



The China factor

Economic exposures and security implications in an interdependent world

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Executive summary

- 1** Potential negative impacts of economic dependency on China are increasingly scrutinized. However, conventional trade statistics are a poor guide to bilateral export exposures. For a better analysis of risks, countries need to consider the impacts of their indirect trade with China linked to their role in the product supply chains.
- 2** Value-added decomposition identifies countries most vulnerable to supply chain weaponization. A high level of exposure points to a deeper supply chain embeddedness of an economy. Exposure combined with narrow industrial specialization indicates enhanced vulnerability towards trade weaponization.
- 3** Countries exporting to China have four major types of trade structure: deeply integrated into global supply chains, raw materials suppliers, exporters of high-value-added goods, and countries with both supply chain embeddedness as well as a portion of high-value-added exports (in-betweeners).
- 4** The value-added decomposition of exports shows that final demand from nearby countries is often lower than what bilateral trade statistics indicate. The figure is inflated by trade in intermediate goods, which the difference can in certain cases be up to a multiple of four.
- 5** Risks, vulnerabilities, and dependencies are easier to identify and guard against for countries exporting directly to China as raw materials suppliers than for countries embedded in the supply chain.
- 6** Risk management policies need to recognize the role of the major trading economy - an anchor - within a supply chain, which plays an outsized role in creating exposures and dependencies of the smaller economies within their orbit.
- 7** A prudent approach towards risk management should incorporate aspects of risk mitigation, risk avoidance, and risk acceptance strategies in order to reduce risks without hurting the economy and/or creating a populist backlash.

Introduction

In December 2021, reports about China pressuring German firms to stop using Lithuanian suppliers in the production of their China-bound export goods started to emerge.¹ These actions were aimed at hurting laser and automotive industries, which account for a significant portion of Lithuania's overall exports.² China's move came during a high profile spat with Lithuania³, which had already seen a number of coercive Chinese measures - suspending imports of Lithuanian agricultural products, banning Lithuanian companies from participating in Chinese government procurement, stopping freight train services connecting Vilnius under China's Belt and Road Initiative - it still took many by surprise. Such an open and brazen attempt to inflict economic damage via a country's position in the global supply chain was unprecedented.

Lithuanian exports to China have always been very low, constituting about half a percent of total exports. At the same time, some of China's earlier moves, such as the removal of Lithuania from China's customs system, have already frozen direct imports from Lithuania.⁴ While Lithuanian policymakers had anticipated such retaliation before opting for pursuing a closer cooperation with Taiwan⁵, a coercive measure via supply chains was out of their expectations at that time.

The Lithuanian incident alerted the international community to this new type of supply chain weaponization, which some call "informal secondary sanctions."⁶ Due to their complex and somewhat "hidden" nature within the global supply chains, the potential impact and risks related to these sanctions appear difficult to measure. This is also evident from the fact that despite the recent proliferation of analyses on risks, vulnerabilities, and dependencies vis-a-vis China, informal secondary sanctions rarely make it to these publications.⁷

Economic relations are measured in terms of trade, foreign direct investments, supply chains, and industrial policies. While trade relations often feature prominently in the analyses, they are typically measured through the angle of bilateral trade statistics. This method provides undoubtedly a number of valuable insights, however, it comes with significant limitations. Apart from the conventional issues with data quality and availability, we believe the main issue is structural. Since the onset of globalization, supply chains have proliferated and extended. Firms no longer keep all stages of production under one roof, on the contrary, the production is split between multiple firms, often residing in a number of countries. The material and components needed to produce goods can cross borders multiple times before a final product is ready and reaches the final consumer.

The difference between intermediate and finished goods has a number of ramifications, and distinguishing between the two helps us establish the final demand exposure that would often have been obscured by the trade in intermediate goods. Final demand exposure reveals where the products eventually end up being consumed. In other words, it helps us understand the real dependence on final consumption, which is often indirect, channeled via third countries (as was demonstrated in case of Lithuania's exposure to

China via Germany). This has a number of policy implications, as it changes the level of dependence, risks, and vulnerabilities.

Supply chains not only obscure the real size of trade linkages, but can also augment the impact of other developments: macroeconomic changes, risks, challenges as well as the potential of adversarial action. At the same time, their complex and interdependent nature ties the hands of policymakers and reduces the scale and impact of tools that can be used to govern and mitigate the risks.

The need to mitigate supply chain risks and increase economic resilience has rapidly gained prominence in the policymakers circles. NATO Secretary Jens Stoltenberg's remarks at the Munich Security Conference on 18 February 2023 provide a recent, high-profile and clearly worded example, when he cautioned that "we should continue to trade and engage economically with China. But our economies and our economic interests cannot outweigh our security interests" and urged "not make the same mistakes with China and other authoritarian regimes" as were made in case of building Europe's fossil fuel dependency on Russia.⁸

This analysis will strive to address these issues by measuring what we call final demand exposure of individual states to China. It will do so by overcoming the traditional bilateral accounting of trade relations and applying insights from the methodology used in the analysis of global value chains. This paper's contribution is first and foremost in establishing the need for inclusion of supply chain exposure in policy discussions and measurements of economic dependencies, resilience, and risk estimations. It does so by quantifying the final demand exposure, identifying the countries with increased risks, reviewing the potential policy approaches and recommending those that could most effectively manage supply chain risk, mitigate vulnerabilities, and enhance resilience.

This paper first introduces the notion of measuring supply chain effects on countries' exports. This is followed by analysing the supply chain related exposure of 42 countries vis-a-vis China as the source of final demand. This is followed by introducing risk-handling strategies that both companies and states can pursue, as well as specific policy tools that will help individual countries to better understand the levels of their economic exposure to China.

This paper is a first in a series of deep dives into how states deal with their economic exposure to China and associated vulnerabilities, and how they can improve their resilience. This first paper introduces the concept of supply chain exposures and provides macro-level insights into 42 countries' exposures. Follow-on analyses will provide a more in-depth look into specific cases of the Central European and Baltic states, as well as insights into sectoral dependencies on China.

How to uncover hidden relationships in global value chains

The analyses of trade relationships between countries have traditionally been based on the use of bilateral trade statistics. While this method is easy to measure, simple to understand, and allows quick comparisons across countries, it comes with a significant shortcoming as it does not reflect the effects of the decentralized nature of supply chain involved in the manufacture and global shipping of intermediate process across the production vertical, known as fragmentation of production⁹. Since the onset of globalization in the 1970s, multinational corporations have developed complex global manufacturing supply chains that replaced the previous practice of managing all stages of a manufacturing process in one place.

Vertical specialization - often referred to as “fragmentation of production”¹⁰- resulted in the increase of international trade in intermediate products, which are inputs used in the manufacturing process and not final products). In 2012, the Organization for Economic Cooperation and Development (OECD) estimated that more than half of global trade in goods concerns intermediate goods and more than 70 percent of global trade in services is in intermediate services.¹¹ The United Nations Conference on Trade and Development’s (UNCTAD) 2013 report estimated that 80 percent of global trade is linked to the production network of multinational companies.¹²

In Europe, German firms were at the forefront of vertical specialization. As Hans-Werner Sinn argued, geographical proximity, cultural similarities, and relatively low labour costs (mainly due to excessive wage growth in Germany) have led many German firms to move parts of their production facilities into Central and Eastern European (CEE) countries.¹³ The magnitude of this process has changed the structural relationship between the German and Visegrad Four (V4; i.e. Slovakia, Czechia, Hungary, and Poland) economies to such a degree that the International Monetary Fund identified a “German-Central European supply chain cluster”¹⁴ and Roman Stöllinger’s team from The Vienna Institute of International Studies called it the “central European manufacturing core”.¹⁵ Richard Baldwin called the region “Factory Europe”.¹⁶

High integration of regional supply chains resulted in a steep increase of bilateral trade due to a surge in the trade of intermediate products used in manufacturing. This has created challenges for interpreting official trade statistics as these are generally measured in gross terms, which include both final and intermediate goods. Within cross border supply chains, intermediate goods are imported and re-exported after some processing. This results in inflation of export figures and inaccurate reporting of domestic value added, which is the most important driver of domestic employment and economic growth.¹⁷

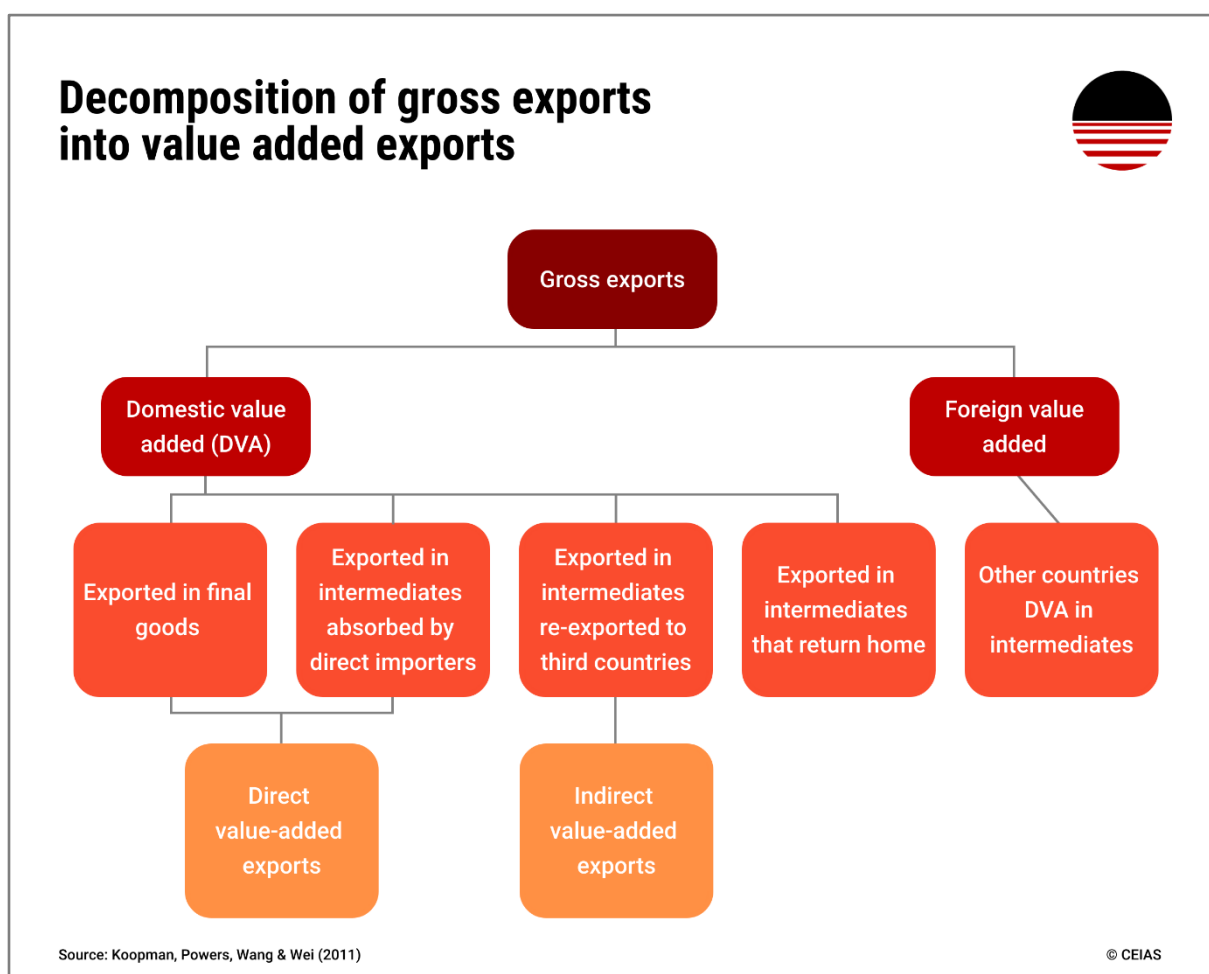
A more accurate measurement of trade flows is by considering the value added by each country in the production of goods and services that are consumed worldwide. This allows for a more precise mapping of bilateral, inter- and intra-regional relationships, participation in global value chains, as well as “global orientation” of industrial activity.¹⁸ Case studies

