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Improving Supply Security: Guidelines and Policy Proposals

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Supply security is threatened by technical, business, natural and policy shocks. Geopolitical tensions and climate change are likely to exacerbate the risks. Is there a rationale for policy intervention? If yes, what are efficient and effective measures that achieve derisking at the lowest possible costs? This policy brief uses welfare theoretic arguments that explain why private incentives do not generally lead to an optimal diversification of supply sources or technologies. First, measures to improve the general quality of the business location strengthen protection against and resilience in the face of shocks. A key measure must be to deepen and complete the EU single-market. Second, governments should refrain from policies that further disincentivize diversification such as the ex-post skimming of excess-profits or the granting of short-time wage compensation without a deductible when adverse shocks force a stop of production. Third, they should work on framework conditions that facilitate diversification, e.g., by concluding trade or investment agreements. Finally, in the case of non-diversifiable risks, it makes sense to invest in common strategic reserves. Importantly, most measures are best taken at the EU-level.

1. Introduction and Motivation¹

In recent years, various shocks – from pandemic-related production interruptions abroad, to disruptions of maritime transport routes caused by pirates or extreme weather, to politically imposed sanctions and counter-sanctions – have led to bottlenecks in supply chains. These had a lasting impact on industrial production and triggered, at least partly, higher prices. Increasing geopolitical tensions and higher climate risks make such disruptions more likely.

The EU has a higher degree of openness than the US or China.² It is, therefore, more exposed to external disruptions of supply chains. Because of its lack of a common foreign policy and a military, it is also more vulnerable to opportunistic behaviour of foreign powers which seek to employ asymmetric economic interdependence as a geo-economic weapon. This danger became clear in 2021 and 2022, when Russia

first raised uncertainty about gas supplies to Europe and eventually massively cut its exports. Before that, China's attempt to restrict the export of so-called rare earths had already caused great irritation. There are also major concerns about certain active pharmaceutical ingredients, above all penicillin, which is always in short supply during waves of disease, about various agricultural raw materials such as fertilizers and key intermediate products, above all some metals and computer chips.

A major reason for the supply risks and for high procurement prices for important raw materials and intermediate products was and still is the partly low diversification of the supplier portfolio of European companies or the supply channels through which European companies obtain their imports. Carrara et al. (2023) show that for several critical goods there is only one or very few suppliers. If, in these supplier relationships, adverse shocks occur, the EU experiences supply shortages, and rapidly rising prices.

¹ This policy brief is based on a study co-written by the authors at the Scientific Advisory Board at the German Federal Minister for Economic Affairs and Climate Action (https://www.bmwk.de/Redaktion/DE/Downloads/Wissenschaftlicher-Beirat/wissenschaftlicher-beirat-presseerklarung-versorgungssicherheit-gutachten.pdf?__blob=publicationFile&v=6).

² According to Eurostat, the share of exports and imports of goods and services divided by the GDP is 50% in the EU, 38% in China and 28% in the US.

In large parts, however, the EU's supplier portfolio is well diversified; see, for example, Felbermayr (2023).

There are fears that uncertainties about supply chains complicate the transformation towards a climate-neutral European economy, because raw materials for battery-electric cars, wind turbines or photovoltaic systems, amongst other things, are often sourced from a small number of non-democratic countries. Finally, there is a general concern about deindustrialisation because distortions in supply relationships, especially if they are politically induced, could change the structure of comparative advantages to the disadvantage of Europe.

Against this background, many countries have begun to fundamentally rethink their foreign economic policies. Foreign economic and foreign policy considerations are moving many countries towards a much more active industrial policy than was common in the years of the Washington Consensus from 1990 to 2008. Both the USA and the EU are stepping up efforts to secure their strategic autonomy and to reduce blackmail opportunities due to one-sided dependencies. The focus is on China and Russia, but the list of potentially problematic suppliers has grown longer in recent years. According to the latest data, only slightly more than one-eighth of the world's population now lives in liberal democracies, while a share of more than 70% lives in autocracies.³

For various reasons, ever larger shares of world trade are burdened by economic sanctions of various kinds (Morgan et al., 2023). In recent years, many countries have increasingly used export restrictions to obtain industrial or distributional advantages or to avert perceived security threats. For this purpose, lists of critical or strategic goods that deserve special scrutiny have emerged in various countries and are being constantly extended. The EU Commission and national governments have opted for a strategy of de-risking. How this is to be distinguished from decoupling and which instruments are to be used to achieve the objective still needs to be clarified.

This policy brief presents the difficulties arising in the identification of strategic dependencies. It derives welfare-economic justifications for government interventions in supply chains. It elaborates general regulatory principles for supply chain regulation. Finally, the brief discusses measures that should lead to an improvement in the diversification of the supplier portfolio.

2. Identifying Strategic Dependencies

How can strategic dependencies be identified? Objective answers are hard to come by because the available data are incomplete and circumstances are constantly changing. Therefore, there is a risk that government interventions do not take place in the right areas and are poorly calibrated. The following passages discuss data sources, methods of analysis and difficulties, but also highlight some fundamental premises for evidence-based economic policy in the supply chain context.

