

Resilience of global supply chains

Challenges and solutions

SUMMARY

The growing importance of global supply chains has fundamentally changed the way the global economy and goods manufacturing are organised. While trade conducted through global supply chains has fallen somewhat as a share of total trade since the 2008-2010 global financial and economic crisis, more than two-thirds of international trade still involves transactions made possible by such chains. The EU is profoundly involved in these production chains, more so than most other countries, and significantly more than both the United States and China.

The pandemic disrupted many supply chains at its outbreak, and the subsequent economic recovery, the strongest on record, led to enormous further strain on the global supply system; surging demand, coupled with shortages of workers, ships, containers, air cargo space and clogged ports, created a 'perfect storm'. Supply chain bottlenecks are starting to weigh on the economic recovery, slowing growth and leading to delays, holding back the manufacturing sector and fuelling inflation.

The EU had recognised its strategic dependence on some foreign inputs even before the pandemic, and had started to seek ways to increase its autonomy – a quest which has been accelerated by the impact of the coronavirus. To improve the resilience of supply chains, the EU is applying a policy mix that aims to increase domestic capacity, diversify suppliers and support the multilateral rules-based trade environment; it has also enhanced its cooperation with the US on supply chains. Other like-minded countries apply a similar policy mix, focusing on supporting reshoring or nearshoring.

While this situation is not ideal, global supply chains are hard to reconfigure, and increasing their resilience is a time-consuming and costly process. Moreover, most experts predict that reshoring or nearshoring will be of limited importance. With time, though, resilience may improve through international cooperation, diversification and the accelerated uptake of digital technologies.



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Significance and dynamics of global supply chains

The emergence of global supply chains has fundamentally changed [the way](#) we produce goods. In the modern economy, most final products contain foreign and domestic inputs, added at different stages of production and delivered through international supply networks that go beyond traditional business concepts. As the [International Labour Organization](#) has observed, these chains form 'complex, diverse, fragmented, dynamic and evolving organizational structures'. For example, the [Apple](#) 2020 supplier list comprises 204 enterprises spread over 43 countries and 6 continents.

This internationalisation of supply chains is both the enabler and the effect of the globalised economy. It was made possible due to myriad [factors](#) such as dismantling trade barriers, spreading technological advances, liberalising investment and the [rise of Asia](#) as a centre of global production, particularly since [China's accession](#) to the WTO in 2001. While driven mainly by multinational enterprises ([MNEs](#)), global supply chains also involve a multitude of small and medium-sized enterprises ([SMEs](#)).

According to the [World Bank](#), supply chain growth occurred mainly in machinery, electronics and transportation, and in the regions specialising in these sectors: Europe, North America and east Asia. While most countries in these regions participate in complex global value chains, engaging in advanced manufacturing and innovative activities, many countries in Africa, Latin America and central Asia still supply commodities and intermediate goods for further processing in other economies (see Figure 1). Most global supply chains span North America, the EU and [Asia](#).

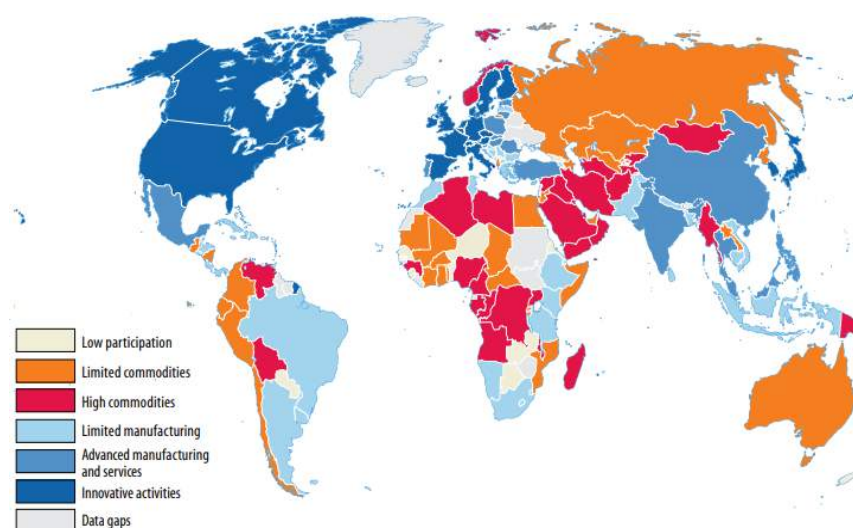
The [overall share](#) of supply chain trade in total world trade has been rising robustly since the 1990s, but it seems to have started stagnating or even declining after the 2008-2010 global financial and economic crisis. As the EU is highly interlinked with the global economy, it was subject to the same phenomenon: trade in [intermediate goods](#) was increasing its share of total trade until 2008.

Supply chains and value chains

A [global supply chain](#) describes the full range of activities involved in cross-border organisation of the production of goods and bringing them to consumers. It interconnects many processes: starting with sourcing of inputs, such as raw materials, and ending when the outputs – or the finished products – are delivered to the final customer. A [global value chain](#) encompasses all the cross-border activities that add value to the product, so it also includes its conception and design as well as marketing and after-sale services.

