



# COMPETITIVENESS IN TIMES OF GEOPOLITICAL CHANGE

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## **References**

This is a translated version of the original German-language chapter "Wettbewerbsfähigkeit in Zeiten geopolitischer Veränderungen", which is the sole authoritative text. Please cite the original German-language chapter if any reference is made to this text.

## KEY MESSAGES

- The competitiveness and, hence also, the success of the German economy over the past few decades have largely been based on its increasing integration into the global economy.
- Economic dependencies and growing geopolitical tensions pose new challenges for Germany and Europe.
- Greater diversification of supply chains, the expansion of European production capacities and infrastructures as well as the strengthening of strategic autonomy are therefore urgently needed.

## EXECUTIVE SUMMARY

The competitiveness of an economy is a key driver of growth and prosperity. In recent decades, Germany has benefited more than almost any other European economy from the liberalisation of trade and the growing **international division of labour**. However, **increasing dependencies** pose new challenges to Germany's trade-based economic model – especially with regard to supplies of energy and critical raw materials. In addition, third countries use **subsidies** in a way that distorts competition, which can make the procurement of critical raw materials from alternative sources uneconomical and create dependencies on these third countries. At the same time, economic and trade policies are increasingly being influenced by geostrategic considerations. Given the **geopolitical changes** evident, for example, in Russia's war of aggression on Ukraine and the tense relationship between some Western economies and China, the question is how strategic autonomy can be strengthened without restricting international economic openness.

In order to reduce dependencies and increase the resilience of value chains, greater **diversification** of supply chains is urgently needed. This is primarily the responsibility of the private sector. However, the government could provide targeted support for diversification. **Strategic alliances** with countries that share European values and priorities in the areas of democracy, human rights and the rule of law can contribute here. At the same time, there should continue to be openness to partnerships with third countries, not least in relation to global public goods such as climate protection and public health. Furthermore, long-term agreements to supply raw materials can be secured by means of **untied loan guarantees**. **Investment guarantees** for German firms in third countries could also support diversification.

Dependencies can be reduced by **increasing European production capacities** in strategically important areas. This includes the expansion of renewable energy and the domestic extraction of critical raw materials. To strengthen strategic autonomy, the **stockpiling** of products of overriding strategic importance could also be expanded. To this end, the tax discrimination against stockpiling should be scrapped.

Geopolitical changes should be addressed by **strengthening European interests and values**. The concept of '**open strategic autonomy**' proposed by the European Commission provides an appropriate framework for acting as autonomously as necessary but as openly as possible. Protectionist tendencies and trade-distorting practices by third countries should be decisively countered by the European Union's (EU) enhanced trade defence instruments. In addition, the **benefits of democratic constitutional systems** should be emphasised in the public discourse.

# I. COMPETITIVENESS IN TIMES OF GEOPOLITICAL CHANGE

462. In its role as the national productivity board, the GCEE is addressing competitiveness issues this year. The European Union's view (2022) is that a **competitive economy** is capable of generating sustainable economic growth and thus growing income and prosperity. Germany's productivity and economic performance have improved significantly in recent years owing to the increasing liberalisation of **international trade**. Its strong integration into international value chains therefore now makes Germany one of the most open and prosperous economies in the world. [↗ ITEMS 473 FF.](#)
463. However, the success of the German economic model depends on the **availability of imported intermediate goods** and **raw materials** (Felbermayr, 2021). Recent crises have revealed how quickly disruptions in supply chains can affect large sections of the economy and how great the country's **dependence** on foreign manufacturers is – for example its reliance on individual suppliers of **critical raw materials**. These are essential in the production of many key technologies [↗ GLOSSARY](#) such as semiconductors or wind and solar power plants. The high degree of reliance on Russian energy supplies is currently posing major challenges for the German economy. [↗ ITEMS 56, 61 AND 268](#) Politicians and business leaders need to ensure that the country does not become similarly dependent on items such as critical raw materials. [↗ ITEMS 486 FF.](#)
464. Germany's future competitiveness is thus likely to rely crucially on whether it manages to **reduce the dependencies** in its supply chains and value chains. **Firms** are theoretically responsible for strengthening their own resilience by diversifying their procurement activities. However, the incentive to do so is reduced if the government performs an insurance function in the event of risks materialising or if the firms concerned diversify their risk by operating through international locations. However, the government can provide supporting incentives for firms to diversify their procurement. Adapting existing **strategic alliances** and developing new ones is likely to be essential for securing future competitiveness. Countries that share European values and priorities in the areas of democracy, human rights and the rule of law should come more into focus, but without excluding third countries, especially when it comes to providing global public goods such as climate protection and public healthcare. [↗ ITEMS 506 FF.](#)
465. The targeted **development of European manufacturing capacities** for products of overriding strategic importance may be appropriate. As far as supplies of raw materials are concerned, this could be achieved, for example, through the greater exploitation of available raw material deposits and the expansion of renewable energy. This would require the right legal framework to be put in place by, for example, accelerating the necessary planning and approval procedures and strengthening the internal energy market. In addition, the tax disadvantages on stockpiling should be removed. [↗ ITEM 521](#) Subsidies should be used as a last resort. [↗ ITEM 533](#)

466. After all, the future competitiveness of the German economy depends to a large extent on its ability to raise its productivity and maintain high levels of employment with the help of **innovation** and new technology (Aghion et al., 2005; GCEE Annual Report 2019 items 134 ff. and 146 ff.). To this end, the right conditions for encouraging innovation – such as capital formation in education and **human capital** – are of paramount importance. [↗ BOX 22](#)
467. Germany is confronted with **geopolitical changes** arising from the war in Ukraine and the tense relationship between the West and China. In particular, there is a growing risk that some countries will exploit economic dependencies as a **way of exerting political pressure**. These developments pose the question of how European values and interests can be safeguarded without fundamentally restricting international economic openness. [↗ ITEMS 500 FF.](#)

Given these geopolitical tensions, the concept of **Open Strategic Autonomy proposed by the European Commission** offers a suitable starting point. This concept pursues the preservation of European objectives by strengthening multilateralism while, at the same time, recognising the benefits of international cooperation and the division of labour. Institutions, such as European competition law, also play an important role in this context, ensuring that the creative destruction necessary for structural change is not delayed by the interests of individual countries or groups of actors (Aghion et al., 2005; Acemoglu and Robinson, 2012). The EU's enhanced trade defence instruments also offer new opportunities to push back against autocratic states that condone the use of unfair trade practices.

[↗ ITEM 535](#)

## II. CLASSIFICATION OF GERMAN COMPETITIVENESS

### 1. Indicators of competitiveness

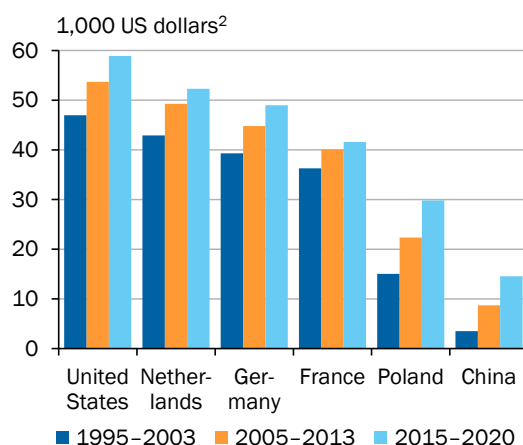
468. The **traditional** understanding of competitiveness has been shaped by a **nation-state, mercantilist view** that regarded countries as competitors in world markets and focused on cutting costs and winning market share (Thurow, 1992; Luttwak, 1993; see also the discussion in Voinescu and Moisoiu, 2015; and Aiginger, 2017). This interpretation of competitiveness, which is similar to that of firms, was criticised by Krugman (1994) as a “**dangerous obsession**”. This is because one relevant difference between firms and countries is that a firm, unlike a country, can exit the market and be abandoned if it lacks competitiveness. For an economy, on the other hand, it is much more important to use its factors of production efficiently and to strengthen its long-term growth process.
469. Growth in **productivity** and long-term potential output therefore lies at the heart of almost all definitions of the **competitiveness** of national economies **to-day**. According to the definition used by the European Union (2022), a competitive economy is able to increase its national income and, therefore, its prosperity by generating sustainable productivity growth. A key element here is the international division of labour between national economies, which delivers productivity

#### ➤ CHART 130

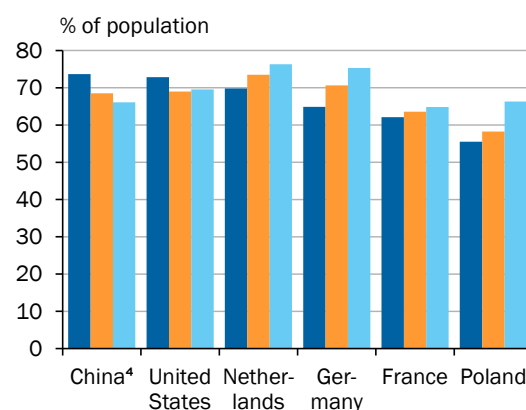
#### Economy wide indicators of competitiveness in international comparison<sup>1</sup>

Average over the respective period

Development of GDP per capita in Germany in the midfield of the most important trading partners



Strong increase in employment rate<sup>3</sup> in Germany



1 – For Germany and the five most important trading partners by exports and turnover in 2021. 2 – US dollars in constant prices and in purchasing power parities in 2015. 3 – Employees aged 15 to 64 in relation to the population in the same age group. 4 – International Labour Organization (ILO) estimates for workers aged 15 and over.

Sources: ILO, OECD, World Bank, own calculations

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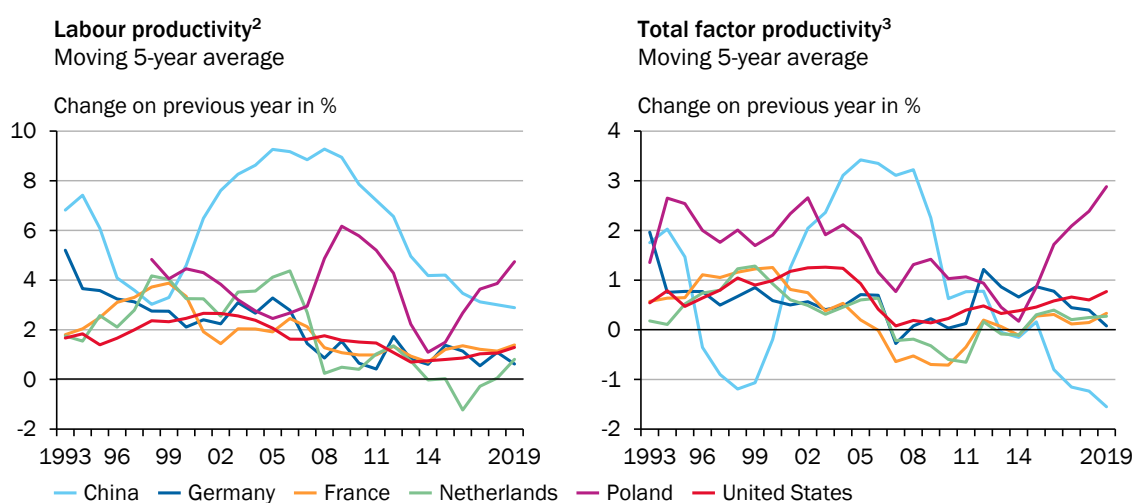
and welfare improvements for all trading partners as a result of the more efficient use of factors of production (GCEE Annual Report 2017 items 629 ff.). [↗ ITEM 474](#)

**470. Measures of target achievement** can include gross domestic product (GDP) per capita and the employment rate. [↗ CHART 130](#) Comparing Germany with major trading partners reveals differences in the levels of material prosperity. [↗ CHART 130 LEFT](#) **Economic output per capita has increased** in Germany and in all of its relevant trading partners since 1995. At the same time, however, none of these countries has managed to catch up with the levels of prosperity in the US. The differences in these nations' employment rates are less clear. [↗ CHART 130 RIGHT](#) Here all countries except the United States and China have been able to **raise their employment rates over time**. Germany has even managed to increase its employment rate quite sharply in comparison and therefore – like the Netherlands – has achieved the European Commission's target of an employment rate of at least 75 %.

**471. Increasing productivity** is essential for raising the level of prosperity over the long term. Productivity growth, in turn, is essentially determined by investment in innovation and technological progress, in education and the creation of human capital, as well as in the productive capital stock. [↗ BOX 22](#) An international comparison of the economies considered here reveals that labour productivity is still highest in the US, although Germany and other European economies have managed to catch up. [↗ CHART 153 APPENDIX](#) At the same time, **productivity growth** slowed in almost all economies shown during the period under review. [↗ CHART 131](#)

[↗ CHART 131](#)

### Productivity growth declining in many economies<sup>1</sup>



1 – For Germany and the five most important trading partners by exports and turnover in 2021. 2 – GDP per hour worked. 3 – Total factor productivity growth indicates the part of GDP growth that cannot be explained by the increased use of the production factor labour and capital, and measures efficiency gains and technological progress.

Sources: Federal Statistical Office, Penn World Table 10.0 according to Feenstra et al. (2015), own calculations  
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## [↗ BOX 22](#)

### Determinants of competitiveness

When analysing the **competitiveness** of an economy, a distinction is made between price competitiveness and **non-price competitiveness**.

#### Price competitiveness

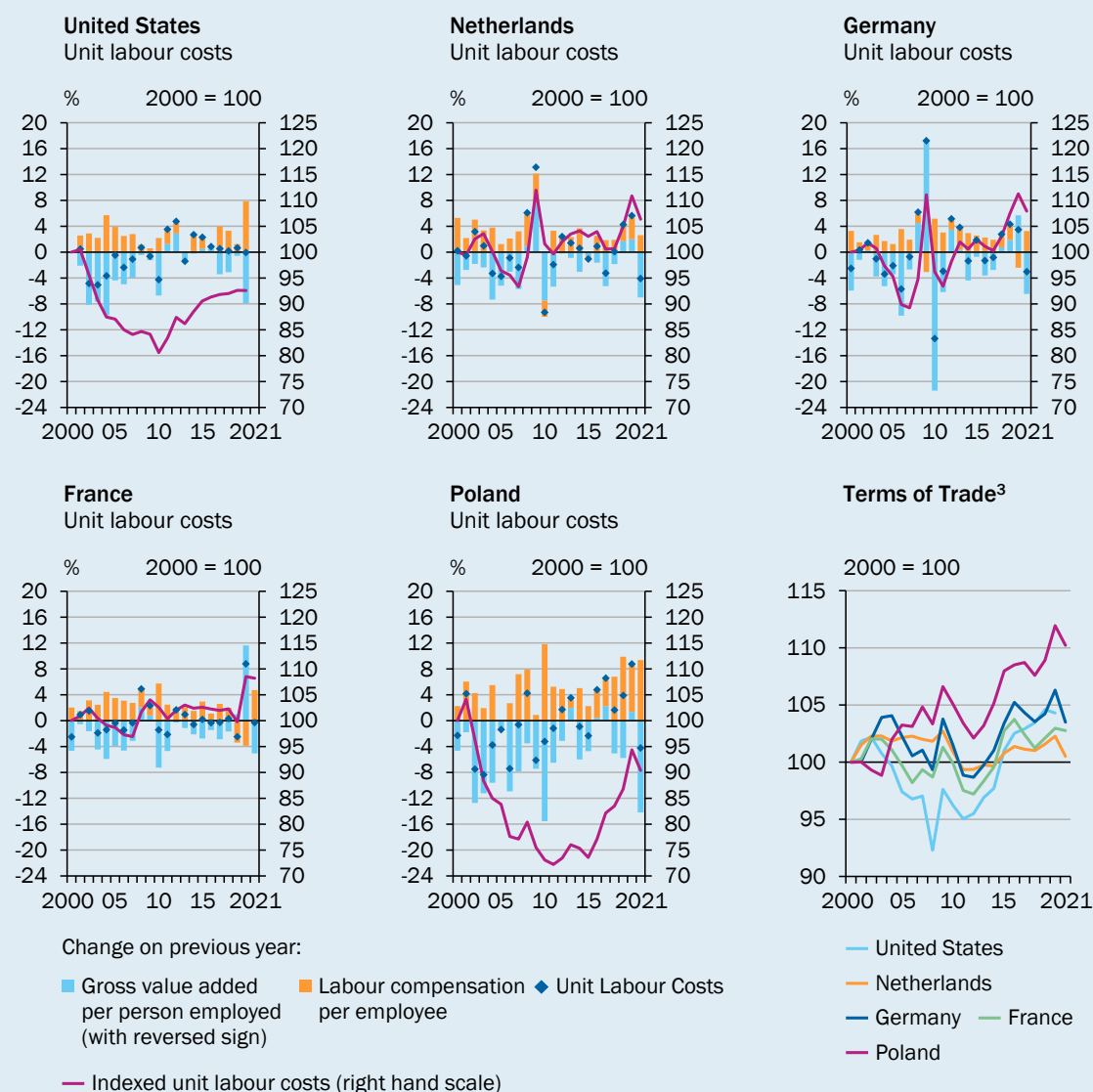
Price competitiveness is the **relative price and cost position** of an economy compared with its trading partners and is a key indicator of export performance. The indicators most commonly used to measure price competitiveness include unit labour costs [↗ GLOSSARY](#), terms of trade [↗ GLOSSARY](#) and real effective exchange rates [↗ GLOSSARY](#) (Peneder and Rammer, 2018). Unit labour costs in the manufacturing sector are a key factor for assessing a country's quality as an industrial location (IfW, 2020, p. 98). The **decomposition of unit labour costs** into their components can provide information on the relationship between **labour costs** and **labour productivity** over time. [↗ CHART 132](#) Unit labour costs in Germany's manufacturing sector are high compared with major trading partners (IfW, 2020, p. 102 ff.; Schröder, 2020), which is partly due to the country's large, labour-intensive engineering industry (Schröder, 2020, p. 49). Unit labour costs in all countries considered here declined between 2000 and 2007, which is explained by the sharper rise in labour productivity relative to workers' remuneration (so-called wage moderation) (Deutsche Bundesbank, 2019; GCEE Annual Report 2014 items 459 and 462 ff.; GCEE Annual Report 2019 box 6 and item 166). Unit labour costs in Germany increased by a total of about 12 % between 2010 and 2021, while in the US they rose similarly by almost 15 %. [↗ CHART 132](#) The largest increase over the same period was in Poland (around 24 %). In France and the Netherlands the growth in unit labour costs was comparatively low at around 5 % each. Germany's rise in labour costs of about 25 % contrasts with a labour productivity increase of only about 12 % over the period from 2010 to 2021. [↗ CHART 132 TOP RIGHT](#)

As a real exchange ratio between exports and imports, the **terms of trade** determine whether a country is able to finance its imports through its exports (Peneder and Rammer, 2018, p. 91). The terms of trade increase when the price of a unit of exported goods rises more than the price of a unit of imported goods in an economy because, for example, domestic goods generate high foreign demand. Rising terms of trade therefore support the domestic income of the exporting economy. For a country like Germany, which is strongly integrated into international value chains, its terms of trade are of great importance because its high share of imported intermediate goods means that a broad increase in import prices can substantially reduce the purchasing power of export buyers. While the terms of trade in Germany and its major trading partners fluctuated until the financial crisis, they improved after 2012/13 but have deteriorated significantly since 2020, especially in the European economies. [↗ CHART 132 BOTTOM RIGHT](#) This is mainly due to the sharp increase in the prices of imported intermediate goods, raw materials and energy since the COVID-19 pandemic. The war in Ukraine has further exacerbated this trend during 2022. [↗ ITEMS 8 F. AND 291](#)

Real effective exchange rates represent the nominal exchange ratio of a currency vis-à-vis its trading partners together with the ratio of price levels. [↗ GLOSSARY](#) In contrast to the terms of trade, this usually takes account of the prices of tradable and non-tradable goods over time and thus the level of prices across the economy as a whole. Changes in relative price differences reflect differences in productivity growth between countries (Balassa, 1964; Samuelson, 1964). An economy's higher productivity growth in tradable goods relative to non-tradable goods compared with its trading partners can lead to an appreciation in the real effective exchange rate and, consequently, a deterioration in price competitiveness (Peneder and Rammer, 2018, p. 96 f.). **Measured in terms of** its real effective exchange rate, Germany has appreciated slightly during the period under review since 2010. Its price **competitiveness** has thus **declined**.