2.1 The Need for a European Perspective

The first such premise is that strategic dependencies and crisis preparedness need to be discussed at the EU level. Within the EU single market, production networks are densely interconnected. Moreover, Member States have ceded trade policy and other relevant competences – such as some regulation of foreign investments – to the EU.⁴ Therefore, interdependencies should be examined at the EU level, not only at the national level; economic policy responses must also be primarily sought and found at the EU level. The provisional deal on Europe's crisis preparedness in the IMERA/SMEI dossier reached on 1 February 2024⁵ shows what Union co-legislators at the moment deem in Europe to be politically acceptable in terms of resilience and crisis preparedness. The provisional deal is not irrelevant for supply security and provides a framework for European discussions on eminently political matters such as strategic stocks, critical goods and public procurement.

2.2 What Is Considered Scarce Depends on the Context

The second premise is that the perception of scarcity is highly context dependent. During the pandemic, in rapid succession, a lack of medical face masks was implored, shortly later, there was talk of shortages of reagents and glass vials for the manufacture of testing or vaccination agents. In winters, the public is concerned about the availability of medicines. When the supply chain crisis hit, there have been worldwide fears about shortages of toilet paper, flour, or yeast, which have led to hoarding. Especially for goods with high salience for households, shortages and the associated price increases are discussed particularly emotionally by the public. Based on rumours, bank-run-like effects can lead to shortages, even if the security of supply is not actually at risk at all. In addition to sensitive communication, reliable, up-to-date and readily available real-time data can help avoid such episodes.

³ V-Dem Project (2023).

⁴ See, e.g., Article 6 para 9 last sentence Regulation (EU) 2019/452.

Besides such rather anecdotal cases, supply problems are also discussed from an industrial policy perspective. Around the introduction of electric vehicles, dependencies on electronic components such as chips have become more apparent. Shortages have weighed on the output of the German motor vehicle industry in 2021 and 2022. However, in the meantime, the chip shortage has receded and there are already warnings of oversupply.⁶

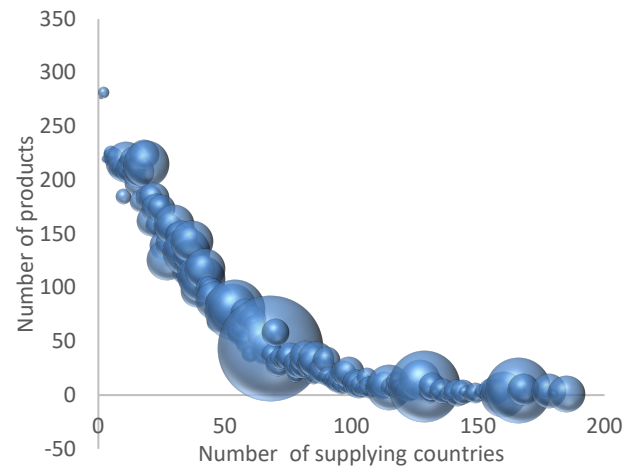
In the case of rare metals, which are important to produce batteries as well as wind turbines, the focus also changes constantly when new deposits are found or developed,⁷ and when innovations make substitutes possible or savings achievable. Especially in metals, boom and bust cycles and high price volatility are the rule rather than the exception. Due to the increasingly integrated global economy and a high simultaneity of industrial and economic policy priorities and their poor predictability, these fluctuations have become greater.

There is a danger that hectic policy measures which curb these fluctuations are counterproductive because increasing supply typically takes time and therefore their effect often only kicks in when shortages are already decreasing. Ill-considered policies geared to short-term needs also run the risk of failing to keep future shortages in mind. Thus, a poorly designed government commodity policy would not reduce but fuel price volatility. In addition, commodity policies that are not aligned with regulatory principles become a gateway for special interests. It is therefore of great importance to have a correct empirical picture of dangerous economic dependencies and a clear regulatory compass.

2.3 Information: Incomplete and Asymmetric

The most important data source for identifying dependencies at the product level are trade statistics. They are detailed and comparatively timely, but only refer to goods; services data are much less complete despite the fact that, in most countries, services account for at least about 70% of gross domestic income or employment. Based on detailed product-level trade data, various authors have analysed the degree of diversification of EU imports. For example, in 2019, out of 10,280 products imported by the EU, 779 products came from a maximum of three different supplier countries (see Figure 1).

Figure 1 How many products are supplied to the EU by 1, 2, 3, ... supplier countries?



Source: Own elaboration based on Comtrade-Data for the year of 2019. The size of the bubbles is proportional to the import value. 280 products come from a single supplier, 779 products are supplied by at most 3 countries.

Also, in 2019, China accounted for more than 50 percent of global exports for almost 600 of around 5,000 products contained in the globally harmonized trade statistics (Jean et al., 2023).