of global value chains have provided detailed examples of the discrepancy between gross and value-added trade. The most commonly cited study of the Apple iPod found that only \$4 out the \$144 price of Chinese factory assembled iPod constitutes the Chinese value added.¹⁹ Subsequent studies refined the methodology and computed value added mostly within Asian supply chains.²⁰

In the comprehensive model developed by Koopman et al.²¹, gross exports are decomposed into five categories depending on the location of value added and stage of production. These are (1) domestic value added (DVA) in final goods, (2) DVA in intermediate goods not processed for export, (3) DVA in intermediate goods processed for exports, (4) DVA exported to another country that returns back to the original country, and (5) foreign value added (FVA) used as input into exports.

Components (1) to (4) refer to value added generated domestically. Components (1) and (2) measure direct exports, out of the supply chain, while components (3) to (5) indicate supply chain related exports, which can be further divided into upstream (components (3) and (4)) and downstream (component (5)) activities. An analysis based on the decomposition of the components of value added allows for distinguishing between direct exports, supply chain related exports, as well as identifying foreign value added in bilateral trade. This produces new insights and facilitates a more nuanced discussion on the risks, exposures and vulnerabilities embedded in the global supply chains.

Figure 1²²

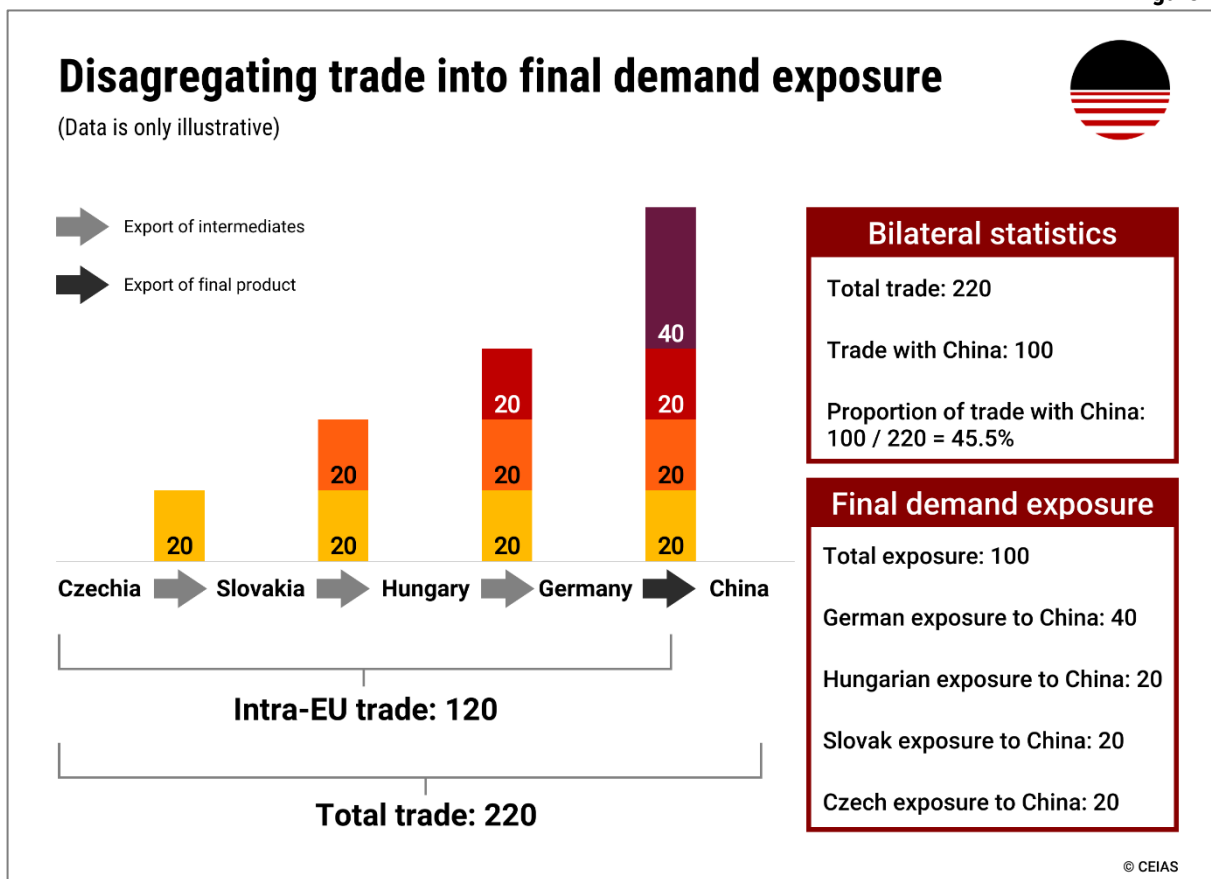


Mapping exposure to China via supply chains

The decomposition of gross exports to value added exports provides a number of insights, especially when contrasted with the data originating from bilateral trade statistics. The most important insight is quantifying and measuring the final demand exposures, which measure the trade relationships between countries based on the final consumption of products. A high proportion of trade in intermediate goods is characteristic for countries with high supply chain embeddedness. However, not all intermediate products are consumed in the immediate export destination, which causes a mismatch with standard bilateral trade statistics. They are often used in further production stages and reexported to third countries. In such cases, the final demand does not originate from the immediate export destination and the exposure must be allocated to the country where the goods are actually consumed.

An example from the European supply chain discussed earlier might help explain this concept. An intermediate product used in the assembly of an automobile is exported from Hungary to Germany. The German car plant uses this product in finalizing a passenger car, which is then exported to a Chinese consumer. In this way, the final demand exposure of the Hungarian export is in China, not in Germany.

Figure 2



Final demand exposure hence traces the indirect trade dependencies, which become more prominent in countries with high supply chain participation. While bilateral trade data shows a high proportion of trade being conducted by countries within a supply chain cluster, final demand exposure measurements indicate that the ultimate source of demand often comes from other places. Countries like the United States or China are not as deeply integrated in supply chains of certain industries, therefore, they record lower levels of trade in intermediates. Yet, when final demand is considered, the proportion of exports to these countries increases significantly. The analysis of dependencies on final demand are useful in identifying trade linkages, exposures on economic performance of third countries, as well as risks, vulnerabilities and challenges related to production within global supply chains.

Final demand exposure on China was calculated for 42 countries, most being OECD members, for which data was collected in the World Input-Output Database (WIOD). Yet, when compared against the bilateral trade statistics from the Direction of Trade Statistics (DOTS) database compiled by the IMF, the results reveal a number of significant differences between the two statistical datasets. Since most of the analyzed countries are embedded in global supply chains, the bilateral trade data points in the DOTS database only consider direct exports to China as they are mostly lower than those measured by the final demand exposure. When indirect exports of value-added via third countries are added, the exposure to China rises. In a number of countries, the increase is higher than 100%, which indicates a strong level of supply chain participation. In some cases the data returns a reading of exposure that is lower than what the bilateral data indicate. This indicates lower supply chain participation and the level of risk of adverse activity being conducted via supply chain decreases. This does not mean, however, that those countries are immune to the risk of Chinese coercion, it is only more likely to be exerted directly rather than via supply chains.

To put things in perspective, it is important to distinguish between a high level of export exposure through supply chains and a high level of overall exports. For example, Australia has a high level of exports to China, which creates dependencies, linkages and vulnerabilities. Nevertheless, when supply chains are considered, Australia's exposure to China is lower, since a number of Australia's exports to China are re-exported, as is explained below. In contrast, Lithuania has a very low proportion of exports to China, yet this number rises significantly when supply chain activity is considered, as a lot of Lithuanian products reach China via third countries. This indicates that Lithuania's exposure to China is underestimated in the bilateral statistics and, as a result, Lithuania is highly vulnerable to potential adverse actions by China via supply chains.

The exposure analysis is accompanied with a temporal comparison, which allows us to look at mid- to long term trends. The data in Figure 4 show an increase in exposure in most countries, which should however not come as a surprise, as it correlated with the increase of exports to China. Nevertheless, the increase has been significant in certain regions, which calls for a higher level of urgency among local policymakers.

A color coded geographical distribution of final demand exposure to China provides a simplified comparison of the analyzed countries. Exposure categories are low (up to 2%), medium (up to 8%), high (up to 15%) and very high (above 15%).²³ Most of Europe and North America are in the medium exposure category, while Asian countries have closer trade links due to geographical proximity. Only a handful of the analyzed countries have a low final demand exposure to China.