↙ CHART 132

## Unit labour costs<sup>1</sup> in manufacturing and terms of trade for Germany and major trading partners<sup>2</sup>



1 – Unit labour costs measure the average labour costs per unit of output relative to the ratio of labour costs to real gross value added (GVA) according to the person concept in manufacturing. Reading aid: The changes in unit labour costs can be decomposed into the contribution of the change in GVA per person employed and the contribution of the change in Labour compensation per employee. For example, the blue diamond in 2021 in the panel of the Netherlands indicates that unit labour costs fell by about 4 % between 2020 and 2021. This is because GVA per person employed has increased by about 7 % (light blue column; with reversed sign). This increase is only partly offset by the increase in Labour compensation per employee of about 3 % (orange column). 2 – The selection includes Germany and the five most important trading partners in terms of exports and total turnover except China in 2021. 3 – Terms of trade measure the real exchange ratio between export and import goods, calculated as the export price level in relation to the import price level and thus provide information on the relative purchasing power level compared to the trading partners.

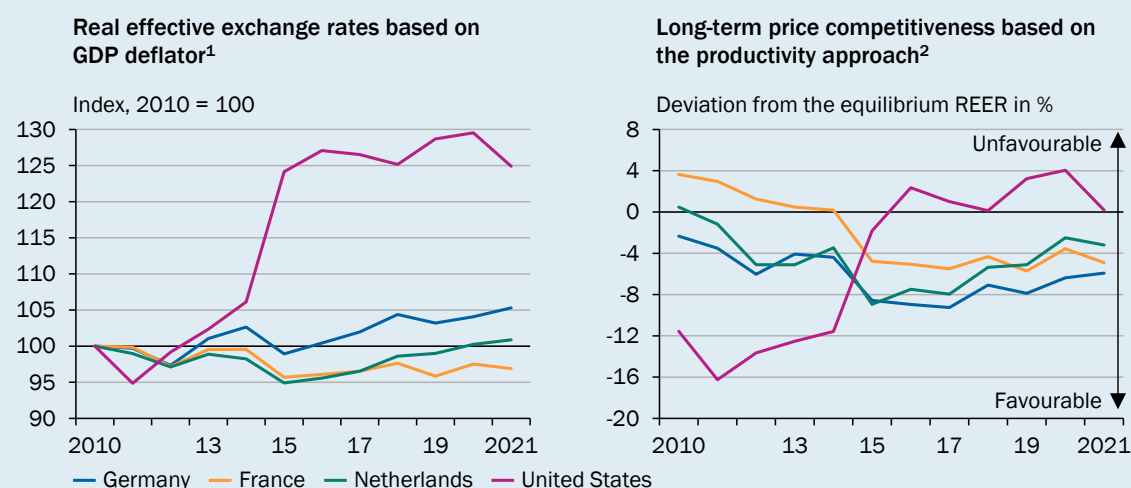
Sources: Federal Statistical Office, OECD, own calculations  
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↘ **CHART 133 LEFT** The real appreciation and, thus, the loss of price competitiveness experienced by the US and China over the same period was significantly larger. This was due in particular to the strong appreciation of the US dollar and the Chinese renminbi. There was little change in the price competitiveness of European trading partners important to Germany, such as France and the Netherlands, owing to the lack of an exchange rate channel within the euro area. The massive increase in Europe's energy costs is likely to bring about a further deterioration in price competitiveness in the short to medium term, as is already evidenced by the deterioration in the terms of trade. ↘ **ITEMS 63 AND 300**

↘ **CHART 133**

### Price competitiveness in Germany slightly declining recently



1 – The Real Effective Exchange Rate (REER) indicator measures the change in trade-weighted exchange rates, taking into account relative prices and costs vis-à-vis 37 trading partners. 2 – Price competitiveness defined as the percentage deviation of real effective exchange rates from the equilibrium value based on the productivity approach. Calculations of the Deutsche Bundesbank according to the approach of Fischer (2019). Only the current trade weights of the years 2016 to 2018 were used.

Sources: Deutsche Bundesbank, European Commission, Fischer (2019), own calculations

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Although real effective exchange rates are suitable for capturing changes in price competitiveness, without a theoretically sound equilibrium value they do not allow any assessment to be made about the level and, hence, the long-term competitive position of a country (Fischer and Hossfeld, 2014). **Equilibrium real exchange rates** ↘ **GLOSSARY** **enable the level of competitiveness to be assessed** in relation to an indicative value. Estimating an equilibrium benchmark often involves **using a productivity approach**, which attributes differences in relative prices between two economies to different levels of productivity and, thus, to differences in the prices of non-tradable goods (Balassa, 1964; Samuelson, 1964). Calculations done by Deutsche Bundesbank for Germany, which are based on the productivity approach for the equilibrium real effective exchange rate (Fischer, 2019) and were made available to the GCEE, show a slightly negative deviation in the real effective exchange rate from the equilibrium value for 2021 and therefore reveal a favourable competitive position. ↘ **CHART 133 RIGHT** This is the case even though the real effective exchange rate has been pointing to a deterioration in price competitiveness for about five years now. Given these productivity-based, equilibrium real effective exchange rates, however, Germany's overall position in terms of price competitiveness is encouraging. Following the appreciation of the US dollar in 2014/15, the United States has achieved a relatively neutral competitive position after having been undervalued in 2021.

## Non-price competitiveness

Peneder and Rammer (2018, p. 94 f.) argue that although price competitiveness indicators provide information on a country's export performance, they are not suitable measures of a country's longer-term competitiveness. Ultimately, the non-price competitiveness of an economy is primarily determined by factors that **increase productivity growth in the long term** and thus contribute to sustainable income and employment growth, i.e. **innovation** and capital formation in productive physical and human capital.

**Research and development (R&D)** are key drivers of technological progress (GCEE Annual Report 2020 items 485 ff.). Germany's domestic R&D expenditure as a share of GDP has risen steadily over the past 25 years to 3.13 % at present, exceeding the 3 % target set at EU level (Federal Statistical Office, 2022). [↘ CHART 134 TOP](#) **Germany's R&D ratio is high by international standards**. Given the high level of concentration in Germany's manufacturing sector, R&D expenditure in this country tends to be more focused on individual industries – especially automobiles and engineering – than it is in other nations (GCEE Annual Report 2019 item 293). While R&D spending as a share of revenue is high in sectors such as pharmaceuticals, Germany does not really specialise in patents that can be assigned to the key technologies [↘ GLOSSARY](#) of the fourth industrial revolution [↘ GLOSSARY](#) (EFI, 2022; GCEE Annual Report 2020 items 529 ff.).

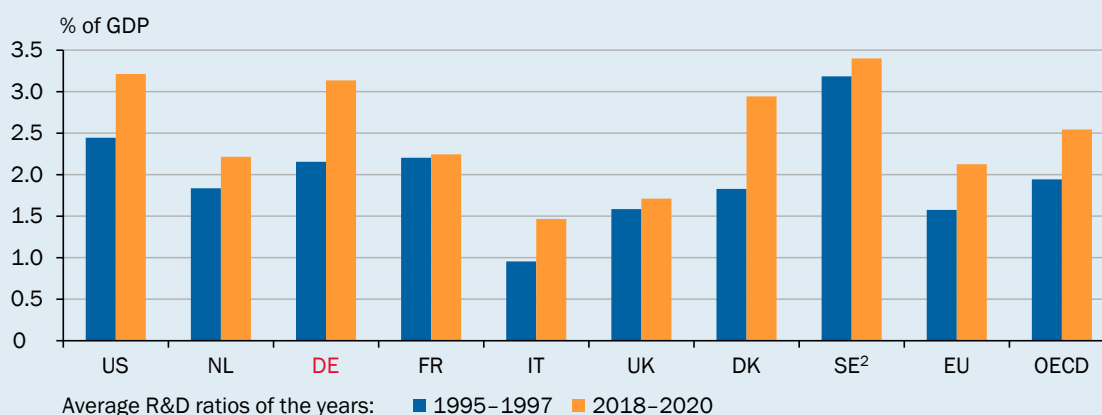
Key to increasing productivity is that **R&D results** are translated into commercially viable **innovations** (GCEE Annual Report 2020 items 487 ff.) and that the resulting **new technologies spread**. However, the proportion of companies in Germany that introduced product or process innovations declined between the late 1990s and 2017 (GCEE Annual Report 2020 item 502). The low availability of **venture capital** by international standards – which is a major source of funding especially for start-ups and young innovative firms and, consequently, for the diffusion of new technologies – could explain part of this decline (GCEE Annual Report 2019 items 284 ff.; GCEE Annual Report 2020 items 520 ff.). The introduction and use of new technologies at existing firms often requires adjustments to be made to processes and organisational structures. Good management can play a decisive role in ensuring that these adjustments are successful. Although the level of **managerial skills** at German companies is very high compared with other countries, the variations between firms are also considerable, especially at SMEs (Bloom and Van Reenen, 2010; Broszeit et al., 2019; GCEE Annual Report 2019 items 194 f.). At the same time, the diffusion of technologies depends on other **locational factors** such as the quality of digital infrastructure (GCEE Annual Report 2020 items 540 ff. and 571 ff.).

Another key determinant of productivity is the **human capital** available in an economy. A large stock of human capital is a prerequisite for R&D (GCEE Annual Report 2020 item 486), is essential for the use of new technologies (GCEE Annual Report 2020 item 489) and raises workers' productivity (Abowd and Kramarz, 2005; GCEE Annual Report 2021 items 326 ff.). Human capital in Germany, as measured by the World Bank's Human Capital Index, is at a level similar to other EU member states but above the level in the US and China. One indicator of the level of human capital developed by the OECD even saw Germany in first place within the OECD in 2014 (Botev et al., 2019). **Investment in education plays an important role** in the ongoing development of an economy's human capital (GCEE Annual Report 2021 items 325 ff.). This was measured by expenditure per person at an educational institution relative to per-capita GDP and, for Germany as a whole, was slightly below the OECD average in 2018 (GCEE Annual Report 2021 item 375). [↘ CHART 134 BOTTOM LEFT](#) While spending on secondary education slightly exceeded the OECD average, expenditure on primary education was significantly lower. However, spending on early-childhood education for ages zero to five was slightly above the OECD average. Capital formation in early primary education is particularly worthwhile, as deficits in this area are difficult to compensate for subsequently and therefore have a negative impact on later human capital levels (GCEE Annual Report 2021 items 327 ff.). [↘ ITEM 411](#)

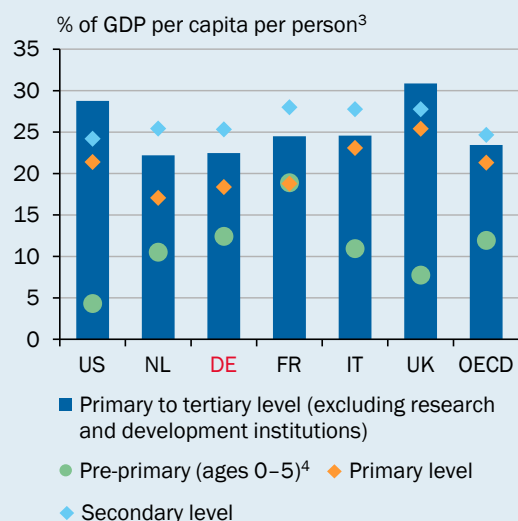
▮ CHART 134

### Research and development expenditure and capital formation in international comparison<sup>1</sup>

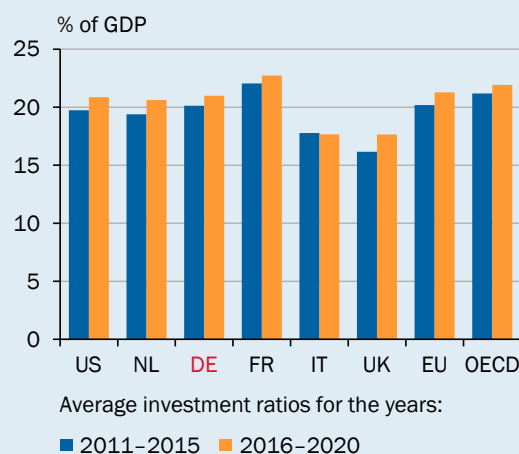
#### German expenditure on research and development high in international comparison



#### German spending on educational institutions slightly below OECD average in 2018



#### German gross fixed capital formation slightly below OECD average



1 – US-United States, NL-Netherlands, DE-Germany, FR-France, IT-Italy, UK-United Kingdom, DK-Denmark, SE-Sweden, EU-EU27, OECD average of OECD member States. 2 – No value available for the year 1996 3 – Private and public expenditure on educational institutions per school child or per student. Based on data adjusted for purchasing power. 4 – Expenditure on childcare and pre-school education for the year 2017. 5 – Pre-school expenditure is included.

Sources: OECD, World Bank, own calculations

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And, last but not least, productivity growth is affected by capital formation in **productive capital**. This increases labour productivity and intensifies the use of capital as a factor of production (GCEE Annual Report 2019 items 147 ff.). The decline in labour productivity growth in Germany since the 1990s is therefore partly due to a decrease in capital intensity growth. World Bank data show that Germany's gross fixed capital formation as a share of GDP averaged 21.0 % from 2016 to 2020, which was slightly below the OECD (21.9 %) and EU (21.3 %) averages. ▮ CHART 134 BOTTOM RIGHT Germany also has very low (and only slowly growing) investment ratios for capital formation in **intangible capital goods**, which have gained in importance in recent years (GCEE Annual Report 2020 items 563 ff.) – especially in the service sector – on an international comparison.

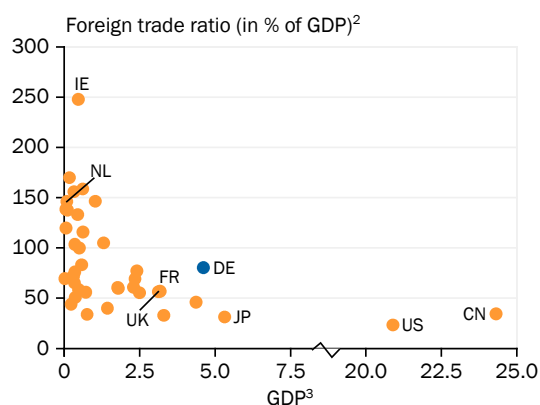
## 2. Importance of the international division of labour for German competitiveness

472. A **significant proportion** of the **growth** in the **German economy** in recent years can be attributed to its **strong focus on international trade** and the **integration of its manufacturing sector into global value chains** (Fries et al., 2020). Germany's total foreign trade as a share of its GDP (so-called 'foreign trade ratio') is particularly high at about 80 %. [↪ CHART 135 TOP LEFT](#) The country's involvement in international trade is thus stronger than that of comparable large

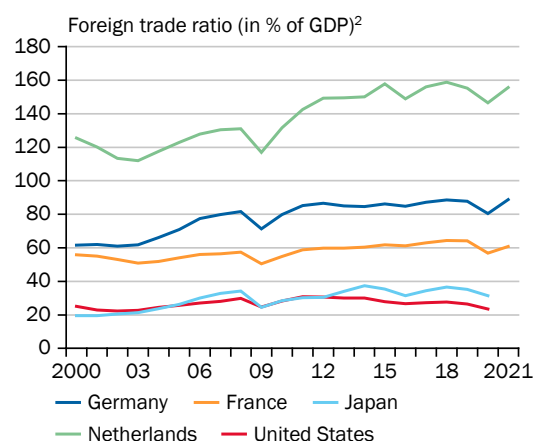
↪ CHART 135

### Foreign trade ratios in international comparison and German exports and imports by region

In terms of GDP, Germany was one of the most open economies in 2020<sup>1</sup>

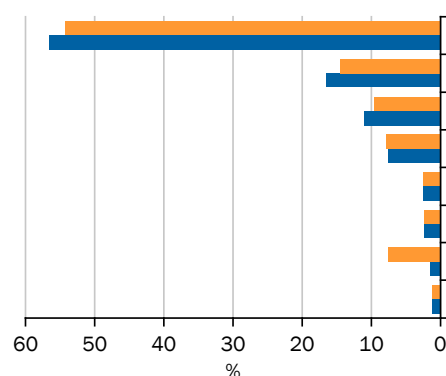


Openness of the German economy has risen distinctly compared to similarly sized countries

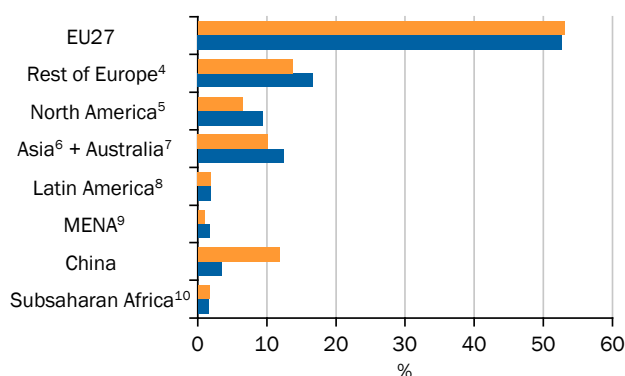


### Strong concentration of German exports and imports on EU member states

Share of exports in total exports



Share of imports in total imports



1 – CN-China, DE-Germany, FR-France, IE-Ireland, JP-Japan, NL-Netherlands, UK-United Kingdom, US-United States. Number of advanced economies: 33. Number of emerging countries: 7. 2 – Share of the sum of exports and imports in the GDP of the respective country. 3 – In trillions of US dollars in purchasing power parities. 4 – Countries outside the EU27. 5 – Mainly Canada and the United States. 6 – Asia excluding China and countries in the MENA group (see footnote 9 for composition). 7 – Including Oceania. 8 – Mexico and Central and South America. 9 – Middle East and North Africa (Algeria, Bahrain, Egypt, Djibouti, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, occupied Palestinian territory, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, Yemen). 10 – Africa without countries in the MENA group.

economies such as the United States, France and Japan but weaker than that of small open economies such as the Netherlands. Germany's openness as measured by its foreign trade ratio has also grown over time. This increase is substantial compared with similarly sized economies. Only small economies such as the Netherlands have seen a sharper rise in their foreign trade ratio. [↗ CHART 135 TOP RIGHT](#)

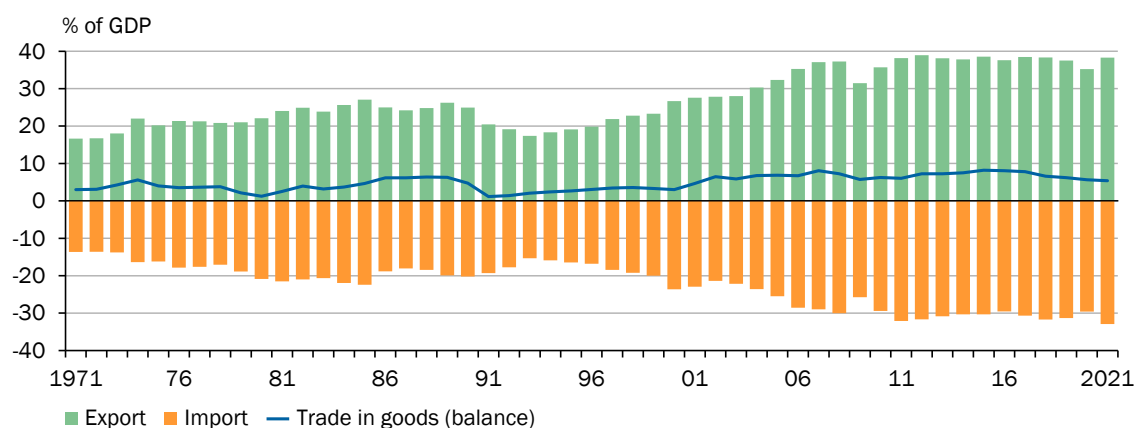
473. Broken down by economic area, **trade within the EU still accounts for** by far the **largest share of German exports** at over 55 %. However, Germany's share of exports to Europe (EU and non-EU trade) declined slightly between 2000 and 2021. Exports to China have grown significantly. [↗ CHART 135 BOTTOM LEFT](#) By far the largest share of German imports comes from EU27 member states. [↗ CHART 135 BOTTOM RIGHT](#) This proportion increased slightly between 2000 and 2021. The share of imports from **China rose sharply between 2000 and 2021**, reaching 12 % in 2021. As with exports, this is mainly due to the opening of China's economy and its entry into the World Trade Organization (WTO).