Alarming as these numbers may seem, on their own, they are not informative. They must be complemented with production data which are not available at the same level of granularity as trade data. Moreover, if no production of a certain product in a certain country in a situation of relatively free international trade is observed, one cannot infer anything about the capabilities that can be mobilized in a situation of crisis. Technological dependencies from foreign countries, too, are rarely well observed, as they go beyond material inputs but could be crucial in a situation of conflict. Finally, elasticities of substitution between products or sources are notoriously hard to estimate, because there are no reliable price data. Information is, therefore, incomplete.

It would be naïve to believe that the missing data could be easily obtained by surveying companies. Supply chain data are sensitive because they allow to draw conclusions on firms' productivities and vulnerabilities. Moreover, firms have strong incentives for strategic communication, having equity markets and public opinion in mind. It is therefore unlikely that they would provide complete and unbiased information to policy makers. Hence, information is also asymmetric.

⁶ See, for example, the reports in the Frankfurter Allgemeine Zeitung on 9.1.2023 ("Autohersteller leiden weiter unter Chipmangel") and in Neue Zürcher Zeitung on 10.9.2022 ("Nach dem Chip-Mangel kommt das Überangebot").

⁷ For example, on 16 February 2023, the British weekly magazine The Economist reported that the metal cobalt was suddenly superabundant.

2.4 Insights from Macro-Data

What we know about vulnerabilities is, therefore, either highly partial and thus prone to misinterpretation, or based on relatively aggregate data.

One can obtain a comprehensive picture about aggregate dependencies from balance of payments (BoP) statistics, where trade in services as well as primary and secondary incomes are shown in addition to trade in goods.⁸ It shows that the USA is still the most important economic partner for the EU 27, ahead of the UK. China comes third, followed relatively closely by Switzerland, which is 160 times smaller in terms of population. If we look only at trade in goods, China dominates. However, it has only very little significance in services trade and primary income. On the import side, services dominate trade with the USA and the UK. On the export side, trade in goods dominates in all of the EU's trading relationships; in many countries, however, income from exports of services and foreign investment exceeds income from exports of goods. The comprehensive BoP-perspective also reveals that the EU's external economic relations are actually quite balanced. This is highly relevant from a geo-economic perspective because asymmetrical bilateral relations are particularly vulnerable to political abuse (Mattoo and Staiger, 2020). A bilaterally balanced BoP-position with a trade partner does, however, not imply the absence of one-sided strategic dependencies, because foreign goods can have a higher criticality in domestic value networks than vice versa.

To convincingly identify strategic dependencies, an appropriate analytical framework must not only capture European trade and production data but also incorporate global input/output relationships and production opportunities. Furthermore, information on the substitutability of goods and services by alternatives in production and consumption is needed. Felbermayr and Krebs (2023) have used such a model to study various disruptive scenarios for Germany. The key insights, which also hold for other EU countries, are (1) The economy is not only dependent on imports of raw materials and industrial supplies, but also on imports of services. (2) Moreover, macroeconomically relevant vulnerabilities exist not only vis-à-vis China, but also vis-à-vis other important trading partners such as the USA, UK or Switzerland. (3) While the macroeconomic costs of decoupling value chains from individual countries are sizeable in the short-run, their regional incidence exhibits substantial heterogeneity, hitting some countries so badly that very substantial shares of their economic activity is threatened.

2.5 Evidence-Based Micro-Management is Hard

Besides incompleteness and asymmetry of information, there are additional complications. E.g., firms, both domestic and foreign, continuously adjust to changing circumstances, and they do it fast. They also react to public policy interventions, e.g., by redirecting their sourcing, by acquiring or selling vertically integrated units, or by changing their pricing policies in oligopolistic markets. Hence, the nodes in input/output networks at the company level are endogenous and changeable. A reliable and objective identification of strategic goods (or services) is very hard and the classification of goods, industries, or technologies as critical is a highly political decision.

Moreover, there is a danger that lists of industries or goods worthy of protection are drawn up based on special interests rather than general welfare, and may be used to subsidize domestic production, prohibit takeovers of domestic suppliers by foreign rivals or vice versa, restrict exports of goods or technologies, or take other protectionist measures.

That does not imply the complete rejection of such lists; they are necessary for many policies. However, clear rules and processes that set out clearly and transparently how the list entries are generated are needed. It is important that policies to secure the supply of raw materials and industrial inputs are based on principles that do not take specific products of firms as starting points, but instead set a regulatory framework that is helpful for many configurations of potential supply crises. For this to succeed, the reasons that contribute to excessive concentration of procurement on a few suppliers (or countries) need to be well understood.

3. Welfare-Theoretic Foundations

3.1 Do firms optimally diversify?

Do companies have the correct incentives to sufficiently diversify their supply chains? If their suppliers or supply routes can be hit by "shocks", be they political, related to business failures or climate hazards, firms can insure against this risk by diversifying their supplier base. However, including other than the cost-minimal supplier into the portfolio raises costs. Firms must balance supply risks against costs and the highest possible degree of diversification is unlikely to maximize firm value. The choice depends on many influencing factors: (i) the nature and strength of the correlation of the shocks, (ii) the loss of profit due to non-delivery, (iii) the possibility of varying sourcing quantities at short notice, (iv) the costs of different suppliers for different

⁸ Primary income refers to income from all types of foreign investment; it includes income from the posting of workers. Secondary incomes are

payments without reciprocation. They are relatively insignificant in quantitative terms.

quantities of inputs, (v) the fixed costs that arise for each active buyer-seller relationship,⁹ (vi) the costs of alternative hedging options, such as warehousing or traditional insurance. In addition, diversification can only work if there is more than one source of supply for a product.

