



Absence of external resources in Germany - An analysis about the deglobalization of resources in Germany based on the case studies oil and gas and rare earths

Scientific Paper

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Abstract

This scientific paper deals with the question of to what extent the deglobalization of raw materials will have an impact on Germany. For this purpose, a general understanding of the terms “*globalization*” and “*deglobalization*” will be provided. In addition, the drivers and challenges of (de)globalization are explained in more detail. The question was then examined based on specific case studies, which are decisive for today's prosperity and are predominantly imported. This includes gases, oils, and rare earths. The paper distinguishes between the effects of a loss of these resources on Germany, if the deglobalization takes place slowly and planned or unplanned and fast. The effects are then considered at three different levels: at the government level, at the corporate level, and at the population level. At the corporate level, the focus was primarily on the largest German industries. Each of the case studies ends with possible hypothetical scenarios that do not have to happen but could happen in the worst case. The scenarios show how bad things can get and provide an answer to the scientific question of how deglobalization in the case study could affect Germany.

1. Introduction

Deglobalization is the process of eliminating interdependence and incorporation among nations' economies, cultures, and inhabitants as a result of cross-border trade in goods and services, technology, and movements of invested capital, people, information, and border controls rather than global institutions, treaties, and free movement. Instead of global organizations, treaties, and unrestricted migration, focus on information and border controls. Some argue that the world has entered a period of de-globalization, citing recent events such as Brexit, Trumpism, the Ukraine conflict, supply chain issues, the global energy crisis, and a reduction in foreign direct investment over the last decade. After decades of expanding globalization, there appears to be a stalling or even a move toward de-globalization, which means slower trade and investment and fewer global value chains (Kolb, 2021).

Can the Covid pandemic speed the path of de-globalization, or will most parts of our interconnected world be more resilient in the face of extreme shocks? The global economy of the 2020s looks quite different from the world of the past three decades, in ways that we are only just beginning to comprehend but that might have far-reaching ramifications for macroeconomic policy. When the problem is a shock to the supply-side of the economy, such as when a pandemic disrupts global supply lines, a greater stimulus to help put people to work tends to exacerbate inflation. The Covid-19 outbreak, serious interruptions to maritime transportation, the revival of populist nationalism, and escalating tensions between China and all of its main trading partners have prompted analysts to declare globalization dead. However, a less globalized world is not on the horizon (Levinson, 2021).

We chose to focus on oil and gas since Germany is experiencing a serious energy crisis as a result of the current Russia-Ukraine war, which has caused interruptions in gas supplies and driven energy prices to record highs. This predicament has compelled the German government to advise individual families and industries to reduce their energy use in order to avoid planned gas or electricity disruptions this winter. Furthermore, rare earth elements are critical to the global high-tech economy since they are widely employed in the automotive, electronics, and power generation industries. Certain rare-earth elements are also employed in the manufacture of missiles.

Currently, Germany imports more than 70% of its energy needs. Domestic production accounts for only 2% of total crude oil consumption and 6% of total natural gas consumption, indicating a declining trend in the face of rapidly diminishing oil and gas resources and the absence of substantial fresh finds. Things were different before. Wietze alone accounted for 80% of domestic oil output at its height. As Germany grapples with its energy reliance on Russia in the aftermath of Moscow's invasion of Ukraine, the museum recalls a period when Germany was not self-sufficient in energy imports but was clearly more assured in its oil supply (Benölken & Wietze, 2022).

While the EU is working hard to reduce its energy reliance on Russia, the EU is also heavily reliant on China for industrial metals and rare earths needed for wind turbines, electric vehicles, solar cells, and semiconductors. The desire for these kinds of rare metals is projected to climb further given the rising speed of digitalization and the energy transition, yet mining is concentrated in only a few places throughout the world. Germany's reliance on metal imports ranges between 75% and 100%, depending on the metal. Furthermore, of the 30 raw materials designated as crucial by the EU, 19 are mostly sourced from China. China has a de facto monopoly on magnesium, rare earths, and bismuth, providing up to 98% of the supplies required in the EU. China aspires to be carbon-neutral by 2060 and needs more vital raw resources. Through large-scale investments and long-term contracts, China has already secured essential imports from Africa and elsewhere in a strategic move. Instead of exporting raw resources, China intends to become a worldwide technological leader in important industries. Germany has been attempting to diversify its raw material imports for many years. Rare earths are currently imported not just from China but also from Brazil. It established the German Minerals Agency in 2010, which regularly evaluates the availability of resources across the world (Wrede, 2022).

German politicians are hurrying to prepare for that eventuality and the ensuing greater energy crisis, launching a slew of new measures aimed at reducing gas usage and preparing alternative energy sources to counter shortages. The government has committed to lessening the impact on households by giving more funding to offset home energy costs this winter, but customers can expect prices to climb further. The impending crisis should provide a chance for German policymakers to undertake painful but long-overdue adjustments to the country's energy environment, with an emphasis on growing renewable energy sources rather than restarting coal plants and continuing to be reliant on fossil fuels (Kinkartz, 2022).

1.1 Global Value Chains

Global value chains (GVCs) are a type of international production partnership in which production is divided into tasks and procedures performed in different locations. To maintain a competitive advantage, businesses are progressively globalizing their manufacturing, breaking down their value chains into smaller segments provided by a growing number of global sources. As European organizations progressively globalize their manufacturing processes, the outsourcing of business operations is a major aspect of global value chains (GVC's) (Eurostat, 2022). The whole range of operations (design, manufacture, marketing, distribution, and ultimate customer support, for example) that are distributed across various enterprises and people across geographic locations to carry a product from conception to end usage and beyond. GVC's engagement does not simply provide positive results. Some of the concerns include the possible collapse of social cohesiveness, the deterioration of labor welfare, and environmental degradation, which are not limited to nations with poor governance and regulatory capacity. Furthermore, the potential for expanding economic disparities across countries exists as a result of the division of labor (Seric & Tong, 2019).

