarily back home but to a neighboring country close to the country of origin. However, it does make a difference whether manufacturing activities are relocated back home with high production costs (e.g. Germany) or to a neighboring country with lower production costs (e.g. in Eastern or Central Europe). The decision to reshore will thus also be affected by cost considerations as well. The terms of reshoring, backshoring or nearshoring refer all to the reversal of offshoring activities (De Backer et al., 2016). Therefore, backshoring and nearshoring are viewed as part of the ‘umbrella term’ reshoring.

While there is no explicit theory of reshoring, there are frameworks to explain the decision-making process of multinational firms. In a nutshell, reshoring takes place when offshoring appears no longer sufficiently advantageous to a single firm, e.g. when the benefits of offshoring (cost efficiencies or market and knowledge seeking) are outweighed by disadvantages (e.g. higher transaction costs or less control over offshored activities) (Kinkel, 2020). A decision to reshore can be interpreted through different lenses such as internationalization theory, the resource-based view of the firm or transaction cost theory. These approaches mainly focus on the firm level of decision-making. However, microeconomic shocks can propagate into aggregate business cycle fluctuations and hence have a macroeconomic impact (Carvalho et al., 2021).

There are different types of reshoring. One classification framework (Gray et al., 2013) clusters four different modes of reshoring according to the ownership structure (Figure 4-1):

- (A) *In-House Reshoring* refers to the case when a company is relocating manufacturing activities from completely owned facilities abroad back to completely owned facilities to the home country;
- (B) *Reshoring for Outsourcing* can be classified as a process where a company relocates manufacturing being performed in completely owned offshore branches back to home-based suppliers;
- (C) *Reshoring for Insourcing* applies to the situation where a company relocates production being currently performed by offshore suppliers back to their owned facilities in the home country;
- (D) *Outsourced Reshoring* implies reshoring manufacturing activities performed by offshore suppliers back to home-based suppliers.

Fundamentally, reshoring is thus a location decision irrespective of the ownership mode (Gray et al., 2013). All four modes relate to the strategy of backshoring.

**Figure 4-1: Different types of reshoring**

		To: Onshore	
		In-house	Outsourced
From: Offshore	In-house	In-house Reshoring	Reshoring for Outsourcing
	Outsourced	Reshoring for Insourcing	Outsourced Reshoring

Source: Gray et al., 2013

Most of the public debate focusses on type (C) and (D) in terms of reshoring. Whereas option (C) is an investment-intensive option, (D) requires the availability of comparable home-based suppliers. Location choices depend also on the general conditions in the economy such as tax rates, tariffs, exchange rates, productivity levels, energy costs and wage rates. According to the literature the motivation of reshoring has been mainly driven by (a) product quality issues (b) better alignment in supply chain strategies and (c) achievement of higher environmental sustainability (Barbieri et al., 2020). In the context of this paper, the focus is on reshoring in a broader sense including bringing back value creation activities either back to the home country or a neighboring state in Europe. In particular, whether this strategy is useful to reduce interdependencies in the GVC and hence offset potential shortfalls in intermediate products as well as avoid supply chain bottlenecks.

## 4.2 Rationale for reshoring

Even before the Corona crisis backshoring or nearshoring occurred due to several reasons: Eroding cost advantages of emerging economies, underestimation of the full cost of offshoring or the need for production to be close to markets and innovation (De Backer et al., 2016). Moreover, the length and complexity of GVC have exposed companies to large levels of supply risk in the event of adverse shocks such as the current pandemic. However, before the disruption in the course of the Corona crisis, the case for reshoring was often associated with the hope to create value added, bring back employment and investment in advanced economics. But events like the tsunami in Japan in 2011 or the volcano eruption in Iceland in 2012 as well as newly emerging protectionism had already demonstrated the fragility of GVC and led companies to look for new ways of diversifying risks. One study finds that the exogenous shock of the natural disaster in Japan had significant macroeconomic effects (Carvalho et al., 2021). The disruption caused by the Great East Japan Earthquake of 2011 and its aftermaths resulted in almost half a percentage point decline in Japan's real GDP growth in 2012. Moreover, the study shows how this propagated upstream and downstream along supply chains affecting direct and indirect suppliers but also customers of the affected firms. Hence, it emphasizes the crucial role of contagion and possible spillover effects of regional shocks. In contrast, the pandemic has affected GVC and hence caused multiple sources of disruptions.