In general, one cannot expect the decentrally chosen degree of diversification to correspond to the social optimum. This would be the case if (i) the buyer's behaviour does not exert any relevant externalities on other market participants or the general government, (ii) full information and (iii) perfect competition prevail, and (iv) there are no further distortions, for instance due to (poorly chosen) economic policies or the lack of risk markets. Importantly, as shown by Grossman et al. (2023), when a producer cannot supply the market anymore, besides lost profits, there is also a damage to consumers which is not fully incorporated in firm-level decision making ("consumer surplus externality"). Hence, firms under-diversify, thus justifying state intervention.¹⁰

The situation is exacerbated when distortions interact at individual stages of a supply chain, for example, when incomplete information hinders the operation of price signals along the supply chain beyond the buyer. Then, the buyer's behaviour generates a potentially negative externality on further (downstream) firms that cannot be (fully) internalised by contracts (Liu, 2019). In other words, in complex supply networks, systemic risks can arise that are not addressed by market activity alone. Firms do not sufficiently diversify their supplier base (and keep their inventories too small) because the impact of failures will equally be borne by other firms in the production network and these risks are not properly priced ...

3.2 The Security Externality

Procurement decisions of domestic companies can have an impact on a country's security. E.g., a strong concentration of procurement of an essential input on only one supplier country makes the government vulnerable to blackmail by that supplier country, because an interruption of supplies would be associated with large economic and political costs.

However, domestic "strategic autonomy" does not enter the decision-making calculus of companies because it has characteristics of a public good: Companies are not willing to incur higher costs to improve their governments' strategic autonomy through better diversification of their supplier portfolios, because the respective contribution of each

company on its own has only a very small effect on its own corporate success. Therefore, under-diversification occurs, just as under-supply occurs in the private provision of public goods.

Ignoring the consequences of power-politics is rational at the individual economic level, but irrational at the collective level. One can speak here of a security policy externality, whereby "security" can refer both to military security and to security of supply. State intervention can be justified by the divergence of individual economic and total economy rationality.

These comments apply not only to procurement processes (imports), but also analogously to the sale of goods or services (exports) in the form of an excessive concentration of individual countries or buyers. However, the elimination of export opportunities does not lead to supply bottlenecks and price pressure but rather the opposite. In this respect, from a welfare economics perspective, dependencies on individual export markets are less problematic than on individual import markets.

3.3 Moral Hazard through Rescue Policies

These problems are exacerbated if companies can count on government support measures such as short-time allowances, liquidity assistance or subsidies in the event of a supply disruption. All of these reduce the incentives to invest in their own supply security. To eliminate the problem, governments would have to be able to commit *ex ante* – i.e., before shocks occur – that there will be no support measures, even if this causes major economic distortions. However, such "no-bail-out" commitments are rarely credible. The resulting "moral hazard" reinforces the problems mentioned above and drives an even larger wedge between the socially optimal degree of diversification and the one resulting from decentralised decisions.

3.4 Excess Profit Taxation

If an industry is hit by a supply chain crisis, e.g., because an important supplier country restricts exports to the EU, firms within that industry that have diversified their supply relationships continue production of final goods while firms that have not will have to stop. Output available to consumers in the EU falls and the resulting scarcity drives prices up. Firms unable to produce register losses, those that invested in diversification benefit from high price and record bumper profits. In such an environment, public opinion tends to turn against the firms that continue producing and blames

⁹ See for example the overview article by Antras and Chor (2022) and the numerous references contained therein.

¹⁰ There is the theoretical possibility of over-diversification: Firms want to be able to produce when a supply chain crisis hits because this enables them to raise prices and increase profits. In their optimization, they disregard the effects of their decisions on competitors' profits. This

"business stealing effect" is likely to be small if the alternative strategies require upfront investment and the probability of distress is low, especially since the consumer surplus remains with the consumers in any case.

them for causing "greedflation". In the recent crisis, governments have responded with increasing profit taxes for such firms (e.g. in the electricity sector).

Such ex post excess profit taxation is highly problematic for a whole host of reasons. The concept of excess profits is ill-defined and the uncertainty in tax policy resulting from ad hoc adjustments of tax rates for certain firms or industries puts off investment. Most importantly, if firms must expect a skimming of profits in supply chain crises, they lose any incentives to incur the ex-ante costs of diversifying their supply chains. Therefore, to encourage risk-conscious behavior, governments should credibly renounce any form of excess profit taxation.