1.2 Offshoring

The operating activities are relocated to another country, and the geographical region is irrelevant with respect to offshoring. Offshoring can be divided into two divisions: nearshoring (neighboring countries with or without a shared border) and farshoring (a distant country, e.g., countries in East Asia). Offshoring is often employed to reduce the personnel costs of a company. However, its success is subject to its own leverage, one of which regards communication. In the case of Germany and Europe, it is advisable to offshore the production of rare earths to countries that already have abundant deposits. Here, offshoring it to developing nations or regions such as Brazil, Greenland, or Vietnam could be advisable since these countries are not active participants in geopolitics (Pistilli, 2022).

1.3 Nearshoring

Nearshoring is the outsourcing of business or manufacturing processes to companies in nearby countries, often sharing a border with the target country. For a company based in Germany, typical nearshoring locations include Poland, the Czech Republic,

and Serbia. Nearshoring offers optimal solutions for companies that want to outsource processes in order to maximize business efficiency but reduce the obstacles of traditional offshoring. But since the deposits of rare earth in Europe are very minimal, it is very difficult for countries like Germany to rely on neighboring regions (Pistilli, 2022).

1.4 Friendshoring

Germany and Kazakhstan Sign Rare Earths Agreement

Berlin — Chancellor Angela Merkel of Germany and President Nursultan Nazarbayev of Kazakhstan agreed on Wednesday to a strategic partnership that guarantees German companies the right to search for and mine rare earth metals and other raw materials in Kazakhstan in exchange for technological and other investments. The agreement, which was signed between the two countries' ministers of industry and technology, involves about 50 separate accords that total €3 billion, or nearly \$4 billion (Eddy, 2012).

Germany seeks rare earth recycling as a hedge

The question is whether they can come up with ways to make it cost-effective enough. Germany's cabinet announced a new commodities strategy aimed at helping industry secure supplies. Concerns about China's squeeze on a raw material so vital to electronics and auto parts, industries in which Japan and Germany are major players, have pushed up prices sharply, catching buyers off guard (Thatcher, 2010).

A major hurdle at a high cost

The biggest hurdle, according to analysts, is the high cost of recycling. German companies have only begun talking about the need for recycling rare earth metals over the last decade. "The prices have been so low that rare earths could not be recovered cost-effectively with recycling. The rising prices will raise the incentive for recycling as well as research in recycling," said an official at the BDI German Industry Federation. Over the past decade, the price of neodymium metal, used in products such as

computer hard disks, has risen about sixfold and that for dysprosium, used in data storage devices, eightfold. (Thatcher, 2010)

2. Methodology

The snowball approach is used in combination with systematic literature research. A literature review is conducted to identify the causes and impact of the absence of external resources in Germany. A combination of systematic literature research and the snowball system is used. The systematic literature search is divided into the following steps: After the research question has been defined, the search terms are selected. Then the databases are selected for research, and the search is narrowed down. Subsequently, search strategies are selected, and the literature is reviewed and assessed as to whether it is relevant to the work. In the end, the literature is obtained via the database. The title of the thesis as well as the research questions were already determined in advance and contain keywords that can be searched for in the literature search. Various methods can be used to select the search terms. Searching for the search terms in different languages as well as using synonyms has proven helpful (Universität Kassel, Institut für Psychoanalyse, 2010). In the present work, various databases such as Google Scholar and ZBW (Leibniz Information Centre for Economics) were used. The advantage of these databases is that a large number of scientific articles can be accessed free of charge. In order to find a large amount of literature, various operators can be applied. One operator used is truncation. Here, the symbol (*) is added to any position of the word, except for the initial letter. This truncates the search term to a root word. Example: "*Glob**" results in the words "*globalization*", "*global*" and many more (Universität Kassel, Institut für Psychoanalyse, 2010). In a systematic literature search according to the snowball system, one piece of literature is used as a starting point for another. Further literature by the author or the publisher can be searched for. In addition, the bibliography can be used to draw attention to further literature. This method is used at the beginning of the paper to get an overview of the topic. Attention should be paid to the date of the literature, as the publication date is therefore further back. It is therefore recommended to use a recent work as the starting literature (Hochschule Luzern, o. D.). Due to the topicality of the subject, work was carried out with the help of the website of the federal government and various institutes in Germany. The study also looked at news stories about changes in the law that had happened recently. In addition to that, the scenario

technique was applied. The current situation was considered as well as the scenarios of abrupt deglobalization and prepared deglobalization. Temporarily, these stages can be defined as: in a few months for the fast deglobalization and 3-5 years for the slow deglobalization. The effects that take place in these two situations are going to be explained in the case studies.

3. Drivers and Challenges of (De)Globalization

The term "*globalization*" refers to the increasing interconnectedness of the world's economies, cultures, and inhabitants as a result of cross-border commerce in products and services, technology, and movements of investment, people, and information. Over many years, countries have formed economic alliances to enable these flows. Deglobalization is a trend toward a less interconnected world defined by strong nation states, local solutions, and border controls rather than global organizations, treaties, and unrestricted movement. The buying and selling of commodities and services between countries throughout the world is known as trade. Imports are goods that are brought into a country, whereas exports are goods that are sold to another country. Trade takes place because no country has enough raw materials or produced items to be self-sufficient. Global trade has been made feasible by the globalization process. International production, commerce, and investment are increasingly organized along so-called global value chains (GVC's), in which distinct phases of the manufacturing process are spread across many nations. Globalization encourages businesses to rearrange their operations on a global scale via outsourcing and offshoring activities. Over the last several decades, there has been a significant tendency toward the internationalization of value chain operations such as design, production, marketing, distribution, and so on. Throughout history, there have been periods of increasing and decreasing globalization. America's support of a new international order in 1945 enabled cross-border flows of commodities and money to return after years of war and disorder. After 1990, this period of globalization accelerated as China recovered, India and Russia abandoned autocracy, and the European Union came into prominence. As a result, global commerce increased from 39% of GDP in 1990 to 58% in 2018. International assets and liabilities increased from 128% to 401% of GDP, as did the stock of migrants, which increased from 2.9% to 3.3% of the global population (The Economist, 2019).