### Welfare gains from the international division of labour

474. The **integration of the German economy into international value chains** has increased significantly **in recent years**. According to the OECD, the total value of exported and imported goods and services as a share of Germany's GDP rose from around 31 % in 2000 to almost 47 % and 41 % respectively in 2019 (OECD, 2022a). This means that foreign trade has become more important for Germany over this period than it has for the average of all OECD countries, where the average export and import ratio rose from around 23 % to about 28 % and 30 % respectively over the same period (OECD, 2022b).
475. The **balance of trade provides key indicators of international competitiveness** (European Commission, 2015). It compares the value of a country's exports with the value of its imports and therefore measures, on the one hand, the appeal of domestic goods for foreign countries and, on the other, whether an

[↗ CHART 136](#)

#### Sustained trade surplus in Germany<sup>1</sup>



1 – Values before 1991 refer to West Germany.

Sources: Deutsche Bundesbank, Federal Statistical Office, own calculations

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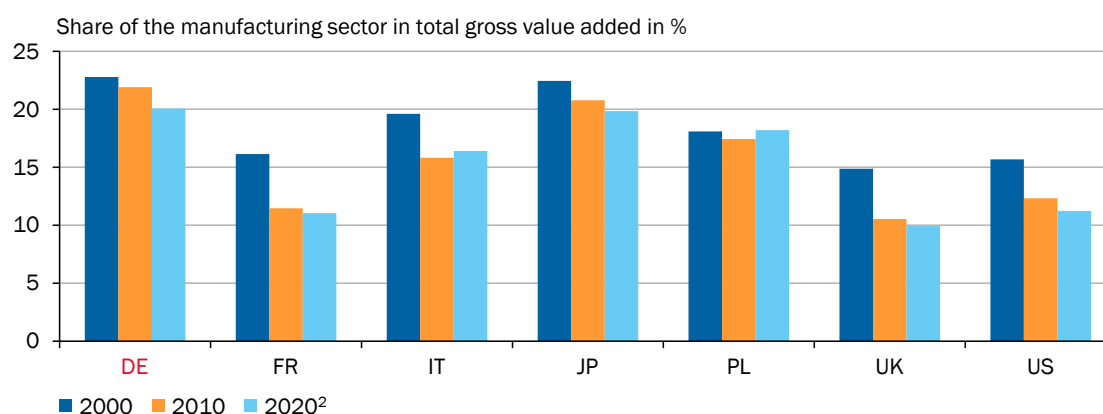
economy as a whole has to take on debt to finance its consumption. A positive balance indicates that an economy exports more value added than it imports and can thus reduce its foreign debt or build up foreign assets. Germany has consistently run trade surpluses (positive balances) since the 1970s. [↪ CHART 136](#) These surpluses are mainly attributable to brisk foreign demand for German products, which is essentially due to the non-price competitiveness of German firms. This is expressed in terms of the high value of intangible assets and the large number of intellectual property rights as a proportion of the total goods exported (Dieppe et al., 2012; BMWi, 2015; Fu and Ghauri, 2021; McAdam et al., 2022). At the same time, the level of price competitiveness has an impact on the total value of exports and imports over time – primarily in the form of unit labour costs and exchange rate trends (Deutsche Bundesbank, 2016; GCEE Annual Report 2019 item 167).

[↪ BOX 22](#) [↪ ITEM 63](#)

- 476. Germany's welfare gains from globalisation are also considerable.** In an expert report prepared for the GCEE in 2017, Felbermayr et al. (2017) estimate the gains from trade for Germany compared with a counterfactual autarkic state of the economy to be around 22 % of real GDP per capita for 2014. These welfare gains rise over time. For 1990, for example, Felbermayr et al. (2017) calculate a 13 % higher welfare level compared to a counterfactual autarkic state of the German economy, i.e. 9 percentage points less than for 2014. Eppinger et al. (2021) put the hypothetical welfare loss for Germany that would have resulted from a global return to autarky at about 19 % in 2020. The elimination of trade in intermediate inputs alone would result in a welfare loss of about 5 % (Eppinger et al., 2021). An international comparison shows that the welfare gains from trade are greater for small open economies – such as Belgium and the Netherlands – and for emerging economies – such as eastern Europe, the Baltic states and China – than they are for Germany. These gains are much smaller, though, in less open economies with large domestic markets such as the US and Japan.

[↪ CHART 137](#)

#### Contribution of manufacturing to gross value added in Germany declines less than in other economies<sup>1</sup>



1 – DE-Germany, FR-France, IT-Italy, JP-Japan, PL-Poland, UK-United Kingdom, US-United States. 2 – 2019 for France and the United Kingdom.

Sources: OECD, own calculations

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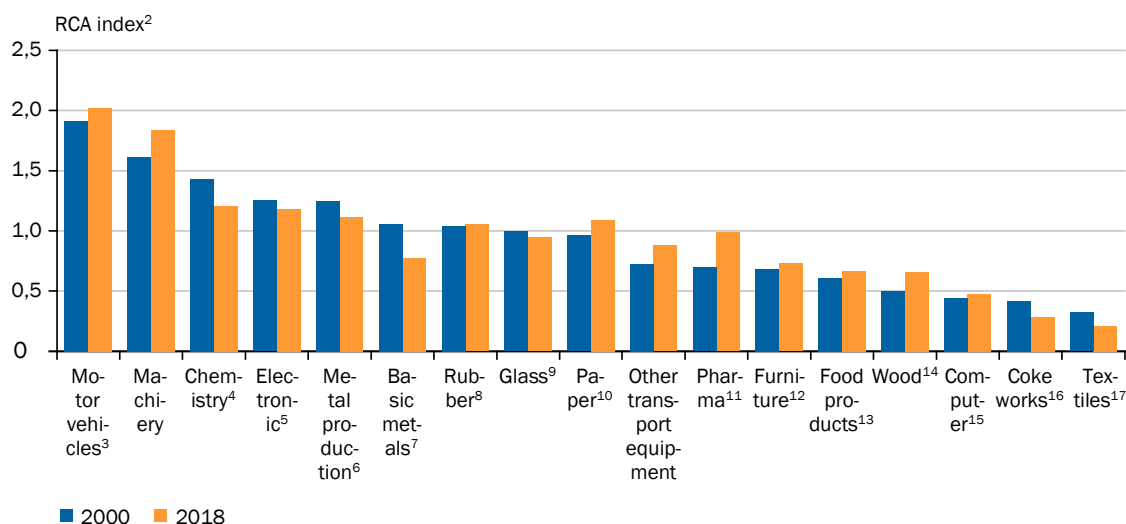
**477. Manufacturing**, which produces more easily tradable products than services do, **has benefited particularly** strongly from trade liberalisation. It is estimated, for example, that Germany's trade in vehicle manufacturing increased by 70.5 % between 2000 and 2014 because of free trade agreements. Trade in chemical and pharmaceutical products doubled as a result of the country's integration into the EU single market (Felbermayr et al., 2017, p. 33). Although manufacturing as a proportion of gross value added has been declining in Germany and many other advanced economies since the turn of the millennium, [↗ CHART 137](#) the importance of manufacturing for employment and value added in Germany remains high and is declining less sharply than it is in other advanced economies. [↗ CHART 152 APPENDIX](#)

## Specialisation of German industry

**478.** German firms have a **comparative advantage in sectors with high value added** (GCEE Annual Report 2019 item 204). Consequently, Germany's revealed comparative advantage [↗ GLOSSARY](#) lies primarily in the manufacture of motor vehicles and parts and in mechanical engineering. [↗ CHART 138](#) The revealed comparative advantage in these sectors increased between 2000 and 2018, i.e. Germany has gained export strength here compared with other exporting countries. Although Germany still has a comparative advantage in the chemicals, electronics and metal production sectors, this advantage has decreased.

[↗ CHART 138](#)

**Germany's comparative advantages lies mainly in motor vehicles and machinery<sup>1</sup>**



1 – According to the International Standard Classification of Economic Activities (ISIC Rev. 4). 2 – A country's revealed comparative advantage (RCA) over a group of reference countries. If the value is >1, the country has a comparative advantage in the production of exported goods. 3 – Manufact. of motor vehicles, trailers and semi-trailers. 4 – Manufact. of chemicals and chemical products. 5 – Manufact. of electrical equipment. 6 – Manufact. of fabricated metal. 7 – Manufact. of basic metals. 8 – Manufact. of rubber and plastic products. 9 – Manufact. of other non-metallic mineral products. 10 – Manufact. of paper and paper products, printing and reproduction of recorded media. 11 – Manufact. of pharmaceutical products and pharmaceutical preparations. 12 – Manufact. of furniture, other manufacturing, repair and installation of machinery and equipment. 13 – Manufact. of food products, beverages, tobacco products. 14 – Manufact. of wood and products of wood and cork, articles of straw and plaiting materials. 15 – Manufact. of computer, electronic and optical products. 16 – Manufact. of coke and refined petroleum products. 17 – Manufact. of textiles, wearing apparel, leather and related products.

Sources: OECD, own calculations

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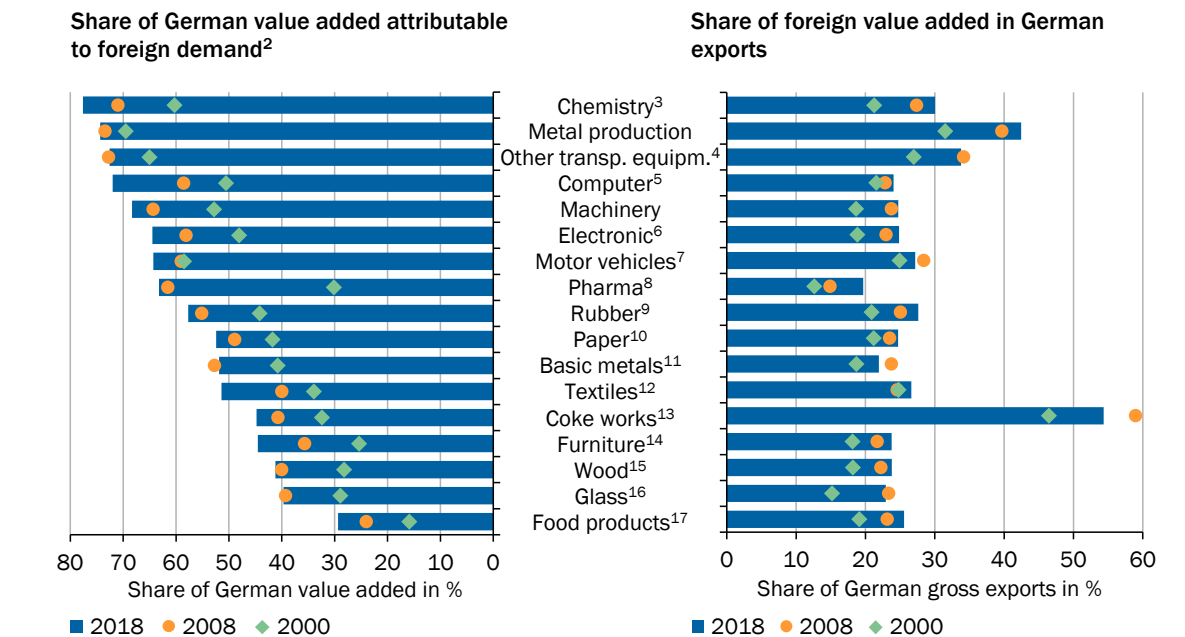
479. An examination of Germany's revealed comparative advantage in **key technologies** [↗ GLOSSARY](#) shows that the country's **strength** lies particularly in **traditional technologies**. Germany is relatively strongly positioned and has a revealed comparative advantage of about 1.64 in advanced manufacturing, i.e. in advanced technologies that positively impact on innovation in manufacturing (such as robotics, automation technology and computer-integrated manufacturing) (Izsak et al., 2021). In contrast, Germany has a comparative disadvantage in technologies that are important for the development of new web-based services and the fourth industrial revolution (Internet of Things, big data and artificial intelligence (AI)), where its revealed comparative advantage values of 0.72, 0.40 and 0.52 are each well below 1, which is the average for all countries considered here. The EU27 is slightly stronger than Germany, but China has a particular comparative advantage in these areas, with an average value of 2.43 across the three key technologies considered here [↗ GLOSSARY](#) (EFI, 2022; Kroll et al., 2022).
480. Analysis of the sectors currently becoming key technologies [↗ GLOSSARY](#) and the growing importance of renewable energy raises the question of whether the strength of German firms is keeping pace with these shifts. In **vehicle manufacturing**, for example, **German carmakers are increasingly transferring their strengths** in the production of conventional combustion vehicles to **battery electric vehicles**. While Tesla remains the market leader in battery electric vehicles in 2020 and the Chinese group BYD is in second place, German manufacturers have gained significant market share over the past few years (from 6 % in 2013 to 15 % in 2020) and are rapidly approaching their market share in combustion vehicles (Sievers and Grimm, 2022).

### Integration into international value chains

481. The German economy is largely driven by **foreign demand for final products** and **relies on imported intermediate goods and services**. Around 78 % of the gross value added in the chemical products sector in 2018 stemmed from foreign demand. The corresponding proportion was similar for fabricated metal products (74 %), other transport equipment (73 %) and the manufacturing of optical, electronic and computer products (72 %). [↗ CHART 139 LEFT](#)
482. As far as imports of **intermediate goods and raw materials** are concerned, the importance of the current reliance on foreign producers (outsourcing) and German branches abroad (offshoring) is illustrated by the proportion of **foreign gross value added** per export unit. [↗ CHART 139 RIGHT](#) Around 30 % of manufacturing exports contain imported intermediate goods and raw materials. Exports from the coking and petroleum industry and the metal industry in particular depend to an above-average extent on foreign value added. Foreign value added accounts for about 27 % of the value of exports in the automotive sector. This is slightly below the average for manufacturing (OECD, 2022c). The importance of global value chains has increased over time. [↗ CHART 139 RIGHT](#)

↘ CHART 139

### Germany is strongly integrated into international value chains<sup>1</sup>



1 – According to the International Standard Industrial Classification of All Economic Activities (ISIC Rev. 4). 2 – Domestic value added embodied in foreign final demand captures the total value added exported by each industry both directly through exports of final goods or services and indirectly through exports of intermediate goods that reach foreign final consumers (households, government and capital investment) via other countries' exports. 3 – Manufact. of chemicals & chemical products. 4 – Manufact. of paper & paper products, printing & reproduction of recorded media. 5 – Manufact. of computer, electronic & optical products. 6 – Manufact. of electrical equipment. 7 – Manufact. of motor vehicles, trailers & semi-trailers. 8 – Manufact. of pharmaceutical products & pharmaceutical preparations. 9 – Manufact. of basic metals. 10 – Manufact. of other non-metallic mineral products. 11 – Manufact. of fabricated metal. 12 – Manufact. of textiles, wearing apparel, leather & related products. 13 – Manufact. of coke & refined petroleum products. 14 – Manufact. of furniture, other manufacturing, repair & installation of machinery & equipment. 15 – Manufact. of wood & products of wood & cork, articles of straw & plaiting materials. 16 – Manufact. of rubber & plastic products. 17 – Manufact. of food products, beverages, tobacco products.

Sources: OECD, own calculations  
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## Import dependencies

- 483. Reliance on importing individual goods** can also be considered. The European Commission's (2021a, p. 16 ff.) multi-stage procedure for identifying strategic dependencies in the euro area identifies 278 products for which Germany is highly dependent on imports. ↘ [BACKGROUND INFO 26](#) These account for 4.4 % of its total volume of import trade. The numbers of these products heavily reliant on foreign sources of supply as well as their share of total imports have fluctuated between 278 and 304 and between 3.3 % and 4.4 % respectively since 2017. Although only 137 such products were identified for the EU in 2019, they accounted for 6.0 % of total imports (European Commission, 2021a, p. 22).













## ➤ BACKGROUND INFO 26

### Identification of import dependencies at the product level

The approach used by the European Commission (2021a) to identify import dependency is based on a combination of three complementary indicators: (1) the **diversification** of imports, which is calculated using the Herfindahl-Hirschman Index (HHI) and describes how strongly the imports of a certain product are concentrated in individual countries, (2) **non-EU imports as a share of total domestic demand**, and (3) the ability to **substitute** an imported product with a domestic product. If all three indicators for a particular product are above a certain threshold, the product is identified as having a high import dependency. Of the 5,375 product categories in Germany, 278 exceed these thresholds. The thresholds chosen here are an HHI of more than 0.4 normalised to the interval 0 to 1, an extra-EU share of more than 50 % of German imports, and imports of a certain product that exceed the exports of this product. To obtain the overall indicator, all products are ranked according to the expression of the three indicators and the resulting rankings for each product are given a one-third weighting and added together.

➤ TABLE 22

### China dominates share of total German imports of products with the strongest import dependencies<sup>1</sup> 2020

Dependence on ...	Share of products with strong import dependency in total imports	Number of products with strong import dependency	Trade value of products with strong import dependency
	%		1,000 US dollars
1  China	45.1	208	19,003,594.60
2  United States	15.7	197	6,640,676.25
3  Switzerland	4.4	204	1,875,778.63
4  Netherlands	4.4	219	1,867,587.10
5  United Kingdom	3.2	222	1,331,753.42
6  South Africa	2.6	73	1,110,997.78
7  Poland	1.8	170	762,281.73
8  Japan	1.8	122	762,096.92
9  Czechia	1.8	173	742,687.21
10  Brazil	1.6	76	666,801.41

1 – The total number of products with the strongest import dependencies is 278. Natural gas was excluded in the calculation.

Sources: CEPII BACI (version 202201 HS17), own calculations  
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484. Measured in terms of the volume of products imported into Germany, **data processing equipment, aircraft engine parts and antibiotics** were among the most important **products with the strongest dependencies** in 2020. 45.1 % of the imported products with the greatest dependencies come from China and a further 15.7 % of them originate from the United States, which means that Germany relies on just two countries for more than half of its products with strong dependencies, for many of which there are no suitable substitutes. [↗ TABLE 22](#) For the EU, China is even more important in terms of imported products with the strongest dependencies, accounting for 52 % of the total in 2019, but the US is much less significant with a share of only 3 % (European Commission, 2021a). At the same time, a large number of products with large dependencies are imported from countries with the largest share of imports. [↗ TABLE 24 APPENDIX](#)

### III. CURRENT CHALLENGES FOR GERMANY'S COMPETITIVENESS

485. Both the COVID-19 pandemic and the war in Ukraine have brought into focus **the vulnerability of international supply chains to disruption** and Germany's dependence on certain countries for its imports. These dependencies are particularly problematic when intermediate products are critical to the manufacturing process and their production is strongly geographically concentrated (Kamin et al., 2021; Kamin, 2022). In Germany and the EU this is the case for various energy and non-energy feedstocks. Germany's reliance on Russian gas has become all too evident in recent months, and its dependence on individual producers of critical raw materials is also a growing concern for politicians and business leaders (Blume, 2022). [↗ ITEM 280](#) [↗ BACKGROUND INFO 14](#)

These challenges are exacerbated by **third-country subsidies** of critical inputs that distort world market prices – possibly deliberately – in such a way that alternative sources are not explored due to a lack of economic viability. In some cases – rare earths from China, for example – this has resulted in a strong concentration on certain supplier countries and greater reliance on individual producers. This poses an economic and political challenge against the backdrop of a changing global order in which economic dependencies are likely to be increasingly used as **geopolitical leverage**.