Both terms focus on the same issues of international production and trade but from somewhat different angles. For the purposes of this paper, literature covering both is used.

Figure 1 – Participation in global value chains



Source: [The World Bank](#), 2020.

Since EU producers relied strongly on imported parts and components from third countries, extra-EU imports of intermediate goods stood at 65 % of total trade for all goods. After periods of further decline and growth, in 2019 this share stood at 58 % of total trade, similar to levels reached in 2004.

The Organisation for Economic Co-operation and Development (OECD) confirmed in February 2020 that the overall [level of integration](#) of international production chains remains high, but has weakened. The financial crisis has negatively impacted trade finance and led to a consolidation of global supply chains. This has been accompanied by a slowing down of [international trade](#) growth due to issues such as a rise in restrictive measures and weak levels of cross-border investment.

There are also many structural factors at play, which indicate the downward trend will continue. China and other [emerging economies](#) create more domestic (and regional) supply chains and also produce more for their domestic markets.¹ [Rising wages](#) in developing countries, the increased role of services and the impact of technologies such as automation and artificial intelligence (AI) make it increasingly economical and [greener](#) to bring manufacturing closer to customers.

In addition, the [World Bank](#) mentions that many enterprises base their location decisions on factors other than wages, such as talent, infrastructure and proximity to the final destination market. This is also connected to the growing importance of skill-intensive inputs, notably services ([servitisation](#)) in production and value chains, which increases the value of proximity and makes costs alone less of a decisive factor.

With the rising focus on R&D and innovation, both global value and supply chains are becoming increasingly knowledge-intensive, which points to an upcoming change in the nature of global production processes from labour-intensive to capital-intensive. Countries with robust innovation ecosystems and highly skilled labour would stand to gain from this shift.

That said, the importance of global supply chains should not be under-estimated: more than [two-thirds](#) of international trade involves transactions made possible by these chains, and this is even more pronounced for the EU. The [European Central Bank](#) reported in 2019 that, despite the global slowdown in economic integration, the euro area is profoundly involved in global production chains, more so than most other countries, and significantly more than the United States and China.

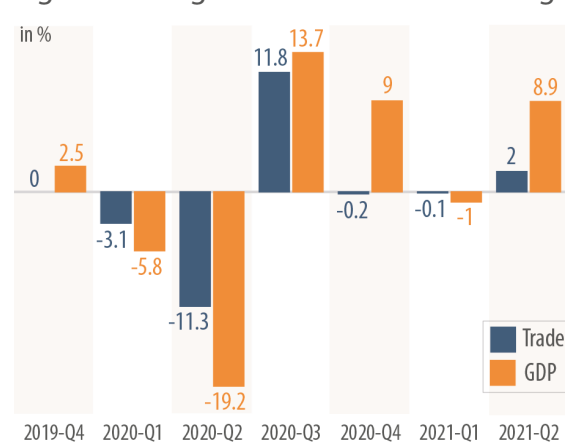
The impact of the Covid-19 pandemic

The initial phase of the pandemic-related crisis started as a supply-side shock – European factories started to report [problems](#) in February 2020 due to the spread of the virus in China. Public health measures, such as lockdowns, stopped or limited business activities and led to economic contraction. Disruption spread along global supply chains, compounded by heavily restricted movement of persons, including those working in logistics, and grounded the airline industry. Chains that are international and complex in character have been affected [most](#).

The biggest economic slump on record was followed by the biggest-ever rebound in the third quarter of 2020, with EU GDP and total goods trade with third countries rising sharply (see Figure 2). Most supply chains recovered rapidly and have been affected less during subsequent waves of infections.

However, this economic recovery created problems of its own and led to a second supply chain crisis during the pandemic. [Stimulus packages](#), unspent savings and pent-up demand all contributed to a robust rise in global consumption. Many companies under-estimated the scale and pace of the rebound and did not make sufficient medium- and long-term orders to cope with the change.

Figure 2 – EU goods trade and GDP changes



Source: Eurostat [NAIDO_10_GDP](#), Eurostat [Comext](#).

Customer spending has mostly been geared towards buying goods, since the services sector recovered only partially due to months of lockdowns and restrictions. Shutdowns of [factories](#) and [ports](#) in places with lower vaccination rates (or with more contagious strains), as well as the significant reduction in air traffic and resulting difficulties in transporting air cargo, have all created bottlenecks, with cascading effects throughout entire supply chains.² Recent data show that global [delivery times](#) in the manufacturing sector are the longest since data collection began 23 years ago. Almost every manufacturing sector is affected, with parts, intermediate goods and products moving from Asia to the EU and US most affected. [Shortages](#) of material and equipment have reportedly limited production for about two in five European manufacturers, the highest proportion since Eurostat started its business surveys in 1985.