Adjiedj Bakas, a Dutch trend observer, coined the term "*slowbalization*" in 2015 to characterize the reaction against globalization. "Slowbalization" or slow globalization means that cross-border flow growth is slowing and a higher level of regionalization is developing (Canuto, 2022). This "*slowbalization*" has various underlying reasons. Trading has stopped growing cheaper after huge drops in the 1970s and 1980s. The 2008-09 financial crisis was a tremendous shock for banks. Following that, many people were more cautious about financing commerce. The average rate of return on all multinational investments fell from 10% in 2005-07 to 6% in 2017. Trade and supply chain dynamics tend to indicate a saturation period, as the draw of cheap labour and multinational investment in physical assets has become less essential (The Economist, 2019).

The most significant change in EU trade policy is likely to be the increasing geoeconomic aspect of globalization. Trade is increasingly being utilized to project power rather than to generate wealth. Rather than developing institutions to support rules-based free trade, major countries utilize trade and investment to create networks of dependency. Climate change, the increasing frequency of diseases, populist protectionism, and large-power competition are all difficulties and goals that trade policy must address. Climate change presents a number of challenges for trade policy, particularly as major trading nations increasingly utilize harsh carbon pricing to reach their emission objectives. This has the potential to significantly alter manufacturing costs and, as a result, the globalization of production. Climate change is also endangering the world's food supply. Next, population size and affluence are major determinants of market attractiveness. As a result, global population trends have significant consequences for trade policy. While the EU will continue to be a prosperous area, its percentage of the world population is decreasing. Technology is increasingly crucial in defining competitiveness, as well as geoeconomic vulnerability or strength. Europe's ability to innovate lags behind that of the United States and China. If the EU is to stay internationally competitive, it must strengthen its inventive skills. Finally, as the Covid-19 pandemic has shown, epidemics can have significant economic consequences. Trade policy is becoming increasingly concerned as the frequency of epidemics rises. It is crucial that critical medical supply chains remain operating and that manufacturing clusters in one region are avoided on a global scale (Bluth, 2021). As significant as these non-political megatrends are, the political megatrends provide a more immediate challenge to which EU trade policy must

respond. This is especially relevant given the escalating competitiveness between the United States and China, but it also applies to the trend of “*weaponizing interdependencies*”, the persistence of protectionist populism, and the weakening of multilateral institutions. “*Weaponizing interdependencies*” is described as a state in which an entity may use its position in an embedded network to acquire a negotiating advantage over others in a confined system (Drezner et al. 2021). The EU and the US, along with many other nations, are concerned about the trade repercussions of China's anti-competitive measures. Both are finding it difficult to elicit a genuine policy response from China - the US trade war has delivered few significant outcomes, while the EU's discussions with China are moving slowly. The “*weaponization of dependencies*” is a key characteristic of “*gloeconomic globalization*”. Rising populism poses a significant threat to EU trade policy. Political developments among trading partners, as well as possibly in the EU and its member states, may make trade policy less predictable and more difficult to implement as a result of rising politicization. Another major problem for the EU as a significant commercial force is the erosion of international institutions, particularly the World Trade Organization (WTO). There is a danger that multilateral policymaking may be undermined by large power struggles and gloeconomic globalization. It is critical for the EU to safeguard the liberal globalization contained in rules-based trade governance (Bluth, 2021).

Even though trade disputes dominate the news, fundamental shifts in the structure of globalization have largely gone unreported. Despite the fact that production and trade continue to grow in absolute terms, trade intensity is decreasing throughout practically every goods-producing value chain. Flows of services and data are increasingly playing a significantly larger role in connecting the global economy. Not only is trade in services rising faster than trade in products, but services are also producing value that exceeds what national accounts measure. These variations are explained by three factors: 1) rising demand in China and the rest of the developing world, allowing these nations to consume more of what they create; 2) the creation of more complete local supply chains in those countries, lowering intermediate goods imports; and 3) the expanding influence of emerging technologies (Lund et al. 2019).

The Russian invasion of Ukraine on February 24, 2022, has brought the relationship between Russia and the political West to an all-time low, triggering a chain reaction of economic penalties and counter-sanctions. It appears that protectionist measures will result in a complete decoupling of value chains, with Russia on one side and the EU, US, and their allies on the other. With the obvious exception of energy commerce, Russia is a very small commercial partner for the majority of nations in the political West. For example, only 2.8 percent of imports to Germany, Europe's largest economy, will come from Russia in 2021. A decoupling from other nations, particularly China (11.8 percent of German imports in 2021), would pose a significantly greater danger to the EU's long-term prosperity. Researchers examined the short-run impacts of a halt in Russian energy supplies to Germany and discovered that such a halt would affect German GDP by 0.5 to 3 percent (Felbermayr et al. 2022). China's share of world commerce in goods was 13.1% in 2020, over doubling Germany's proportion of global trade in goods (7.2%). China is Germany's top trading partner for goods, accounting for 9.5% of German trade in 2021. As an example, Germany's commerce in products with the four Visegrád nations in 2021 was about 40% higher than the value of trade in goods with China, despite the fact that the four countries constitute just 6.7% of China's GDP and 4.5% of China's total population. The country supplies 7% of all foreign intermediate inputs used in German final output. This figure is important, but it is also far lower than the percentage of foreign intermediate inputs ascribed to US value added (10%) (Baur & Flach, 2022).

Other European Union (EU) member states are the primary providers of intermediate items, accounting for 44% of foreign value added in German final goods manufacturing. This demonstrates that China is a significant but not dominant supplier for Germany. A similar picture emerges when it comes to the importance of China as a sales market for German goods and services. The EU single market, on the other hand, is critical for Germany in terms of both intermediate products and sales markets. In terms of value added, the EU is China's most important source of intermediate inputs. China is essentially dependent on foreign intermediate products and foreign demand originating in the EU, although the magnitude of these economic ties has shifted dramatically over the last 25 years (Baur & Flach, 2022).