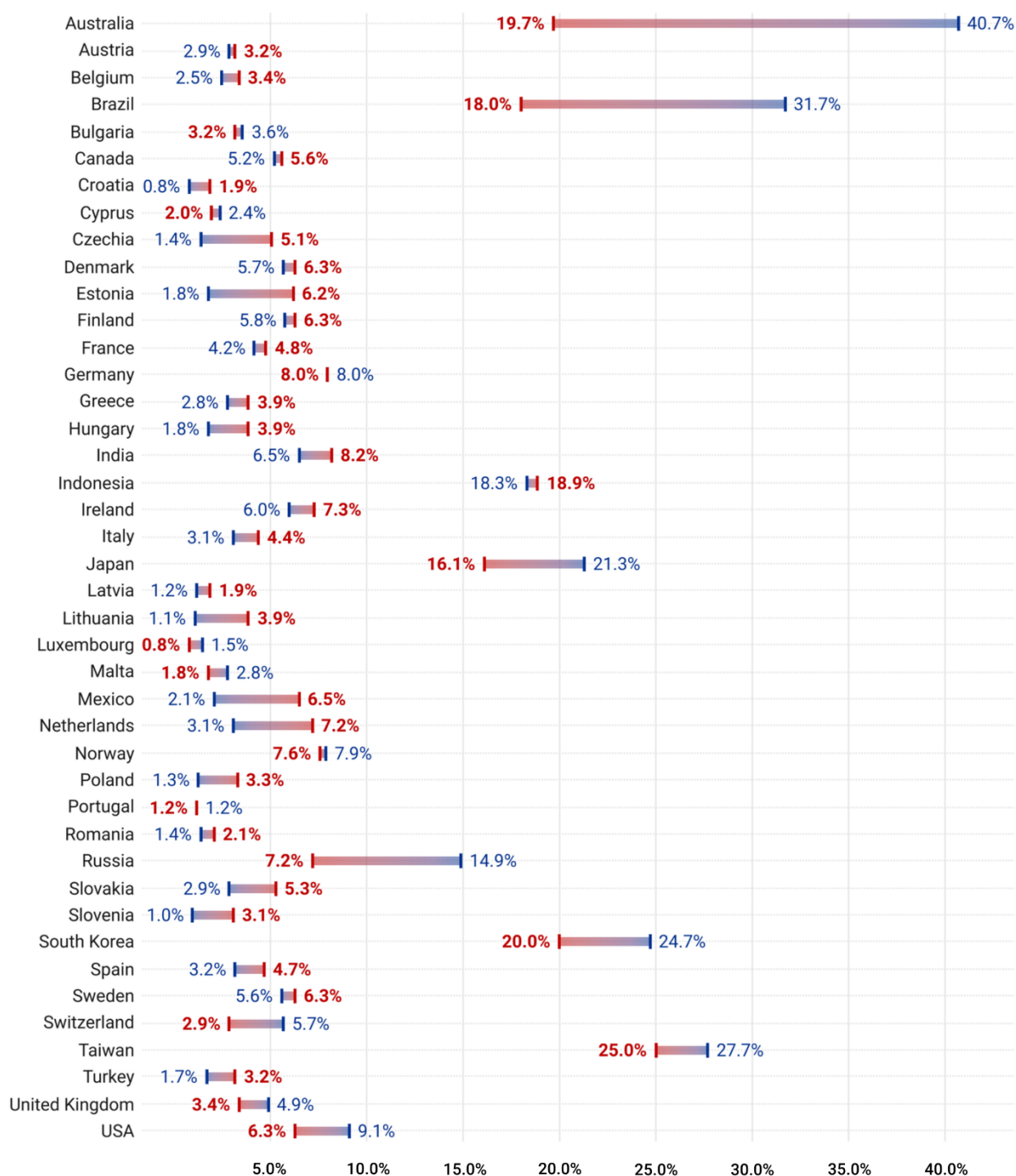
Figure 3



Bilateral trade vs. final demand exposure

■ Bilateral trade with China

■ Final demand exposure towards China

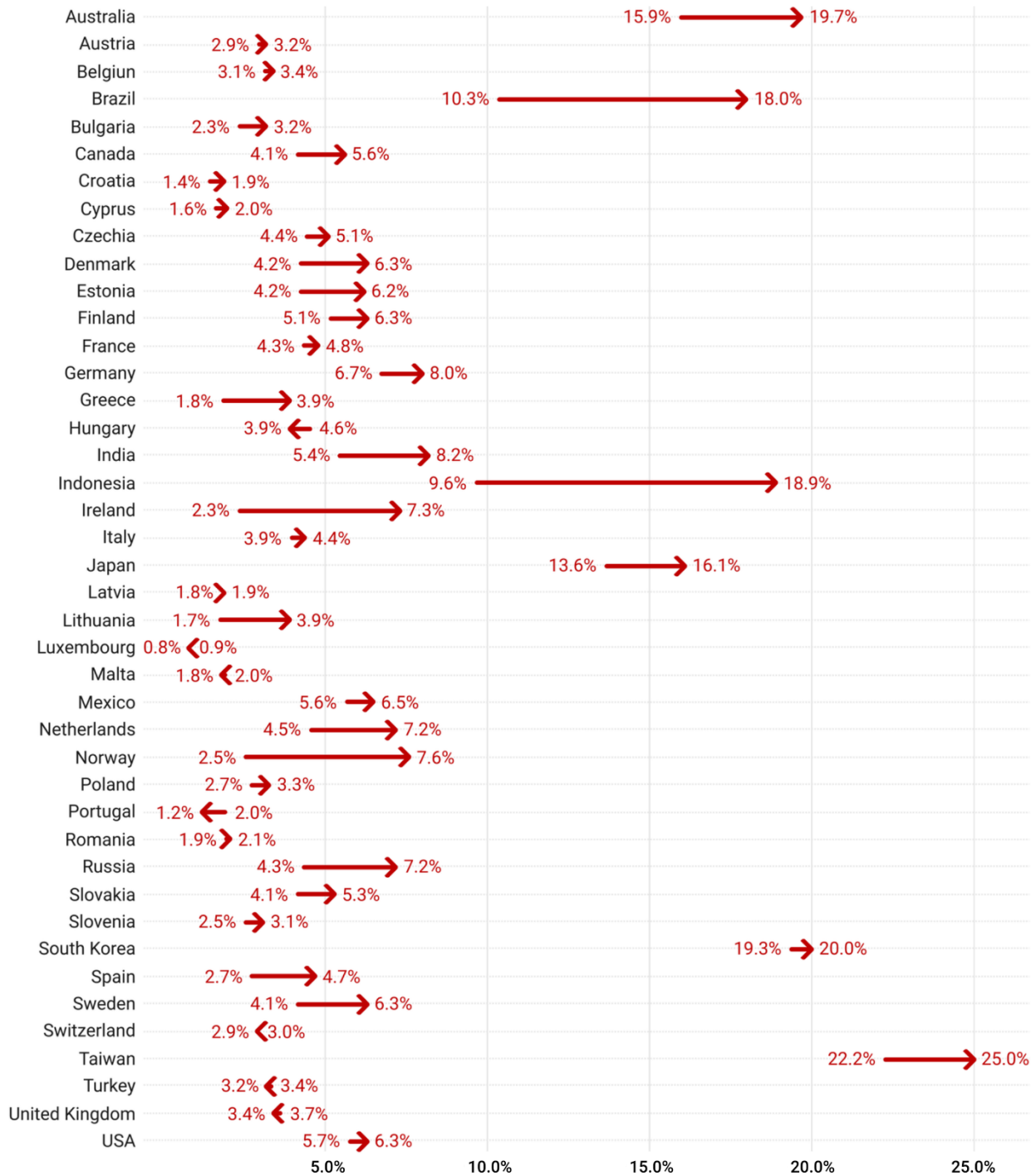


Data: CEIAS calculations

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Figure 4

Final demand exposure to China rose significantly between 2014-2020

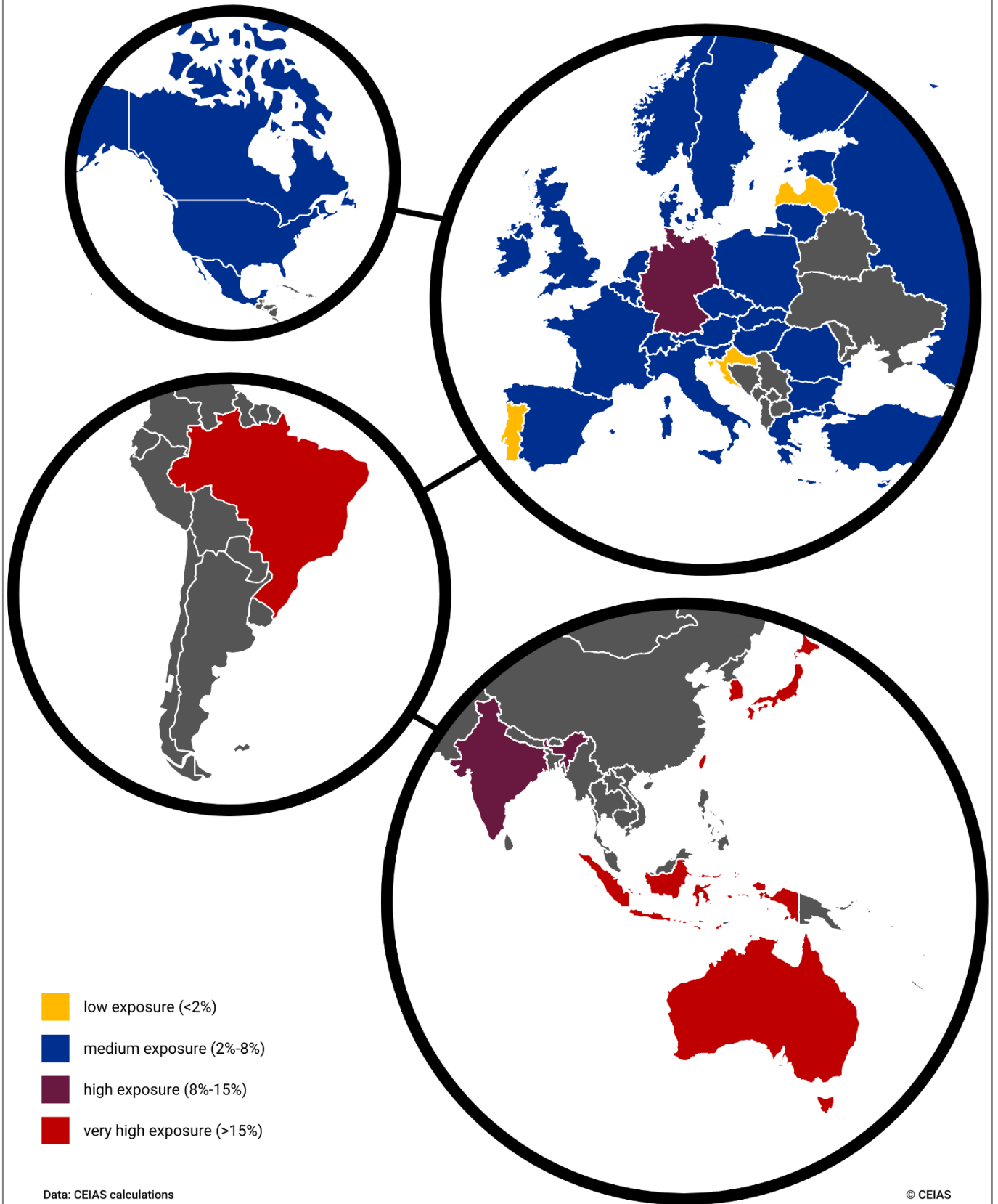


Data: CEIAS calculations

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Figure 5

Geographical distribution of final demand exposure to China



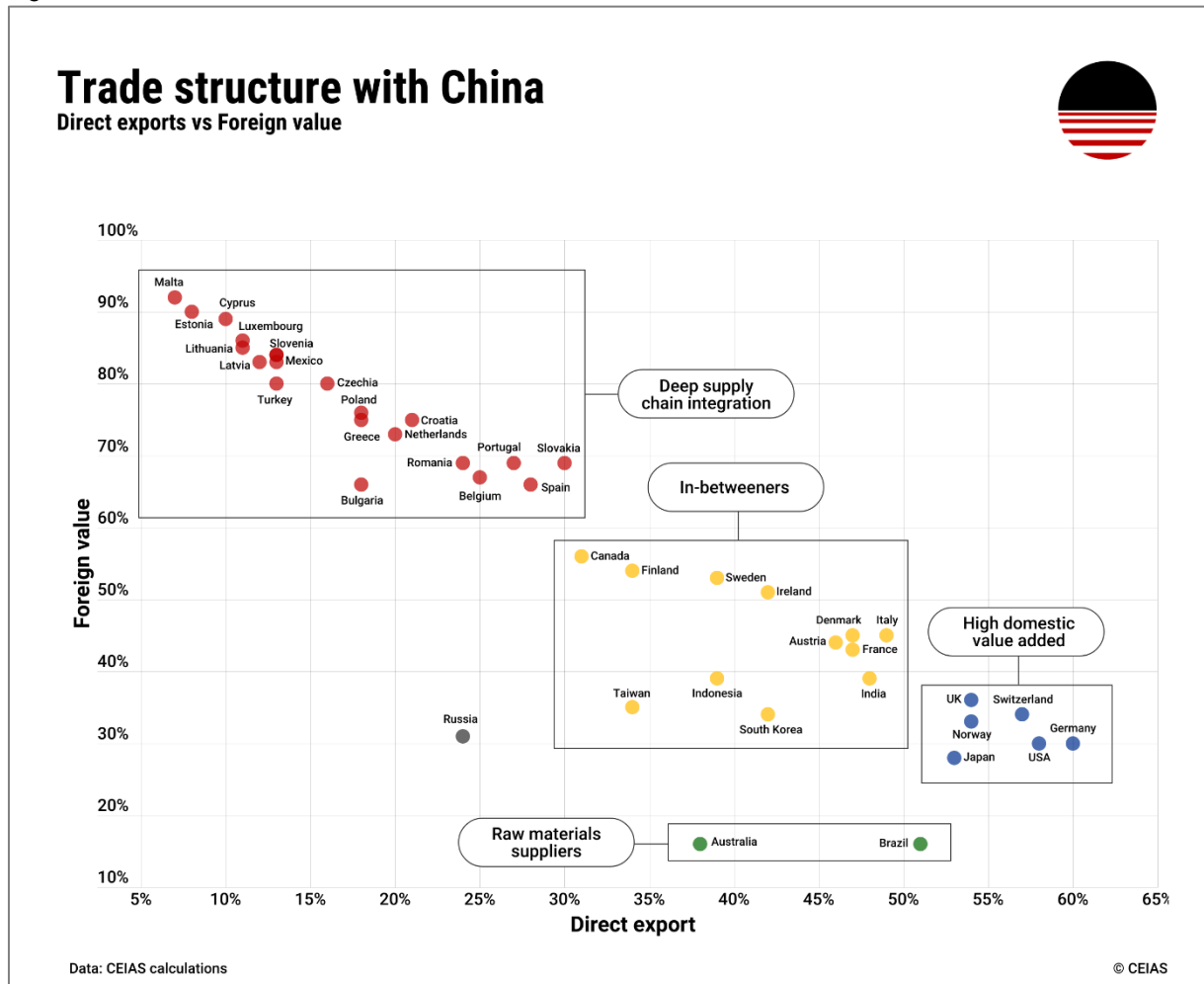
Data: CEIAS calculations

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Structure of value added in trade with China

To make sense of the differences presented in Table 1, the structure of exports to China is broken into five components described earlier. When comparing direct exports to China (components (1) and (2), x-axis) with the proportion of foreign value added (component (5), y-axis) in the exports to China one can derive four general major export relationships countries have with China (Figure 4). Before defining individual relationship types, it is important to note that not every country falls neatly into one category and the categories should be understood as a directional guidance rather than a definitive statement.

Figure 6



Raw materials suppliers, in the bottom part of the chart (Figure 6), are countries that have a relatively high proportion of direct exports, yet their exports contain a low proportion of foreign value added. This indicates that countries such as Australia and Brazil, which fall into this group, have a low level of integration in supply chains that encompass China. A further analysis of their exports by industrial categories shown in Figure 7 reveals that they are indeed primarily raw materials suppliers to China.