To make matters worse, skyrocketing demand led to a surge in container prices, both globally and on the crucial corridor between China and northern Europe (see Figure 3). There is only a finite amount of space available on container ships, and shipping lines cannot quickly increase their fleets in a meaningful way.³ Overall capacity is also limited by delays at ports (ships wait [six days](#) to dock in the EU's largest port, Rotterdam) and by a [shortage of containers](#), which are stuck at congested [ports](#) or inland, due to factors such as insufficient numbers of workers and drivers.

Figure 3 – Container shipping prices



Source: [Freightos](#).

This situation creates wider macroeconomic risks. As reported by the [European Central Bank](#), supply chain linkages play a major role in the transmission of shocks across the globe. For the EU, disruption to supply, intermediate goods and production inputs means that exports shrink more than imports, negatively impacting its trade balance. But the disturbances may have even broader repercussions. A recent economic study estimated that about a [quarter](#) of the pandemic-related real GDP decline is due to disruption of global supply chains.⁴

In its October 2021 [World Economic Outlook](#), the International Monetary Fund (IMF) scaled down growth projections, citing supply chain disruptions as one of the main reasons, particularly for [developed economies](#). Similarly, as shown in Figure 2, EU trade growth has been uneven over the last three quarters, and the Commission, in its latest [European Economic Forecast](#), attributes this to global shipping problems. The euro area recorded its highest growth rate for 15 years in July 2021, but this has been followed by three months of declining growth and increasing input prices, both due to [supply chain bottlenecks](#) which [hold back](#) the recovering [manufacturing sector](#). On the demand side, [consumer confidence data](#), while above the long-term average and still close to pre-pandemic levels, started to decline in October 2021.

Crucially, the jury is still out on whether the global economy is heading towards persistent inflation or whether the current price increases are just temporary. As well-functioning supply chains are known to have [disinflationary effects](#) on the economy, disruptions to these chains feed [inflation](#), which puts economic recovery at risk.⁵ In the most negative [scenario](#), this may lead to [stagflation](#) (an economy with high inflation, and a slow or stagnant growth rate): prices go up as demand cannot be satisfied due to supply rigidities, and central banks address the resulting inflation by raising interest rates, which then erode economic growth.

The [Bruegel](#) think-tank points out that most economic forecasts predict this will not materialise, as current shocks are temporary and a medium-term return to pre-pandemic growth and inflation is likely. It also adds a caveat: 'This could be, however, a case of extended group thinking, with different forecasters converging on the same view. A collective error would not be surprising given that forecasts are built with little relevant prior experience of a recession brought on by a pandemic.'

A study by the [Federal Reserve Bank of New York](#) suggests that the current crisis is indeed novel: the pandemic led to a structural shock, in which disruptions to supply chains have an unprecedented inflationary effect that is amplified across the whole economy. [Much depends](#) on whether the gridlock will be resolved soon or whether it persists.

Possible policy responses and expert views

While companies themselves are best suited to assess supply chain risks and take action to mitigate them, public policy can play an important role in boosting their resilience. An [OECD framework](#) and [Chatham House](#) analysis provide an overview of the extensive set of tools that public authorities have at their disposal.

They may, for example, influence supply chain design by incentivising shortening, reshoring, near-shoring or diversification. Possible measures to achieve this include subsidies, tax incentives, tariffs and local content requirements, provisions in free trade agreements, and government ownership/investment in strategic sectors, including through public-private partnerships. Public authorities can also enhance resilience through standardisation, which increases opportunities to substitute goods, and facilitates management of global production and distribution when an emergency strikes. Legal certainty in trade and in the investment framework, and supporting a strong international rules-based trading system, also help to create a stable environment; as such, they increase the resilience of global supply chains.

Furthermore, public funding may be used to help companies in strategic sectors monitor their supply chains, improve their transparency, screen risks and develop potential disruption scenarios and ways to mitigate them. [Stress-testing](#) supply chains together with the private sector could be very helpful in this respect. Public authorities can also develop risk management strategies and sectoral guidelines, and monitor risks through common vulnerability indicators and early warning indicators. They can identify the bodies that deal with specific risks, and regularly review the role of different regulations, with a view to making the system more agile and flexible. Special emergency measures, such as simplified customs duties and streamlined border processes for critical goods, can be readied to kick in when disruption occurs.

Public authorities can also actively use public procurement to create stable demand for critical goods, and provide financial means to develop resilient supply chains. This can be particularly useful for costly measures such as creating alternative factories, well-diversified sourcing and stockpiling. The [OECD](#) sees two avenues through which procurement can contribute to supply chain resilience: first, cross-border sharing of information on risk management and on the availability of essential goods, prices and contacts is essential to inform efficient procurement strategies and minimise supply disruptions. Second, 'regional or bilateral standardisation of procurement procedures, joint procurement agreements, and lending agreements can help smooth over temporary disruptions in the flow of goods by simplifying cross-border transactions, facilitating the sharing of goods and inputs, and improving buying power, particularly those of small states.'