China produces just a tiny portion of important industrial items. The chemical industry has the biggest percentage of essential dependence on China, accounting for roughly 27% of all critical industrial items imported from China, followed by electrical equipment (21.4%) and transportation equipment (14%). Magnets, projectors, amino acids, and heterocyclic compounds are examples of crucial industrial goods. The reliance on Chinese raw resources is significantly greater than the reliance on Chinese industrial goods. The figures show that a sudden decoupling from China would cause huge disruptions in key supply chains, emphasizing the significance of increased diversification in these areas. According to the study results, 46% of industrial enterprises and more than 40% of wholesalers and retailers rely on intermediate supplies from China. Almost every second business in Germany's industrial sector that receives major inputs from China intends to cut its imports from China in the future. This percentage is only somewhat lower for wholesalers, hovering around 44%, while it exceeds 55% for retailers. Four out of every five manufacturing enterprises that seek to reduce their reliance on Chinese inputs in the future expect to increase their reliance on inputs from other European nations in exchange (Baur & Flach, 2022).

Germany attempts to diversify its oil and, in particular, its natural gas sources by negotiating new gas supply contracts with nations such as Qatar, Canada, and Senegal. Perhaps the most significant influence will be felt in the medium term in the development of renewable energy. Previously, increasing renewable-energy capacity, such as wind power, solar photovoltaic cells, or green hydrogen, was viewed as a way to decarbonize energy output and achieve climate change mitigation objectives. Renewable energy generation is now being proposed as a way to improve Germany's energy security. Aside from energy, Germany and Russia are decoupling in other areas such as metals, industry, and agriculture. This decoupling is the outcome of both the tough sanctions system against Russia, in which Germany participates, and the unilateral withdrawal of German firms from the Russian market. This trend of economic decoupling between Germany and Russia is unlikely to be reversed anytime soon, raising the prospect of a much larger scale reduction in interdependence with China (Berger, 2022). Finally, the EU is generally doing the right thing and pursuing the correct policy goals. The atmosphere in which trade policy is decided in the future will be much riskier than it is today. Finding an appropriate means to cope with these dangers will be the primary task of the new trade strategy. Among these numerous

policy areas and objectives, it is critical not to lose sight of the primary purpose of trade policy: to assist individuals and companies in increasing their wealth (Bluth, 2021).

4. Case Study 1 - Oil and Gas

4.1 Scarcity of oil and gas

The aim of this case study is to show the effects of the Absence of external resources in Germany. How does the deglobalization of resources affects the country and the European Union? When talking about the deglobalization of external resources, the trade of oil and gas, must be considered. According to evaluation of the Umweltbundesamt oil accounts for the highest share of primary energy demand in Germany, and gas for the second highest (Umweltbundesamt, 2022). Germany is an Energy importing and goods trading country. This is associated with geopolitical dependencies (Dürfeld, 2022).

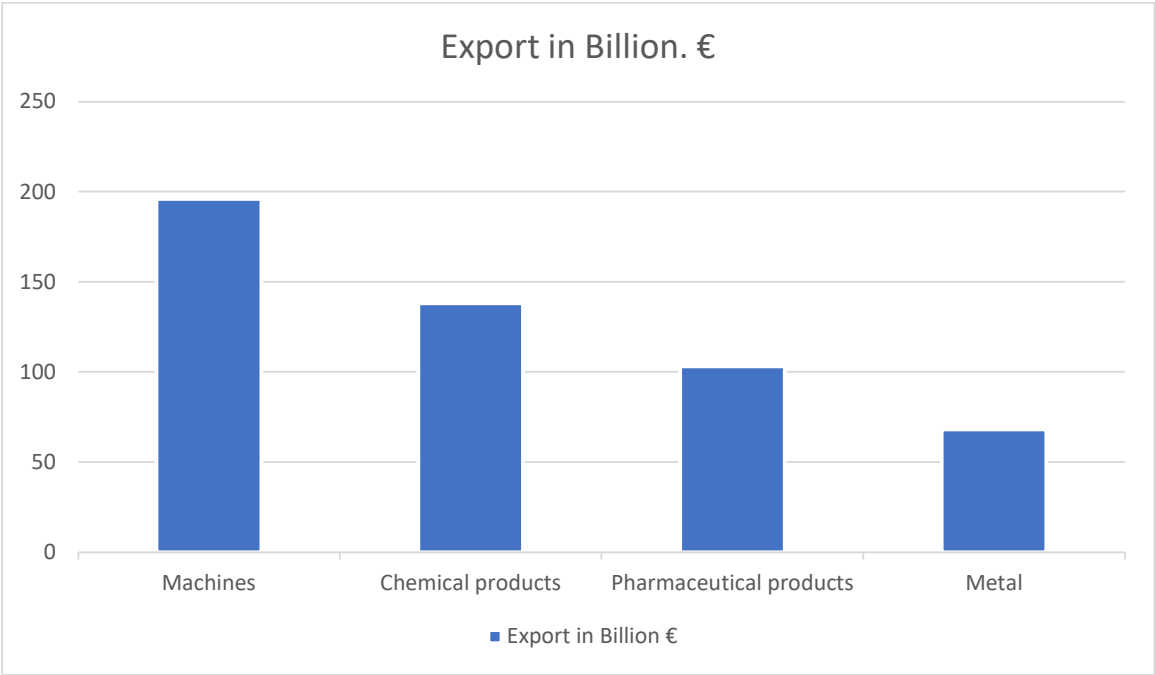


Figure 1: Export of traded Goods in Germany 2021

Source: Own representation, data from Statistisches Bundesamt, 2022.

In 2021 the most important German traded goods for whose production oil and gas are necessary were automobiles followed by machines, chemical products, pharmaceutical industry products and metal (Statistisches Bundesamt, 2022).