4. General Policy Principles

Because the future needs of the European industry and the nature of possible disruptions affecting supply chains are unknown today, the best strategy is to create general structures that increase security of supply and improve resilience to shocks. Interventionism driven by special situations typically comes too late – namely only after the disruption has occurred – and can, thus, have procyclical effects.

The management of supply chains and the responsibility for their resilience in crises is fundamentally a private sector task due to the information deficit of the public sector. Government subsidies for diversification make sense if companies themselves do not have sufficient incentives to ensure a diversified portfolio of suppliers. This could be the case in view of systemic and geopolitical risks, as shown in Chapter 3.

Which instruments do exist, what is their efficiency and effectiveness and how can they be safeguarded against protectionist abuse or unwarranted influence of lobbyists? In general, what is required is a regulatory framework that targets the security externality and the moral hazard problem, that provides incentives for the diversification of sourcing and sales as well for research into substitute products.

4.1 Decoupling and Friendshoring are not the Solution

Eppinger et al. (2022) show that a decoupling from individual supplier countries would not contribute to supply security. While European economies might experience less significant negative effects from disruptions in foreign supplies if they relied less on imports, the costs of decoupling are orders of magnitude higher than the benefits of reduced dependence. Even if one were to allow security policy arguments to apply alongside economic considerations, these would have to be given an extremely high monetary valuation for the calculation

to turn around. In addition, if domestic supply suffers an adverse shock while foreign supply is restricted, the damage would be maximum.

Starting from a situation of well-diversified supply networks, it obviously does not make immediate economic sense to concentrate procurement on friendly countries ("friendshoring") because, while it may be argued from a security perspective, this reduces the diversity of domestic supply relationships. Conversely, expanding supply networks to countries with which friendly relations exist may make good sense from a security perspective if diversification for critical products that cannot easily be substituted is improved in this way.

4.2 Expand Reciprocity of Bilateral Dependencies

Mattoo and Staiger (2020) show that unilateral bilateral dependencies can be abused for opportunistic deployment. The attractiveness of such behaviour can be reduced by the (tacit) threat of countermeasures. However, this requires the existence of a threat potential. It is therefore important not only to have a good grasp and understanding of one's own dependencies, but also about trading partners dependencies on European inputs and technologies. Reciprocity in this sense, however, cannot be measured by the balance of bilateral trade. Even if exports are equal in value to imports, it is not certain that an interruption of supply would be associated with similar or even equal economic losses. In addition, the political costs for a foreign government should not be equated with economic costs alone.

Gehrke and Ringhof (2023) recommend expanding technological leadership positions in a targeted manner to maintain sustainable pressure points vis-à-vis trading partners. The best instrument for this is a smart innovation and technology promotion policy that specifically seeks to strengthen comparative advantages instead of compensating for comparative disadvantages.

4.3 Coordination of Policy Interventions

Policy-makers should ensure that other foreign policy initiatives do not have counterproductive effects on security of supply. All measures relevant to foreign trade should be examined regarding their intended and unintended as well as direct and indirect effects on the security of supply, especially with regard to the question of whether they promote or impede diversification.¹¹ All measures should be coordinated as far as possible with partner countries.

¹¹ The proposed EU Corporate Sustainability Due Diligence Directive is an interesting example. In its design, the effects on diversification of EU

supply relationships do not seem to have received substantial attention by law-makers.

5. Measures to Promote Diversification

5.1 “Breathing Tariffs”

“Breathing tariffs” are import duties that vary with global market conditions or with import shares. They could be used to discourage the excessive dependence on few supply sources. Indeed, a targeted (second-best) policy would be to design bilateral tariffs that increase in the share of sourcing obtained from the trade partner in question. For example, the EU could set the import duty on certain materials to be zero in general, but to jump to a value of x percent, if the import share of a specific country exceeds a threshold of z percent of total domestic absorption. Such a quota tariff violates the most favoured nation principle of WTO law, but could possibly be defended with help of legitimate national security objectives under Art. XXI GATT (National Security Exception). Of course, where the EU still has external tariffs on inputs or raw materials, it can vary them within the framework agreed under WTO law, i.e., without discriminating against trading partners. For example, there are tariffs on lithium and gallium, on many steel products or in the agricultural sector. These tariffs could be lowered when world market prices are high and increased when world market prices are low. Switzerland maintains such a system of “breathing tariffs”. This cannot directly promote diversification, because the system would have to be applied equally to all trading partners. However, the price effects of shortages could be mitigated in this way. It could also provide incentives to develop alternatives to the respective imported goods.

5.2 Trade Agreements

For companies to diversify, they need the best possible and least bureaucratic access to as many international procurement markets as possible. This means that the EU should push for trade agreements that minimise import tariffs or non-tariff restrictions on trade. However, this requires a strategic shift: instead of focusing primarily on opening new sales markets for European goods and services, the security of supply for its own economy must gain in importance as a strategic goal for EU trade policy. This means, among other things, that the EU must conclude agreements with countries that are particularly important as procurement markets for raw materials. For example, since 2003, the EU has a trade agreement with Chile. Recently, this treaty was updated significantly – with a special focus on raw materials but it is also innovative

in terms of the provisions on sustainability and human rights.¹²

Often resource-rich countries have been granted unilateral trade advantages by the EU in the context of the Generalised System of Preferences, making access to the European market conditional on compliance with human or environmental rights. In times of greater scarcity of raw materials and high prices, the conditions for granting preferences should be reviewed and adjusted if necessary. The negotiation and adoption of agreements on critical minerals – a process the EU has started with the USA or Chile, for example – is welcome even if it is a step away from comprehensive free trade agreements under Art. XXIV GATT.