Finally, all these actions involve contact with the [private sector](#) and, as such, public authorities need to establish information-sharing platforms, include firms' feedback in policy decisions and create partnerships with the private sector so that there is high responsiveness and clear division of responsibilities in case of supply chain crises.

EU actions

The notion of resilience of supply chains was already much discussed before the pandemic, in the context of ensuring availability of resources necessary for the twin – green and digital – [transition](#) of the EU's economy and society. Having featured prominently in the Commission's [foresight reports](#), it became as pertinent as ever with the current crisis. The 2020 [Trade Policy Review](#) stated that 'strengthening the resilience and sustainability of the EU economy, and its supply chains is a pillar of the European Union's drive towards open strategic autonomy (OSA)'.

Similarly, an October 2021 [study](#) for the European Parliament considers supply chain resilience to be one of the main premises on which the EU's drive for autonomy is based. According to the Commission's DG Trade, the [concept of OSA](#) means that the EU, which has always promoted multilateralism and open trade, will continue to do so wherever possible, while increasing its capacity to act independently.

To this end, the Commission's [report on strategic dependencies and capabilities](#) outlines a general approach, which could address complex problems of supply chain resilience.⁶ It says that, by strengthening and diversifying external trade, the EU makes its position in global value chains stronger. This can cushion possible shocks and disruptions and help ensure that the EU meets its demand for certain goods; diversification of import sources is also pivotal. Another avenue is strong involvement of the EU in multilateral cooperation and coordination mechanisms. Working through fora such as the Group of Twenty (G20) and the World Trade Organization (WTO) may help to monitor and maintain critical supply chains.

The Trade Policy Review and strategic dependencies report also mention how new measures and existing tools fit the task. For example, EU trade policy tools that help to obtain access to new markets and improve existing access to global markets also help to increase resilience. This is done by developing partnerships with like-minded countries and stronger engagement with markets and third countries. Trade policy has another important role in ensuring EU businesses can compete on an equal footing globally. This can be achieved by better enforcing existing trade agreements and providing effective defence against unfair trade practices. A useful new instrument is the regulation on [distortive foreign subsidies](#), currently under [consideration](#) by the co-legislators.

The EU can also increase resilience of supply by expanding domestic production and strategic stockpiling of important goods. For the former, dedicated industrial alliances at EU level and the important projects of common European interest ([IPCEI](#)) tool offer the scale and vision necessary to overcome persisting industrial weaknesses. Currently, IPCEIs exist in the value chains of [batteries](#) and [microelectronics](#) (including semiconductors, which are also an object of the recent [Alliance on Processors and Semiconductor Technologies](#), focused on identifying and addressing gaps in the production of microchips, and the forthcoming [European Chips Act](#)).

A good example of an industrial alliance is the European Raw Materials Alliance ([ERMA](#)), launched in October 2020 to specifically address the numerous challenges faced by raw materials value chains. The March 2020 [Industrial Strategy](#) called for the creation of such industrial alliances and complete industrial ecosystems to achieve the EU's green and digital transition. What can also be put in place is a crisis-preparedness strategy in strategic sectors and those where supply chains risk interruption, including stock-building and development of alternatives, possibly in cooperation with international partners. An example of a sectoral policy is the 2020 [Pharmaceutical Strategy for Europe](#), which has a dedicated section on enhancing resilience through diversified and secure supply chains.

Strategic dependencies, sensitive ecosystems and critical supply chains

In May 2021, the Commission published an update to its [New Industrial Strategy](#), accompanied by [analysis](#) of the EU's strategic dependencies. It reviewed 5 200 imported products and identified 137 products in [sensitive ecosystems](#) for which the EU is highly dependent on external suppliers. About a quarter of these (34 products) are very vulnerable, given their low potential for diversification and substitution by EU products. The EU imports about half of these products from China (52 %), followed by Vietnam (11 %) and Brazil (5 %). The report also included six in-depth reviews of supply chains in strategic areas characterised by prevalent use of these materials: active pharmaceutical ingredients (APIs), batteries, hydrogen, raw materials, semiconductors, and cloud and edge technologies. The Commission estimated that, in sensitive ecosystems, the EU is less dependent on the US than vice versa but both have important common dependencies vis-à-vis China. This particularly concerns APIs, critical raw materials and products needed for the green and digital transition. The updated Industrial Strategy suggests that, where common dependencies exist, 'the EU may choose to pool resources and build stronger and more diverse alternative supply chains with our closest allies and partners'.

Furthermore, the Commission sees potential in using public procurement to increase resilience. Smart procurement already helps to achieve key EU priorities related to the green and digital transition, innovation and social objectives across many industrial ecosystems. By creating demand and supporting strategic sectors, public procurement helps to reduce dependencies and strengthens the resilience of industrial ecosystems and supply chains.

Funding that targets strategic priorities and investment in research can also help to build domestic capacity and boost resilience; [the Recovery and Resilience Facility](#) provides a chance to expand this type of funding. Furthermore, EU research and innovation programmes can help to enhance the EU's strategic industrial capabilities: [Horizon Europe](#) supports research and innovation in strategic areas where supply shortages persist, such as raw materials, and its key work strands are accelerating the green and digital transition, and increasing the resilience of industry.