The analysis also reveals a relatively high level of reexports, i.e., the products from Australia are exported to China, where they are used in industrial production to create products for further exports. When a Chinese firm produces a final product from a raw material such as iron and exports it abroad, the final demand is then in the third country, and Australia's

exposure to China falls. This does not mean that Australia does not have a high export dependence to China. Though China is not the final consumer, there are nonetheless important policy implications for countries like Australia: in case of China's adverse behaviour, the Pacific country should be in position to find alternate export markets for a significant part of their raw materials.

Figure 7



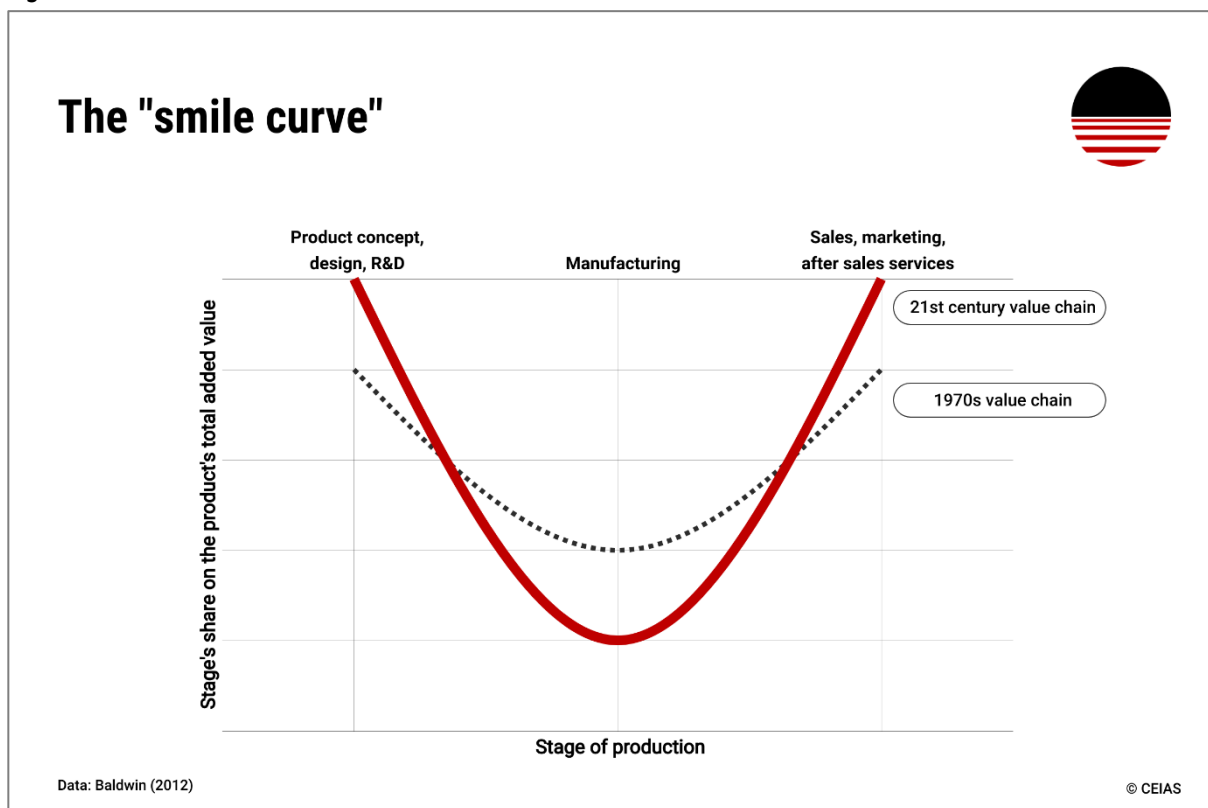
High value added exporters, in the bottom right part of the chart (Figure 6) are countries with a high proportion of direct exports, which mostly contain domestic value added. These countries – Germany, Japan, Switzerland, Norway, the United Kingdom, and the United States – are integrated in the global supply chains, which provide a high amount of domestic value added. This indicates that they concentrate on high value adding activities within the production cycle.

The position of these countries in the global supply chains can be graphically depicted by introducing Richard Baldwin's smile curve. As indicated earlier, vertical integration has been enabled by "unbundling" and subsequently offshoring stages of production²⁴. Baldwin noted that value added tends to shift away from the offshored part of production, creating a "smile curve." Value added is higher at the two ends of the curve, which require more knowledge input. Fabrication, especially final assembly, involves less value creation.