#### 1. Economic dependencies due to imports of critical raw materials

486. Global economic and population growth and technological change have significantly increased the demand for raw materials over recent decades. This is particularly true of the demand for **critical raw materials** (EFI, 2022) as part of the production of **key technologies** [↗ GLOSSARY](#). The European Commission classifies raw materials as critical if they are highly important for the functioning of

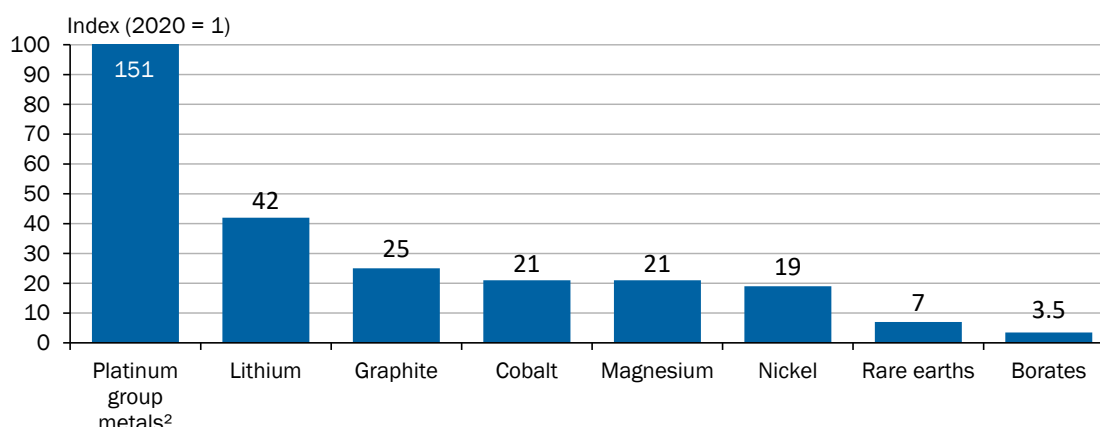
industrial ecosystems and their availability is associated with a high risk (European Commission, 2020a). For example, the development of electrically powered cars is based on the use of lithium-ion batteries and electric traction motors as key technologies, [↗ GLOSSARY](#) which in turn rely on the availability of lithium, cobalt and rare earths (Thielmann et al., 2020). Semiconductor production depends on the availability of many critical raw materials such as silicon (Deigner, 2022). Many civilian technologies – such as catalysts and magnets – are also strategically important in the military sector (Kullik, 2019).

At the same time, critical raw materials play a **significant role in the energy transition** (GCEE Annual Report 2021 items 550 f.). Rare earths, for example, are needed for solar and wind power plants. There is therefore already a high demand for these raw materials today, which is likely to increase further. The International Energy Agency (IEA, 2021), for example, estimates that the demand for critical raw materials needed to achieve the goals of the Paris Agreement could increase sevenfold between 2020 and 2040 in the area of rare earths and as much as 42-fold for lithium. [↗ CHART 140](#)

- 487.** The extraction of critical raw materials is highly **geographically concentrated**. More than 80 % of rare earths are mined in China, and more than 75 % of platinum and palladium come from South Africa and Russia (Steinmüller, 2020). [↗ CHART 141 LEFT](#) **Further processing** often takes place outside Europe and is concentrated in just a few countries. **China** in particular has established itself as the most important producer on the world market in recent decades. To this end, the Chinese government has encouraged domestic companies through subsidies and industry consolidation (Schüler-Zhou et al., 2020; Penke, 2021) to shift from extracting critical raw materials to producing alloys and magnets (European Commission, 2020b; Nem Singh, 2021). [↗ CHART 141 RIGHT](#) [↗ BOX 24](#) Since 2008 the European Commission has published an official list of all raw materials that are of

[↗ CHART 140](#)

**Growth of global demand for selected critical raw materials over the period 2020 to 2040<sup>1</sup>**



1 – Projections based on the International Energy Agency (IEA) Sustainable Development Scenario, which indicates total demand in a scenario consistent with the Paris Agreement targets. 2 – Includes iridium, osmium, palladium, platinum, rhodium and ruthenium.

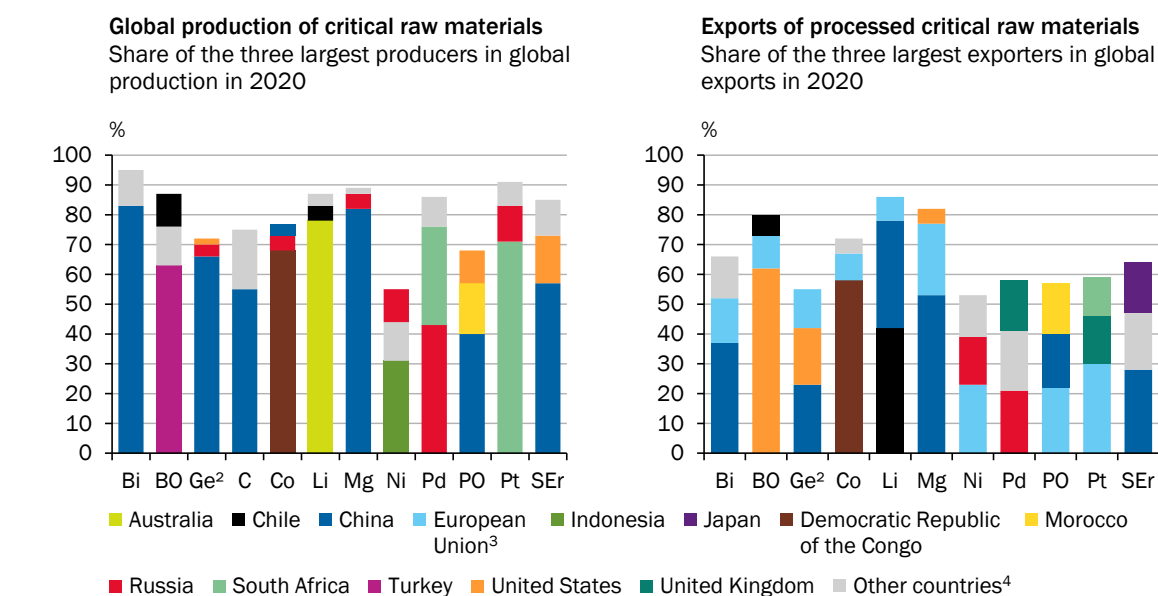
Source: IEA (2021)

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↗ CHART 141

### Production and processing of selected critical raw materials<sup>1</sup> are in the hands of a few states



1 – Bi-bismuth, BO-borates, Ge-germanium, C-graphite, Co-cobalt, Li-lithium, Mg-magnesium, Ni-nickel, Pd-palladium, PO-phosphates, Pt-platinum, SEr-rare earths. 2 – For better readability, the following raw materials have been grouped together under germanium (Ge): gallium, germanium, hafnium, indium, niobium, vanadium. 3 – The European Union is considered as a single exporter. 4 – Countries that each produce or export less than 15 % of the critical raw materials are grouped together. The composition varies in the individual categories.

Sources: U.S. Geological Survey (2021), UN Comtrade  
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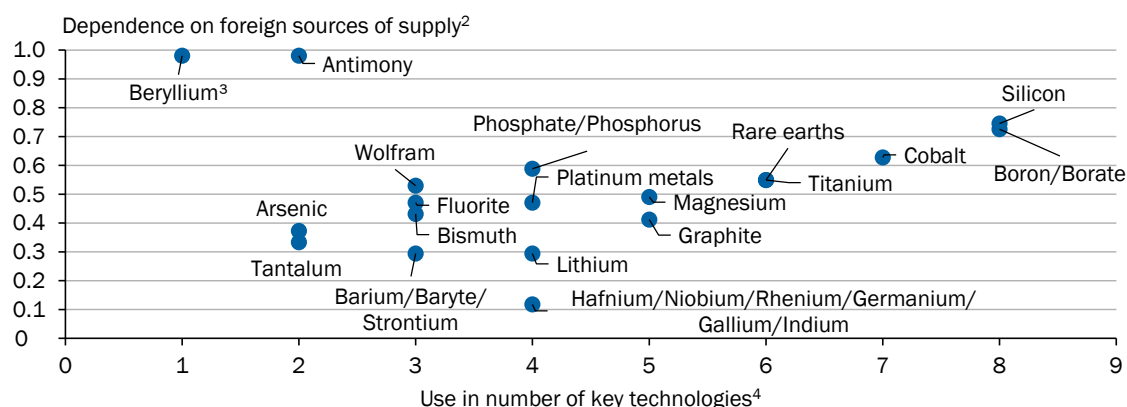
critical economic importance but are not mined in the EU and are therefore exposed to considerable supply risks (European Commission, 2017).

Not surprisingly, Germany is **highly dependent on** 15 out of 19 raw materials or raw material groups, including antimony, silicon, boron and cobalt. ↗ CHART 142 These critical raw materials mainly come from China, Norway, France and the United States. ↗ TABLE 24 APPENDIX Raw materials involving high levels of dependency are also used in a **large number of key technologies** ↗ GLOSSARY (Flach et al., 2022).

488. Industrial users of critical raw materials are sometimes exposed to considerable **price fluctuations** owing to their high dependence on individual producers. The prices of magnesium and silicon, for example, rose significantly last year. ↗ CHART 143 The reasons for this were Chinese energy-saving targets and production restrictions, which caused a reduction in exports (DERA, 2021; Schäfer, 2021). Higher prices in the longer term place a financial burden on industrial production in the form of higher costs. However, they also increase profitability and, therefore, the incentive to mine, process and develop recycled substitutes (European Commission, 2020b).
489. In addition to strong demand, the **complex process of extracting** critical commodities – which makes it difficult to expand supply in the short term – contributes to the high concentration of the commodity market. In many cases their extraction requires **long lead times and a considerable capital outlay**

➤ CHART 142

### Dependence and use of critical raw materials for key technologies in Germany<sup>1</sup>



1 – For the dependency and the number of key technologies, the maximum of the assigned products of a raw material is given in each case. Assignment of products of the Harmonised System (HS) nomenclature to raw materials according to the German Raw Materials Agency (DERA) raw material list and own assignment. 2 – Indicator with values from 0 (not dependent) to 1 (highly dependent) according to the method of the European Commission (2021a). See background info 26. 3 – For beryllium, the dependency figure must be considered with caution, as the calculation of the indicators for 2021 is based on only two observations. 4 – Number of key technologies in which the corresponding raw material is used (selection of nine technologies) according to the European Commission (2022b).

Sources: DERA, European Commission (2020b), Federal Statistical Office, own calculations  
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(Azevedo et al., 2022). An analysis by the IEA suggests that an average of 16 years elapses between the discovery of critical raw materials and initial production (IEA, 2021). In addition, there are uncertainties about future demand owing to unpredictable technological progress.

490. Umbach (2022) also emphasises the **conflict between local nature conservation and global climate protection** as an obstacle to the expansion of raw material extraction. The extraction and processing of critical raw materials can pose **environmental risks** that do **not have social or political support in industrialised countries** and thus prevent the expansion of supply. Thus, in principle, numerous critical mineral raw materials would be available in the EU. ➤ **TABLE 23** Lithium deposits, for example, are known to exist in Austria, Italy, Portugal, and Spain as well as in the Rhine Graben and the Erzgebirge. However, these have not been mined so far because of concerns about environmental damage and social resistance (BGR, 2021; Lewicka et al., 2021; Handelsblatt, 2022).

At the same time, reluctance to support the mining of critical raw materials in the EU encourages the extraction and processing of such raw materials in **third countries** with **significantly lower environmental and social standards**. In this context, Christmann (2021) mentions the energy-intensive production of raw materials in China, for example, 58 % of whose energy mix still consisted of coal in 2019. In total, between 15 % and 17 % of the world's energy demand has so far been required for the extraction of mineral raw materials. Moreover, mining is often accompanied by human rights violations. Cobalt mining in the Democratic Republic of Congo, for example, is often associated with problems such as child labour and corruption (de Brier et al., 2021).

TABLE 23

**Known deposits of critical raw materials<sup>1</sup>**

Share of global reserves in %

Continents/countries	Borates	Graphite	Cobalt	Lithium	Magnesium	Nickel	Phosphates	Rare earths
<b>Africa</b>								
Algeria							3.2	
Democratic Republic of the Congo			50.7					
Egypt							4.1	
Madagascar		0.8	1.4			1.8		
Morocco			0.2				72.5	
Mozambique		7.8						
South Africa			0.6			4.2	2.0	0.7
Tanzania		5.3						0.7
<b>Asia</b>								
China	2.0	22.8	1.1	7.1	13.2	3.2	4.6	36.7
Democr. People's Republic of Korea		0.6			30.3			
India		2.5			1.1		0.1	5.8
Indonesia						23.6		
Jordan							1.2	
Philippines			3.7			5.4		
Russia	3.3		3.5		30.3	7.8	0.9	10.0
Saudi Arabia							2.0	
Syria							2.6	
Uzbekistan		2.4					0.1	
Viet Nam		2.4					0.0	18.3
<b>Australia and Oceania</b>								
Australia			19.7	13.3	4.2	22.5	1.6	3.4
New Caledonia						7.5		
<b>Europe</b>								
Finland							1.5	
Greece					3.7			
Slovakia					4.9			
Turkey	91.7	28.1			2.7			
<b>North America</b>								
Greenland								1.3
Canada			3.1	2.5		3.2		0.7
United States	3.3		0.8	3.6	0.5		1.5	1.3
<b>Latin America</b>								
Argentina				9.1				
Brazil		21.9			2.6	18.0	2.3	17.5
Chile	2.9			43.8				
Cuba			7.0			6.2		
<b>Other areas</b>			7.9	10.0	5.3	15.7	1.2	0.3

■ 81–100 % ■ 61–80 % ■ 41–60 % ■ 21–40 %.

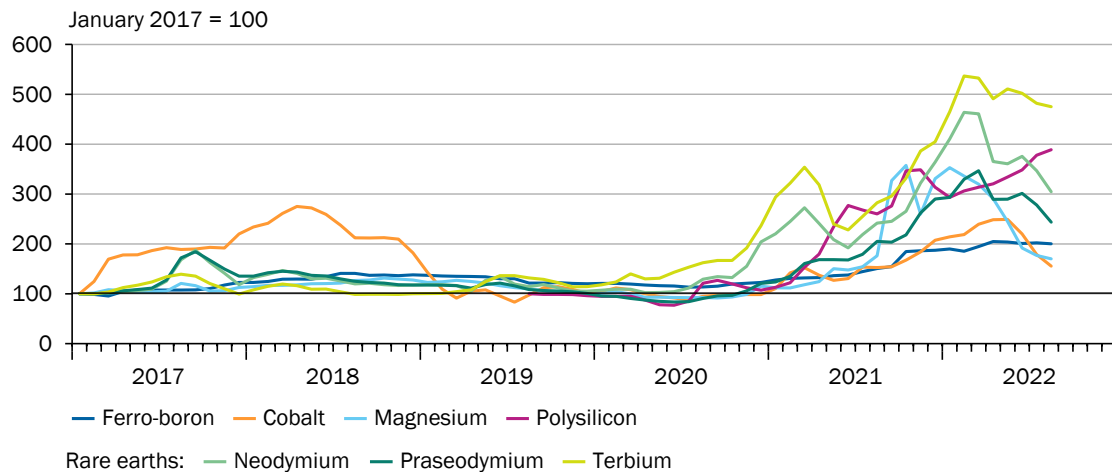
1 – The list includes countries with at least 1 % of the world's known reserves of at least one of the eight raw materials.

Source: U.S. Geological Survey (2021)

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➤ CHART 143

**Dynamic price development of selected critical raw materials since 2020**



Source: German Mineral Resources Agency (DERA)

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491. Global commodity supplies in recent years have been affected by targeted government pricing and settlement policies (Shen et al., 2020). The **Chinese government's active pricing policy**, for example, has significantly inhibited the extraction of other international deposits by providing support for national resource extraction and the expansion of refinery production. Known rare earth deposits in Greenland and Sweden are not being mined owing to Chinese price pressures (Kullik, 2019).

This situation also places the spotlight on the use of mineral raw materials as a **geopolitical instrument**. China has already used other countries' reliance on imports of Chinese mineral raw materials as a geopolitical instrument, as in the cases of Japan in 2010 and the United States in May 2019 (Handelsblatt, 2019). Japan has subsequently significantly reduced its dependence on China (Ruiz Guix, 2021). ➤ BOX 23

➤ BOX 23

**International commodity strategies**

The **Chinese government** has been pursuing a consistent **raw materials strategy** for several years. Parts of this strategy, such as a focus on rare earths identified as a strategic resource, are set out in the **National Mineral Resources Plan** (Schüler-Zhou et al., 2020; Shen et al., 2020; Ruiz Guix, 2021). China's approach includes both government involvement in key players in value chains and government incentives to specifically promote certain commodity sectors and achieve the goals set by the state. In addition to WTO-compliant import duties and value added tax refunds, the instruments used include forced mergers of companies in order to make them international leaders (Schüler-Zhou et al., 2020). By investing heavily in the relevant sectors, China today dominates not only the mining and production of rare earths but also a large proportion of the further manufacturing process up to and including the production of components and final products (Kullik, 2019). ➤ CHART 141 In addition, capital spending on the infrastructure of resource-rich developing countries is supported by the provision of loans from state-owned banks (China Development Bank and China Exim Bank) (Steinmüller, 2020). China's

“going out” strategy includes the “two markets, two resources” concept, which aims to improve access to foreign resources through foreign direct investment and to penetrate the global market while keeping its domestic market isolated (de La Bruyère and Picarsic, 2020). For example, the sale of tungsten, tin and antimony is subject to government control and is only permitted for licensed local firms (Schüler-Zhou et al., 2020; Wu et al., 2021).

At the same time, many industrialised countries have in recent years developed strategies to enable them to break out of their **commodity dependencies and promote the resilience of their commodity supply chains**. For example, the Industrial Strategy for Europe published in 2020 (European Commission, 2020c) resulted in the European Commission compiling an updated list of critical raw materials (European Commission, 2022a) and devising a Critical Raw Materials Action Plan (European Commission, 2020a). This includes the European Industrial Raw Materials Alliance launched in 2020, which aims to strengthen the EU’s resilience in rare earths by increasing domestic production, promoting recycling and finding reliable suppliers abroad. Given the existing reliance on individual supplier countries and the growing competition for available resources of **critical raw materials**, the European Commission has proposed the adoption of a **European Critical Raw Materials Act** (European Commission, 2022b). This Act aims to improve understanding of which raw materials are strategically important, establish a European network of national raw-materials agencies, mobilise investment for the extraction of critical raw materials and ensure a level playing field with competitors in the areas of stockpiling and recycling.