The Commission will also examine the role and specificities of [SMEs](#), which may be in need of targeted support to help them diversify their supply chains and boost their resilience. The task is even more challenging since they are particularly vulnerable to lock-in effects and high switching costs. At the same time, due to limited resources, SMEs are often not prepared for supply chain disruption, with lasting negative [consequences](#). Through the [European Cluster Collaboration Platform](#) and the [Enterprise Europe Network](#), the EU aims to address disruptions and vulnerabilities and help SMEs diversify supply by linking them with new partners. The Commission also plans to help the EU workforce develop skills useful for building domestic capacity. Finally, the EU is moving towards a mandatory system of [due diligence](#) for supply chains, to curb human rights and environmental abuses. According to the [OECD](#), companies which implement due diligence are also likely to build more long-term value and resilience.

Measures on the world stage

This section contains a selection of national and international actions on supply chain resilience. It is useful to compare the EU with other major nations that are highly ranked in the [Economic Complexity Index](#) (ECI). The ECI, which covers 146 countries, increases with the [number and complexity](#) of the products that countries successfully export. The top scorers, which include many EU Member States (with Germany third in the world), are highly integrated in global supply chains as major importers and exporters.⁷ Australia is also included, as a differing example of a country which is developed, yet ranks low (ECI rank 86) and imports significantly more than it exports.⁸

United States

With the arrival of the pandemic, the US (ECI rank 11) took a series of measures to protect supply chains. Under the US\$2.2 trillion stimulus package, the 'Coronavirus Aid, Relief, and Economic Security' ([CARES](#)) Act, which became law in March 2020, [funding](#) has been provided for medical supply chains and air cargo. The government also reverted to applying the [Defense Production Act](#) – which in times of emergency gives the President sweeping authority over the private sector – to increase domestic capacity and significantly boost production of necessary medical goods and vaccines.

European Parliament

In its resolution of November 2020 on a [New Industrial Strategy for Europe](#), the Parliament called for action to strengthen, shorten and diversify supply chains, while making them more sustainable, to reduce over-reliance on a limited number of markets and increase their resilience. It also asked the Commission for a strategy for smart reshoring to redeploy industries to the EU, increase production and investment, and relocate industrial manufacturing. In its resolution of July 2021 on [trade-related aspects and implications of Covid-19](#), the Parliament called for incentives, including through State aid, for EU businesses to make their value chains more sustainable and to shorten or adjust their supply chains where it could benefit the EU's economy, resilience, geopolitical objectives and strategic autonomy. MEPs stated that shortening or altering supply chains to the EU's neighbourhood and Africa could have a positive effect on their sustainable, green, inclusive and resilient economic growth.

A series of important [executive orders](#) by both pandemic-era presidents (Trump and Biden) also supported US medical supply chains, ranging from direct funding to reducing dependence on foreign sourcing. A major step taken by President Biden in his first week in office was to launch a [comprehensive review](#) of critical supply chains, cutting across all the branches of administration and relevant stakeholders. The goal was to identify risks, address vulnerabilities and develop a strategy to promote resilience. It resulted in a [100-day report](#) published in June 2021, with an initial set of reviews of supply chains in four key areas: (i) semiconductors; (ii) large capacity batteries; (iii) critical minerals and materials; and (iv) pharmaceuticals and active pharmaceutical ingredients.⁹ As with the EU, China is again the main source of dependencies for the US in these chains. The report lays out steps to be taken to boost supply in these sectors, one of which is 'building strong relationships with allies and partners who share our values'.¹⁰

So far, the US has started supply chain partnerships with [Japan](#), [South Korea](#) and the [EU](#) (the latter through the [Trade and Technology Council](#), discussed in more detail in the last section of this briefing). An important part of boosting resilience is increasing domestic [industrial](#) capacity – to that end, the US has passed the [Innovation and Competition Act](#) (which explicitly seeks to launch 'a supply chain resiliency and crisis response program' and mentions working together with the EU on supply chains within a meaningful [transatlantic alliance](#)), the [Bipartisan Infrastructure Framework](#), (to upgrade airports and ports) and is considering the [Build Back Better Act](#) (to support domestic supply chains). President Biden also launched the [Supply Chain Disruptions Task Force](#) in June 2021, to target transport- and logistics-related obstacles to economic recovery, and increased [cooperation](#) with the private sector to address delays and congestion at US ports. The White House announced in June 2021 that it will convene a [global forum on supply chain resilience](#), bringing together its partners and key stakeholders to 'collectively assess vulnerabilities, develop common approaches to supply chain challenges, and work to build strength through diversity and shared prosperity'.