The data for the six countries in the second group indicate that their export oriented industries engage in the higher value added stages of production cycles. Therefore, their exports to China contain a high proportion of domestic value added, while at the same time they contain a certain amount of foreign value added, which was generated in countries engaged in manufacturing stages of the production cycle. Countries in this group should generally have a rather high leverage in their trade relationship with China, as they export state-of-the-art products manufactured by cutting edge technologies. These are products that China strongly demands and is unable to manufacture on its own in desired quality and quantity. China's potential "punitive actions" could easily backfire, as they could harm its own industry.

A caveat is warranted for the case of the United States, where although most of the exports contain domestic value added, the export mix combines agricultural products with high value added goods such as pharmaceutical products.

Figure 8



The **"in-betweeners"** occupy the middle of the chart (Figure 6), where the proportion of direct exports is roughly the same as the proportion of foreign value added in their trade structure with China. The export-oriented industries in these countries appear to be engaged in all stages of a production cycle. While some industries are active mostly in the stage of producing final product and add a higher proportion of domestically-created value added, others are more heavily engaged in the manufacturing of intermediate products for exports. The industries they primarily engage in are automotive, machinery, electronics, and chemicals.

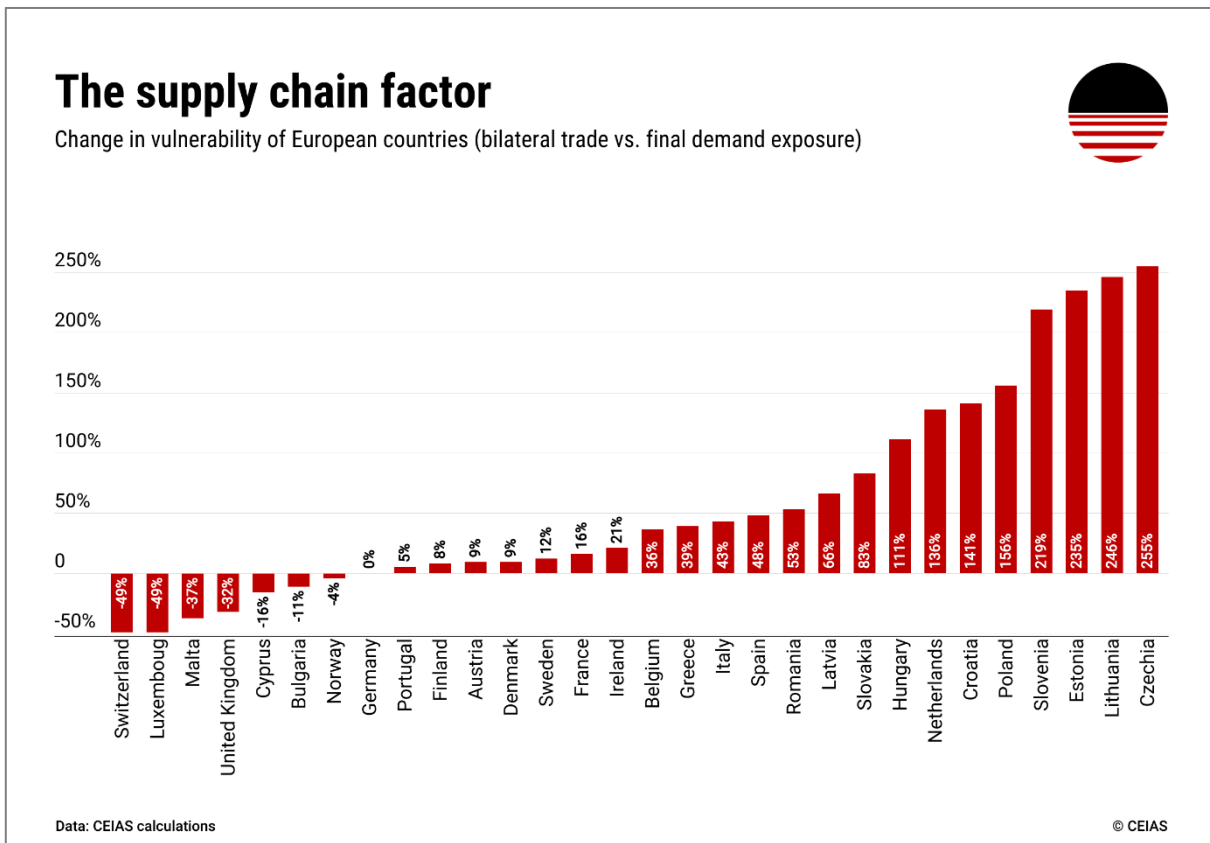
Countries such as France, Italy, Sweden, and Finland produce a relatively high value of intermediate goods for export, yet their industrial firms are also capable of manufacturing a significant amount of high value added goods for export. Therefore, the risk posed by a potentially adverse trading partner is medium, since the supply chain linked part of the industry is at a higher risk level and the final stage production part of the economy is rather resilient in such situations.

Integrated supply chain nations, a large group of countries in the top left corner of the chart (Figure 6), carry a high amount of foreign value added in their exports to China while the proportion of direct exports is small. This indicates a deep embeddedness in supply chains, and within them a focus on the manufacturing stages of the production cycle. These countries also exhibit the highest discrepancy between bilateral trade and final demand exposure data. The industries they primarily engage in are automotive, machinery, electronics, and chemicals.

The supply chain champions are on the one hand benefactors of the open global trade in intermediate goods. The steep increase in global trade until the mid-2010s has enabled a number of countries to pursue economic development by engaging in the trade in intermediates. On the other hand, however, the supply chains linked them to countries and customers far beyond the country's borders and beyond their ability to affect the final importer's behavior via traditional trade policy tools. Supply chains may thus act as an avenue, facilitator, or accelerator of global economic dynamics spreading to and impacting smaller countries. Therefore, the countries in this group are the most exposed to the risks and vulnerabilities, which will be discussed in more detail in the next section.

Figure 9 depicts the distribution of enhanced supply chain vulnerabilities. These are found almost exclusively in Europe, particularly in the central and eastern part of the continent. The factor of exposure versus bilateral trade is the highest in this region, which indicates an often underestimated level of linkages to China. These findings to a large degree align with the geographical scope of the Central European supply chain cluster discussed in previous sections.

Figure 9



Supply chain vulnerabilities

The results of the above analysis indicate that countries with a high level of supply chain participation have significantly higher exposure to China than commonly-used bilateral trade statistics indicate. Since policymakers often evaluate trade relations with other countries based on bilateral trade data, they might underestimate the scope of their countries' linkages to China. A policy analysis based on the presented data should consider three areas of concern: demand dependence, anchor dependence, and the threat of weaponization of the supply chain.

Demand exposure

Increased exposure to the final demand in countries such as China engenders dependence on the economic performance of such countries. When the Chinese economy grows, the corresponding increase in demand for foreign goods will indirectly benefit countries with high exposure to China. However, when the Chinese economy decreases or a domestic production of the affected product is developed, this will partially translate into the decrease in the economic activity in the supply chain, even in those countries that do not have high export volumes to China.

It is therefore important for all these countries to closely monitor the developments in the Chinese economy – both on the macro level as well as the measures, which can impact trade relations, such as industrial policies or tariffs.

Case study: Changes in global car exports

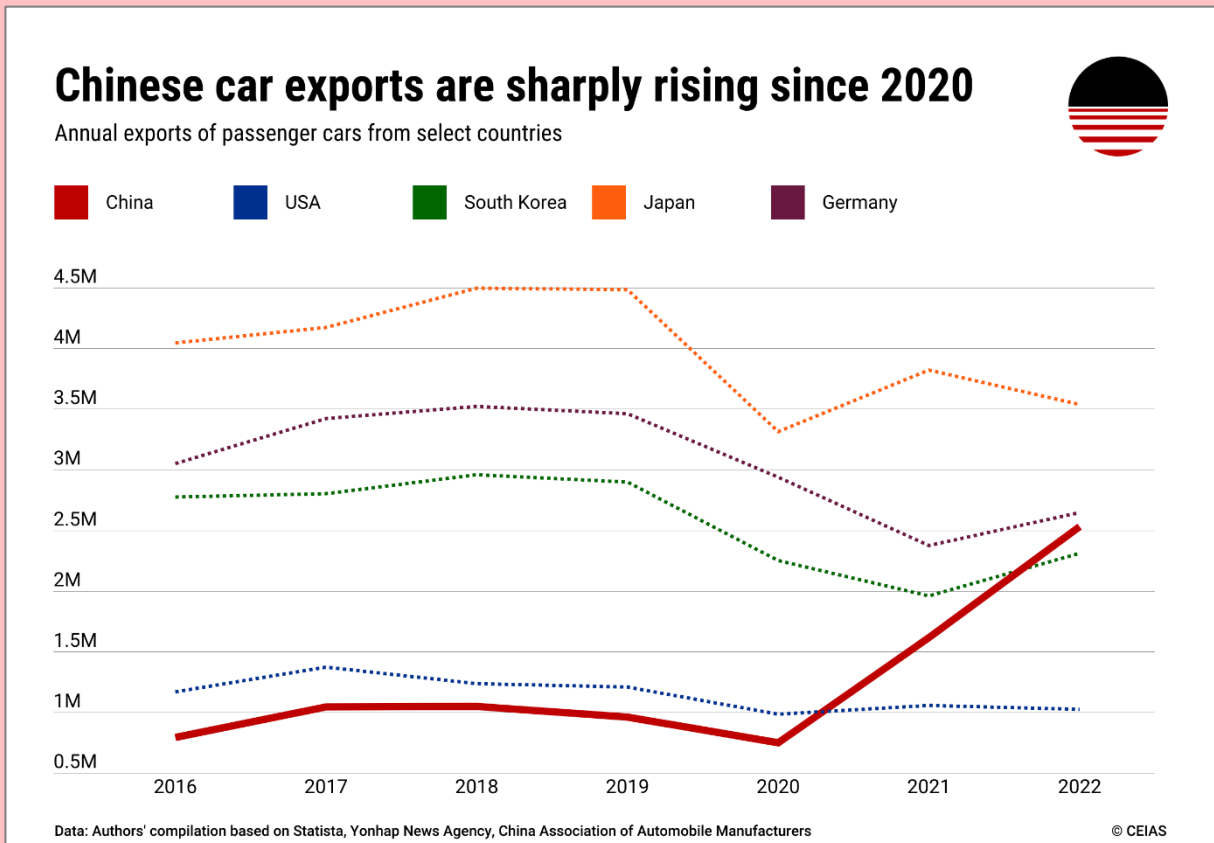
An example might be a change in the Chinese regulations on direct ownership of automotive companies in the country. The requirement to form a joint venture (JV) with a local partner has inhibited the amount of automotive investment by foreign companies, as they feared their local JV partner would acquire their know-how. Therefore, they opted for exporting luxury cars to China instead of producing them in the country.²⁵

However, there have been a number of adjustments to the JV requirement in the last five years. In 2018, the JV restriction was removed for special-purpose vehicles (carrying fire-fighting, ambulance and rescue equipment) and new energy vehicles, while the maximum foreign ownership share was increased to 80% for other types of vehicles. All restrictions were removed in 2022.²⁶

The relaxing of JV requirements has resulted in the increase of car production in China by foreign producers, which has impacted the global trade in vehicles. On the one hand, the Chinese share of global car exports has grown significantly after companies like Tesla started exporting the cars produced in their Chinese plants.²⁷ On the other hand, the share of exports of other countries to China fell due to the decrease of direct exports, which have been partly replaced by domestic production in China.