5.3 International Investment Agreements

In many cases, it is not possible to diversify the supplier base because there are only a few countries where certain raw materials are produced or because the production capacities are limited. It can therefore make sense for European companies to invest in countries rich in raw materials to find alternative sources of supply. Because legal certainty is often not sufficiently well guaranteed in these countries, investment promotion and protection agreements (International Investment Agreements, IIAs) have been concluded in the past. These have fallen into disrepute, in particular since the discussion about the transatlantic free trade agreement TTIP. However, if foreign investments are perceived as too risky and cannot be properly insured, they are not made. The result can be that the procurement base of domestic companies is not sufficiently diversified.

5.4 Trade and Investment Guarantees

EU countries maintain well-functioning systems of export credit insurance. These can be adapted to give companies incentives to better diversify their sales markets, for example by making the conditions dependent on how high the share of EU companies in the target markets already is. Moreover, instruments to insure import transactions are much less developed.

Many EU countries grant guarantees for foreign investments, but only under certain conditions and if an IIA is available. It would make sense to take the criterion of securing the supply of raw materials into account when granting guarantees. Especially in countries where the human rights situation is problematic, investments from Europe can trigger changes for the better. In any case, the granting of investment guarantees should take geostrategic and security of supply policy arguments into account.

¹² Council adoption on 18 March 2024. <https://www.consilium.europa.eu/en/press/press-releases/2024/03/18/eu-chile-council-gives-final-endorsement-to-bilateral-trade-agreement/>

[releases/2024/03/18/eu-chile-council-gives-final-endorsement-to-bilateral-trade-agreement/](https://www.consilium.europa.eu/en/press/press-releases/2024/03/18/eu-chile-council-gives-final-endorsement-to-bilateral-trade-agreement/)

5.5 Securing Transport Corridors

For raw materials and industrial primary products to reach Europe safely and at good prices, efficient and secure transport infrastructure is needed. The Chinese Belt and Road Initiative is aimed precisely at opening procurement and sales markets for its own benefit; development policy goals take a back seat. Infrastructure such as ports, road or rail connections are in principle available to all trading partners of the countries in which they are developed. In practice, however, it often turns out that access is not equal and Chinese companies are favoured (Bluhm et al., 2018). It is important that Europe, e.g. in its Global Gateway approach¹³, makes attractive offers to countries in the global South. In addition to the human rights situation, arguments such as the country's own security of supply or geostrategic influence should find their way into investment decisions made by publicly financed development banks. Furthermore, the protection of transport routes must be given higher priority. For example, Sandkamp et al. (2022) empirically show that pirate activities on European sea routes to and from China have negative consequences for maritime trade. The recent events in the Red Sea show how relevant such concerns are. The recent announcements by the EU and the USA to push ahead with the development of an India – Middle East – Europe Economic Corridor and a Trans-African Corridor within the framework of the Partnership for Global Infrastructure and Investment are therefore to be welcomed.¹⁴

5.6 When Diversification Is Not Possible: Strategic Reserves, Urban Mining, and R&D

It is rarely feasible or desirable to fully control all supply risks through diversification. In the case of products the manufacture of which is associated with strong economies of scale, an increase in the global number of production sites is associated with substantial cost increases. This is the case in battery cell production or in the production of computer chips. In such markets, purely market-based processes lead to a sub-optimally small number of producers in the presence of a security externality. Therefore, it may be justified to promote the location, establishment or scaling of production facilities in the EU (or even abroad) with subsidies.¹⁵ However, the correct calibration of subsidy policy is difficult. The risk of subsidy races is high and there is a threat of global overcapacity.

For products where there are only a few sources of supply or where the risks over the possible suppliers are highly correlated, the establishment of strategic stocks may be necessary, as for example with mineral oil. However, because stockpiling is expensive when interest rates are positive, there are limits to this strategy and unconditional security of supply cannot be established. The government should consider providing additional fiscal incentives to build sufficient stocks of critical inputs. It should ensure that companies can create storage capacities – this requires appropriate zoning and the approval of storage buildings. In addition, it should consider state-organised strategic storage for inputs that play a key role in many industries. The establishment of a strategic gas reserve, for instance along the lines of the strategic oil reserve, is a good example of this. Strategic reserves should be pooled EU-wide and used to manage prices – in the oil market this has been done for decades in close coordination with the USA. Also Switzerland offers an interesting example and decades of experience in the area of compulsory stocks of strategically important import goods.

