

Global flows

# The complication of concentration in global trade

Concentration in the origins of traded products is widespread, prompting questions about whether to diversify or decouple.

*By Olivia White, Jonathan Woetzel, Sven Smit, Jeongmin Seong, and Tiago Devesa*



# At a glance

- **No region is close to being self-sufficient.** Every region relies on trade with others for more than 25 percent of at least one important type of good.
- **About 40 percent of global trade is “concentrated.”** Importing economies rely on three or fewer nations for this share of global trade (Exhibit).
- **Three-quarters of this concentration comes from economy-specific choices.** In these cases (30 percent of global trade), individual countries source a product from only a few nations, even when global supply options are diversified.
- **Over the past five years, the largest economies have not systematically diversified the origins of imports.** All have vulnerabilities, some more than others.
- **Informed reimagination of global trade requires a granular approach,** both in mapping concentrated trade relationships and in deciding on action—whether to double down, decouple, or diversify.

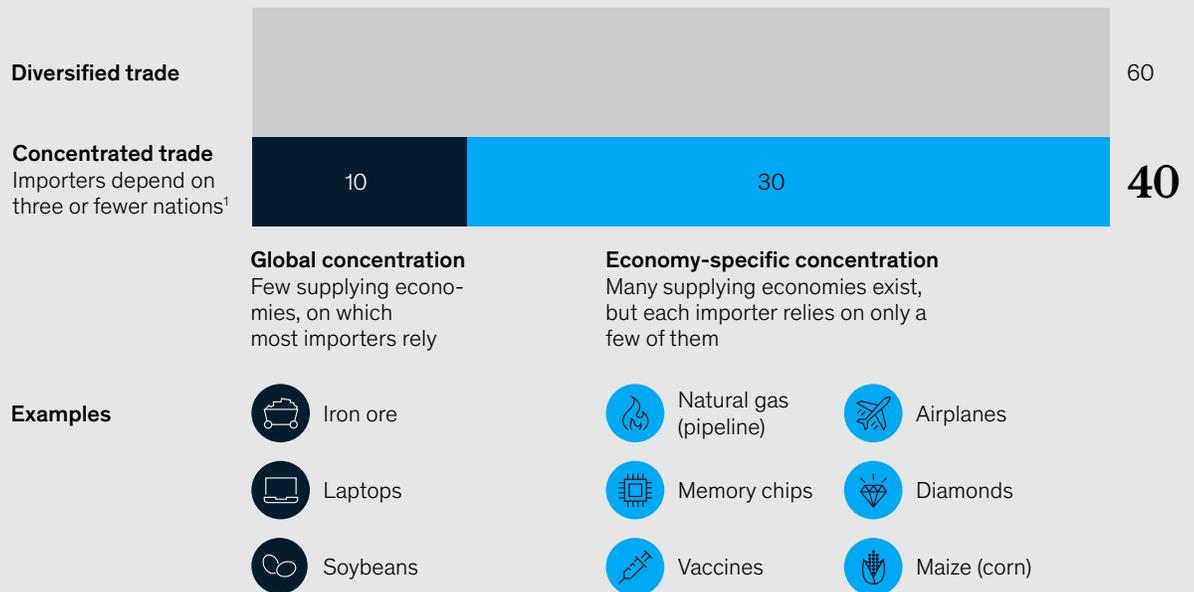
Exhibit

## About 40 percent of global trade is ‘concentrated,’ mainly due to economy-specific factors

### Global trade value by type of concentration, 2021

#### Total goods trade

Proportion by type of concentration, %



<sup>1</sup>Concentration refers to the product-level concentration for the importing economy. In the underlying analysis, “concentrated trade” is defined as all imports with a Herfindahl-Hirschman Index (HHI) over 3,000; this approximately represents cases where a product is supplied to an importer by three or fewer economies. The 10% of trade corresponding to “few supplying economies” is defined as all products with a global export market HHI over 3,000.

<sup>2</sup>Non-exhaustive. Examples given are the largest, ordered by total value of concentrated trade, across a range of sectors. Source: UN Comtrade, 2021; McKinsey Global Institute analysis

We live in a highly interconnected world. Every region relies on imports for more than 25 percent of at least one important type of good, according to recent McKinsey Global Institute (MGI) research.<sup>1</sup> Interconnections have created broad benefits over time, improving efficiency, increasing global product availability, and fostering economic growth. But recent supply chain disruptions, Russia's invasion of Ukraine, and rising tensions between China and the United States have highlighted the importance of resilience. Firms and policy makers alike are examining where inputs come from, and, in some cases, contemplating reconfiguring or even breaking certain long-standing trade ties.