In the following section we want to show the global and the national importance of oil. Furthermore, the consequences of scarcity in industries and households are being analyzed. The global demand of oil will rise 1 percent every year until 2030. To make this more visual, in 2007 the demand was 85,2 million barrels per day. In 2030 the demand will be 105,2 million barrels (Mildner et al., 2011). 35 percent of German crude oil consumption last year came from Russia (Bundesministerium für Wirtschaft und Klimaschutz, 2022). The importance of oil becomes clearer when we look at the automotive sector. The mobility sector still uses gasoline and diesel for vehicles. The future lies in renewables even when it comes to fuel, petrochemical fuels will be replaced by synthetically produced fuels from renewable sources in the future. Besides the mobility sector there is a big need of oil in the chemical industry (Dürfeld, 2022). A scarcity, whether in oil or gas, leads to a shift to substitutes. Use and importance of renewable energies rises. A driver for this increase is the climate change. Our approach to reach net zero until 2050 in the world and 2045 in Germany is directly connected to a disrupt in oil and gas use. The IEA (Internationale Energie Agentur) points out that Germany can no longer invest in oil and gas when the country wants to achieve our 1.5-degree target (Bildung, 2022). 12,3 percent of global oil reserves are in private hand and 87,7 percent in state ownership (Mildner et al., 2011). In other words, it's about government regulations and political decisions. Due to the aggressive war in the Ukraine, the EU agreed on an oil embargo. In this way, Germany shows that they do not want to help finance this war. There is a bridging period of six months for the import of crude oil and eight months for gasoline or diesel. So, the sanctions will not start until the beginning of the next year, respectively (Cygan, 2022).

Now, the topic gas is being addressed. As in the previous section, the importance of the resource and its absence will again be analyzed. Of all European countries, Germany is the country that imports the most of Russian gas (Bildung, 2022). By observing the import and export between the countries, we put forward the thesis that the relationship between Germany and Russia can be described as a dependency relationship. To imagine this, 60 percent of our gas came from Russia (Bundesministerium für Wirtschaft und Klimaschutz, 2022). The natural gas

occurrence in Germany in 2020 comprises around 0,05 trillion cubic meters of (Centre for Energy Economics Research and Policy, Heriot-Watt University, 2021). This is not enough to cover the demand in Germany. So, Germany must import gas from other countries. Russia has a natural gas occurrence amounted to around 37,4 trillion cubic meters of gas (Centre for Energy Economics Research and Policy, Heriot-Watt University, 2021). 1980 Germany started importing Russian gas under Federal Chancellor Helmut Schmidt (SPD), who signed an agreement for a Soviet-German cooperation (Bildung, 2022). One thing that must be considered is that Russia was already using the export of gas and the dependence of importing countries as political leverage. For instance, in 2009 Russia and Ukraine had a conflict which led to disruptive geopolitical impact. Since Ukraine is a transit state for gas the countries Bulgaria, Moldova and Serbia were affected by bottlenecks (Bildung, 2022).

In the relationship between Germany and Russia, there has been cooperation, alliance, but also hostility throughout history. Since Russia attacked Ukraine, Germany has been discussing an embargo on gas. For now, the German government is against an embargo because this would directly lead to a loss of wealth for Germany. However, imports have already fallen by 40 percent. Germany could become completely independent of Russian gas by the summer of 2024. Gas from other countries is more expensive than from Russia. A higher price will lead to a higher use of substitutes, which can be solar or even oil (Bildung, 2022). On a governmental level, Germany as well as the EU has to react to scarcities in oil or gas. Decisions made by the EU directly affect Germany. Like the oil embargo, there could be a gas embargo.

4.2 Slow/Prepared Deglobalization

A prepared deglobalization means a cut of the relationship between Russia and Germany for the trade of gas. Further Germany has to find other import-partners in the future. From 2026 Germany will import gas from Qatar for a timespan of at least 15 years. Qatar has the third largest gas deposit in the world (Witsch & Stratmann, 2022). In the industries gas in basic chemistry and in the paper industry could be replaced by hydrogen in the future (Fremerey & Iglesias, 2022). In the mobility sector there will be mainly electric vehicles since this industry switches to synthetically produced fuels from renewable sources (Dürfeld, 2022). For Germany the supply of gas is necessary now and in the near future. Since gas become more expensive, consumers must reduce

their consumption by at least 20 percent to prevent the country from entering a gas supply emergency, at which point rationing would be implemented. In the future the most households switched to climate friendly heating systems like heat pumps. The German government is planning that from 2024 500.000 heat pumps are going to be installed every year (Bundesregierung, 2022). Even during the Energy transition, Germany still relies heavily on imports of fossil fuels, as its domestic resources are largely depleted, or extraction is prohibitively expensive. However, the projected decarbonization of all sectors by 2045 should almost completely remove the use of fossil fuels in Germany's energy consumption. Future reliance will be on renewable power or environmentally friendly fuel imports such as green hydrogen.

4.3 Fast/Abrupt Deglobalization

For now, the impacts of a scarcity in gas take place especially in paper-, metal-, glass- and ceramic industry and basic chemistry. The short-term saving potential in 2022 in these industries is as follows: Metal industry: 12,5 %, Glass and ceramic industry: 7,6 %, Basic chemistry: 4 % and Paper industry: 2,6 % (Fremerey & Iglesias, 2022). The gas is used as a fuel in industry. However, in some industries there is no substitute. For example, gas is needed in the production of steel. Direct consequences can be the collapse of production and resulting supply stoppages. The elimination of oil and gas is associated with high costs as well as Investments in substitutes. At this point disruptive effects occur. A collapse of production would threaten industries and companies and thus also the German economy. After production collapses, stocks will fall, investors will bail out, and companies can no longer repay loans. If many companies and industries crash, banks will bust. This would lead to a rise in inflation as well as interest rates. On the citizen level a collapse in industry would cause jobs shortages. Besides employees, whole households are affected. The government and its network regulator frequently push consumers to minimize their gas use due to rising gas prices and inflation. One possibility for owners is to switch to a climate-friendly energy source like be a heat pump. Tenants have fewer options for action and must accept the high prices (Pittel et al., 2022). But also, other European countries that are dependent on German export goods would be threaten. Supply shortages of these goods would weaken the economic situation of the countries. It can therefore be assumed that the EU member states would support Germany with gas supplies in order to avoid this situation (Pittel et al., 2022). In conclusion, we can assume that the

deglobalization of the raw materials oil and gas is leading to a decrease in prosperity for Germany (Vitak, 2022).