**Germany** developed a **national raw materials strategy** back in 2010, as described in BMWi (2019). In this strategy paper the German government emphasised that business bears primary responsibility for its own supplies of raw materials, and the government therefore rejected any state intervention in the commodity markets in the form of purchasing or stockpiling. In the latest revision of its raw materials strategy the German government (BMWi, 2019) shows that it is open to the possibility of modifying the role of the state in view of increasing government intervention in the world market for critical raw materials by, for example, adopting measures to create a level playing field in the supply of raw materials. However, Kullik and Schmid (2021) express doubts about the need for a national solution in view of the strategy adopted at European level.

**Japan** is pursuing a particularly successful strategy to reduce its dependence on raw materials. This came into effect back in 2010 as a result of geopolitical tensions with China (Ruiz Guix, 2021). Japan announced at the time that it would cut its reliance on Chinese rare earth elements to less than 50 % by 2025. By 2018 it had already achieved a reduction from 91.3 % in 2008 to 58 % (China Power, 2021). A major part of this strategy was the 250 million US dollars invested by Japan’s Sojitz Corporation and the state-owned Japan Oil, Gas and Metals National Corporation (JOGMEC) in Lynas Corporation, an Australian mining company. Assisted by this financial support, Lynas Corporation became the only supplier outside China capable of processing rare earths. The company now supplies Japan with almost a third of its rare earth imports (Seo, 2018). The Japanese government plans to make further such investments under US and Australian initiatives (Hanafusa, 2020). Japan’s approach to reducing its dependence on imported critical raw materials is part of a holistic strategy to ‘protect its own economy’. This includes the pursuit of military and economic security as well as the promotion of multilateral networks (Kölling, 2022).

For some years now the **United States** has also increasingly been addressing its dependence on imports of critical raw materials. To this end, a list of 35 critical raw materials was published in 2018, following the European example. In 2020, President Trump declared rare earths to be “essential for national defence”. This freed up resources for the Department of Defense to take action to secure domestic production capacity (Trump, 2020). Most recently, the US government strengthened the processing of critical raw materials at home. In addition to relations with Australia and Japan, the US government has strengthened its ties with Canada through the U.S.-

Canada Joint Action Plan on Critical Minerals Collaboration, which was signed in early 2020 (U.S. Department of Energy, 2021). Furthermore, in June 2022 the US launched the **Mineral Security Partnership** with Australia, Canada, Finland, France, Germany, Japan, South Korea, Sweden, the United Kingdom and the European Commission, which encourages international coordination to secure supplies of critical raw materials (U.S. Department of State, 2022).

## 2. Market distortions caused by international subsidies

492. **Fair competition** is needed for the efficient international division of labour and allocation of resources. However, this fairness is **impaired by state intervention**. This includes certain requirements in government procurement, tariffs, various trade restrictions and subsidies. Since the financial crisis, the latter have been the most common international trade-related instrument for influencing the competitiveness of individual industries and companies (IMF et al., 2022). Exporting countries can support domestic firms by providing subsidies in order to lower production costs and gain global market share. However, this can create an inefficient subsidy race (GCEE Annual Report 2019 items 318 ff.). In addition, it disadvantages non-subsidised sectors and companies.

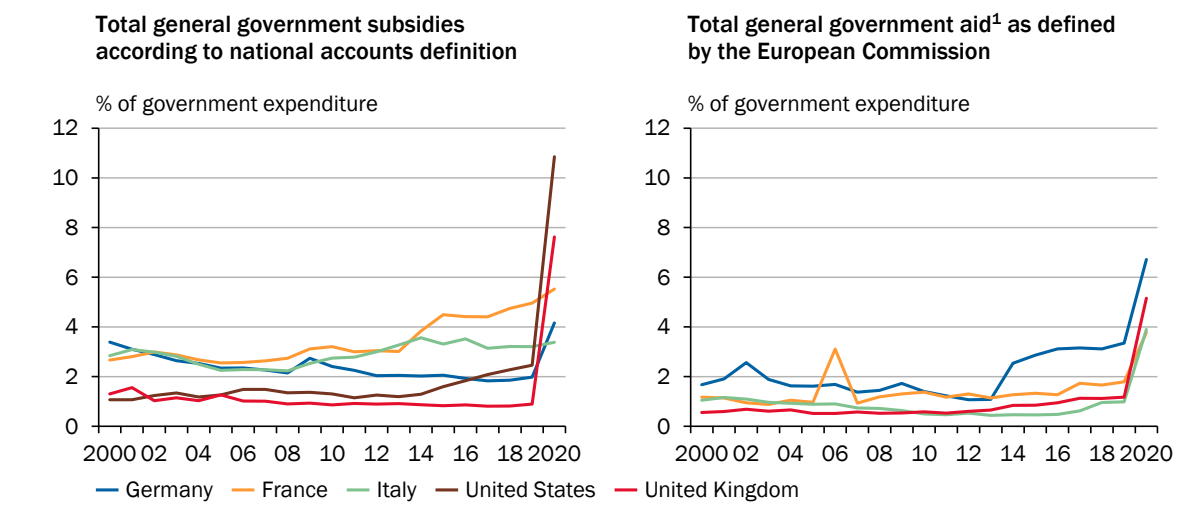
However, it is **virtually impossible to systematically capture** all subsidies and their effect on competition. Firstly, there is no standard definition of subsidies and, secondly, it is difficult to assess which criteria should be applied to a subsidy that distorts competition.

493. It is possible to measure subsidies in individual areas. For example, **subsidies for renewable energy have increased** slightly in recent years. Subsidies for solar energy account for the largest share within the EU (European Commission, 2021b). The US is significantly raising subsidies under its Inflation Reduction Act. While subsidies for the use of renewable energy there have positive aspects in terms of climate protection, the requirements relating to domestic production are much more problematic from the perspective of distorting competition. European firms suffer significant competitive disadvantages as a result or have to relocate production to the US, which is detrimental to Europe as a business location. In this respect it is questionable to what extent such subsidies are WTO-compliant.
494. In its latest subsidy report the **German Federal Ministry of Finance** (BMF, 2021, p. 10) explicitly mentions **securing Germany's competitiveness** as an **objective of subsidies**. In addition, subsidies are aimed at achieving domestic political goals. According to the BMF, these include overcoming the COVID-19 pandemic, promoting climate protection and encouraging research and development. Domestically motivated subsidies, such as funding for COVID-hit businesses and financial support for households and firms in the wake of the energy crisis, can have both a positive and negative impact on the short- and long-term competitiveness of a national economy.



### [↗ CHART 144](#)

#### Heterogeneous concept of subsidies



1 – Subsidies and transfers.

Sources: European Commission, OECD, own calculations

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## Subsidies compared internationally

- 495.** International comparisons of subsidies are difficult because there is **no standard definition available**. [↗ BACKGROUND INFO 27](#) The definition of subsidies according to the national accounts differs slightly from the definition used in EU state aid law [↗ CHART 144](#) and, more distinctly, from the World Bank's World Development Indicators (WDIs). [↗ BACKGROUND INFO 27](#) Some countries, such as China, do not provide official data, which further complicates any analysis of the use of competition-distorting subsidies.
- 496.** The OECD has prepared detailed analyses of **subsidies** and other state aid for some **sectors**. There is a particular focus here on fossil fuels, as global reductions of subsidies are a key element of international climate policy and would boost the competitiveness of carbon-neutral energy sources (GCEE Annual Report 2021 items 575 ff.). In fact, subsidies – especially those for oil – have been decreasing internationally for about ten years now. Other areas that receive strong government support include agriculture (OECD, 2021a), aluminium production (OECD, 2019a) and semiconductor technology (OECD, 2019b). As with fossil fuels, [↗ CHART 145](#) China represents an outlier in the latter two areas as it still grants extensive subsidies.



### [↗ BACKGROUND INFO 27](#)

#### Definition and economic impact of subsidies

The German government's definition of **subsidies** includes **financial assistance** in the form of cash benefits for private firms and sectors of the economy as well as **indirect subsidies** when goods or services are made cheaper for households. Tax

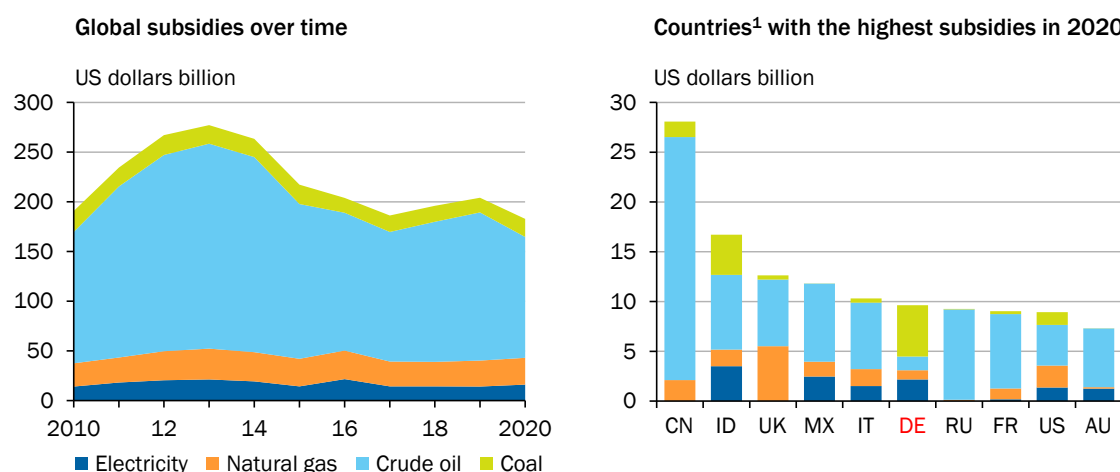
concessions for individual sectors or parts of the economy are also taken into account (BMF, 2021). The **national accounts definition, on the other hand**, is limited to government financial assistance provided to firms for current purposes, excluding investment grants and transfers for one-off purposes (Thöne and Happ, 2015, p. 29). The European Commission's **definition is based on EU state aid law** and is broader but only takes account of subsidies that affect intra-European trade (Thöne and Happ, 2015; p. 30). The **term "subsidy"** is defined very broadly in the annual **Kiel Subsidy Report** (Laaser and Rosenschon, 2020). This report considers subsidies granted to semi-public organisations, firms that perform infrastructure functions, and other subsidies that are only mentioned in the German government's subsidy report (Laaser and Rosenschon, 2020). Overall, this results in **considerable differences in the scope of the subsidies** reported. While the national accounts for Germany quote a figure of €33.2 billion for 2017, the European Commission puts it at €42.3 billion, the German government's subsidy report mentions a figure of €52.8 billion and the Kiel Institute for the World Economy (IfW) reckons that it is €185.5 billion. The **World Bank goes even further** in its World Development Indicators (WDIs) under the summary entitled '**Subsidies and other Transfers**', which account for about 84 % of all public expenditure in Germany. This national-accounting-based definition encompasses all government payments that include non-repayable transfers in the broadest sense, including state welfare benefits.

## Subsidies in the internal market and from third countries

- 497. EU state aid law** contains a **general prohibition of state aid** by member states in Article 107(1) of the Treaty on the Functioning of the European Union. This ban is overseen by the European Commission. Aid is prohibited if companies or sectors of production benefit from government assistance in such a way that competition in the internal market is distorted or threatens to be distorted and trade between the member states is affected by this. However, paragraphs 2 and

### ▸ CHART 145

#### Slow decline in subsidies for fossil fuels



1 – CN-China, ID-Indonesia, UK-United Kingdom, MX-Mexico, IT-Italy, DE-Germany, RU-Russia, FR-France, US-United States, AU-Australia.

Source: OECD

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3 of Article 107 stipulate a **number of exemptions**. These include aid that possesses a social character and is granted to consumers to compensate for the damage caused by natural disasters or exceptional occurrences, aid to support the development of disadvantaged areas, aid to encourage the implementation of important projects of European interest, aid to promote culture, and aid to facilitate the development of certain economic activities, provided that market conditions are not affected to such an extent as would be contrary to the common interest. In addition, the group exemption regulation defines sectors and activities that are exempt from the EU ban on state aid under certain conditions and how these exemptions are applied (European Commission, 2014a). The exemptions include spending on research and development and broadband infrastructure.

- 498. The European Commission (2014b) has defined detailed criteria for the exemptions applicable to the financing of **Important Projects of Common European Interest (IPCEI)** using public, national or European funds. In addition to helping to achieve the EU's strategic goals, IPCEI projects must be supported by several EU member states and have a positive spill-over effect for the entire EU. Furthermore, private investors and firms must be involved in this financing and mainly support the project. Previous IPCEI projects cover areas such as microelectronics, cloud infrastructure and battery cell manufacturing (GCEE Annual Report 2020 items 458 f.). There is also a new IPCEI project on hydrogen technology (BMW, 2021a).
- 499. While EU state aid law sets tightly defined limits on subsidies by member states, the existing state aid rules have proven to have **gaps** when dealing **with subsidies from third countries to companies within the EU**. Firms subsidised by third countries can, for example, relocate their production to the EU or submit better bids for mergers and acquisitions and public procurement contracts. Moreover, subsidised services are hardly covered (Wambach, 2020). Although domestic demand benefits from third-country subsidised prices, European firms are disadvantaged in a way that distorts competition. The European Commission (2020d) has reacted to these increasingly competition-distorting subsidies from third countries by producing a White Paper.

The key aspects of a **regulation building** on the White Paper and adopted in 2022 are **three new instruments** (European Commission, 2021c). This regulation covers all business activities within the EU and therefore includes services. In the case of mergers, firstly, companies must declare financial contributions of €50 million or more from third countries if one of the firms involved has revenues of more than €500 million. Secondly, there are reporting requirements for financial assistance from third countries in bids for public procurement contracts if their value exceeds €250 million. Thirdly, for all other market situations, such as mergers and lower value procurement procedures, the European Commission can initiate their investigation. If the Commission finds evidence of distortive effects on competition from third-country subsidies in the course of its review, it can react by taking a range of countermeasures. These include the repayment of subsidies, a ban on certain types of market behaviour, and even the prohibition of mergers and participation in public contracts.

### 3. Changes in the global order

500. Discussions about the German economy's dependence on foreign markets and actors are increasingly being shaped by changes in the global order. International observers attest to the gradual dissolution of the **rules-based** order in favour of a **power-based order** in which the "law of the strongest" prevails over the "strength of the law" (Hilpert et al., 2022). The **influence of geostrategic considerations** on **economic decisions** and vice versa inevitably increases as a result (Farrell and Newman, 2019). EU Commission President Ursula von der Leyen therefore spoke of the need for a "**geopolitical**" **commission** as far back as 2019 (von der Leyen, 2019; Kamin et al., 2021).
501. The attack on the rules-based order is being supported by the growing use of **targeted propaganda by autocratic governments** (Guriev and Treisman, 2022). Modern-day autocrats use not only repression but increasingly also a **distortion of reality** to ensure the obedience of their populations. To do so, they exploit the weaknesses of democratic systems (Lippert and Perthes, 2020). They also use conceptual confusion to undermine the public discourse – one of the key elements of the basic democratic order. Last year, for example, China officially christened its system "a democracy that works" (Büchenbacher, 2021; People's Republic of China, 2021).
502. The **war in Ukraine** has given new impetus to the question of Europe's strategic autonomy (von Ondarza and Overhaus, 2022). **Strategic autonomy** is defined as the ability "to act independently whenever and wherever necessary and to act jointly with partners whenever possible" (Borrell, 2020). The conflict with Russia illustrates not only Europe's lack of autonomy in terms of energy supplies but also the key role of economic interdependencies in the exercise of power. It also shows that economic interdependencies are less of a safeguard against armed conflict than previously thought (Seaman et al., 2022).
503. In parallel, political developments in the **People's Republic of China** are causing European governments to reassess risk (Seaman et al., 2022). Trade conflicts have influenced perceptions of China, as have human rights violations and increasingly visible geostrategic ambitions manifested, for instance, by increased military manoeuvres around Taiwan (Felbermayr et al., 2019; European Council, 2021; Hilpert et al., 2022). [↘ BOX 24](#) China's ambivalent stance on Russia's war of aggression in Ukraine provides additional reason to reconsider the development of Sino-European economic relations, calling into question, for example, progress on the EU-China Comprehensive Agreement on Investment (CAI; European Council, 2021; European Parliament, 2021a; Hauberg, 2022). [↘ ITEM 541](#) In the wake of international tensions, Europe has already been referring to China as a "**systemic rival**" since 2019 (European Commission, 2019). The systemic rivalry with China is also explicitly mentioned in the coalition agreement signed by Germany's current government (SPD, Bündnis 90/Die Grünen and FDP, 2021).
504. **Security policy concerns** about cooperation with autocratically led states are also being expressed. The involvement of Chinese providers in the expansion of the 5-G network infrastructure, for example, has been critically discussed by

policymakers and the general public, while the use of Russian technology also poses challenges for Germany's security authorities. One example of this is the use of virus protection software from the Russian provider Kaspersky, which Germany's Federal Office for Information Security warned against only a few weeks after the war in Ukraine began, citing possible cyberattacks (BSI, 2022; tagesschau.de, 2022).

The vulnerability of critical technological infrastructure also raises questions about **Germany's technological sovereignty** (von Ondarza and Overhaus, 2022; GCEE Annual Report 2019 item 330; GCEE Annual Report 2021 item 496). High dependencies on non-EU countries have emerged in some areas, such as telecommunications and cross-sectoral ICT services, over the years. For example, only two companies currently produce the latest generation of microchips: Taiwan Semiconductor Manufacturing (TSM) and Samsung from South Korea (GCEE Annual Report 2021 box 29). Should tensions between China and Taiwan escalate further, global supplies of microchips would be significantly at risk (Hilpert et al., 2022).

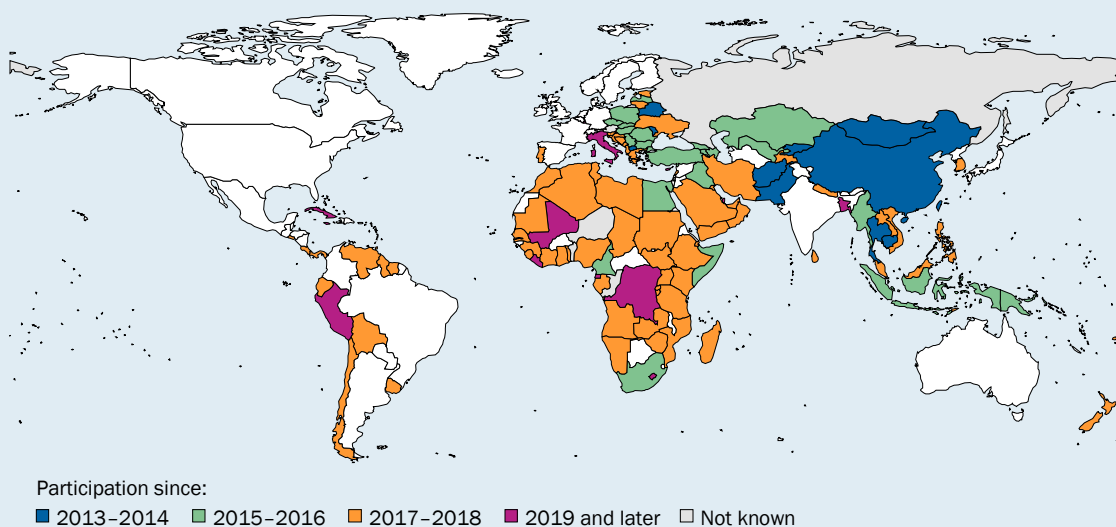
#### BOX 24

##### China's state-led industrial strategies

To strengthen its international competitiveness, China has developed two state-led industrial strategies in recent years. These include the **Belt and Road Initiative**, launched in 2013, and the **"Made in China 2025"** strategy, launched in 2015 (Wübbecke et al., 2016; OECD, 2018; European Court of Auditors, 2020). Like the country's five-year plans, these longer-term macro plans set out strategic guiding principles that define priorities and targets as well as government support for specific areas.