Concentrated global trade creates complications. On the one hand, concentrated trade relationships can reflect and drive efficiency gains. On the other, interruption of concentrated trade flows can be particularly disruptive if products are harder to replace on short notice due to a lack of visibility and alternatives.

Where do concentrated trading relationships exist across products and between countries? In the face of new disruptions, how should companies and countries adjust these relationships, if at all? To examine these questions, this article builds on the findings of MGI's recent research on global flows, analyzing concentration across more than 120 countries, roughly 6,000 products, and eight million individual trade corridors.<sup>2</sup>

### **About 40 percent of global trade is 'concentrated,' mainly due to economy-specific factors**

For many products, countries rely on a diversified pool of trade partners. This is particularly true for larger economies. For example, China imports crude oil from more than 40 economies, and the United States imports cars from more than 25 nations.

However, a significant portion of global trade is concentrated in the sense that an economy relies on only a handful of nations to source almost all of its imports of a specific product. Indeed, 40 percent of the value of global goods trade corresponds to cases

where the importing economy relies on three or fewer nations for the supply of a given manufactured good or resource (Exhibit 1). Narrowing the focus further, about 15 percent of global goods trade corresponds to cases where the importing economy relies on only two or fewer nations.

In some instances, concentration arises because only relatively few economies export a given product, defined here as "global concentration." Soybeans are an example (see Box 1, "A tale of two commodities: Global versus economy-specific concentration in soybeans and wheat").

However, such cases account for a relatively small share of total concentrated trade. Most concentration is due not to a lack of supplier economies. Instead, concentration arises because of specific choices to source products from only a few countries despite the fact that other potential supplying countries are available. In this research, this type of concentration is described as "economy-specific concentration." Of the 40 percent of global trade value that relies on three or fewer supplier economies, about three-quarters corresponds to economy-specific concentration.

**In 40 percent of global trade in products (by value), the importing economy relies on three or fewer nations for the supply of a given product.**

<sup>1</sup> *Global flows: The ties that bind in an interconnected world*, McKinsey Global Institute, November 2022.

<sup>2</sup> Unless otherwise noted, all findings in this article are based on MGI analysis of UN Comtrade, 2021 data, accessed in November 2022, using six-digit Harmonized System (HS) codes to categorize all traded goods, including both manufactured goods and resources.

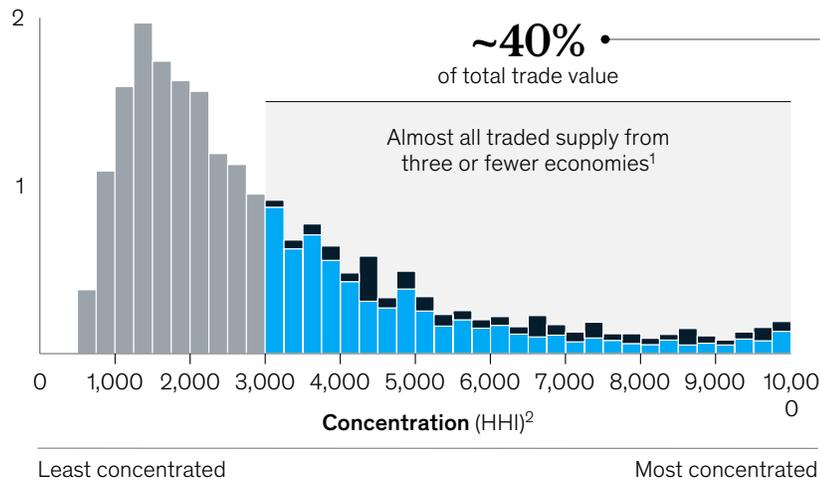
Exhibit 1

## A significant share of global trade is concentrated, largely due to economy-specific factors.

■ Global concentration ■ Economy-specific concentration

### Global goods trade by product-level concentration for the importing economy, 2021

Trade value, \$ trillion



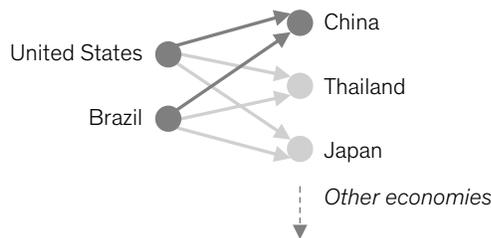
### Conceptual overview of import concentration