Against the background of supply shortages and pronounced bottlenecks due to the COVID-19 pandemic as well as a shift in the international order towards geopolitical rivalry between the USA and China, also the recent EU policy debate has highlighted the role of reshoring (Raza et al., 2021). In this economic policy context, reshoring serves a dual role: to increase the security of supply of critical products and to strengthen strategic autonomy of the EU economy. A discussion on the resilience on GVC has acquired new urgency by the outbreak of the pandemic but also because of ongoing threads such as extreme weather events, cyber-attacks, and political conflict. What is more, the quest for technological supremacy has led to ring fencing key technologies such as semiconductors leading to pronounced supply chain bottlenecks. Hence, for critical products with pronounced sourcing bottlenecks the EU might want to take more interventionist policies including reshoring (Raza et al., 2021). Although it is not clear a priori which strategies should be recommended, the decision needs to be based on the qualities of the respective GVC and the level of importance of the respective goods to the security of supply for the public. Furthermore, reshoring is not the only possible strategy to increase resilience as it is outlined in Section 3. There are several further points which make the 'beneficial' view of reshoring questionable as a recommendation for policy makers:

- First, concentrating production locally might not increase resilience since domestic production can be equally affected by a regional or international crisis and still requires the imports of raw materials and commodities (Baldwin/Evenett, 2020). Hence, it might not increase but diminish resilience of supply chains. A key finding from a recent OECD study (2021) is that GVC play an important role in cushioning economic shocks, hence warning against policies aiming at reshoring.
- Second, reshoring of manufacturing will lead to a loss of the efficiency gains through international division of labor. A recent study for Germany (Sachs et al., 2020) estimated the cost related to Corona-induced reduction in globalization to be between 100 and 500 euros per capita. Moreover, particularly small and medium-sized companies would be confronted with higher fixed costs in case policy makers would incentivize reshoring by increasing import tariffs and non-tariffs barriers (Flach, 2021). Smaller companies usually exhibit a lower degree of supplier diversification as well as lower revenues which makes it more

difficult for them to deal with increasing trading costs. These companies often prefer single sourcing strategies to reduce transaction costs and incentivize suppliers to offer price reductions.

- Third, various studies highlight that the welfare losses from cutting off GVC (e.g. through decoupling strategies) dwarf mitigation effects (e.g. reducing contagion of supply shocks in GVC). Using a quantitative model, Eppinger et al. (2021) find that after the introduction of decoupling on the level of GVC (and not on the stage of final goods), the repercussions of foreign supply shocks are reduced on average. However, not only do some countries experience magnified effects due to decoupling, but on average welfare losses from decoupling far exceed any benefits from a lower shock exposure across various scenarios.

Without technological advancements reshoring production to Europe will *ceteris paribus* lead to higher production costs, higher prices and hence lower international competitiveness. Moreover, due to relatively high labor costs as well as the high degree of automatization in high tech industries, it is unlikely that reshoring will lead to high employment gains (except for high skilled workers) in the home country.

Most of the current debate on bringing back production to Europe focuses on the severe supply chain bottlenecks and shortfalls of production when assessing the case for reshoring. However, there is research indicating that particularly in the field of PPE, policy failures caused misalignments between the sourcing strategies of multinational companies and priorities of government officials, thus resulting in costly delays in terms of health outcomes (Gereffi, 2020). Further examples include the reoccurring issues with the slow rollout of vaccines in Germany. Even within the EU member states, national governments vary substantially in their approach on how to trade and cooperate with each other. In the beginning of the pandemic in Spring 2020 19 EU member states unilaterally closed their borders without any coordination on the European level. First, cross-border movements of passengers halted followed by a short-term breakdown in goods transport. The European Commission could only react instead of organizing and guiding a coordinated approach. According to the WTO some 80 countries invoked temporary measures to restrict exports since the outbreak of COVID-19 (WTO, 2021). It is thus possible that reshoring decisions that are taken now are suboptimal since some of the apparent disruptions were not directly caused by supply chain failures but misalignment between policy goals and company strategies to deal with the massive demand for essential products during the pandemic. Furthermore, current policy initiatives might be biased because they rely on an assignment that gives too much “cost” to the challenges recently experienced during the corona crisis. A concept formally called ‘availability bias’ in the psychological literature (Tversky/Kahneman, 1973).