Japan

The country is a global leader in economic complexity (ECI ranking 1). Japanese businesses, similarly to the EU and US, have continued to significantly expand their [supply chains](#) in China (ECI ranking 16) since the 1980s. In response to the pandemic, the government began to [reduce the dependence](#) of Japanese supply chains on China. Part of a generous JP¥108.2 trillion (US\$700 billion) stimulus package adopted in April 2020 has been dedicated to supporting companies which decide to move their supply chains back to Japan and to Association of Southeast Asian Nations ([ASEAN](#)) countries (equivalent to US\$2.1 billion for Japan and US\$220 million for ASEAN countries), reinforcing the [trend](#) which started before the pandemic. These financial funds are meant to be used to [cover costs](#) for feasibility studies, introducing equipment or constructing new facilities, with a maximum threshold per company of JP¥15 billion (US\$140 million) if it is willing to relocate to Japan.

The [Programme for Promoting Investment in Japan to Strengthen Supply Chains](#) was launched in [2020](#) and [2021](#), covering nearly 300 firms. Apart from reshoring/nearshoring, the second edition of the programme aims to 'enhance viability of industries by strengthening supply chain resilience' by subsidising equipment and companies' facility costs. To better understand the scale, there are estimates that Japan had at least [7 400 affiliates](#) in China before the pandemic. In 2020, only 8 % declared their [intention](#) to leave or limit their activity there in the future.

In October 2021, Japan hit the headlines by appointing the world's first [economic security minister](#), Takayuki Kobayashi, to 'develop strategies and a legal framework to enable Japan to boost economic security encompassing supply chains, resources, innovative technologies and relevant infrastructure', with a particular focus on [semiconductors](#).

South Korea

The country (ECI ranking 4) was the first outside China to experience a [factory shutdown](#) due to the coronavirus. Its efforts, similar to those by the United States and Japan, are also designed to reduce dependence on foreign suppliers for [geopolitical reasons](#).

South Korea has a long-term reshoring strategy, which started in 2014. However, according to the Ministry of Trade, Industry and Energy, on average only around [10 companies](#) returned every year between 2014 and 2018, and South Korea's reliance on external supply chains has only [deepened](#) since 2013. Companies looking to relocate are eligible to have their [corporate taxes](#) waived for the first five years, with an additional 50 % cut offered for two consecutive years after that.

In July 2020, the Korean Ministry of Trade, Industry and Energy issued its [Materials, Parts, Equipment 2.0 Strategy](#). The reasons behind the initiative are to pre-emptively address the shift in global supply chains in the post-coronavirus world and to deal with the fall-out of [export restrictions](#) introduced by [Japan](#), whose [trade](#) and economy is [closely linked](#) with South Korea's, while diplomatic relations remain characterised by persisting [difficulties](#).

Under the strategy, the Korean government will allocate ~~KRW~~1.5 trillion (US\$1.3 billion) over five years to develop new technologies for materials, parts and equipment. The funding will also be available to attract high-tech industries from abroad, including through reshoring subsidies, infrastructure investments and tax deductions for high-tech investments. The government is [offering to provide](#) up to ~~KRW~~20 billion (US\$16.8 million) to cover [relocation and facility costs](#) for firms relocating to regions outside Seoul, and up to ~~KRW~~15 billion (US\$4.2 million) to high-tech firms relocating to the Seoul capital region. It is also increasing the amount available to reshore firms that build smart factories or deploy industrial robots, from ~~KRW~~300 million to 500 million (US\$430 000).

Australia

Before the pandemic struck, the country launched the [Cyber and Infrastructure Security Centre](#). The ministerial [announcement](#) noted an increasingly risky environment, one element of which is its high reliance on outsourced and offshored supply chains. The Centre carries out coordinated, whole-of-government national security risk management and assessment, contributing to the resilience of critical supply chains. Like in many other countries, the pandemic further highlighted [vulnerabilities](#) in Australia's supply chains and difficulties in managing its relations with China, although the government's [Productivity Commission](#) argued that the vulnerabilities are limited and the resilience of supply chains is high. Nonetheless, the Australian government changed strategic course towards increasing the resilience of its [economy](#), with a set of actions focused directly on [supply chains](#).

The government provides funding through an AU\$1.3 billion (US\$1 billion) [Modern Manufacturing Initiative](#) to support the scaling-up of Australian businesses, transform ideas into commercial opportunities, and integrate better into international supply chains. The priority sectors are space, medical applications, resources technology and critical minerals, food and beverages, defence, recycling and clean energy. There is also a [Supply Chain Resilience Initiative](#), which offers grants of up to AU\$2 million (US\$1.4 million) to firms to help minimise supply chain vulnerabilities for critical goods such as medicines and chemicals. Funding is to be used to develop or increase a specific manufacturing capability or a related activity which targets supply chain weaknesses for a critical product or input identified in the [Sovereign Manufacturing Capability Plan](#).

WTO

Since the WTO is at [the core](#) of the multilateral trade regime, it is an essential global forum to debate and address all related matters and monitor trade policies to ensure a [smooth flow](#) of goods and services. The WTO also plays a pivotal role in ensuring trade openness, which feeds into increasing supply chain resilience, providing for diversification and a wider geographical spread of risks.