5. Case Study 2 - Rare earths

5.1 Rare earth elements: The vitamins of modern industry

Rare earth elements (REEs) are a group of 17 chemical elements, all metals, that tend to be found together in geologic deposits. Rare earth metals and the alloys that contain them are used in a variety of high-tech applications, such as wind turbines, electric vehicles, rechargeable batteries, radar systems, and laser crystals. For this reason, they are called "vitamins of modern industry."

"The importance of these elements for key industries and the dominance of China in their global supply puts REEs at the center of power struggles. In 2010, China blocked exports of rare earths to Japan during a dispute on East China Sea islands." (Gao & Beraud, 2019)

5.2 Adam Gao, Director, Specialty Chemicals, S&P Global Commodity Insights

Rare earths have become indispensable for today's day and age as well as for future technologies. In a report dated Feb. 16, 2022, the German Bundestag describes how important rare earths are to the daily lives of the German population:

"Many people are unaware of the enormous impact rare earth elements have on their daily lives, but it is almost impossible to use a piece of modern technology that does not contain one. Even a product as simple as a lightweight flint contains rare earth elements." (Deutscher Bundestag, 2022, p. 6)

At the time of their discovery back in the 18th century, these turned out to be components of complex oxides, which were called "earths" at the time. Since it was assumed that these materials were scarce, the elements were called "rare earths." Yet they are not that rare and are readily available. What makes rare earths so scarce for the economy is the economic exploitation of these deposits. According to the Institut für seltene Erden und Metalle AG (Institute for Rare Earths and Metals), an economically viable source should have a concentration of rare earths of 5%, unless other products are mined in the process. (ISE) Thus, the problem arises that many occurrences are present, but most are not economically profitable. Also, the mining of

rare earths has downsides. For example, mining produces large amounts of residues containing toxic waste, and most rare earth deposits contain radioactive materials (Öko-Institut e.V., 2011).

Because of such risks and economic exploitability, a few have emerged who supply nearly the entire world with rare earths. A precise overview of the individual elements of rare earths, as well as their various applications, can be found in the annex. The largest producer and thus the "king of rare earths" is China. China has about one-third of the world's rare earth mineral reserves and has only recently gained supremacy in this sector. After discovering new reserves in the 1960s, it took China until the early 1990s to replace the United States as the world's leading producer of rare earths. Chinese rare earth production is both geographically divided by type and heavily concentrated in a handful of mines (Jones, 2019). Even though China has ample resources and large mines, it has only gained its near monopoly on the global supply of rare earth elements by controlling the processing steps that separate the elements from the rest of the rock in which they are found. This control has presented a global supply risk, which became painfully evident in 2010 when China abruptly halted the export of rare earth ores, salts, and metals to Japan, a primary consumer. The United States, which imports many of the final products that Japan produces with rare earth elements, felt a secondary impact. Though the ban was temporary, it sent shockwaves through the global community and prompted countries and producers to scramble to try and find, develop, or reopen alternative rare earth element sources. (Jones, 2019) 2010 has shown how dependent the world is on the Chinese supply of rare earths. And Germany is highly dependent on Chinese imports. Therefore, the question for Germany is to what extent it is possible for the country to be independent of other countries and to build structures, and what happens if the supply of rare earths suddenly stops.

5.3 Rare earths in Germany

The increasing demand may become more and more problematic for Germany if its great dependence on China continues. Because in the course of China's plan to become climate neutral in 2060 and to become the global technology leader in key industries, the Chinese will need more and more raw materials for themselves (Wrede, 2022). In addition, geostrategic problems for Germany could also arise. Germany could

become involved in the rivalry between China and the USA and suffer significant damage as a result. The friendly relationship between the USA and Germany is no secret. The German Embassy itself concretizes the close ties with the USA: "Germany and the United States of America are linked by a long and growing friendship. They share many common experiences, values, and interests. The partnership with the U.S. will continue to be of paramount importance for our freedom, security and also for our economic success in the future." (Auswärtiges Amt, 2017)

The rivalry between the U.S. and China is clearly on the rise. In official U.S. government strategy documents, China has been trading as a "long-term strategic competitor" since 2017. This rivalry is multidimensional and refers to the technological dimension, economic and financial policy, and global power competition (Lippert & Perthes, 2020). If the conflict between these two economic powers worsens, and in the worst-case scenario, Germany could find itself in a lose-lose situation. Either Germany sides with China and risks the friendly relationship with the U.S., or Germany sticks to the friendly relationship and risks the loss of Chinese raw materials, which are crucial for the German economy.

5.4 Slow/Prepared deglobalization

Thus, the deglobalization of rare earths can proceed in two ways. On the one hand, in a gradual form in which Germany is aware of the risk of dependence and thus initiates countermeasures. On the other hand, a fast and abrupt form in which Germany does not have the time to take countermeasures and in which they do not have the choice as to whether they still get access to rare earths. In the first case, the initial question is whether Germany does not have its own deposits that could be used. In fact, a few years ago, a large deposit in Storkwitz was found with a deposit of rare earths. Since the content of the sought-after metals in the ore is less than half a percent, it became clear after a few years that extraction was not worthwhile (ARD, 2022). Therefore, Germany must find alternate solutions to make itself independent of China. Another possibility here would be diversification. Here, however, the problem arises again because there are few deposits that can be mined profitably. Therefore, there are only a few countries from which Germany can diversify while still meeting its own needs. This does not mean that it is impossible to diversify, and Germany is already showing this in its efforts. For example, in addition to China (as of 2020), Austria, the USA, France, Italy, and Japan are also major suppliers of rare earths (Bocksch, 2022). This

reduces the risk of a total loss of rare earths, but Chinese supplies are still needed to cover the total demand for rare earths in Germany.