#### CHART 146

##### 138 countries participate in the „New Silk Road“



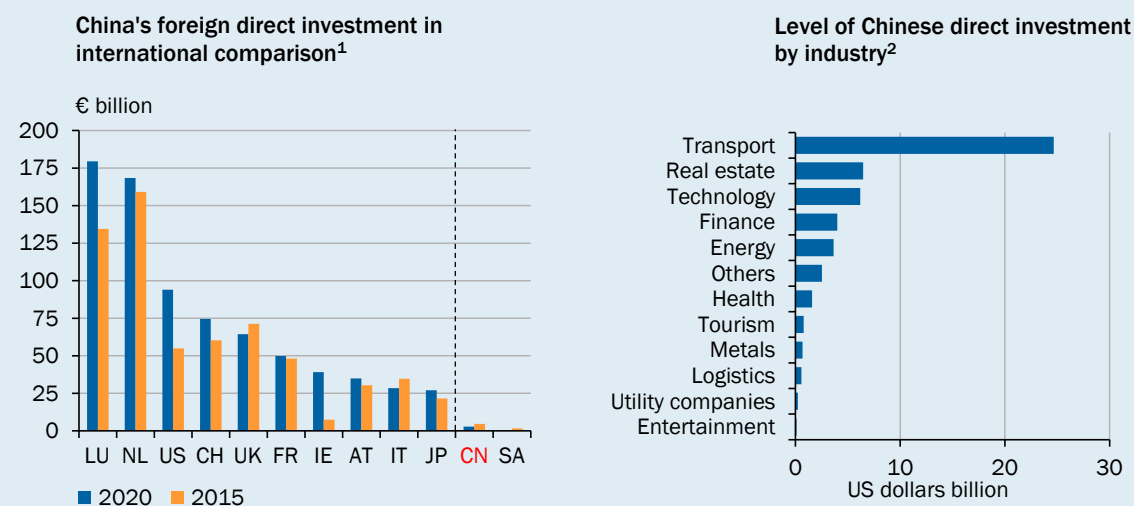
Sources: Council on Foreign Relations, EuroGeographics regarding administrative boundaries  
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The primary objective of the **Belt and Road Initiative** (BRI or ‘New Silk Road’) is to connect Asia, Africa and Europe via land and water routes. The focus here is on a BRI free trade area, improving financial cooperation, expanding transport infrastructure and facilitating access to raw materials. Substantial sums have already been invested in infrastructure such as ports, railways and power plants. The relevant projects are mainly being financed by Chinese development banks and the Silk Road Fund. In addition to the economic aspects involved, this programme could pursue geopolitical objectives by tying trading partners more closely to China. As of March 2020, 138 countries had signed a Memorandum of Understanding with China under the initiative, including EU member states, although Germany was not among them owing to concerns about the transparency of the project and the unlevel playing field for companies and European workers (Ulatowski, 2022). ↪ [CHART 146](#) The economies participating in the BRI account for more than one-third of global GDP and more than half of the world’s population (OECD, 2018; EBRD, 2022). With almost 60 % of China’s foreign loans now issued to countries in financial distress compared with just 5 % in 2010, however, its foreign lending is now much more cautious than it was in the past (Wei, 2022).

The “**Made in China 2025**” strategy aims to develop China into a high-technology nation by 2049. It seeks to nurture ten core domestic industries such as information technology, aerospace and energy. Furthermore, Chinese companies are being encouraged to invest **abroad**, especially in **strategic sectors** such as energy and telecommunications. State-owned enterprises are benefiting from public subsidies (European Court of Auditors, 2020; García-Herrero and Ng, 2021). The capital stock of Chinese foreign direct investment in Germany and the EU is still relatively small compared with the amounts being invested by other European countries and the United States. ↪ [CHART 147 LEFT](#) In the past, however, Europe has seen targeted acquisitions in strategically important sectors such as the takeover of German engineering firm Kuka by the Chinese conglomerate Midea in 2016 as well as Chinese investments in German corporations such as Deutsche Bank and Daimler (Jungbluth, 2018). Overall, the average share of

↪ [CHART 147](#)

#### China's foreign direct investment in Germany



1 – The ten countries with the highest foreign direct investment in Germany in 2020, plus China and Saudi Arabia. LU-Luxembourg, NL-Netherlands, US-United States, CH-Switzerland, UK-United Kingdom, FR-France, IE-Ireland, AT-Austria, IT-Italy, JP-Japan, CN-China, SA-Saudi Arabia. 2 – In the period from 2005 to 2021.

Sources: Deutscher Bundestag, Eurostat  
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Chinese investment exceeding 100 billion US dollars between 2005 and 2021 was highest in the transport sector, which includes the automotive and vehicle sectors, followed by real estate and technology (Deutscher Bundestag, 2022). [↗ CHART 147 RIGHT](#) Jungbluth (2018) also shows that the share of capital spending in the energy and environmental technology sectors, as well as pharmaceuticals, biotechnology and healthcare, is increasingly attracting Chinese investment.

At first glance, a **centralised top-down strategy** such as the one pursued in China may seem promising, especially if it can implement politically controversial projects that promote economic development (Friedman, 2009). In a case study of the Chinese shipbuilding industry, however, Barwick et al. (2019) show that although China's industrial policy has gained global market share, it has mainly supported **unproductive businesses**. Moreover, the resulting net profit is below the amount invested by extensive state support, and massive excess capacity has been created. State-owned enterprises in China also have significantly lower productivity than private firms (Dollar and Wei, 2007; Hsieh and Klenow, 2009; Jurzyk and Ruane, 2021).

**Calls for European champions** able to compete successfully against Chinese conglomerates should therefore be viewed **critically** (GCEE Annual Report 2019 items 322 f.). The resulting lack of competition, which would be prevented by the targeted support given to just a few companies, might stifle innovation and hinder economic growth (Aghion et al., 2005; World Bank, 2019; GCEE Annual Report 2019 items 255 and 321). In addition, **democratic systems** are more likely than autocratic systems to **stimulate growth** by providing legal certainty, a safe investment environment, better education and adequate public goods (Acemoglu et al., 2019).

## IV. POTENTIAL COURSES OF ACTION TO STRENGTHEN COMPETITIVENESS

- 505.** In the past, supply chains were often primarily optimised in terms of their cost and time efficiency ('just in time'), but they were less rigorously tested for their resilience to crisis-related disruption, production bottlenecks and shortages of materials. However, these problems have become more prevalent during the COVID-19 pandemic and since the beginning of the war in Ukraine. [↗ ITEM 58](#) Issues at individual stages of the value chain have quickly spread to the entire supply chain (Wellbrock, 2022). Consequently, both economic dependencies on individual suppliers and the **fragility of international supply chains** have become part of the **political and corporate consciousness**.

Given the increasing geopolitical risks, these challenges are likely to remain relevant for the foreseeable future. This therefore poses the question of what might be an appropriate **strategy for reducing economic dependencies** while **strengthening economic resilience**. Resilience should be understood as the ability to mitigate the negative effects of shocks and to return more quickly to the original growth path after an adverse shock; it is not a complete avoidance of risk. In the short term, a resilient growth path may be subject to greater cyclical fluctuations than a risk-minimising path. In the long run, however, it offers higher growth potential (Brunnermeier, 2021).



## 1. Strengthening the resilience of supply chains

506. The debate around reducing dependencies and strengthening the resilience of supply chains often centres on geographical **diversification of sources of supply** (Baur et al., 2022). Various analyses show that diversified value chains contribute significantly to mitigating shocks and accelerating the economic recovery (D'Aguanno et al., 2021; OECD, 2021b).

**Responsibility** for diversifying supply relationships lies, in principle, **with the companies concerned**. Firms can achieve diversification by procuring goods and services from different suppliers. If they are internationally positioned as multinational corporations, they can also achieve diversification by locating production sites in different regions. If market conditions in Germany deteriorate, the latter option could result in a reduction of local jobs in favour of other locations and be politically and economically undesirable from a national perspective. It is therefore essential to ensure a suitable business environment that makes it economically viable for international production sites to remain in Germany for the firms concerned, without providing government guarantees for private-sector risks.

### Debate about reshoring, nearshoring and friendshoring

507. However, diversifying value chains does not necessarily imply relocating production back to Germany or neighbouring countries (“**nearshoring**” or “**reshoring**”). A simulation study conducted by the Ifo Institute (Fuest et al., 2022) shows that both “reshoring” and “nearshoring” – i.e. relocating operations back to EU member states, Turkey or North Africa – would have negative consequences for Germany’s economy. Moreover, shorter value chains and local production are not necessarily less vulnerable to disruption (Qiang et al., 2021). Decoupling the European economy from the rest of the world would be accompanied not only by economic losses but also by a loss of power and influence that could even exacerbate geopolitical crises (Grimm, 2022a).
508. Given recent geopolitical tensions, US Treasury Secretary Janet Yellen introduced the principle of “**friendshoring**” into the debate (Yellen, 2022). “Friendshoring” means shifting trade relations away from strategic rivals and towards partners who share one’s own – in this case, democratic – values and priorities (James, 2022). It thus contrasts with the long-held paradigm of “change through trade”. As far as many central and eastern European partners are concerned, however, Russia’s invasion of Ukraine signals the failure of this foreign policy, which assumed that trade and financial relations could be used to integrate other countries into a stable international order and to persuade them to adopt democracy and the rule of law (von Ondarza and Overhaus, 2022).
509. However, trade relations can contribute to **stability** even if they do not trigger a shift towards democracy and the rule of law among trading partners. Despite all the examples of the failure of economic linkages as a means of maintaining peace, Jackson and Nei (2015) show that the development of **multilateralism has averted military conflict in the past**. A partial return to protectionism

through friendshoring risks inadvertently abandoning economic ties with “unfriendly” or “indecisive” countries that cannot (yet) be assigned to any particular bloc by democratic states.

Moreover, there are **no guarantees of continued reliability** even between strategic partners, as political events can lead to rapid changes in domestic and foreign policy stances. The surprising withdrawal of the United States from political agreements and treaties under international law as well as from established organisations and cooperation forums under the Trump administration is a case in point (Schaller, 2019). The concept of friendshoring is also counterproductive when it comes to providing **global public goods** or combating **global challenges** such as pandemics and climate change (European Commission, 2021d).

510. Countries should therefore identify mechanisms that enable mutual cooperation gains through the close interplay of competition and cooperation (**coopetition**). In this context the **positive-sum logic should be emphasised**, which postulates that specialisation gains can be generated by all trading partners and can play a pacifying role in conflict situations (Kamin et al., 2021). In the recent past, the benefits of international cooperation have often taken a back seat to a zero-sum logic that has increasingly been extended to security policy aspects, especially owing to the trade dispute between China and the US and the transatlantic upheavals during Donald Trump’s presidency (Felbermayr et al., 2021).

It is therefore the responsibility of the community of states to set appropriate **incentives for choosing collaborations that will allow all parties to reap greater rewards** than by simply going it alone. For this reason, the exploration of raw material deposits in third countries should, for example, always be accompanied by a willingness to engage with the development of the partner countries so that all parties involved benefit from more intensive cooperation. [▶ ITEM 512](#)

## Diversification through strategic alliances

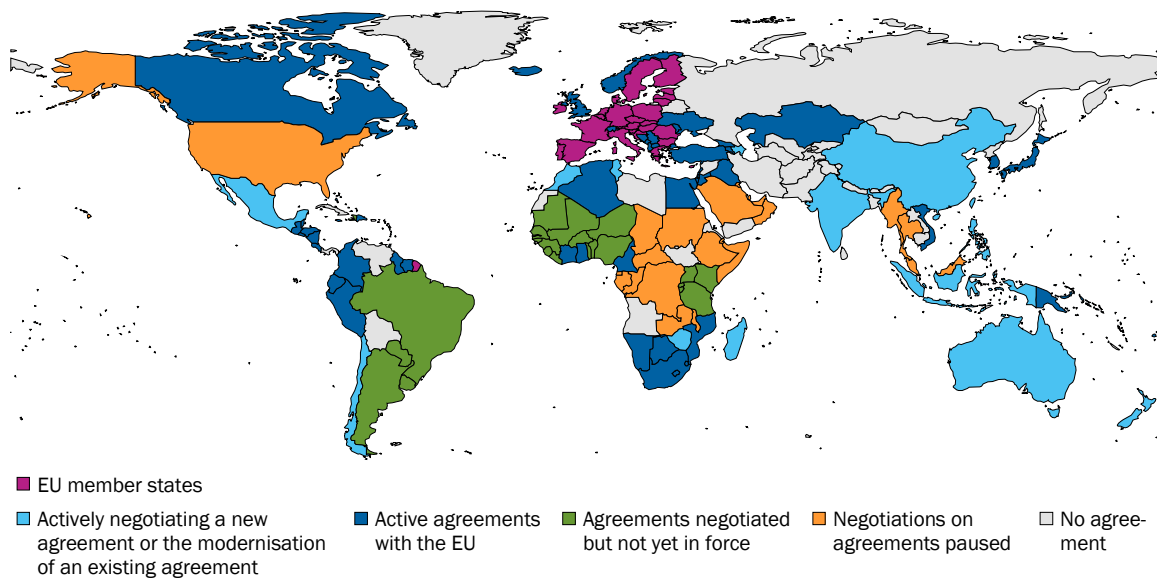
511. Governments can support corporate risk prevention by forming **strategic alliances**. Participating countries could thus help each other out in the event of any supply chain disruption. The **multilateral, rules-based trading system** (European Commission, 2021e) offers a suitable framework for building strategic alliances that can open up new markets in order to diversify sources of supply and provide fair and equitable access to critical goods.

**Trade agreements** negotiated at European level should therefore be **ratified promptly** and negotiations currently under way should be concluded swiftly.

[▶ CHART 148](#) This is especially true for trade agreements with Africa and Latin America, whose reserves of critical raw materials are particularly highly valued. Nevertheless, agreements with these countries have often been postponed or their ratification is still pending. Potential **synergies** should be used to strengthen the diversification of supply relationships more comprehensively and more quickly. In addition to the procurement of energy supplies, for example, options are often available in the area of critical raw materials or in general with regard to trade

➤ CHART 148

Numerous EU trade agreements are still being negotiated – in some cases negotiations have been paused



Sources: EuroGeographics for the administrative boundaries, European Commission  
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agreements, as was recently discussed during the German Chancellor's visit to Canada (Krapp et al., 2022).

512. The **economic development of partner countries should be encouraged** and potential adverse social consequences and harmful environmental impacts should be considered. Although the projected demand for critical raw materials, for example, could boost Africa's economic potential, it also carries the risk of inflicting local environmental damage and creating technological dependencies when setting up production. Usman et al. (2021) therefore propose the introduction of local content requirements, which could encourage the establishment of production facilities that include knowledge transfer and local development of the technology needed for production.

513. In an effort to help companies diversify their sourcing strategies, governments could map local and international actors involved in key value chains and **collect and share information** on potential concentrations and bottlenecks with stakeholders (OECD, 2021b).

The cooperation between the EU and the US within the framework of the Trade and Technology Council is the right approach in this respect. It aims to increase the **resilience of international supply chains**, for example by putting in place a joint early warning and monitoring system for semiconductor value chains (European Commission, 2022c). In addition, the European Commission is working on the development of a Supply Chain Alert Notification (SCAN) system that can bring about a better understanding of supply chain disruption among policy-makers and industry (Amaral et al., 2022).

## Diversifying supplies of critical raw materials

514. In a comparative analysis of US and European plans to **secure access to raw materials**, Ruiz Guix (2021) finds many commonalities that offer the **potential for cooperation**. This involves, for example, creating a research and development plan for areas such as recycling, setting sustainability standards and geological mapping as well as diversifying trade, setting priorities for international capital spending and expanding the storage of critical raw materials. A suitable framework for this could be provided by the US joining forces with the European Commission in the Mineral Security Partnership. [↗ BOX 23](#)
515. Another instrument for diversifying the supply of critical raw materials are **untied loan guarantees** (UFK guarantees; BMWi, 2019). UFK guarantees are guarantees issued by the German government for loans to foreign borrowers that are used for commodity extraction projects, among other things. One precondition for the issuance of these guarantees is that the guarantee recipient concludes a long-term purchase agreement with German firms as part of the new investment in raw material extraction projects. The raw materials must be of general economic interest. In addition, the credit default risk must not be too high. The foreign trade guarantee system carried out by Euler Hermes AG on behalf of Germany's Federal Ministry for Economic Affairs and Climate Action (BMWK) lists political risks in particular (agaportal, 2022a).
516. Despite the usefulness of, and the high demand for, UFK guarantees to strengthen security of supply, the German government is **reluctant to issue guarantees**. At the end of 2021 the total value of guarantees, spread across twelve individual guarantees, was only €4.7 billion, which was a fraction of the €75 billion set aside in the 2021 budget. Projects were funded in a total of 13 countries between 2017 and 2021, covering eleven different commodities. Moreover, while 13 projects were deemed eligible over the last five years, no UFK guarantees were approved in 2021. Only one guarantee was approved in 2020 (agaportal, 2022b). There is a large discrepancy between the number of requests for UFK guarantees (of which there were 35 in 2021) and the numbers of applications submitted and approvals granted ultimately. Projects for which there was interest in UFK guarantees often do not finally materialise or the default risk was estimated to be too high. Over the past few years there has also been greater interest in UFK guarantees for projects in connection with imports of green hydrogen and green ammonia. If UFK guarantees are issued too cautiously, this not only affects the supply of raw materials, it also creates vacuums that are filled by foreign firms that comply less strictly with social and environmental protection standards.

Given the growing demand for raw materials, the German government should **re-evaluate** its own **ability to take on risk** so that it can encourage investment in countries that can make a significant contribution to diversifying the sources of raw material supplies. The government can **use the issuance of UFK guarantees in a guiding manner**.

517. **In addition, investment guarantees** [↗ GLOSSARY](#) issued by the German government for foreign direct investment (FDI) by German firms in insecure countries

can boost supplies of raw materials (BMWK, 2022a). So far, however, these guarantees have **not been in demand** in industries that are closely associated with the **extraction of raw materials** (BMWK, 2022a). Here, there is primarily a need for German firms to increasingly enter the extractive sector (including as part of joint ventures). The government could actively point out the availability of investment guarantees. A potential role model here could be the Danish Trade Council, which both actively and passively offers various services to help Danish companies to open up export markets. One strategy used by the Trade Council is to contact firms directly, provide advice and offer its services (Buus et al., 2021; Ministry of Foreign Affairs of Denmark, 2022).

There is also the possibility for the government to play a guiding role in the case of investment guarantees. There are currently discussions, for example, about the option of **revising the legal rules on investment guarantees** as part of a new trade strategy with regard to China (Bräuner, 2022; Müller, 2022). Given the changing **geopolitical situation** and some companies' growing dependence on China as a supplier and market, investment guarantees should be issued more selectively so that firms also take other markets into consideration (Müller, 2022). Since investment guarantees, like UFK guarantees, are export subsidies, they must be applied within the scope of the OECD's Working Party on Export Credits and Credit Guarantees [↗ GLOSSARY](#) (OECD, 2022d).

### Long-term diversification of energy supplies

518. Current geopolitical realities call for a **diversification of energy supplies** in the medium term. Under its **REPowerEU strategy**, designed in response to Russia's invasion of Ukraine, [↗ ITEM 287](#) the EU is seeking "new energy partnerships with reliable suppliers, including future cooperation on renewables and low-carbon gases" (European Commission, 2022d).