Analysis by [Chatham House](#) points to measures the WTO undertook with the onset of the pandemic: 'First, the WTO Secretariat stepped up monitoring of its members' policies with respect to trade and trade-related measures adopted in the context of the pandemic. Such transparency facilitates information sharing between governments, which in turn supports the flow of essential products at a time of crisis.' As of 20 October 2021, WTO members had submitted a total of [427 notifications](#) related to Covid-19.

Chatham House's analysis is critical about the adequacy of monitoring under the current notification process, arguing that it under-reports the number of measures introduced – particularly in comparison to other independent trade-policy monitoring accounts, such as [Global Trade Alert](#), which reports that, since 2019, the number of harmful interventions has almost doubled (from 987 to 1976). This is a well-known [weakness](#) of the WTO's monitoring role, as many of its members are slow or altogether fail to notify the WTO Secretariat of all the measures taken.

Furthermore, Chatham House's analysis and [analysis](#) by the WTO's Economic Research and Statistics Division underline the WTO's role in mitigating the use of export restrictions, which increased significantly during the pandemic. While WTO rules ([Article XI](#) of GATT, the General Agreement on Tariffs and Trade) generally prohibit export restrictions, exceptions to this rule make it possible to impose such restrictions in emergencies related to national security or health. The [number](#) of restrictions and under-reporting increased with the arrival of the pandemic. This has fuelled global debate over reshoring manufacturing of essential goods, as it brought to light the fragility of supply chain production in a situation of sudden and critical shortage. The surge in restrictions also led early on in the pandemic to a joint G20 trade ministers' [statement](#) in May 2020, which contained short- and long-term actions to support global trade and boost resilience of supply chains.¹¹

Finally, the WTO provided a useful platform for some of its like-minded members to cooperate more closely to address challenges arising from the pandemic. An example is the [Ottawa Group](#), which brings together 13 countries and the EU in an effort to advance a [Trade and Health Initiative](#), and contains measures to increase the resilience of medical supply chains. In the [future](#), the WTO can help to monitor trade policies more effectively, strengthen international coordination so as not to disrupt the logistics sector, and increase the role of digital technologies in boosting supply chain resilience, including through ongoing [e-commerce negotiations](#).

Other agreements

Some countries have decided to address the issue of supply chain resilience jointly. In March 2020, Australia, Brunei Darussalam, Canada, Chile, Myanmar, New Zealand and Singapore issued a [joint statement](#) in which they committed to 'maintaining open and connected supply chains' and working with all like-minded countries to 'support the viability and integrity of supply chains globally'. In April 2021, Australia, India and Japan launched the [Supply Chain Resilience Initiative](#), which seeks to jointly develop policy based on the enhanced use of digital technology in supply chains and on supporting trade and investment diversification to minimise risks. The three countries will share best practice and hold investment promotion events to diversify suppliers.

Prospects and the role of international cooperation

The global supply chain system is mainly based on the '[just in time](#)' production system and was created to maximise the operational efficiency and shareholder value of businesses. Components arriving at precise times to be assembled and passed on to consumers eliminate the need for large stocks, limit factory downtime and material waste, and shorten the time it takes for the product to reach the market. While these lean supply chains keep current costs low and profitability high, they are not [well equipped](#) to deal with sudden disruption, be it on the supply or demand side, with the initial shock being passed on and magnified across the chain. This has become more evident than ever during the pandemic.

However, as demonstrated by [IMF research](#), these complex supply chains take a long time to be put together, and during this process their integration deepens. This, in effect, means that they are inflexible and very difficult to reconfigure. Also, many of the policy responses described above will take a long time to implement: increasing domestic capacity, improving infrastructure and developing new skills for the workforce are not quick fixes.

At the same time, the private sector has taken some important steps to address current problems: the [World Bank](#) reports that multinational enterprises operating in emerging markets and

developing economies have already increased their use of digital technologies and stepped up diversification of suppliers and manufacturing sites to enhance their resilience to supply chain shocks. While not easy and often costly, these processes occur because of market-driven incentives: research by the [Boston Consulting Group](#) confirms that more resilient companies outperform their competitors even in normal times. It seems that resilience is starting to become a necessity, not a luxury: [McKinsey](#) notes that 'changes in the environment and in the global economy are increasing the frequency and magnitude of shocks'. Almost a third of global trade is carried out with the countries ranked in the bottom half of the world for [political stability](#), while almost 80 per cent involves states with dwindling political stability scores.

A World Bank paper on the impact of [natural disasters](#) on global value chains may offer a glimpse into the future: while there was some shift to new suppliers, the 2011 earthquake in Japan did not lead to significant reshoring, nearshoring, or diversification. This mostly chimes with the [overall view](#) from industry and experts that reshoring or nearshoring will be limited after the pandemic and will [depend](#) on sector, location, the type of sourcing and the manufacturing network. Resilience is likely to improve through [diversification](#) and the accelerated uptake of [digital technologies](#) such as AI, robotics, [blockchain](#), the Internet of Things and 3D printing, which reduce [the need for labour](#) and facilitate [trade](#). A full decoupling from China seems [unfeasible](#) in most cases, but diversification through the increasingly debated '[China Plus One](#)' strategy, in which a company supplements a Chinese supplier with another one from south-east Asia, may be a more likely scenario.