Recycling is another attempt at an alternative solution to achieve rare earth independence. Part of the solution could be to reuse more materials through more efficient recycling processes and to focus more on a circular economy. But there are limits to this. As long as overall demand continues to rise steadily, recycling can only mitigate the problem in Germany, according to Peter Buchholz, head of DERA. "The industry can only recycle what is actually available," Buchholz said. "Forty years ago, copper demand was 10 million tons per year; today it's more than 20 million tons." (Wrede, 2022). To cushion the shock of potential export cuts, many countries, including the US, and Japan have sought to accumulate significant reserves of natural resources. As bad as the dependence and fear of dependence on China are, it must not be forgotten, according to Bleischwitz (Leibniz Center for Tropical Marine Research), that China is also dependent on imports from Germany and imported more raw materials, such as forest products and processed metals, before the Covid-19 pandemic (Wrede, 2022). Even if this is the case, however, it cannot be ruled out that access to rare earths from China will be denied. However, alternate solutions to this problem can act as an escape from China's monopoly in this rare earth market. Many small solutions will lead to a decrease in China's power over Germany. This includes diversification and recycling, but also the further development of new technologies that lead to being less dependent on rare earths. These are measures that make sense and will work if Germany has to invest in research and development in this segment. However, this does not have to be the case in the current situation. Therefore, the question arises as to what effects deglobalization will have on Germany if it cannot be planned and therefore happens quickly and uncontrolled.

Furthermore, Germany and Europe could increase their domestic extraction of raw materials. Possible options include introducing tax incentives for the extraction of raw materials, speeding up approval procedures, and participation by the federal government or the relevant state government. This would not only strengthen Germany's role as a raw materials producer and increase the security of supply for the entire EU, but could also be implemented in accordance with high environmental standards that China does not currently meet. Security of supply, (regional) economic promotion, and environmental protection could be combined. By leaving this raw

material market completely to China, the West would not only endanger the security of raw material supplies for its own industry but also do a great disservice to environmental protection. However, preventing all this would require rethinking and a coordinated change of course at the political level (Kulik, 2019).

Accordingly, if the West wants to substantially increase its security of supply for rare earths, it will have to think and act strategically, counter-cyclically, and in the long term. This would require a stronger role for the governments of the leading industrialized Western countries, especially Germany. The German aversion to fundamental debates on industrial and regulatory policy and to uncertain investments must not be used as an excuse to ignore the rare earths problem and let it remain below the radar. Rare earths will be critical raw materials for the foreseeable future, whether we like it or not. The time has come to face this raw materials and security policy challenge level (Kulik, 2019).

5.5 Fast/Abrupt deglobalization

A loss of rare earths from China would cause serious difficulties for the entire Western industry, especially the high-tech industry. Fig. 2 shows which materials have the highest supply risks and what impact they have on different technologies and their sectors.

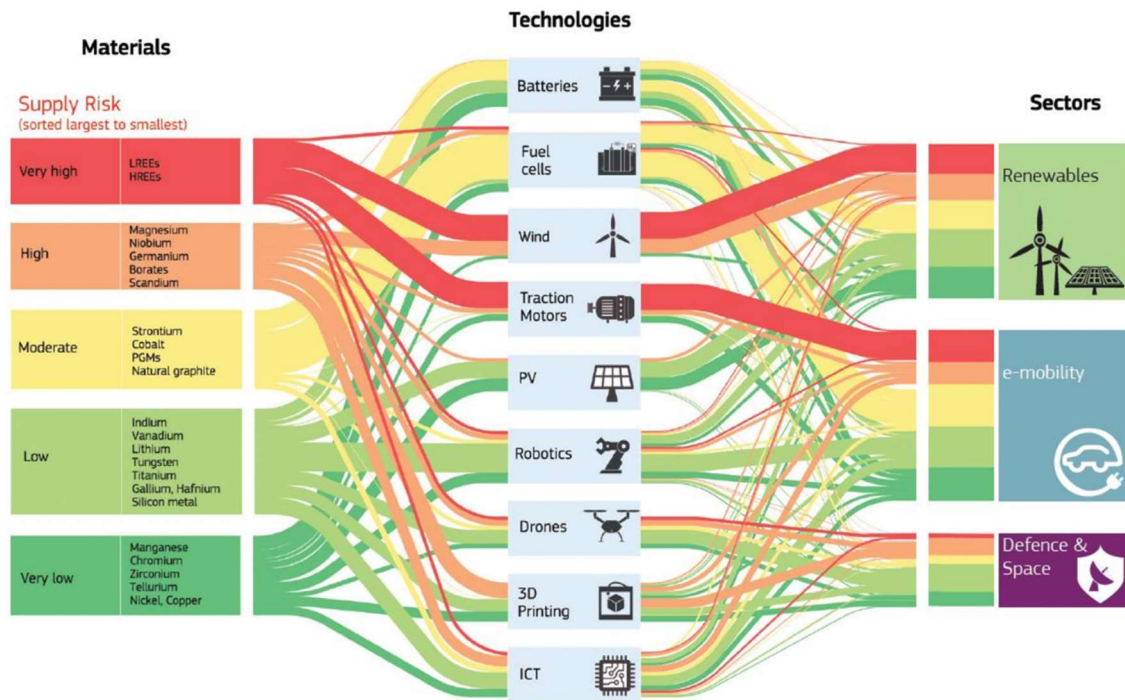


Figure 2: Supply risk and impact

Source: (European Commission, 2020, S. 10)