Whether reshoring becomes more prominent in the future also depends on in what ways and to what extent new insights about production shortfalls and malfunctioning supply chains become part of the cost-benefit-analysis of firms (Petersen, 2020). Conventional calculus misses a lot of environmental and social costs associated with offshoring and outsourcing. While energy costs and currency changes are quantifiable, other factors such as disruption or quality risks are difficult to evaluate. Reshoring will also depend on the cost structure of a given industry. In some cases, reshoring appears not as a viable option because of high local costs. However, in the manufacturing sector the share of automatization and robotization has increased reducing labor costs and making this strategy more feasible. Germany in particular has the highest robot density in Europe – fourth place worldwide in 2020 (IFR, 2021). Yet, while it might become more beneficial to reshore and insource production capabilities, raw materials must still be imported. Therefore, production shortfalls can still be caused by bottlenecks in GVC. Market structure and strategic competitiveness are thus crucial factors for reshoring.

### 4.3 Reshoring activities in Europe and Germany before and during the pandemic

Empirical evidence on reshoring activities in Europe are relatively scarce (Kinkel, 2014; Dohse et al., 2020). The European Manufacturing Survey (EMS) provides survey data on the European manufacturing industry. The survey spans across Europe and starts with the year 2001. The latest survey was carried out in 2018 in eleven countries (Fraunhofer Institute for Systems and Innovation Research, 2021). Several studies have analysed this data and found a limited role for backshoring manufacturing activities (Kinkel, 2014; Dachs/Zanker, 2015; Dachs et al., 2019; Kinkel, 2020). However, the studies mainly focus on microeconomic motivations for reshoring and macroeconomic crisis or changing environments are often not considered.

Kinkel (2014) analyses the EMS (including answers from 1,450 to 1,650 German manufacturing companies) between 1997 and 2012 and finds that backshoring production is a relevant phenomenon albeit with a declining trend in frequency. In absolute numbers, between 400 and 700 German companies backshored manufacturing activities per year. However, between 2010 and 2012 this encompassed only 2 percent of all German manufacturing companies. Interestingly, about 80 percent of those location decisions were characterized by a short- to medium-term correction to the initial decision to offshore and only 20 percent of German manufacturing companies backshored because of long term considerations (e.g. a changing local environment). Likewise, reshoring activities were not a major lever to restore industrial competitiveness in high wage countries as initially hoped by policy makers in favor of reshoring. Moreover, it is interesting to note that relearning the once outsourced competences proved to be a difficult process and reclaiming a leading position almost impossible (Kinkel, 2014). This also highlights why firms want to keep their global focus and benefit from offshoring and specialization.

Dachs and Zanker (2015) employ the same data source for European companies and find that between 2010 and 2012 for every backshoring company there were more than three firms that offshored. Moreover, they confirm that backshoring is a rare phenomenon. Only 4 percent of all European manufacturing companies have moved production activities back to their home country in the observed period. Motivations to reshore included foremost quality issues and loss of flexibility but also increasing transportation costs as well as the intention to increase capacity utilisation at home. Backshoring was more frequent among large firms with more than 150 employees as well as in high technology sectors (Dachs/Zanker, 2015). Hence, in the sectors that were particularly affected by supply shortages during the pandemic (e.g. pharmaceuticals or electrical equipment) there might be a higher propensity to offshore and backshore, although offshoring always played a bigger role. Nevertheless, larger companies in these sectors may have the capacities to react with such a strategy when policy measures are taken to foster this development.

Kinkel (2020) analyses reshoring activities of German manufacturing companies between 2012 and 2015 based on the EMS which includes 1,300 German companies. Between 2013 and 2015 roughly 3 percent of German manufacturing companies (roughly 500 to 550 companies per year) backshored parts of their foreign production capacities indicating a slight increase compared to earlier survey results (between 2010 and 2012). Offshoring activities also stayed at a low level of around 9 percent (compared to 8 percent in the last survey of 2012). Hence, the declining trend continued or at least was not significantly reversed. The most important reasons for backshoring decisions included a lack of flexibility in the foreign locations as well as low quality of the goods produced abroad. Often, the management misjudged the total cost of the offshoring project. Whereas EU neighboring countries have been a much more important source for nearshoring

activities of German companies between 2006 and 2012 (around 50 percent of all reshoring cases) the focus shifted to Asian countries (without China, roughly 23 percent) and China (13 percent).