**The EU Energy Platform**, created in April 2022, is intended to help here, aiming to secure European energy supplies at affordable prices. It intends to coordinate the **joint procurement** of pipeline natural gas, liquefied natural gas and hydrogen and to prevent "energy nationalism" (European Commission, 2022e; Koch and Stratmann, 2022). As energy deals are primarily the responsibility of private-sector actors, however, the success of the platform is based on voluntary cooperation. Boltz et al. (2022) therefore suggest that companies that already benefit from good terms and conditions in their long-term contracts would not have to give them up if they participated. Furthermore, temporary participation, for example on an annual basis, should also be possible, enabling participants to react to changing conditions.

519. Given the particular urgency of obtaining energy supplies to replace Russian natural gas and oil, **synergies** should be used in **procurement**. Many countries that have the potential to export fossil fuels are planning, for example, to increase their capacity to export hydrogen or other climate-friendly energy carriers based on it. These include Canada, Australia, Norway and countries in the MENA region (Breitschopf et al., 2022). Linking negotiations on the procurement of natural gas and hydrogen should increase the chances of establishing supply relationships

despite the limited period available for procuring natural gas. Contracts without destination clauses could facilitate the signing of long-term agreements by allowing the resale of natural gas once the original customer has switched to hydrogen (Grimm, 2022b).

520. The procurement of green hydrogen requires extensive capital expenditure, which requires large-volume and **long-term supply contracts** at fixed prices. In order to compensate for the differential between the demand price and the initial production cost, a two-sided auction was devised within the framework of the **H2Global** initiative, which keeps the production cost low and can help to initiate long-term contracts (BMWK, 2022b; Grimm, 2022c). Procurement under long-term contracts should thus make it possible to mobilise private capital expenditure in the relevant facilities and supply chains. Each individual supply relationship is likely to require a high-volume contract owing to economies of scale. In order to facilitate diversification of supply relationships, it might therefore be necessary and expedient for a coalition of the willing among the EU member states to join forces to jointly procure green hydrogen in the future. The EU Energy Platform would be particularly suitable for this purpose. [▶ ITEM 518](#)

## 2. Expansion of European production and stockpiling

521. The greater disruption to international supply chains since the COVID-19 pandemic and the intensification of geopolitical tensions have triggered a public debate about the need for domestic capacity. On the one hand, this involves the expansion of strategic **stockpiling**. On the other hand, there are growing calls to **increase European production capacity**, be it in the field of semiconductors or critical raw materials. In most cases, any expansion of domestic capacity – for example by relocating foreign production facilities back to Germany – would be associated with high costs. [▶ ITEM 507](#) Nevertheless, it may be necessary in individual cases to preserve **strategic autonomy**, which should not be compromised by weaknesses in international supply chains or decisions by individual companies.

### Resilience through stockpiling

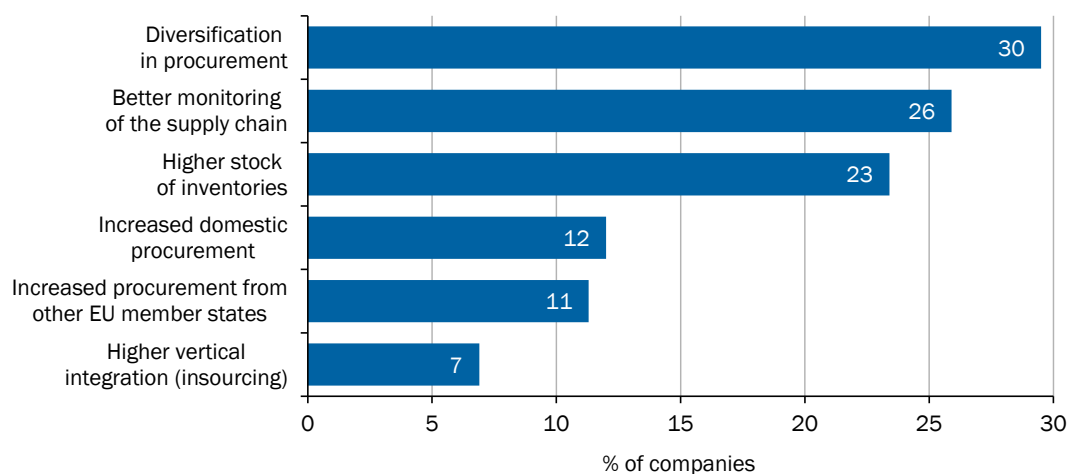
522. Increasing the **stockpiling** of strategically important products can be done either by the government or privately. The current disruption to gas supplies shows that active risk management by the government is necessary in the event of systemic crises and in sectors that are strongly affected by politics (Fuest, 2022). At the EU level, therefore, specific stockpiling requirements were introduced for gas storage facilities in 2022 to ensure that suppliers reach a fill level of at least 80 % by 1 November 2022 (or 90 % from 2023) (European Parliament and European Union, 2022).
523. In principle, companies **themselves** have a considerable **incentive** to strengthen their resilience by increasing their inventories. Last year, therefore, almost a quarter of firms were already planning to expand their inventories



➤ CHART 149

### Companies are adapting their procurement strategies (May 2021)<sup>1</sup>

#### Manufacturing



1 – Online survey of more than 5,000 companies in the manufacturing sector. Companies were asked about the global supply chain disruption caused by the Corona pandemic: Does your company plan to change its sourcing strategy in the future? Possible answers: a) yes, b) no, c) don't know. If yes, how? Possible answers: a) diversification in procurement, b) increased domestic procurement, c) increased procurement from other EU countries, d) higher vertical integration (insourcing), e) higher stock of inventories, f) better monitoring of supply chains.

Sources: Flach et al. (2021), ifo Business Surveys, May 2021

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despite the associated costs in order to hedge against supply bottlenecks and a shortage of inputs. ➤ CHART 149

Under current legislation, however, **stockpiling** in Germany is **disadvantageous from a tax point of view**, as it increases current assets and only the use of the raw materials entitles the companies to a business expense deduction. This disadvantage could be eliminated by amending the relevant tax legislation, for example by creating a raw material stockpiling reserve, which is measured according to the acquisition cost of the raw materials and entitles the firm in question to an immediate business expense deduction (Wachter et al., 2022b, 2022a). This reserve would thus merely cause a delay but not a reduction in profit taxation as a result of the sale or use of the raw materials.

### Mining of domestic raw materials and recycling

524. If critical raw materials are available domestically, domestic extraction could be an alternative to diversification. As far as **critical raw materials** are concerned, it is therefore necessary to weigh up the need to extract domestic **resources in order to meet demand**, on the one hand, against **inadequate profitability** and **environmental concerns**, on the other (Flach et al., 2022). Using inadequate profitability as a justification should be challenged in particular when international commodity prices are the result of targeted third-country intervention. The extraction and processing of domestic raw materials might not only strengthen Europe as a business location; they could also be done in line with the



environmental and social standards customary in Europe, which do not always exist in third countries. [↗ ITEM 490](#)

525. It would be helpful to **identify** German and European **deposits of critical raw materials** in order to ensure security of supply. This could be done, for example, through the network of European raw material agencies planned under the EU's Critical Raw Materials Act. [↗ BOX 23](#) Plans to repurpose the identified areas from, for example, brownfield to commercial or private use should therefore always be closely scrutinised from the perspective of raw material supplies. In addition, the potential consequences of local raw material extraction should be weighed against the global consequences of extraction in third countries with less stringent environmental regulations. If necessary, existing European **environmental regulations** would then have to be **adapted**.
526. The **acceleration of planning and approval procedures** could increase the entrepreneurial willingness to invest in raw material projects (Kullik, 2019). To this end, these procedures should be provided from a single source and pooled in authorities that have the necessary levels of staffing and expertise (Wachter and Hillmann, 2022). At the same time, long-term purchase agreements signed by private-sector companies could be supported with untied loan guarantees or similar instruments. [↗ ITEM 515](#)
527. The opportunities and risks of **domestic resource extraction** in **Germany** have received **little attention** so far in the **public discourse**. However, a lack of public communication about the necessity for, and consequences of, extraction projects can reduce social acceptance of domestic raw material extraction and processing, which is why the actors involved – such as investors and local government – should pursue a transparent information strategy. The acceptance of the local population could also be increased by sharing in the profits from raw material extraction. The mining law in Portugal was amended specifically for this purpose: up to half of all profits from mining, which previously accrued solely to the state, are now shared with the local population (Handelsblatt, 2022). A model similar to the one in Portugal could, besides creating new jobs, increase local acceptance.
- As **former coal-mining regions** are particularly suitable for the extraction of battery raw materials, it makes sense to strengthen the existing competences of local skilled workers through targeted education and training (European Committee of the Regions, 2021). Potentially negative consequences for the environment after mining activities have been discontinued could already be financially mitigated before mining begins, and the subsequent use of these areas could be arranged swiftly in close coordination between the relevant authorities, raw material companies and municipalities (UBA, 2022; Wachter and Hillmann, 2022).
528. Also, Europe's **recycling infrastructure** for critical raw materials can be used more as an instrument to reduce import dependencies. This objective was formulated in the Action Plan for the Circular Economy as a building block of the European Green Deal (European Commission, 2020e), and the German government mentions recycling as a key component of its raw materials strategy (BMWi, 2019). This should be intensified – especially in resource-intensive sectors such

as the textile, construction, electronics and plastics industries – in order to achieve higher recycling rates within sectors and reduce procurement costs through efficient recycling processes.

However, **recycling is not yet a comprehensive solution** for all raw materials. Many raw materials cannot yet be recycled without a loss of quality or purity. Moreover, the currently achievable, fairly low efficiency of recycling relative to the quantities required for production means that very little material can be returned to the production process, so primary raw materials continue to be needed (BGR, 2021). **Further development of, and greater support for, the recycling industry** in Europe are therefore required. Equipped with appropriate innovations, the recycling industry can make a major contribution to expanding intra-European procurement of raw materials beyond the pure recycling of metals, which has worked well so far. Firstly, this can reduce dependence on third countries and, secondly, a recycling industry in accordance with European guidelines would yield higher social and environmental standards than is currently the case in third countries (UBA, 2019).

#### BOX 25

##### Recycling in Germany

**Recycling** raw materials means **recovering them from waste and returning them to the production process**. Unlike primary raw materials, which do not occur in this country, secondary raw materials obtained from the recycling process can be produced domestically. Although recycling is only possible to a limited extent at present, it offers a sensible approach to achieving further diversification in the procurement of raw materials and a path to sustainable production.

Germany is a pioneer in the production and use of secondary raw materials. In 2020, for example, around 44 % of German copper production and 45 % of crude steel production was derived from secondary raw materials. However, **different materials are recyclable to different degrees**. Metals do not change their chemical structure during processing, so they are easily recyclable. Other materials, such as gypsum, change their chemical structure during processing and cannot be converted back into the original material. However, there are ways of producing substitutes for the actual raw materials from processed and altered substances, examples being recycled glass and building materials (BGR, 2021).

With the technology currently available it is **not yet possible to achieve a sufficiently high degree of efficiency** such that primary raw materials would no longer be necessary. Moreover, many materials that are basically easy to recycle, especially rare earths, are used in such small quantities and strong alloys that the collection of scrap and further processing currently still incurs very high costs (Wilts et al., 2014; BMWi, 2019; BGR, 2021).

Furthermore, there are **competition policy obstacles** to the expansion of the recycling industry. Until at least the mid-2000s, the international recycling industry was a *de facto* monopoly and a competitive market structure is only slowly emerging (OECD, 2006; Wilts et al., 2014; Di Foggia and Beccarello, 2021). There is therefore a need for competition authorities such as the European Commission's Directorate General for Competition as well as Germany's Federal Cartel Office to ensure that incumbents cannot prevent competitors from entering the market.

The German government's **Raw Materials Strategy** already engages in recycling in a big way and addresses many of the issues that have been inhibiting it so far. It identifies three areas that yield efficient recycling processes: old, no longer usable products must be extensively collected and sorted into waste and scrap; recycling technology must be refined in order to increase the efficiency of recycling and the quality of the secondary raw materials obtained; and

the demand for recycled raw materials must be managed (BMW, 2019). For example, research and development in the field of processing technology should be promoted, which can yield greater efficiencies, especially in the recycling of rare earths (BMW, 2019).

As part of its Raw Materials Strategy, the German government has created a '**recycled raw materials' dialogue platform** as a forum for communication between industry, academia and policymakers to improve Germany's supply of secondary raw materials (BMW, 2019; BGR, 2022).

A **specific recycling infrastructure must also be created** for electric vehicles – especially for the batteries installed in them – in order to promote the transition to electromobility in individual transport. In 2022, the BMWK funded a project on the 'battery ecosystem', which aims to map the entire value chain of batteries installed in electric vehicles as part of a consortium that includes automotive companies (BMWK, 2022c). In the medium term it will be necessary to expand this project to establish a recycling structure for electric vehicles; to this end, the project partner group should be increased to include recycling firms.

Efforts are being made at **European level** to intensify recycling and set binding targets by 2030 (European Parliament, 2021b, 2021c). However, a concrete, EU-wide **strategy is still absent**. Nonetheless, there are already a variety of start-up businesses which, for example, recycle electric vehicle batteries and building materials (Concular, 2021; Circunomics, 2022). An EU-wide platform acting as a communication forum for these firms could make it possible to identify promising technologies at an early stage and devise suitable funding options without distorting the competitive innovation process.

## Expansion of the energy infrastructure

529. The **expansion of renewable energy** should be accelerated as a priority to ensure a secure and independent energy supply. A **joint approach** should be adopted **by the member states** in order to make the best possible use of the generation potential within the EU. The European Commission's REPowerEU strategy already emphasises the need to significantly increase investment in renewable energy in order to drive the energy transition (European Commission, 2022d). For example, it proposes to more than double the target capacity of photovoltaic installations that should be achieved by 2025 (European Commission, 2022f).

By introducing the next **amendment to the Energy Security Act**, the BMWK aims to adopt measures that could have a positive long-term impact on the energy transition (BMWK, 2022d). These include lifting the limit on the feed-in capacity of private photovoltaic systems, which has so far been 70 % of effective output, and creating a special EEG subsidy for electricity generation from biogas. Also essential for the long-term expansion of renewable energy is the proposal to make enlargement of the electricity grid more flexible, thereby reducing bureaucracy and making it easier to connect offshore wind power plants to the electricity grid (BMWK, 2022d). [▶ ITEM 290](#)

530. Further barriers should also be removed in order to make the best possible use of the energy generation potential within the EU. Even under the current amendment to the German Renewable Energy Sources Act (EEG), for example, only 5 % of the annual target for subsidising new capacity is open to assets from other

European countries (Umweltwirtschaft, 2018; BMWi, 2021b; Bundesregierung, 2022). It would seem sensible to **expand European cooperation in the promotion of renewable energy**, taking account of the geographical and climatic differences between the member states, in order to make this expansion effective across the EU and to develop regions that offer the greatest marginal returns in energy generation first.

531. Strengthening Europe's energy supplies also requires that European **planning processes be more closely coordinated**. A joint approach towards grid expansion and development could eliminate coordination problems and increase efficiency in both the generation and distribution of energy. This applies in particular to cross-sectoral plans to expand electricity, hydrogen and gas grids across national borders. A prime example of undesirable legacy systems is the European gas network, which has been configured in a disadvantageous way, as has become clear since the move away from Russian supplies. Although there are LNG terminals in Spain, for example, they are inadequately connected to the European gas grid via pipelines.

Currently there are various **consortia of network operators**, such as the European Network of Transmission System Operators for Gas (ENTSO-G) and the European Network of Transmission System Operators for Electricity (ENTSO-E), which were established by decrees of the European Parliament (European Parliament, 2009a, 2009b). The main tasks of these consortia are to facilitate the coordination of network operators across national borders and to develop common standards and regulations. However, they do not have a mandate to plan network expansion or design cross-border funding plans.

**Greater centralisation at European level – of long-distance grid development**, at least – which takes account of the needs of all member states and maps capacities from a pan-European perspective could make energy supply more efficient and prevent conflicts, thereby easing the future transition to renewable energy. REPowerEU takes a first step in this direction by mapping hydrogen pipeline requirements up to March 2023 (European Commission, 2022f). In addition to planning, incentives need to be designed in such a way that grid expansion can be financed and decisions are made in a timely manner. [↘ BOX 26](#)

532. The process of **certifying** electricity or hydrogen **as renewable** or green is still **too complicated**. The most recent example of this is the criteria for certifying hydrogen as renewable (European Parliament, 2018; European Commission, 2022g). One particularly contentious issue here is 'additionality', which requires that the green electricity used to electrolyse hydrogen must have been generated by new, additional electricity production and must not be in competitive demand with other consumers. This especially means that small firms – which often generate their own electricity and produce their own hydrogen for the purpose of energy storage in response to the high planning and administrative costs, among other things – are deprived of the opportunity to produce and regionally use hydrogen certified as green (Nationaler Wasserstoffrat, 2020, 2022a; NDR, 2022).

Furthermore, this principle prevents the production of (green or blue) hydrogen and electricity using renewable sources from being ramped up simultaneously

(Edenhofer et al., 2022). Instead, a **price generally applicable to carbon emissions** should also be applied to hydrogen production (Edenhofer et al., 2022). In the medium and long term this price mechanism will regulate the transition to pure green hydrogen produced exclusively using electricity from renewable sources and will eliminate competition for the use of electricity by providing sufficient additional energy.

#### ▸ BOX 26

##### Expansion of hydrogen networks

In order to secure German and European supplies of hydrogen, an extensive supply network is needed within Europe. So far, however, the **development** of such a hydrogen network has **failed** owing to the issues of its **funding** and sensible, uniform **regulation**. It would make economic sense to use existing structures, such as the gas network, when developing a new hydrogen network and to exploit synergies between networks (Nationaler Wasserstoffrat, 2020). However, this can cause problems with the sharing of expansion costs, as it is not clear which actors – households or firms – would bear the cost of this expansion. Industry and the transport sector would initially benefit from a rapidly and extensively expanded hydrogen network; the German Association of Energy and Water Industries (BDEW, 2022), for example, does not see any direct or realistic opportunity for households to use it. However, new business models could also be expected to create macroeconomic welfare effects that would indirectly benefit households.

The current state of the debate suggests that hydrogen grids are to be separated from other energy infrastructure, such as the gas grid, through so-called '**ownership unbundling**'. The intention behind this separation is to prevent competition policy issues such as the implicit cross-subsidisation of (still expensive) hydrogen networks by electricity and gas customers under the ownership of a network operator (Article 9, European Parliament, 2009c). While separation of ownership makes sense from a competition policy perspective, it hinders network expansion by restricting financial flows within a company. In addition, the current regulation makes it difficult to exploit economies of scale and build on the existing gas grid infrastructure when expanding the hydrogen grid. In this context, the National Hydrogen Council ([Nationaler Wasserstoffrat](#), 2022a) recommends that the **separation of energy generators and suppliers should not be further intensified**. Even if this works out, there is insufficient incentive to accelerate the expansion of the hydrogen grid because funding of the hydrogen grid, which will be operated separately from the gas grid, is subject to too much uncertainty during the ramp-up period. Against this background, the German Energy Agency proposes that the grid operators finance the grid expansion themselves but that the German government provides long-term **investment guarantees** (dena, 2022a). Such government issued guarantees could therefore be a way to avoid direct subsidies and to prevent the cross-subsidisation through the natural gas network fee, which has long been demanded by the operators of the gas networks.

Although no European regulation on the planning of grid expansion exists at present, it would provide urgently needed planning certainty for the project's funding. Planning to date has been limited to the expansion of hydrogen networks within the framework of the **IPCEI projects** and the **European Hydrogen Backbone**, an initiative of 31 European network operators, under which some 40,000 kilometres of long-distance hydrogen pipelines are to be built by 2040 (dena, 2022b). ▸ [ITEM 498](#) Lack of regulation poses a significant uncertainty for companies and is inhibiting expansion (Gas for Climate, 2021; [Nationaler Wasserstoffrat](#), 2022a). It is therefore urgently necessary for both the firms organised in the European Hydrogen Backbone and the European Commission to come together in order to swiftly adopt uniform regulations on the funding and operation of the hydrogen networks. This would also require centralised planning



of the pan-European network in order to illustrate and meet the common interests and needs of the member states. ↘ [ITEM 531](#) European competition authorities should weigh up competition policy factors against long-term energy supply issues here, especially in the case of joint ventures between different network operators.