A second means of improving the security of supply of poorly diversifiable raw materials or intermediate products is through fiscal and regulatory subsidies for recycling. "Urban mining" is the extraction of valuable raw materials, such as copper, silver, and gold from waste, such as that produced by shredding old cars or recycling wind turbines. This requires suitable facilities in the EU and cooperation as the necessary economies of scale may not be possible to reach at the level of individual Member States. Above all, it needs a minimum of planning certainty, because if commodity prices fall again on the world markets, the processing plants will no longer be profitable. Because recycling produces far fewer CO₂ emissions than production from raw materials, a high domestic CO₂ price combined with effective CO₂ border adjustment makes domestic processing more profitable than imports, even if world market prices fall. Finally, standards are needed for the efficient recycling of complex products, for example regarding the ease with which batteries from household appliances can be dismantled.

A third sensible approach is to direct research policy towards exploring technological substitutes for raw materials or intermediate products that are difficult to diversify.

¹³ <https://www.consilium.europa.eu/en/policies/global-gateway/>

¹⁴ https://ec.europa.eu/commission/presscorner/detail/en/ip_23_4421

¹⁵ Modern research on the meaningfulness of industrial policy is less sceptical than older research, both in terms of its theoretical foundation and empirical evidence. Liu (2019), for example, shows in

a model in which economic sectors form a production network via input-output linkages that market imperfections lead to distorting effects that are amplified by feedback loops. Therefore, upstream sectors become a reservoir of imperfections and exhibit the greatest distortions. As a result, there is an incentive for a well-meaning government to subsidise upstream sectors.

5.7 Government as Buyer

In many areas, the state is itself active as a buyer, albeit often indirectly. E.g., the market for medical products is heavily dominated by demand from public health insurance schemes. In the last few decades, there has been a strong focus on reducing the pecuniary costs for the health system, for example with mandatory discounts for the pharmaceutical industry, which has reacted by outsourcing and concentrating on the cheapest suppliers. At the same time, health insurance authorities do not seem to have prioritised security of supply sufficiently, presumably because this would have entailed additional costs. As a result, bottlenecks arose when shocks occurred. In such highly regulated markets, the lack of diversification is not always a result of market or management failure, but occasionally of government or regulatory failure.

In any case, in these markets, which are shaped by nation states, it is necessary to consider the effects of one's own measures on the integrity of the EU internal market. In other EU states, it is being observed with concern that Germany is offering up to 50% higher prices to the pharmaceutical industry in order to secure its own supply of medicines, which can endanger the security of supply in other countries. As already emphasised several times: in a single market, close coordination of the EU Member States is needed to manage supply crises.

5.8 New Markets for Supply Security

Finally, newly created markets can counteract the tendencies towards suboptimal low diversification or stockpiling described in Section 3.¹⁶

Government could commit in advance to buy a predetermined quantity of the respective product at a certain price. This instrument is known as Advance Market Commitment (AMC). AMCs go back to Nobel laureate Michael Kremer, who proposed this instrument at the beginning of the millennium for the development of drugs and vaccines against diseases in developing countries. If one wants to use AMCs to prepare for crises, it must additionally be defined when exactly the obligation to purchase by the public sector takes effect. The trigger could be, for example, that the market price of the commodity or intermediate/finished product exceeds a certain level.

When such AMCs are in place, companies can better plan for crises. This reduces the concern that the government will intervene in market prices or tax (windfall) profits in these situations, as they have previously contractually committed to these AMCs. This makes investments in alternative supply channels and stockpiling more attractive.

Such contracts are discussed under the term "pull incentives", as the expectation of future business provides incentives for present investments; the investments are "pulled". These are to be distinguished from "push incentives" where companies get funds to make the respective investments;

It will often be insufficient or poorly targeted to encourage companies to invest today with the expectation of assured profits in times of crisis in order to be prepared for these usually very rare times of crisis. Then it may be additionally necessary to provide financial support for this preparation.

Capacity markets, which are known from the electricity market and are used in the USA or France, for example, do exactly this (Cramton, Ockenfels and Stoff 2013). Electricity producers apply for contracts on the capacity market, with which they enter into the obligation to supply electricity at a predetermined price at certain times – e.g. when the electricity price exceeds a certain level. In return, they now receive funds, payment on the capacity market.

5.9 Transparency

If private actors are to optimally diversify supply chains, market participants and regulators must be properly informed about the risks. As stressed above, information asymmetries may exist between management and owners of companies on the one hand and the authorities on the other. In the literature on financial market risks, however, this is a problem that is often addressed with empirical evidence. Despite years of efforts, transparency about risks and their hedging in this sector is still insufficient. Therefore, it can be assumed that making risks in supply chains transparent is not a trivial undertaking.

Nevertheless, transparency obligations on supply chain risks are surely necessary to improve security of supply. Regular reporting on supply chain risks should enable capital markets to make correct risk-adjusted estimates of company values. It should help government authorities to identify and address systemic risks at an early stage. One must be concerned that additional reporting obligations will burden companies with costs. It is therefore important to create structures that are as efficient as possible. For example, it is typically cheaper not to check all possible occurring (Foreign) supply relationships of the national economy, but to monitor the suppliers and to share the information about them in an appropriate way and to link them along the supply chains. Private sector solutions should be found for this as far as possible, but they require state supervision. The establishment of a European supply chain certificate could therefore be a worthwhile option.