Global concentration



China's soybean imports are mostly supplied by the United States and Brazil—globally there are no other major suppliers available

Supplier economies Importing economies

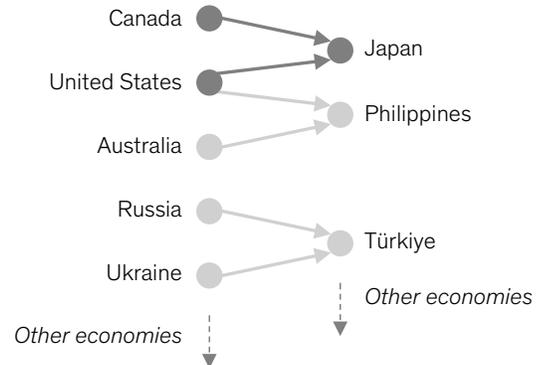


Economy-specific concentration



Japan's wheat imports are mostly supplied by the United States and Canada—this is for economy-specific reasons, as other major suppliers are available

Supplier economies Importing economies



<sup>1</sup>This is an approximate interpretation of a Herfindahl-Hirschman Index (HHI) greater than 3,000.

<sup>2</sup>Measuring concentration using the HHI of each international trade flow using the 6-digit Harmonized System (HS6) to define product categories.

<sup>3</sup>Defined here as products for which all globally traded supply is provided by 3 or fewer economies, with an HHI of about 3,000.

Note: Arrows on bottom panel display cumulatively over 90 percent of supply for a given importer.

Source: UN Comtrade, 2021; McKinsey Global Institute analysis

Box 1

### **A tale of two commodities: Global versus economy-specific concentration in soybeans and wheat**

Feeding the global population relies on flows of agricultural commodities across the world. Often, countries source imports of key agricultural goods, from cereal staples to fruits and vegetables, from only a few partner economies.

Take the example of soybeans and wheat. The typical country receives almost all of its supply of both commodities from two or three other economies. However, beneath this similarity, the underlying dynamics driving concentration for these two commodities are very different.

**Soybean trade is globally concentrated.** Two economies, Brazil and the United States, account for about 90 percent of globally traded supply. The top 15 importers globally, including China, Japan, and Thailand, together account for about 95 percent of global soybeans imports, with each one receiving on average 90 percent of its supply from these two economies.

**Wheat trade often shows economy-specific concentration.** Global supply of wheat is more diversified, with about 15 economies providing 90 percent of globally traded supply. However, most countries source their wheat from only a few of these 15 economies, with main trading partners varying by country. For example, in 2021, more than 90 percent of Türkiye's wheat imports were from Russia and Ukraine, while over 80 percent of imports to the Philippines came from the United States and Australia.

### **Concentration exists in all sectors but is particularly pronounced in mining and the food value chain**

Concentration exists in all sectors and stages of the production process, from raw commodities to intermediates and final products. All countries rely on some inputs whose origins are concentrated, with such inputs often spanning a value chain across different sectors. Agriculture is an example. Soaring global food prices in 2022 largely reflected not just disruption to the growing and shipping of grains like wheat, but also to disruptions to crucial upstream chemical inputs such as fertilizer, most notably potash.<sup>3</sup> The following key findings emerged from an examination of the most traded products by value in each sector (Exhibit 2):

- **Agriculture and food are among the most concentrated sectors, mainly reflecting economy-specific concentration.** The agriculture sector shows the highest average level of concentration. While staple cereal crops such as wheat, rice, and maize are exported by a relatively

wide range of countries, many economies source the bulk of their supply from three or fewer partners. The Philippines, the world's second-largest importer of rice, obtains almost 90 percent of its supply from Vietnam, while Saudi Arabia, the third-largest importer, receives about 75 percent of its supply from India. While a couple of the most traded products in this sector are globally concentrated—for instance, almost all soybean exports are from Brazil and the United States—the global form of concentration is the exception rather than the rule.

Similarly, in the food and beverage sector, everyday goods ranging from fresh beef to beer often show economy-specific concentration. More than 100 economies export beer, but the United States, which is the world's largest beer importer, sources about three-quarters of its supply from Mexico.