As a result, the Chinese share of global passenger car exports has grown at a fast pace, while other major car exporting countries, such as Japan and Germany, have seen their share of exports drop.

Figure 10



Anchor dependence

Another important area of concern is the relationship between China and the anchor country within the supply chain, which acts a "hub" of economic activity. Strong links between China and these "hub" economies gives the former considerable leverage over the latter's economies. One example is the role Germany plays in the Central European supply chain cluster. Germany exports more goods than any other EU country to China (in absolute value) and its exports are predominantly supply chain-related. Hence, a number of smaller export-oriented economies within the cluster gain exposure to China through exporting intermediate goods to Germany. The political, economic and trade relationship between Germany and China therefore impacts multiple countries.

For the policymakers in the countries within the supply chain cluster, it is important to follow and understand the characteristics and changes in the relationship between the anchor economy and the final demand economy. Events such as decoupling, trade wars, imposition of tariffs, etc will spill over and profoundly impact economic activities in the whole supply chain. Additionally, it is also necessary to understand to which degree can the anchor provide stability in the supply chain by absorbing shocks, and to what degree would the shocks be passed down the supply chain. Such information can be acquired by analysing the macroeconomic fundamentals as well as economic, foreign and industrial policy of the anchor country. On the opposite end of policy concerns, suppliers of intermediate goods must maintain an open dialogue with the anchor economy, in order to influence the anchor's economic policy vis-a-vis China to better reflect the suppliers' interests.

Case study: Global Financial Crisis Spillover in CEE

The IMF measured the extent of the EU sovereign debt crisis' spillover on the Central European supply chain cluster to examine how economic openness and intermediate goods trade cause greater exposure to economic shocks²⁸. They found that a shock equivalent to the 2008 global financial crisis would be substantially different depending on whether it came from within or outside Germany. German spillover to Central European countries, while relatively small initially, had increased over time in their simulation. This result took into account the greater economic integration owing to supply chain development, albeit limited due to greater exchange in intermediate goods within the supply chain system. The rest of the EU countries were able to absorb this theoretical shock with quite negligible impact.

However, theoretical spillovers from the rest of the world had a much larger impact on Germany and Central European countries largely due to increased global integration. In the case of Central Europe, the shocks from the Eurozone crisis in 2011 were more profound given both a greater economic integration and the trade of intermediate goods dependent on the final demand in the rest of the world relative to Germany. The result is greater exposure to global volatility - including economic events arising in China - for Central European countries. As a whole, greater trade openness has made Germany and Central Europe more exposed to global shock. Considering Germany's large exposure to China and US and close trade ties with Central Europe, economies in the German-Central European supply chain have become more sensitive to global downturns collectively.

Supply chain weaponization

Exposure to the final demand from China also allows it to weaponize the supply chain to extract political or economic concessions from participating countries. Supply chain weaponization has been around for a number of years in multiple forms, from the control of exports of critical resources, such as rare earths, to crippling supply chain by sanctions, exports controls, or tariffs.²⁹ While all of these have been analyzed in great depth, existing analyses predominantly consider first order effects, i.e., the impact on the country or entity that is being directly targeted.

Supply chains enable China to target countries and entities indirectly via a third country. Even if a firm does not directly export to China or has no other business dealings with the country, as long as they are a part of a supply chain that has exposure to China, the Chinese side might still find tools at its disposal to target such firms, or even whole economies.

A higher final demand exposure on the Chinese market gives the Chinese government leverage in the trade relationship. In order to pressure their trading partners via supply chains, the Chinese government can use a number of tools to discriminate against their firms. These can range from a denial of level playing field – higher tariffs, higher certification requirements, denial of access to subsidies, denial of access to infrastructure – or direct pressure on individual companies. In order to more accurately target impacted entities, such measures will likely be covert and discrete in nature. A higher tariff for a particular firm or country might be in breach of WTO rules, which member countries generally prefer to avoid. On the other hand, direct negotiations with individual firms and off-the-record-threats not only escape public scrutiny, but also convey a precise message.

Case study: Lithuania pressured by China via supply chains

This was the case during the spat between Lithuania and China, when the latter pressured German firms to stop using Lithuanian produced intermediate products in their exports to China. While bilateral statistics only show a tiny proportion of exports to China on overall Lithuanian exports, the participation in global supply chain increases exposure, which China chose to exploit by pressuring German firms to stop producing in Lithuania or sourcing from Lithuanian suppliers.³⁰

The diplomatic row started with Lithuania opening a “Taiwan Representative Office” in Vilnius, as Beijing regarded the name “Taiwan” a violation of its One China principle. Apart from its usual economic coercion tactics seen in cases like Australia, Canada or South Korea, Beijing warned that firms that sourced products from Lithuania could also be barred from the China market.³¹ Traditionally, EU countries such as Germany, France and Sweden have relied on Lithuania for their businesses’ supply chains, providing room for Beijing to exert secondary pressure on Vilnius via its supply chain partners.³²

German business entities like the Continental AG, which sourced its automobile parts from Lithuania and for its China-bound vehicle exports, and the German-Baltic Chamber of Commerce began to pressure Vilnius into crafting a “constructive solution”. Though the Federation of German Industries supported a World Trade Organization (WTO) complaint filed by the European Union on behalf of Lithuania, German pressure on Vilnius has disproportionate weight given Lithuania’s economic dependence on Germany.³³

Despite initial effects, such as Vilnius’ offer to change the name back to “Taipei,”³⁴ Beijing’s tactics had failed to bring substantial results as neither Lithuania nor the EU yielded. French president Emmanuel Macron pledged to pursue an anti-coercion instrument during France’s EU presidency, and the EU also supported a WTO case against Beijing. EU member states also rallied behind Lithuania, while 41 MEPs urged EU leaders to devise a united response against Beijing’s coercive measures.³⁵

Managing dependence and exposure risks in global supply chains

When managing risks, entities can pursue four different strategies: risk avoidance, risk mitigation, risk acceptance, or risk transfer. Risk avoidance is a strategy that strives to achieve the reduction of risk by avoiding risky activities altogether. Risk mitigation aims at reducing the severity of risks by pursuing steps that reduce the effects of those risks. Risk acceptance strategy helps accept the potential risks and to prepare contingency plans should those risks materialize. Risk transfer helps avoid exposure to certain risks by transferring them to a third party.

In the context of risks embedded in exports and supply chain activities, the risk management strategies can be identified as “decoupling” (risk avoidance by refraining from trading), “diversifying” (risk mitigation by reducing exposure), and “doubling down” (risk acceptance by continuing or increasing current trade activity). Risk transfers cannot be applied as there is no entity in the international relations capable of underwriting sovereign risk in such scope.³⁶

Each of the risk management strategies comes with upsides and downsides, as well as a toolkit of measures that would need to be applied if policymakers decided to pursue it. Figures 11 & 12 provide a comparative overview of the strategies.

Risk avoidance

Decoupling is a strategy that could be defined as risk avoidance, as it aims at partial to full removal of trade relations. The proponents of decoupling suggest that the most prudent management of risks associated with Chinese malevolent practices is to remove the avenues through which such activities could be conducted. As trade relationships create a high potential for use of coercive or illicit measures, reduction in trade should also result in reduction of risks.

To carry out such a strategy, states can impose export and import bans or controls, strict screening of counterparts, and other measures primarily aimed at discouraging bilateral trade with China.

The upside of this strategy is a significant reduction of risks, owing to both the reduction of avenues through which China could pursue malevolent activities, decrease of Chinese leverage on foreign entities, as well as higher visibility and transparency resulting from enhanced screening.

There are, however, significant downsides linked to this approach, though. Firstly, it results in a loss of revenue for exporters to China and ensuing decrease in production. It also leads to a decrease of imports, which could either result in inflation if the imports from China are cheaper than goods sourced elsewhere, or issues in production, if China produces unique or highly sought after products other countries cannot provide.

A perfect decoupling does not exist in the real world, as all the above-mentioned benefits and downsides would be made evident even by a partial decoupling. The upsides and downsides of decoupling present a tradeoff, in which higher insulation from China begets higher consumer prices and lower economic output. In the case of decoupling to any extent, policymakers must consider the impact to stakeholders - especially their electorates - and how to communicate it.

The recent adoption of the Economic Security Promotion Act in Japan is a good example of the tradeoffs linked to this strategy. The government's policy aims at moving the supply chains of critical materials out of China in order to enhance economic security and resilience. However, it will also lead to a reduction in productivity and trade gains, at least in the short to medium term.³⁷

Risk mitigation

Risk mitigation is most closely related to the notion of diversification. Firms and states would seek to split their exports to a highly diverse portfolio of export partners and source their imports from a variety of suppliers. At the same time, the manufacturing supply chain should not be exposed to a single location; rather, they should be spread across a number of countries in order to prevent concentration.

Policymakers can advance this strategy by supporting their firms in entering new markets via economic diplomacy, as well as discouraging concentration in imports and exports on certain countries by imposing quota, tariffs, and screening mechanisms.

The upside to this strategy is a highly diversified and resilient trading portfolio and supply chain network, which decreases the leverage a single country can have through high market and trading power. Additionally, this strategy does not necessarily assume a significant reduction of trade relationship with China, in which the consumer can enjoy a wider variety of imports while exporters can keep access to the world's second largest export destination.