Overall, while these survey results give interesting insights into the why and how reshoring takes place, they indicate that backshoring activities have played a limited role in Europe and in Germany in particular in the past while offshoring strategies still dominate in the location decision. They also shed light on the time dimension of reshoring. Whereas it might be easier to bring back certain activities that have been contracted out to third parties in a foreign location a complete reversal of production offshoring hinges on several factors, it includes significant investment and operating costs and might not lead to an increase of industrial competitiveness as well as increasing employment in the home country.

The evidence on reshoring activities since the outbreak of the pandemic is still very limited and at best suggestive. Most studies still rely on business surveys in trying to answer the question on whether we have already experienced backshoring or nearshoring of manufacturing activities (Barbieri et al., 2020; Abel-Koch/Ullrich, 2020; Bunde, 2021). However, as a trigger point Covid-19 could foster and accelerate the process of reshoring. Barbieri et al. (2020) find some evidence retrieving case study examples from news and press releases. For instance, the French company 'Stil' that manufactures measuring instruments decided to bring back production of glass thermometers due to the unexpected closure of its Chinese suppliers. The Italian company 'Coccatto e Mezzetri Srl' started to produce biodegradable face masks locally after having stopped the production in 2005 because of low-cost competition from China. However, these examples illustrate few cases and rather short-term decisions. In the long-term different types of reallocation initiatives might be triggered if bottlenecks in the supply chains and lockdown induced shortfalls in production persist. To reduce risk exposure and increase supply chain resilience companies and governments might form strategic alliances to permanently backshore production plants. One prominent example is the French group Sanofi and the French Federation of Health Industries who recognized the need to bring back the production of active pharmaceutical ingredients. Hence, reshoring might be boosted additionally by policymakers. Raza et al. (2021) have analyzed reshoring-related policies in three key trading partners of the EU: USA, UK, and Japan. However, they found only a few individual success stories of reshoring that were explicitly promoted by economic policies.

While there is anecdotal and survey-based data suggesting that reshoring has taken place in the past, there is no systematic evidence to suggest that this has had a significant macroeconomic impact on the German economy in the past (Dohse et al., 2020). To identify reshoring of value added at the industry level, a new measure by Gottschlich and Südekum (2020) was developed, which – despite all remaining uncertainty about the informative value of such measures – can be regarded as an attempt to develop a more advanced measure of reshoring at the aggregate level (Dohse et al., 2020). The indicator relates the value added of an industry that is produced domestically and is incorporated into domestic finished industrial products to the imported value added that is produced and then imported by the corresponding industry abroad and is also incorporated into domestic finished industrial products. If this ratio increases over time, this provides indication of possible reshoring in the broader sense. If at the same time the value of the imported value added decreases while the value of the domestic value added increases, this can be seen as a further indication of reshoring. However, looking at different industrial sectors in Germany, the study only finds some evidence for reshoring in the sector “other transport equipment” which is related to the automotive sector. At the same time, the regression analysis relies on annual data between 2000 und 2014 and is thus at best suggestive.



## 5 Corona and the future of global supply chains

Measures of GVC linkages suggest that some countries are more exposed to demand and supply shocks than others. As shown, large economies like Germany (or some industries of the US) with high international integration tend to play a central role as providers and demanders of inputs and intermediate products, e.g. in the automotive or pharmaceutical sector. Hence, it is likely that exogenous shocks through the supply chain network might have a more systemic impact on the structure of these economies. However, in the current debate most of the arguments in favour of reshoring are grounded on the recent supply side disruptions without considering one of the main drivers for companies to offshore in the first place: to be close in proximity to demand in the respective country. In this paper we considered different strategies to increase resilience of GVC and the option of reshoring in particular. We raised the question on whether reshoring presents a viable strategy for firms and what role this has already played in the past before the outbreak of Corona. While reshoring arguably increases resilience in the short term it requires substantial sunk costs such as investments in local production plants and a restructuring of value-added chains.