The figure clearly shows that the highest supply risk is for light rare earth elements (LREEs) and heavy rare earth elements (HREEs). The distinction between light and heavy is based on the weight of the elements. Rare earths are essential for angular momentum technologies and traction motors and have a significant impact on e-mobility and renewable energies. This is bad news, especially for Germany, which is known for its strong automotive industry. The automotive industry, in particular, is reliant on rare earths. A break in the supply chain would not only leave German automakers struggling to keep up with the trend toward electromobility, but it would also necessitate a technological regression in order to reduce their consumption of rare earths. Although no one can predict the future exactly, in the extreme case, these effects could cause enormous damage to Germany and its citizens. Companies that are heavily dependent on the supply of rare earths (such as the automotive industry) would suffer a massive loss in sales. They wouldn't be able to keep up with the international market over a long period of time. Some of these companies will have to start thinking about relocating in order to remain competitive in the international market. This migration of companies, combined with the lack of access to the necessary resources for high tech, would lead to Germany taking steps backwards in digitization, losing its export power, and causing massive discontent among the citizens. However,

every fourth job is dependent on exports (bpb, 2022). This, in combination with companies leaving the country and a massive drop in sales, can lead to increased unemployment, which could further intensify the resentment among the citizens. This is exacerbated by rising inflation, as companies must make up for their deficits and thus raise prices. To combat increased inflation, the European Central Bank would have to raise interest rates. This is because rising interest rates make loans more expensive; companies would therefore invest less, which would take away the spending power of consumers (Verbraucherzentrale, 2022). This reduction in aggregate demand would, however, lead to a further increase in job losses in the foreseeable future. The problem of the interest rate increase in the Euro currency is also highly indebted to countries such as Greece, Italy, or Portugal, where the increase would lead to massive consequences (Volkery, Höhler, Waschinski, Louven, & Wermke, 2022). Thus, it makes it difficult for the ECB to take major decisions.

The loss of rare earths also has a massive impact on renewable resources. Germany could face the risk of missing out on its own target of greenhouse gas neutrality by 2045 if it loses access to rare earths. According to a recent study by KfW Research, climate neutrality will cost Germany around five trillion euros (Brand & Römer, 2022). As a result, the citizens would continue to question the government, and discontent would spread. To avoid all this, there would be the possibility for Germany to financially support the companies that suffer from a lack of access to rare earths. But this would also have to be paid for in some way. Even if Germany increases its level of indebtedness, this will also have to be serviced in the long term. The risk here is that citizens will ultimately bear the costs through rising inflation rates. In the worst-case scenario, the government could invoke the Lastenausgleichsgesetz, which is based on the principle that those who have lost little, or nothing give from their assets to those who have lost a lot or everything (The Federal Government, n.d.). The application of this law would again deeply shake confidence in the government, especially for the wealthy with property. All these factors, which increase dissatisfaction and mistrust in the German government, could lead to massive out-migration because life in Germany is no longer considered attractive. This massive exodus could be the starting signal for a long-lasting downward spiral. The massive outflows would lead to a collapse in local demand. This would again reduce supply, making Germany even less attractive as a location. In this scenario, the question must be asked whether Germany can still

function as a social state in this way. The discontent among the middle and upper classes has led many to leave the country. Unemployment is rising sharply, but there are fewer and fewer taxpayers to provide for the lower class and the unemployed. This would mean that in the worst case, Germany would collapse, from which it could recover with difficulty or not at all. Of course, from his point of view, it's hypothetical. However, this scenario should show how bad it can get in the end if Germany is not prepared and everything goes wrong. It demonstrates the importance of rare earths to Germany and the consequences for the government, businesses, and citizens.

6. Conclusion

The two case studies show how dependent Germany is on the resources of other nations to maintain its own prosperity. A sudden deglobalization without the necessary preparation time can affect Germany. The Russia-Ukraine crisis and its consequences show how severe the consequences can be. Also, in the area of rare earths, we have already had a small foreboding in 2010; what will happen if there is suddenly no longer the possibility to fall back sufficiently on these resources? As resources are the basic building blocks of today's civilization, the consequences of a lack of important resources would affect all areas of German society. The German government must consider on a geostrategic level how to ensure the supply of the country, who is still suitable as a strategic partner, and which values must be adhered to. The largest German industries must look at how they can continue to maintain production capacity and also remain relevant for the future on the international market if, for example, no rare earths are available. The population must also ensure its own survival, and the government must ensure that the discontent does not become too great. A lack of confidence in combination with the crisis due to the lack of important resources can lead to the fact that the effects on Germany end up being so extreme that Germany never recovers from this shock. Therefore, it is especially important for Germany to prepare for deglobalization. Long-term trends already show that some resources could become scarce because countries need them more and more for themselves (like rare earths in China). Preparing for this scenario means that it will be easier to react to short-term supply shortages, so that the effects of short-term unplanned deglobalization will not be too intense. These preparations include the establishment of zero-waste recycling systems, the diversification of suppliers (offshoring, nearshoring, and friendshoring), and the advancement of new technologies. Despite

the current difficult situation, Germany is still far from the worst-case scenario. But if care is not taken, the situation could end in disaster for the whole country.

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Annex

Symbol	Name	Selected use
Sc	Scandium	Stadium lighting, fuel cells, racing bikes, X-ray technology, laser
Y	Yttrium	fluorescent lamps, LCD and plasma screens, LEDs, fuel cell Nd:YAG lasers
La	Lanthan	Nickel metal hydride batteries (e.g. in electric and hybrid cars, laptops), catalytic converters,
Ce	Cer	soot particle filters, fuel cells, glasses with high refractive index
Pr	Praseodym	Automotive catalysts, soot particle filters, ultraviolet radiation protection glasses, polishing agents
Nd	Neodym	Permanent magnets, aircraft engines, electric motors, glass and enamel coloration
Pm	Promethium	Permanent magnets (e.g. in electric motors, wind turbines,
Sm	Samarium	nuclear spin tomographs, hard disks), glass dyeing, lasers, CD players
Eu	Europium	luminous numerals, heat sources in space probes and satellites (radioactive element)
Gd	Gadolinium	Permanent magnets (in dictaphones, headphones, hard disk drives),
Tb	Terbium	space travel, glasses, lasers, medicine
Dy	Dysprosium	LEDs, fluorescent lamps, plasma televisions (red phosphor)
Ho	Holmium	Contrast agents (magnetic resonance imaging), radar screens (green phosphor),
Er	Erbium	nuclear power plant fuel elements
Tm	Thulium	phosphors, permanent magnets
Yb	Ytterbium	Permanent magnets (e.g. wind turbines), phosphors, lasers, nuclear reactors
Lu	Lutetium	High-power magnets, medical technology, lasers, nuclear reactors