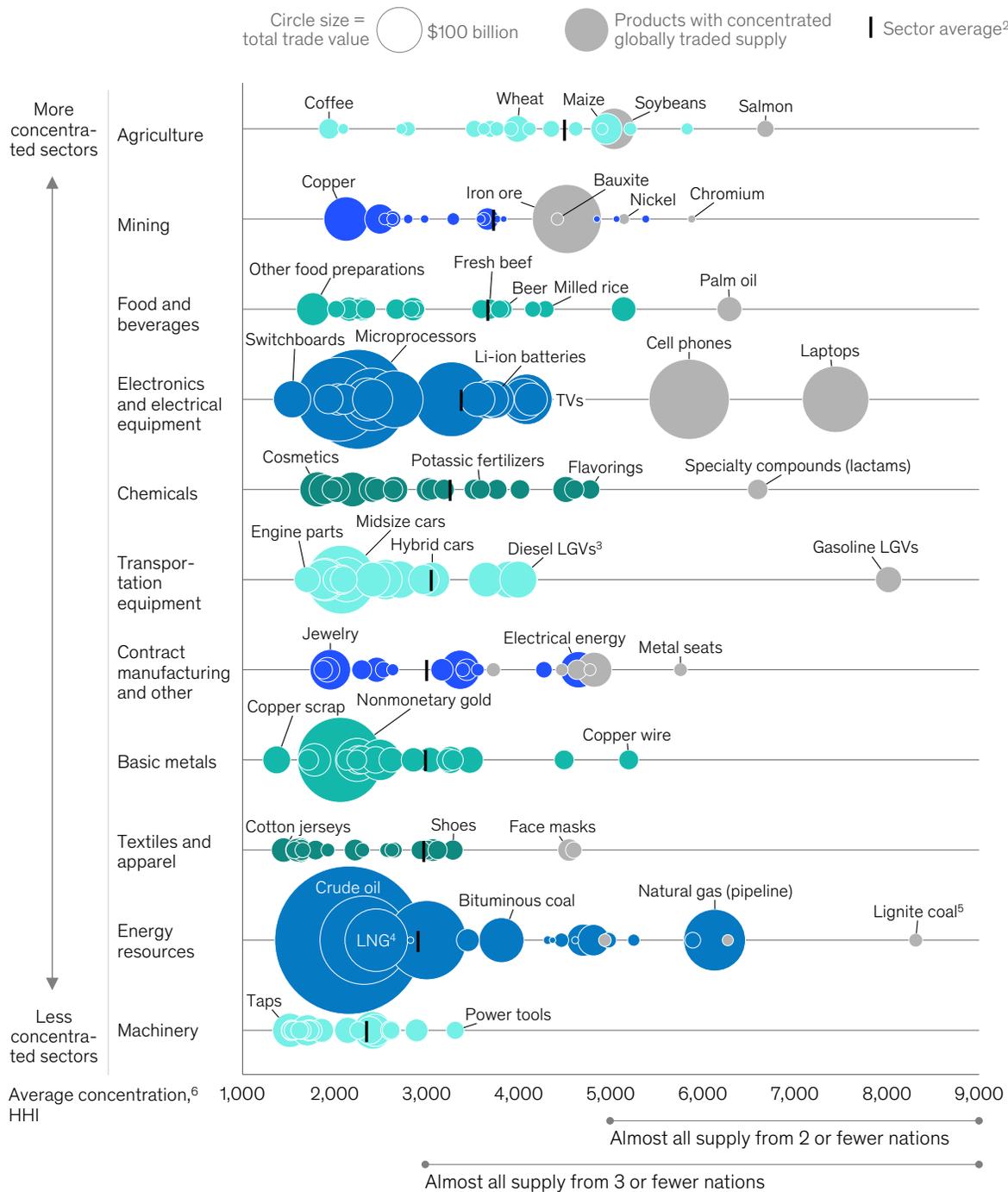
- **Global concentration is most prevalent in the mining sector, especially in the case of iron ore.** In the mining sector, global concentration plays a greater role. In this sector, about 50 percent of

<sup>3</sup> Olivia White, Kevin Buehler, Sven Smit, Ezra Greenberg, Mihir Mysore, Ritesh Jain, Martin Hirt, Arvind Govindarajan, and Eric Chewning, "War in Ukraine: Twelve disruptions changing the world," McKinsey & Company, May 9, 2020.