While the domestic production of products deemed essential (e.g. PPE products) might increase it is also reasonable to assume that offshore production will continue to play a significant role in the future as the survey data on German and European manufacturing companies have indicated. The brief overview of reshoring activities in Europe and Germany has highlighted that reshoring might not enhance the competitive position of the European economy and employment effects are very limited and mostly apply to highly skilled workers in high tech industries. Bringing production back home is rather driven by a short-term correction of the initial offshoring decision as well as by the decision to be in close proximity to the respective consumer market. It is also questionable whether we are currently capable of capturing the true magnitude of reshoring with the available indicators and datasets. To our knowledge, there is no existing dataset comprehensive enough to quantify the macroeconomic impact of reshoring in the German or European industries. At the same time, there are still uncertainties about the 'right' measure of reshoring that quantifies backshoring and nearshoring in a suitable manner. Further research is thus needed to quantify advantages and disadvantages of this strategy adequately in order to enable policy makers to assess viable future strategies.

Even before the outbreak of the Corona virus a phase of "Slowbalisation" (rather than De-Globalisation) could be observed between 2008 and 2019 with world trade as a share of global output decreasing (Antras, 2020). Hence, it depends on both the adjustment process initiated by companies as well as the policy maker reactions to the crisis. It is crucial to differentiate the short-term resolutions (e.g. a quick adjustment of existing GVC to deal with the current crisis) from the long-term effects (e.g. a substantial overhaul of GVC through strategies such as reshoring). In the short term, companies are constantly faced with evaluating the trade-off between efficiency versus resilience to maintain production and prevent future losses of production in the light of fragile supply chain networks. In the long term, however, protectionist measures further restricting international trade as well as subsidizing national production and incentivising reshoring in the context of national industrial policy can have adverse long-lasting effects and hence must be viewed with caution. The Corona crisis has led many countries to fall back on import subsidies and export restrictions on medications and medical devices. At the same time, we observe a dual-speed trade policy (Kolev, 2018) with an urgent need to reform of the WTO framework that can integrate existing structural differences in the respective member states. Otherwise, the multilateral world order remains in an existential crisis (Felbermayr et al., 2019). Reshoring, as an incentivised policy strategy and not a purposeful firm's decision responding to a

changing environment, thus has the potential to create another entry point for protectionist measures rather than dealing with the fragility of GVC revealed by the Corona crisis.

Looking ahead, a major risk for further supply side shocks stem from the effects associated with climate change (Abel-Koch/Ullrich 2020). Negative externalities such as costs for society related to production losses should thus get a higher weight in model-theoretical analysis to determine the optimum degree of international division of labor. While quantifying environmental and social externalities involves complex methodological issues, the cost differentials reported between offshore production and domestic production can be assumed to overstate the real cost differentials when considering externalities. In this context, reshoring of production could be viewed as a contribution to a viable second-best solution to the issue of production sustainability (Baldwin/Evenett, 2020). Still, trade is also a chance for technology transfer and can thus enhance environmental protection in developing countries. Furthermore, it has the potential to enable specialization according to CO<sub>2</sub>-related comparative advantages, if the policy framework is appropriately set (Kolev, 2020a). Nevertheless, understanding and quantifying the ‘hidden costs’ such as environmental costs of long supply chains are crucial. It is noteworthy that the EU was the largest net importer of CO<sub>2</sub> emissions in 2017 (Felbermayr/Peterson, 2020). Thus, it could be asserted that environmental regulations that consider the whole supply chain might favor reshoring (Gray et al., 2013).

Corona has been a truly global crisis, but this presents rather an exception comparing it to the last 50 years. A similar impact might have been the oil price shocks in the beginning of the 1970s. Most countries were also affected by the global financial crisis of 2008/2009. While “Black Swan” events are reoccurring more frequently their specific characteristics remain unknown. Hence, we need a broader perspective integrating the virtues of global networks with local responsiveness. Thereby, it is of utmost importance to distinguish between urgent policy actions during the pandemic and sustainable strategies in the post-crisis era. The vital role of functioning GVC depends on an open rule-based multilateral trading system while allowing limited fall-back options to protectionist measures during a health crisis. Governments can play a role to sketch out practical policy options to foster diversification and resilience in GVC while keeping the benefits from specialization and to ensure supply of essential goods.



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