As for downsides, the entry to new markets is costly and slow and may not suffice to counterbalance the potential loss of Chinese customers due to regulations and restrictions. Relocation (reshoring, onshoring, near-shoring) might be costly and result in a production of more expensive products, which may impact sales and profits of firms.

Risk acceptance

In certain circumstances, entities choose to accept risks as they may experience a net positive impact on their operations. In other words, entities understand the risks related to trading with a partner that may use coercive or illicit measures, but the financial and other benefits of pursuing the trading activity outweighs the risks.

In risk acceptance scenarios, policymakers actively encourage firms to increase their export and import volumes and to link their supply chains to China's. This risk management strategy, however, does not imply that risks should not be measured and managed. The key for this strategy's success is when risks are diligently quantified and assessed, since underestimating the risks could turn the net positive impact into a negative one.

The upsides of this risk management strategy are increase in trade, profits and production in the home country. It also enables access to the suppliers and latest technology of the counterparty. Firms also save money by not needing to relocate their operations elsewhere and by maintaining access to existing infrastructure and ecosystem.

On the other hand, the countries and firms create a higher level of exposure and trade concentration towards individual countries, which increases leverage in the hands of the counterparts. As risks are often hidden or not immediately apparent, their mismeasurement and mismanagement enhance vulnerabilities and expose the entities to potential adversarial actions. Governments in these countries should work with their firms to analyze such risks and implement robust contingency plans.

Figure 11




Risk management strategies in global supply chains (I)

Risk management category	Risk acceptance
Strategy	Double down
Upsides	Access to the Chinese market and consumers Cheaper option as current infrastructure can be utilized
Downsides	Increase in all associated risks
Toolkit	Promote trade with China Keep removing trade barriers
Risk management category	Risk transfer
Strategy	Underwriting
Upsides	Companies can shift risk to the country of origin
Downsides	Countries are unable to fully shift the risks to other countries or international organizations
Toolkit	Underwriting against sovereign risk is only available at the company level via policy banks. However, it results only in shifting risks within the country (from companies to state owned banks) rather than away from the country.

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Figure 12

Risk management strategies in global supply chains (II)



Risk management category	Risk avoidance
Strategy	Decoupling
Upsides	Substantial decrease of risks Deepening trade relationships with friendly countries
Downsides	Loss of revenue in China may lead to decrease in trade and GDP Increase of trade dependence on other countries (de-diversification) New risks emerge in case of substitute demand found in other authoritarian regimes
Toolkit	Controls and outright bans of exports to China Discourage supply chain linkages with China Encourage trade with other countries via economic diplomacy, trade agreements, deepening cooperation
Risk management category	Risk mitigation
Strategy	Diversification
Upsides	Hedging against the risks
Downsides	Risks will be reduced but remain Exports to China can only be partially replaced/relocated
Toolkit	Monitor concentration and trade dependence Encourage trade with other countries via economic diplomacy, trade agreements, deepening cooperation

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Managing supply chain risks with policy tools

Findings in this research can be incorporated into policymakers' toolkits in a number of ways. There is an increasing list of policy instruments that can be used in navigating and managing trade and investment relations with other countries. The policy recommendations listed below are country-agnostic and can be used to steer economic relationships between any two countries. As the focus of this research is China, we do illustrate individual recommendations on the Chinese example.

It is important to note that while all of the recommended actions can be conducted individually, the desired outcome will be best achieved by a simultaneous use of a combination of policy tools.

Employ exposure approach in the audit of economic relations with China

Economic relations are generally scrutinized from the perspective of bilateral trade and direct investment. However, as the results of this analysis have shown, countries integrated within manufacturing supply chains are likely to have a significant indirect exposure to China. This enhances their sensitivity to economic developments in China - which can be both positive and negative - and increases vulnerability towards potential adversarial actions by the Chinese side.

Mapping exposure - quantifying, tracking indirect relationships, identifying impacted industries and firms - is the necessary first step in the process. This should be followed by defining various scenarios and options, accompanied by sensitivity analysis and, optionally, stress testing. Evaluation of results and the subsequent choice of preferred policy strategy will lead to the selection of appropriate policy toolkit.

Use net-benefit analysis in scenario analysis

The analyses of economic relations often take extreme positions, as they overemphasize either the related benefits or risks. However, a comprehensive analysis must consider both risks and benefits of trade, outward and inward investment in China. As discussed in more detail in section 4, there are multiple options of calibrating economic relations with China and each country should pursue an approach that suits their particular position after weighing benefits over possible risks

Additionally, any analysis must have a global scope, as relocation of supply chains, investments or trade activities away from China may result in the creation of new dependencies elsewhere.

Consider sectoral and geographic specifics

A one-size-fits-all approach is not advisable in navigating the economic relations with China. Countries have differing economic structures and geographic positions that need to be taken into account. Those located in China's vicinity will tend to have a higher exposure in terms of trade, supply chains and investments than those more distant. Similarly, the dominant industries in some countries may find it necessary to export to China if it happens to be the world's largest market for certain products. There might also be a necessity to procure products, services and commodities from China if they are unavailable elsewhere, such as rare earths, or if other countries cannot supply them in comparable quality or quantity, such as solar panels. In such situations, the ability to decouple is structurally limited.

Strengthen public-private dialogue on supply chain risks

The relevant government agencies need to communicate regularly with the largest firms engaged in foreign trade. Private companies tend to be reluctant to share information about their exposures and vulnerabilities as this constitutes part of their trade secrets. Nevertheless, from a risk management perspective there is a need to find a balance between trade secrets and economic security.

To this end, ministries can facilitate the establishment of industry fora, in which participants could freely discuss and exchange information on the latest trends in economic security and stability. The governmental organizations may use such fora to stress the importance of supply chain resilience and educate the firms about the latest developments and best practices. The governments may also establish points of contact, through which firm representatives could relay a rapid alert to the authorities. Additionally, the governments may identify critical industries and materials, within which they may make disclosure of supply chain issues and exposures mandatory.

Weaponized transparency

Increasing transparency is a key measure to manage and mitigate many security risks posed by economic relations with authoritarian regimes. Improved transparency of economic relations can act as a deterrent against potential abuse of existing links, thereby contributing to the overall security of maintaining trade relations with China and other authoritarian regimes.

The advantage of these measures is that they are country agnostic and cannot be seen as a policy tool specially applied against a certain country. Furthermore, thanks to such measures, policymakers will have the ability to aggregate data on a country level and actively monitor concentrations and exposures.

Incorporate the disclosure of authoritarian exposures in ESG reporting

Utilizing the “weaponized transparency” approach, economic exposures to authoritarian regimes could be disclosed as part of corporate ESG reporting. These figures can include for instance the percentage of revenue generated in authoritarian countries, the location of supply chains in countries with questionable human rights records, or the share of ultimate beneficial owners residing in authoritarian countries. This information would complement other disclosures made under the G(overnance) pillar of ESG reports.

Such disclosures would enhance transparency of dealing with authoritarian regimes and governments could aggregate individual corporate disclosures in order to gain a full picture of their countries’ economic relations, dependencies and vulnerabilities. However, this is a new regulatory field and the methodology is not well defined. There might be inconsistencies, discrepancies and frequent changes in methodology, nevertheless, the field is expected to mature and stabilize with more experience.

Promote whistleblower protection on disclosures of coercive action

Companies engaged in business relations with authoritarian states should broaden the scope of their internal compliance programs to cover the potential impact of corrosive capital. Furthermore, they should promote the corporate culture of transparency, corporate social responsibility, and accountability among their employees to encourage them to voice grievances and to blow the whistle when they come across illegitimate and/or illegal behavior connected to corrosive capital and authoritarian coercion.

Formulate contingency plans for high exposure entities

Entities with exposure towards other countries, in particular those governed by authoritarian regimes, should have contingency plans ready for a sudden deterioration of political and economic relations with the counterparty. As the Lithuanian example demonstrates, such changes can be abrupt and inflict significant damage.

Governments could actively encourage creation of contingency plans, institute their mandatory disclosure for larger companies, as well as offer guidance to the firms in formulating and implementing such plans.

Apply long term view in risk management

While it is prudent to emphasise currently present risks and formulate corresponding policies, stakeholders should also consider long term implications of their economic decisions, policy choices and risk management tools. As the example of the changes in automotive exports illustrates, a slow change might go unnoticed yet overtime amount to a creation of considerable vulnerabilities. A long term view also enables a more proactive approach, as governments can shape developments of economic relations. Absent a long term view, the policymakers are typically in a reactive position, proposing solutions to remediate immediate issues.

Avoid authoritarian-for-authoritarian swaps

Countries that actively encourage reduction of economic ties to certain authoritarian regimes need to consider the new structure of their total trade and investment balance. Some suppliers may relocate from one authoritarian country to another, or that a domestic firm will export more to another authoritarian country. Such instances to a certain degree defy the primary purpose of reconfiguration of economic relationships. To avoid such occurrences, countries must apply a global view of their economic relations and closely monitor new developments.