Exhibit 2

**Key products across sectors are often sourced from relatively few nations.**

**Average concentration for largest products in selected sectors, 1 2021**



<sup>1</sup>Five sectors have been excluded from the visualization. Medical supplies; glass, cement, and ceramics; rubber and plastics; and wood and paper products have been excluded as the lowest-value sectors by total 2021 import value. Pharmaceuticals have been excluded due to low granularity of available data. Descriptors are indicative of HS6 categorization. <sup>2</sup>Value-weighted average of all products in sector. <sup>3</sup>Light goods vehicles. <sup>4</sup>Liquefied natural gas. <sup>5</sup>While lignite coal is relatively widely produced for domestic consumption, it is exported in significant quantities by only a few countries. <sup>6</sup>Value-weighted average of all economies' import concentration, as measured by the Herfindahl-Hirschman Index for the given product. Source: UN Comtrade; McKinsey Global Institute analysis

all trade by value is in products that are supplied by three or fewer economies. Iron ore, the most traded mineral commodity, is the most prominent case, although many other commodities are also exported from only a few countries, including bauxite (principal ore for aluminum), chromium, natural graphite, nickel, niobium, and rare earths. Some economies develop particularly concentrated relationships. A striking example is South Korea, which sources more than 95 percent of its nickel from New Caledonia.

- **Most energy resources are not particularly concentrated for individual economies, but pipeline natural gas is.** Because of the infrastructure needed for its transportation, pipeline natural gas is a concentrated import for many individual economies, which obtain this resource through pipelines from relatively geographically proximate partners. For instance, in 2021 China received about 85 percent of its pipeline supply from Turkmenistan, Russia, and Kazakhstan, in descending order. And China's supply base is broad relative to most others. For example, in the same year, Argentina obtained virtually all of its pipeline gas from Bolivia, and many European countries sourced it almost exclusively from Russia.<sup>4</sup>

Trade in liquefied natural gas (LNG) by maritime transportation is an alternative channel for economies to achieve some diversification, and it is on average about 60 percent less concentrated than pipeline natural gas. In 2021, European economies tended to source the majority of their natural gas from pipelines, whereas the largest Asian importers (including China, Japan, and

South Korea) tended to source the majority of their supply as LNG.

- **All manufacturing sectors have some concentrated products, with global concentration being most prominent in electronics.** Electronics has the highest proportion of globally concentrated trade of any manufactured goods sector. About 20 percent of the value of electronics trade is in globally concentrated goods, from game consoles to vacuum cleaners. Mobile phones and laptops are the most traded highly concentrated products—their supply originates mostly from China. However, an equal portion of electronics trade—about 20 percent by value—corresponds to cases where goods are more widely produced but an individual economy's supply is sourced from three or fewer economies: economy-specific concentration. Televisions are an example. Although there is a relatively wide set of exporters, the United States sources more than 70 percent of its televisions from Mexico, and Japan receives a similar share of its supply from China.

A skew toward economy-specific concentration is particularly prominent in the transportation equipment sector. In transportation, economy-specific concentration is ten times more common than global concentration, by value. Hybrid cars and goods vehicles provide examples. While both are widely produced, Australia imports more than 80 percent of its hybrid cars from Japan, Brazil imports almost 90 percent of its diesel light goods vehicles from Argentina, and almost all US imports of light goods vehicles are from Mexico.

**In minerals, 50 percent of all trade by value is in products that are supplied by three or fewer economies.**

<sup>4</sup> *Statistical review of world energy*, BP, 2022.

Why have these concentration patterns developed? The reasons differ by type of concentration and by product.

Global concentration is largely found in resources where natural endowments play a role and in some manufactured goods where a few countries have achieved a significant comparative advantage. MGI's previous research highlighted electronics, textiles, mining, agriculture, and food and beverages, which together accounted for more than half of the value of products that are globally concentrated.<sup>5</sup> Global concentration in resources is seen in iron ore. Australia and Brazil have the world's largest iron ore reserves, which are relatively high-grade and economical to extract, complemented by large-scale, efficient extraction processes that deliver low unit costs.<sup>6</sup>

In manufactured goods, two drivers of comparative advantage may historically have led to global concentration: reinforcing scale advantages that are difficult to replicate, and proprietary technology advantages. China established a significant comparative advantage in laptop production in part through lower factor costs and an enabling human capital, infrastructure, and policy environment. Over time, a local ecosystem of suppliers developed that may have enabled China to reinforce competitive advantages. Based on proprietary technology, Japan and South Korea established comparative advantages in many types of advanced machinery. They are the main global suppliers of the machinery used to manufacture flat panel displays, for example, representing almost 80 percent of globally traded supply.