Since, by definition, global supply chain issues concern parties from across the world, international cooperation plays a key role in addressing them. A [research paper](#) on possible policy actions suggests that increasing resilience may also be achieved through formal international agreements, particularly for research and innovation relevant to supply chains. Agreements should lead to the creation of networks and institutions supporting targeted activities related to supply chains. They also need to leverage existing initiatives, such as the network of [Digital Innovation Hubs](#) and [Horizon Europe](#), which will be extended to third countries. Another emerging field for international cooperation is [cybersecurity](#) of supply chains, where the role of the public sector in setting industry standards, interoperability requirements and regulatory cooperation is increasingly crucial.

Chatham House's analysis suggests further international actions. As the EU and US are key players in boosting the resilience of global supply chains, their cooperation, and the involvement of other like-minded countries (such as Australia, Canada, Japan, South Korea and Taiwan) should be enhanced in multiple areas, starting with identifying common priority sectors, definitions and methodologies to feed the policies. Other ways of boosting resilience include extending trade agreements with third countries to diversify markets and decrease dependencies, removing tariff and non-tariff barriers, and tightening cooperation on standards and regulations: 'the most successful strategy will comprise a mix of encouraging domestic production ..., diversifying sources of supply, and holding (common) strategic reserves'.

The [OECD](#) suggests exploring additional commitments in international trade agreements to deal with potential crises and reviewing general and specific exception clauses to encourage cooperation. The EU, US and other partners should also support [WTO reform](#), including rules on the use of export restrictions and trade monitoring. It remains to be seen how to mitigate risks to fair competition internationally, arising from national policies that tighten supply chains.¹²

The newly inaugurated EU-US [Trade and Technology Council](#) may also become important. The [Joint Statement](#) released after its first meeting gave some details on the work of the Secure Supply Chains working group, which is tasked with improving resilience and security of supply in key sectors for the green and digital transition and protecting citizens, with the first focus on semiconductors, clean energy, pharmaceuticals and critical materials. The group will work on improving transparency of chains, mapping existing sectoral capabilities, information exchange and strategic cooperation.

To conclude, a complex mix of policy actions at different levels is the most likely to solve multidimensional challenges around increasing the resilience of global supply chains.

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ENDNOTES

- ¹ This may be even more pronounced in the future as, in the context of its recovery from the pandemic, China announced that it aims to prioritise [domestic over international circulation](#) in the future.
- ² Before the pandemic, about 55 % of air cargo was carried on [passenger aeroplanes](#).
- ³ It takes 2 to 3 [years](#) to build a brand new container ship. The [ships](#) have also grown bigger and bigger, require larger ports, take longer to unload and are uneconomical to run half-empty. This means shipping is less responsive to sudden changes in demand.
- ⁴ It covered 64 countries on all continents and 33 sectors in all areas of the economy.
- ⁵ Other [factors](#) that may feed inflation are high demand, unprecedented stimulus measures and [quantitative easing](#).
- ⁶ The Commission defines [strategic dependencies](#) as those 'considered of critical importance to the EU and its Member States' strategic interests, such as security, safety, health and the green and digital transformation'. Sensitive ecosystems include, in addition, digital, renewable energy, energy-intensive industries, electronics, space and defence, and critical raw materials.
- ⁷ This can be seen, for example, in [World Bank data](#), where the top importing and exporting countries are almost identical.
- ⁸ Interestingly, recent [IMF research](#) on export diversification views Australia, together with Chile and New Zealand, as 'new role models for diversification policies'.
- ⁹ The equivalent of 'critical minerals and materials' in the EU nomenclature is '[critical raw materials](#)'. In parallel, the executive order which launched the exercise also initiated a [year-long review](#) of supply chains in six critical sectors: (i) defence; (ii) public health; (iii) information technology; (iv) transportation; (v) energy; and (vi) food production.
- ¹⁰ The report proposes a '[New Approach](#)' to supply chain resilience, based on what it considers to be America's major strengths: its innovation ecosystem, its people, its vast ethnic, racial and regional diversity, its SMEs, and its international partnerships.
- ¹¹ The former included the non-introduction of further export controls, accelerated and streamlined customs procedures, and reducing sanitary and technical barriers, while the latter concerned issues such as supporting the multilateral trading system, WTO reform, and strengthening cooperation between authorities on supply chain resilience.
- ¹² An analysis by [WTO experts](#) suggest that these national policy instruments are mostly allowed by WTO rules, which leave significant policy space for implementation. In practice, national measures are not easy to challenge, there are general security exceptions under the GATT framework, and flexibilities exist for the application of tariffs.

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