Endnotes

- 1 O'Donnell, John & Sytas, Andrius. 2021. "Exclusive: Lithuania braces for China-led corporate boycott". *Reuters*. December 9, 2021
- 2 Deveikis, Jonas .2022. "China sanctions vs Taiwan investments – Lithuania's central bank weighs economic impact." *LRT*. January 21, 2022
- 3 Lau, Stuart .2021. "How little Lithuania dragged the EU into its showdown with China". *Politico*. October 6, 2021
- 4 Sytas, A. 2021. "Lithuania says Chinese customs is blocking its exports". *Reuters*. December 3, 2021
- 5 Lau, Stuart .2021. "How little Lithuania dragged the EU into its showdown with China". *Politico*. October 6, 2021
- 6 Reynolds, Matthew. & Goodman, Matthew P. 2022. "China's Economic Coercion: Lessons from Lithuania". *CSIS*. May 6, 2022
- 7 Some of the recent examples include the European Commission. "China 2.0 - Status and Foresight of EU-China Trade, Investment and Technological Race." and the European Parliament. "Single market emergency instrument: Protecting the single market in future crises."
- 8 Stoltenberg, Jens. 2023. "Beyond the Alliance: Partnering up for European Security." Opening remarks at the Munich Security Conference session. *NATO*. February 18, 2023
- 9 Arndt, Sven. W. & Kierzkowski, Henryk. 2001. "Fragmentation: New Production Patterns in the World Economy". Oxford: Oxford University Press.
- 10 There is an extensive terminology describing this phenomenon. This paper uses the term "vertical specialization", as used in a pioneering work by Hummels, David, Ishii, Jin & Yi, Kei-Mu Yi. 2001. The nature and growth of vertical specialization in world trade. *Journal of international Economics*, 54(1), 75-96
- 11 Organisation for Economic Co-operation and Development (OECD). 2012. "Mapping Global Value Chains." TAD/TC/WP/RD(2012)9
- 12 United Nations Conference on Trade and Development (UNCTAD). 2013. "Global Value Chains: Investment and Trade for Development. World investment report."
- 13 Sinn, Hans Werner. 2006. "The pathological export boom and the bazaar effect: how to solve the German puzzle". *The World Economy*. 29(9), 1157-1175. September
- 14 International Monetary Fund (IMF). 2013. "German-Central European Supply Chain-Cluster Report". Country Report No. 13/263. August

- 15 Stehrer, Robert & Stöllinger, Roman. 2015. "The Central European Manufacturing Core: What is Driving Regional Production Sharing?" *FIW Research Reports*. 2014/15 N° 02. February
- 16 Baldwin, Richard, 2012. "Global supply chains: Why they emerged, why they matter, and where they are going." *CEPR Discussion Papers 9103*, C.E.P.R. Discussion Papers.
- 17 Breda, Emanuele, Cappariello, Rita, & Zizza, Roberta. 2008. "Vertical specialisation in Europe: evidence from the import content of exports". In *Firms' Objectives and Internal Organisation in a Global Economy*. 189-212. Springer; Hummels, David, Ishii, Jin & Yi, Kei-Mu Yi. 2001. "The nature and growth of vertical specialization in world trade". *Journal of International Economics*. 54(1). 75-96
- 18 Marcolin, Luca, Miroudot, Sébastien & Squicciarini, Mariagrazia. 2016. "GVCs, jobs and routine content of occupations". *OECD Trade Policy Papers*. 187
- 19 Dedrick, Jason, Kraemer, Kennet & Linden, Greg. 2010. "Who profits from innovation in global value chains?: a study of the iPod and notebook PCs". *Industrial and corporate change*, 19(1), 81-116. Oxford University Press
- 20 Koopman, Robert, Wang, Zhi & Wei, Shang-Jin. 2008. "How much of Chinese exports is really made in China? Assessing domestic value-added when processing trade is pervasive". *National Bureau of Economic Research*. June; Wang, Zhi, Powers, William & Wei, Shang-Jun. 2009. "Value chains in East Asian production networks: An international input-output model based analysis". *United States International Trade Commission Working Paper*. 10 October.
- 21 Koopman, Robert, Powers, William, Wang, Zhi & Wei, Shang-Jin. 2011. "Give credit where credit is due: Tracing value added in global production chains". *National Bureau of Economic Research*. December
- 22 Koopman, Robert, Powers, William, Wang, Zhi & Wei, Shang-Jin. 2011. "Give credit where credit is due: Tracing value added in global production chains". *National Bureau of Economic Research*. December
- 23 While the categories of 2%, 8% and 15% do not follow exact science, these figures relate to widely used principles in finance such as the 2% rule (Investopedia. "2% Rule: Definition as Investing Strategy, With Examples") and 8% rule (Stoddard, Scott. 2012. "The 8% Sell Rule Keeps Losses Small, Shields Capital". *Investor's Business Daily*. November 2, 2012).
- 24 Baldwin, Richard, 2012. "Global supply chains: Why they emerged, why they matter, and where they are going." *CEPR Discussion Papers 9103*, C.E.P.R. Discussion Papers.
- 25 Taylor, Michael. 2021. "Foreign Investment Walls Come Down On Auto Fortress China." *Forbes*. December 27, 2021; Setser, Brad W. 2017. "Auto Trade with China". *Council on Foreign Relations*. April 3, 2017
- 26 Schaub, Mark & Zhao, Atticus. 2020. "The impact of China removal of foreign ownership restrictions in auto sector." *King & Wood Mallesons*. April 14, 2020; Wang, Tianyu. 2021. "China to allow full foreign ownership in passenger vehicle manufacturing." *CGTN*. December 28, 2021

- 27 It is important to note that Chinese exports grew mostly due to the increase in the production of electric vehicles by domestic manufacturers, however, this is not related to the regulatory change in question.
- 28 International Monetary Fund (IMF). 2013. "German-Central European Supply Chain-Cluster Report." Country Report No. 13/263. August
- 29 Naval Postgraduate School. 2022. "Excerpt from the proceedings of the nineteenth annual acquisition research symposium." SYM-AM-22-043. Department of Defense Management; Glaser, Bonnie S. 2021. "How China Uses Economic Coercion to Silence Critics and Achieve its Political Aims Globally." Statement before the Congressional-Executive Commission on China. December 7, 2021; Chen, Duanjie. 2019. "Countering China's Economic Coercion: No fear but resolve, no illusion but diversification." MacDonald-Laurier Institute policy paper. September
- 30 Macikenaite, Vida. 2021. "China Pulls the Economic Coercion Card Against Lithuania." *CHOICE (China Observers in Central and Eastern Europe)*. December 20, 2021
- 31 Reynolds, Matthew. & Goodman, Matthew P. 2022. "China's Economic Coercion: Lessons from Lithuania." CSIS. May 6, 2022
- 32 Lau, Stuart & Moens, Barbara. 2021. "China's trade attack on Lithuania exposes EU's powerlessness". *Politico*. December 16, 2021
- 33 Reynolds, Matthew. & Goodman, Matthew P. 2022. "China's Economic Coercion: Lessons from Lithuania". CSIS. May 6, 2022
- 34 Sytas, A. 2022. "Lithuania considers modifying Taiwan representation name to defuse row with China". *Reuters*. January 26, 2022
- 35 Mercator Institute for China Studies (MERICS). 2022. "French EU presidency + Transatlantic coordination on China + Lithuania". MERICS analysis brief. January 20, 2022
- 36 Multilateral organizations can help mitigate only a part of the risk.
- 37 International Institute for Strategic Studies, 2022. Japan's Economic Security Promotion Act and the implications for businesses. Volume 28, December 2022.

Annex: Methodology

The decomposition of gross export followed the methodology developed by Koopman et al.¹ and applied by the IMF.² The analysis utilized the 2014 data from the World Input-Output Database (WIOD),³ which consists of 44 countries (43 and the Rest of the World) and 56 industries.

The decomposition equation (28) in Koopman et al (2010) was used to decompose the gross exports of an origin country to a destination country based on final demand in the destination country:

$$E_{i*} = V_i B_{ii} \sum_{j \neq i} Y_{ij} + V_i B_{ii} \sum_{j \neq i} \sum_{k \neq i, j} A_{ij} X_{jk} + V_i B_{ii} \sum_{j \neq i} A_{ij} X_{ji} + FV_i$$

In which

$$FV_i = \sum_{j \neq i} V_j B_{ji} E_{i*}$$

where V_i is a $1 \times n$ vector, B_{ii} , A_{ij} are $n \times n$ matrices and Y_{ij} , X_{ij} are $n \times 1$ vectors. Thus, the result of matrix multiplication, E_{i*} , is a 1×1 matrix, a scalar number. This equation allows to decompose the gross exports into the below categories:

- Domestic value-added embodied in exports of final goods and services absorbed by the direct importer
- Domestic value-added embodied in exports of intermediate inputs used by the direct importer to produce its domestically needed products
- Domestic value-added embedded in intermediate exports used by the direct importer to produce goods for third countries ('indirect value-added exports')
- Domestic value-added embodied in intermediate exports used by the direct importer to produce goods shipped back to source ('reflected domestic value added')
- Value-added from foreign countries embodied in gross exports ('foreign value added used in exports')

However, since the result of the equation above is only a single number, additional detail per country and per industry is needed. Let's fix ij to get country i 's export to country j . We then have

$$E_{ij} = V_i B_{ii} Y_{ij} + V_i B_{ii} A_{ij} X_{ij} + V_i B_{ii} \sum_{k \neq i, j} A_{ij} X_{jk} + V_i B_{ii} A_{ij} X_{ji} + FV_{ij}$$

with

$$FV_{ij} = V_j B_{ji} E_{i*}$$

E_{i*} can be also simply calculated as

$$E_{i*} = \sum_{j \neq i} (A_{ij} X_j + Y_{ij})$$

as seen in equation (3) in the IMF Report,⁴ which is summed across all but the origin country. Result of this equation is a $n \times 1$ vector with industry detail on the side of the origin country.

The diagonalization equation (11) from Koopman et al.⁵ was adopted to calculate the sector level detail. Instead of V_i , we use $\text{diag}(V_i)$ for sector level detail on the side of the origin country, meaning

$$\text{diag}(V_i) = \begin{pmatrix} v_{1,i} & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & v_{n,i} \end{pmatrix}.$$

Similarly, we use $\text{diag}(X_{ij})$, $\text{diag}(Y_{ij})$ or $\text{diag}(E_{i*})$ for some i, j instead of X_{ij} , Y_{ij} or E_{ij} respectively for the destination country. With this adjustment we get exports from country i to country j on the sector/industry level basis. The result was a 44×44 matrix, when only country level detail is needed, divided into five decomposition categories. For a more detailed result we have chosen a subset of the whole industry level detail matrix (dimensions are 2464×2464).

Methodology endnotes:

- ¹ Koopman, Robert, Powers, William, Wang, Zhi & Wei, Shang-Jin. 2011. ["Give credit where credit is due: Tracing value added in global production chains"](#). *National Bureau of Economic Research*.
- ² International Monetary Fund (IMF). 2013. ["German-Central European Supply Chain-Cluster Report"](#). Country Report No. 13/263.
- ³ Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R. and de Vries, G. J. (2015), "An Illustrated User Guide to the World Input–Output Database: the Case of Global Automotive Production", *Review of International Economics*, 23: 575–605
- ⁴ International Monetary Fund (IMF). 2013. ["German-Central European Supply Chain-Cluster Report"](#). Country Report No. 13/263.
- ⁵ Koopman, Robert, Powers, William, Wang, Zhi & Wei, Shang-Jin. 2011. ["Give credit where credit is due: Tracing value added in global production chains"](#). *National Bureau of Economic Research*.

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