## Opportunities and risks of subsidies

533. Many countries support domestic firms through targeted **subsidies** in order to accelerate the development of domestic production capacity. ↘ [ITEM 492](#) State aid is generally prohibited in Europe under EU state aid law. In an effort to strengthen Europe's **strategic and technological autonomy**, however, subsidising strategically important areas **can make sense**, provided that the economic costs of such subsidies – even in the long term – are estimated to be lower than the consequences of not providing support. Over the past few decades, for example, Germany could have specifically supported the security of its gas supply by expanding LNG terminals. Private firms have had little incentive to do so because of the costs associated with infrastructure development and the reliability of government support in the event of a crisis (Hellwig, 2022). Clearer EU guidelines are therefore essential to define strategically important areas that justify the award of subsidies to strengthen strategic and technological autonomy and prevent the promotion of projects outside this definitional scope (Government Offices of Sweden, 2021).
534. At the same time, there is a **risk** that government decision-makers do **not have sufficient information** about the future viability of individual sectors and therefore provide support in the wrong places. The cost of the benefits granted to individual firms is then borne by competitors, taxpayers and consumers (GCEE Annual Report 2019 item 267). **Conflicts of interest** between strengthening individual sectors and creating potentially negative consequences should therefore be **carefully considered when approving** exemptions to EU state aid rules, and **alternative ways of supporting** individual industries and firms should be **examined in detail**.

Alternatively, reliance on foreign producers can be reduced by **strengthening** Germany's **innovative capacity as a business location**. Key policy areas for achieving this goal are research, innovation and education policy (Dohse et al., 2019; GCEE Annual Report 2017 items 712 ff.; GCEE Annual Report 2021 items 246 ff.). ↘ [BOX 22](#) Subsidies from third countries should also be addressed first by using the trade defence instruments developed under the regulation against distortions in the internal market caused by subsidies from third countries. ↘ [ITEM 499](#)

## 3. Safeguarding European values and interests

535. The growing geopolitical tensions, which are accompanied by an increasing bloc formation between autocratically and democratically led states, are one of the major challenges facing Germany and Europe over the coming years. On the one hand, therefore, **European values and interests** need to be safeguarded

against a backdrop of geopolitical rivalries. This applies especially to the basic democratic order, which is increasingly being threatened by rhetorical, economic and, in rare cases, military attacks by autocratic states. [↗ ITEMS 501 FF](#). On the other hand, it should be possible to perform a balancing act between trade policy autonomy – which aims to reduce external dependencies – and international economic openness.

### Ensuring “Open Strategic Autonomy”

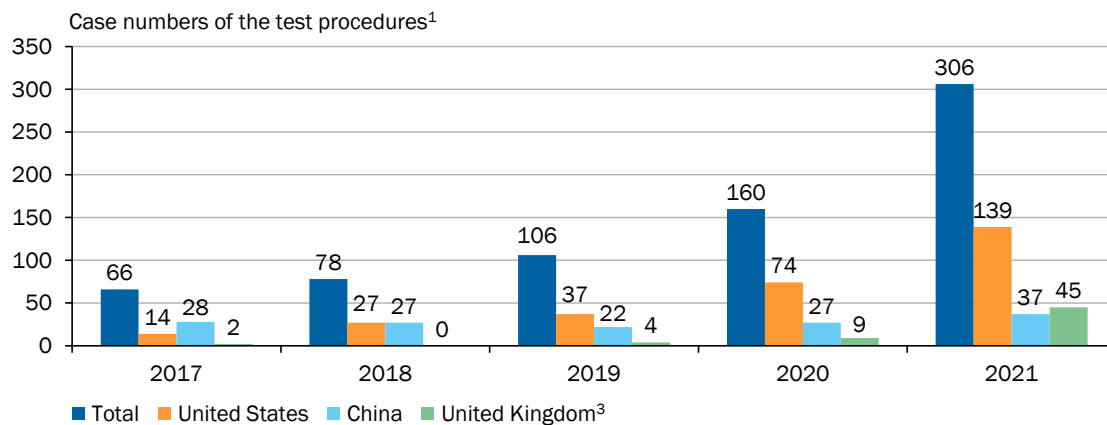
- 536.** Given the current geo-economic challenges, it is important to **define common strategic goals within the European Union** and together with Western partners which take account of the changing circumstances. Since 2021, the European Union has therefore been pursuing its goal of acting as openly as possible and as autonomously as necessary. Following the principle of Open Strategic Autonomy as a guideline (Open Strategic Autonomy; European Commission, 2021f), the EU aims to strengthen **multilateralism** by consistently cooperating with its partners but reserves the right to contest unfair trade practices (European Commission, 2021g, 2021f). [↗ ITEM 538](#) In doing so, it recognises the benefits of the international division of labour as well as the economic and political risks that could arise from compartmentalisation. [↗ ITEMS 474 AND 507](#)
- 537.** When cooperating with old and new partners, the interests of all parties should be taken into account and all parties should be **treated as equals** (Nem Singh, 2021). This means offering appropriate cooperation terms to smaller, less developed countries. It should also be remembered that many nations do not regard the Western democratic system as a role model. [↗ CHART 151](#) [↗ ITEM 501](#) European financial assets and offers should take these systemic and cultural differences into account.
- 538.** At the same time, this implies being able to push back against major systemic rivals by using the **appropriate instruments** and **not making oneself vulnerable to blackmail** as a result of unilateral dependencies. In recent years, therefore, there has been a growing body of opinion that **trade policy instruments** should be used more to **achieve foreign policy goals** (Kamin et al., 2021). Europe’s trade defence instruments might thus not only guarantee fair competition but also, if used carefully, could be used as a means of exerting pressure in the event of a breach of international rules.

Supplementing the regulation against distortions in the internal market caused by subsidies from third countries [↗ ITEM 499](#) the **instrument against economic coercion** by third countries proposed by the European Commission in December 2021 is a step in the right direction. Following the failed attempt at de-escalation through dialogue, this explicitly stipulates coercive measures and trade defence instruments such as tariffs and restrictions on countries’ access to the EU’s internal market (European Commission, 2021h).



➤ CHART 150

### Investment audits in Germany have recently risen sharply



1 – The reference point here is solely the national examination procedures according to the Foreign Trade and Payments Ordinance (AWV). 2 – The EU cooperation mechanism entered into force in October 2020. 3 – Including the Channell Islands (Alderney, Guernsey, Herm, Jersey and Sark). Before the end of the brexit transition period (31 December 2020), acquisitions from the United Kingdom were only assessed within the scope of the sector-specific investment assessment procedure.

Source: Federal Ministry of Economic Affairs and Climate Action (2022e)

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## Review of foreign direct investment

- 539.** In addition, investment auditing under foreign trade law has become much more important. In October 2020, for example, an **EU review mechanism for foreign direct investment (FDI) was adopted**, obliging member states to pursue a uniform approach to investment appraisal throughout Europe (European Commission, 2020f). This regulation does not call into question Europe's openness to FDI. Rather, it is designed for exceptional cases in which FDI poses a risk to security or public order in at least two EU member states. Whether a risk actually exists is assessed against a non-binding list of factors including the impact on critical infrastructure, technology (potentially dual-use technology) and resources essential to security or public order.
- 540.** The EU framework provides a formal channel for the exchange of information between member states in order to draw attention to problematic cases. However, it does not replace **national review mechanisms**. In Germany, the BMWK can examine a foreign actor's direct or indirect acquisition of a domestic company or an interest in a domestic company on a case-by-case basis. The legal basis for this is the Foreign Trade and Payments Act (Außenwirtschaftsgesetz, AWG) and the Foreign Trade and Payments Ordinance (Außenwirtschaftsverordnung, AWV), which were considerably **expanded** by four rapid successive amendments made between 2020 and 2021 (BMWK, 2022e; European Commission, 2022e; GCEE Annual Report 2019 items 324 ff.) and contributed to a significant increase in investment reviews in 2021. ➤ CHART 150
- 541.** Looking in the opposite direction, German companies' access to the Chinese market continues to be hampered by investment restrictions (GCEE Annual Report 2019 item 327). A strategy paper issued by the European Parliament thus calls for

greater efforts to achieve **balanced and reciprocal economic relations** (European Parliament, 2021d). Europe should therefore use access to its single market even more as leverage in international negotiations, and especially in the context of **CAI** negotiations (Kamin et al., 2021). In terms of capital expenditure, the CAI would be the most comprehensive investment agreement China has ever concluded with a third country (European Commission, 2020g). Any investment by Cosco, a Chinese state-owned shipping company, in a terminal in the port of Hamburg (Greive et al., 2022), which is currently under discussion, would not least run counter to the aspiration for reciprocity in economic relations, as a similar investment by German firms in China's strategic infrastructure would not be possible.

## Europe as a normative actor

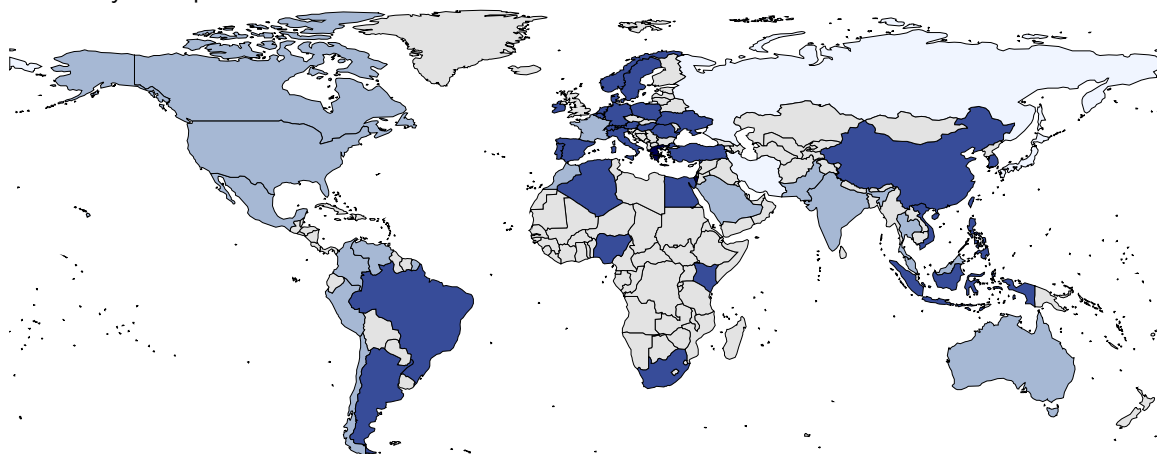
542. Furthermore, the setting of norms and standards is a key instrument for strengthening the rules-based order. For example, the **“Brussels effect”** (Bradford, 2020) shows that the enforcement of European standards can not only help to export European values but also to strengthen competitiveness. The size of the European single market plays a crucial role here. For foreign companies that have to comply with EU rules when exporting to the EU, it is often advantageous to apply these rules in markets where EU standards are not mandatory. Within their home markets they then have an incentive to promote stricter standards so that they do not encounter “unfair” competition there from companies that apply lower standards (Felbermayr et al., 2021).

As recently as 2021, the European Commission reiterated its interest in expanding international norms, standards and global cooperation in superiority areas (European Commission, 2021g). In order to **increase** German participation in

### ➤ CHART 151

#### Perception of democratic order

Democracy Perception Index 2021



Proportion of people who consider democracy in their own country important in %<sup>1</sup>:

□ 60 to 70   ■ > 70 to 80   ■ > 80 to 90   ■ > 90 to 100   □ No values available

1 – Representative survey in 53 states. People who answered the question "In your opinion, how important is it for your country to be a democracy?" with a rating from 7 to 10, where 0 represents "not at all important" and 10 "very important".

Sources: Alliance of Democracies, EuroGeographics for the administrative boundaries

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**standardisation committees** – for example in the field of digital technology or energy and climate protection technology – the German Commission of Experts for Research and Innovation (EFI, 2022) proposes to subsidize the costs that companies incur in connection with standardization projects via the research allowance. In addition, firms and academic institutions should be made more aware of this topic and the importance of standardisation.

543. Finally, the **benefits of the democratic order** should be emphasised more in order to limit the ability of autocratic propaganda to destabilise democratic systems. Even in many parts of the Western world there is a significant proportion of the population that does not consider democracy to be important. [↘ CHART 151](#) The benefits that flow from a democratic process of decision-making for a society should therefore be communicated even more widely than before and in a way that is appropriate for the target group.

In this context, Acemoglu and Robinson (2012) particularly emphasise the **welfare-enhancing importance of inclusive institutions** that limit the concentration of political power. This also ensures that the creative destruction necessary for structural change is not slowed down by the interests of individual countries or groups of actors. Unlike in many autocratic states, for example, German and European competition law has for decades ensured that economic freedom of action and decision-making are preserved in competition. Particularly in times when the decision-making processes of autocratic systems are perceived by some to be more efficient, [↘ BOX 24](#) it is therefore important to clearly emphasise the permanence and reliability of political institutions for long-term growth and prosperity. The risks associated with autocracy, especially massive violations of human rights and freedoms, should also be called out. In particular, the more repressive autocracies have to become in order to retain their power, the more difficult it is to bring about innovation and growth.

# APPENDIX

TABLE 24

## Exemplary use of critical raw materials<sup>1</sup>

Raw materials	Selected use	Use in key technologies
Antimony	Lead batteries, flame retardants, defence applications	Drones, robotics
Beryllium	Electronic and communication equipment, components for the automotive, aerospace and space industry, and for the defence industry	Drones
Bismuth	Alloys with low melting point, medical applications pharmaceutical and feed industry	Digital technologies, drones, robotics
Borates	Fertilizer, high performance glass, permanent magnets	Fuel cells, digital technologies, drones, electric traction motors, photovoltaics, robotics, wind energy, 3D printing
Fluorite	Aluminium production and other metallurgy, refrigeration and air conditioning, steel and iron production	Drones, lithium-ion batteries, robotics
Cobalt	Batteries, catalytic converters, magnets, superalloys	Fuel cells, digital technologies, drones, lithium-ion batteries, robotics, wind energy, 3D printing
Gallium	Semiconductors, photovoltaic cells	Digital technologies, drones, photovoltaics, robotics
Germanium	Optical fibres in infrared optics, polymerisation catalysts, satellite solar cells	Digital technologies, drones, photovoltaics
Graphite	Batteries, refractory materials for the steel production	Fuel cells, digital technologies, drones, lithium-ion batteries, robotics
Hafnium	Refractory ceramics, control rods, superalloys	Drones, 3D printing
Indium	Flat screens, soldering materials, photovoltaic cells and photonics	Drones, photovoltaics, robotics
Lithium	Batteries, glass and ceramics, steel and aluminium metallurgy	Fuel cells, drones, lithium-ion accumulators, robotics
Magnesium	Desulphurisation agent in steel production, light alloys for the automotive, electronics, packaging or construction industry	Fuel cells, digital technologies, drones, robotics, 3D printing
Niobium	High-tech applications (capacitors, superconductive magnets, etc.) high-strength steel and superalloys for transport and infrastructure	Fuel cells, drones, photovoltaics, 3D printing
Phosphor	Chemical applications, defence applications	Digital technologies, drones, lithium-ion accumulators, photovoltaics
Platinum group metals	Fuel cells, chemical catalysts, electronic applications	Fuel cells, digital technologies, drones, robotics
Silicon	Electronic components, semiconductors, photovoltaics, silicones	Fuel cells, digital technologies, drones, electric traction motors, lithium-ion accumulators, robotics, wind energy, 3D printing
Strontium	Aluminium alloys, ceramic magnets, medical applications, pyrotechnics	Fuel cells, drones, robotics
Tantalum	Capacitors for electronic devices, superalloys	Drones, robotics
Titanium	Paints and plastics, lightweight high-strength alloys (e. g. for aerospace and defence), medical applications	Drones, lithium-ion batteries, fuel cells, digital technologies, robotics, 3D printing
Wolfram	Milling, cutting and mining tools, alloys (e. g. for aerospace, defence, electrical engineering)	Drones, robotics, 3D printing
Heavy Rare earths	Catalysts, luminescent phosphor, permanent magnets for electric motors and power generators	Fuel cells, drones, electric traction motors, robotics, wind energy
Light Rare earths	Batteries, glass and ceramics	Fuel cells, digital technologies, drones, electric motors, robotics, wind energy

1 – Selected uses of the critical raw materials analysed are shown, as well as their use in a selection of nine key technologies. Arsenic, barium and rhenium are not shown.

Sources: German Mineral Resources Agency (DERA), European Commission  
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### [CHART 152](#)

## **Employed persons in the manufacturing sector in international comparison<sup>1</sup>**



1 – DE-Germany, FR-France, IT-Italy, JP-Japan, PL-Poland, UK-United Kingdom, US-United States.

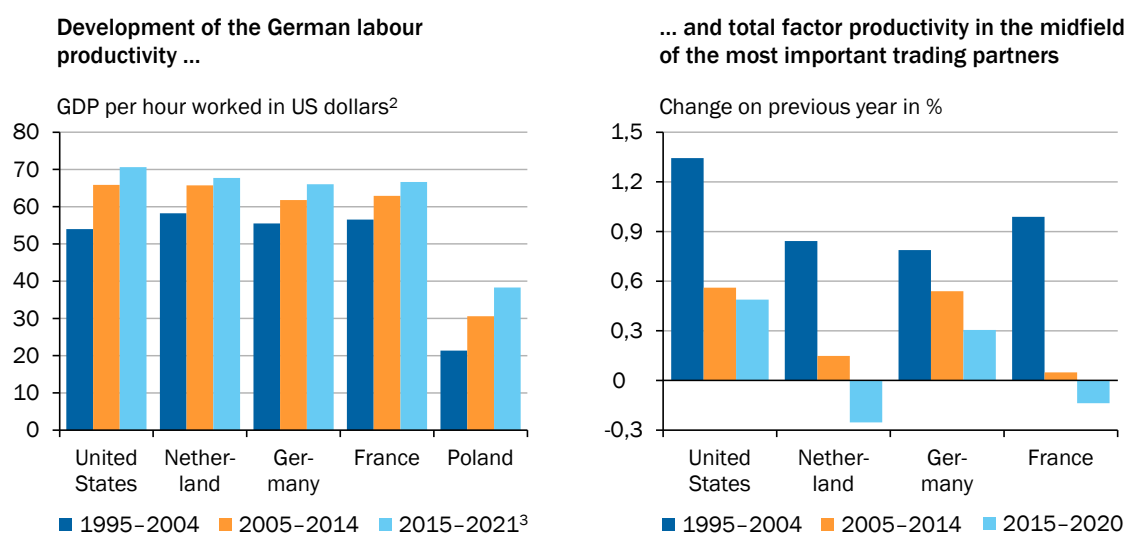
Sources: OECD, own calculations

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### [CHART 153](#)

## **Economy wide indicators of competitiveness in international comparison<sup>1</sup>**

Average over the respective period



1 – For Germany and the five most important partners by export and turnover in 2021. China is not listed as not enough data is available. 2 – US dollars in constant prices and in constant purchasing power parities in 2015. 3 – For Poland and the United States: average from 2015–2020. 4 – Total factor productivity growth indicates the part of GDP growth that cannot be explained by changes in the factors of production labour and capital. Measures the efficiency of the production factors labour and capital in the production process. No data available for Poland.

Sources: Federal Statistical Office, OECD, own calculations

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