¹⁶ Innovative market design can also contribute to easing the situation after a crisis has occurred, see, e.g., Cramton et al. (2020).

6. A European Supply Security Office

For effective and efficient supply security management, the public sector needs comprehensive and adequate information. In addition, competences are needed for the development and implementation of preventive measures, which must be synchronised and harmonised across the EU. Following the Scientific Advisory Board of the German Ministry for Economic Affairs and Climate Action, we therefore propose the establishment of a European Supply Security Office (ESSO).¹⁷

As we have argued above, ex post government support measures may compromise firms' incentives to diversify. Thus, governments should create clear structures and rules for the insurance of supply chain risks. However, governments regularly cannot deny state support in the event of a risk materialising. Therefore, it is appropriate for the government to be aware of the risks and, under certain circumstances, to intervene in a forward-looking regulatory manner if high vulnerabilities build up in companies or sectors.

The ESSO should collect, systematise, and provide quality-assured relevant information and carry out corresponding analyses.¹⁸ In addition to internalising cross-border effects within the EU, an EU institution can use economies of scale absent at national level.

The ESSO should monitor and assess systemic risks in European supply networks and develop measures to limit systemic risk and introduce them into the political process. It could assess and evaluate measures taken by Member States or third countries with regard to their impact on European security of supply. It could design and supervise crisis resilience audits (stress tests) recommended in the EU's draft Raw Materials Act (RMA)) and accredit private auditors. Finally, it could be tasked with coordinating joint strategic reserves.

The ESSO could produce or commission reports on potential systemic risks in supply networks and give specific mandates to expert groups to assess supply chain risks. It could publish, similar to the ESRB Risk Dashboard, a set of quantitative and qualitative indicators of systemic risk in European supply networks.

The ESSO should be integrated into the interaction of national and European institutions in such a way that redundancies, unclear responsibilities, and additional bureaucracy are avoided. Because questions of international security of supply are inherently connected with political, especially foreign policy aspects, for which the responsibilities are shared between the EU and the Member States, the ESSO should not be constructed as an independent agency

with its own decision-making powers but should work with the European and national institutions.

7. Conclusions

Our economic model depends on secure and largely unhindered access to world markets. In recent years, this system has come under threat as various trading partners have sought to exploit Europe's dependence on certain supplies from abroad and on certain export markets to obtain foreign policy concessions. At the same time, the COVID-19 pandemic has highlighted how vulnerable domestic supply chains and security of supply can be. Supply-side disruptions have contributed to the inflation push.

The EU advocates de-risking to reduce unilateral dependencies without leading to isolation vis-à-vis trading partners (de-coupling). However, the transition between the two strategies is a fluid one, i.e., because all important future technologies have both civilian and military fields of application.

A European perspective is central to both the assessment and the development of economic policy responses. Not only does competence for most foreign economic policy fields lie at the EU level; the integrity of the internal market and its dynamism are the best insurance against attempts from abroad to instrumentalise any dependencies. To ensure that national policies and initiatives are optimally dovetailed with the European level, a European Supply Security Office (ESSO) should be established to harmonise the collection of data on supply chains, develop uniform stress tests and monitor the impact of national policies on the internal market.

Government intervention is justified on welfare-theoretic grounds because individual companies are generally too small for their sourcing strategies to have a noticeable impact on their own financial bottom line improvement due to improved strategic autonomy of the EU or Member States. Therefore, such effects are rationally ignored. In sum, however, this results in excessive concentration of imports on a few, low-cost supplier countries. Moreover, if companies expect government aid measures such as short-time allowances or excess profit taxation to be used in the event of a supply chain disruption, this creates further incentives not to sufficiently diversify supply chains.

Given incomplete and asymmetric information, it is impossible to draw up lists of critical goods, technologies, or sectors according to objective standards for the purpose of financial support by the general government or deriving foreign trade policy measures.

¹⁷ The provisional deal on Europe's crisis preparedness in the IMERA/SMEI dossier reached on 1 February 2024 establishes an Internal Market Emergency and Resilience Board. It remains to be seen whether this Board will establish itself as a forum for fruitful discussions on matters relating to supply security from a European perspective.

¹⁸ Experience with the European Systemic Risk Board (ESRB) can be used here. The ESRB is responsible for macro-prudential oversight of the EU financial system and for the prevention and mitigation of systemic risk. As part of its mandate, the ESRB monitors and assesses systemic risks and issues warnings and recommendations as appropriate.

To avoid the emergence of dependencies, an appropriate regulatory framework that can internalise the above-mentioned security externality is needed. In this policy brief, we have proposed a number of measures that make it easier for companies to diversify their supply networks. Free trade agreements are among them, as is the promotion and facilitation of foreign investment to develop alternative sources of supply. Finally, the creation of special markets for supply security – analogous to capacity markets – could improve the security of supply.

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