In the case of economy-specific concentration, what leads individual economies to form concentrated relationships when a broader pool of supplier economies is available? Four factors particularly contribute. The way the following factors play out varies by economy and product, and often several of them play a role for any given product:

- **Geography and transportation costs.** When transportation costs are substantial relative to the cost of the good itself, nearby partners are likely

to be preferred, all else being equal. For example, Egypt and Türkiye historically sourced more than 80 percent of their wheat from relatively proximate Ukraine and Russia, while almost 90 percent of Mexico's wheat imports come from the United States. Landlocked countries that rely on (relatively more expensive) ground transportation may lean toward establishing a narrower set of trading relationships with neighbors. In other cases, the physical requirements of transporting a product require closer partners: pipeline natural gas and electrical energy are examples.

- **Consumer and business preferences.** A product may be exported by a wide range of economies, but consumers or businesses in individual economies may have country- or region-specific preferences that dispose them to source from a narrower partner set. Beer provides an example. While the beer export market is global, France and the Netherlands each source more than 50 percent of their beer imports from Belgium. Austria receives a similar share of imports from Germany. Business production processes may also take in preferential inputs from a particular supplying economy. Certain steel mills in Japan and South Korea import a specific low-alumina iron ore that is produced in a single region of Australia in order to reduce impurities.<sup>7</sup> Many US oil refineries are tooled to process relatively heavier crude oil such as that sourced from Canada. The United States is the world's largest oil producer but still imported more than eight million barrels a day in 2021, of which more than 50 percent came from Canada.<sup>8</sup>
- **Market structure.** In some cases, the structure of buyers and sellers in given markets may lead to concentrated relationships at the economy level. This can be seen in airplane trade—a single airline will often be the largest buyer for a given country, and it may source the majority of its passenger jets from a single supplier. For example, the flag carrier of Portugal currently operates a fleet manufactured primarily in France and Germany, while the largest carrier based in Ireland sources

<sup>5</sup> *Global flows: The ties that bind in an interconnected world*, McKinsey Global Institute, November 2022.

<sup>6</sup> *Iron ore*, Mineral Commodity Summaries, United States Geological Survey, 2022.

<sup>7</sup> *Iron ore: Where quality meets opportunity*, Minerals Council of Australia, 2021.

<sup>8</sup> *Oil and petroleum products explained*, US Energy Information Administration, November 2022; *Mapping the U.S.–Canada energy relationship*, CSIS Briefs, Center for Strategic & International Studies, May 7, 2018.

its fleet almost exclusively from the United States. An importer may also opt to source mostly from a single geography in order to derive benefits, including simplifying the legal, operational, and cultural framework within which an importer operates. In this way, large buyers and sellers may shape the market structure for some products in their economies.

- **Preferential trading arrangements and barriers.** These can evolve for many reasons. In some cases, tariffs or nontariff barriers may steer buyers toward using suppliers from a certain set of countries. Examples of this appear in the automotive sector. In the 1960s, the United States imposed what was popularly known as a “chicken tax” on light trucks in response to the decision by some European economies to impose tariffs on US chicken exports. The tax is still in place today and has meant that the United States mostly imports these vehicles from partners in the United States–Mexico–Canada Agreement, which are exempted from such tariffs.<sup>9</sup>

## All economies have developed concentrated relationships

All economies participate in concentrated trade relationships. Analysis of all 128 economies for which 2021 data were available reveals that every economy sources at least 20 percent of imports (by value) from three or fewer partner economies, and at least 5 percent from two or fewer economies. Examples of economy-specific concentration, many of which have been noted, span all countries. However, there is significant country-by-country variation in the extent of concentration on average and for individual imported products (Exhibits 3 and 4).

The following three findings are worth noting:

- **Economies in Europe and Asia–Pacific tend to have the most diversified trade relationships.** Economies in these two regions tend to trade with a relatively larger number of manufacturing-

heavy intraregional partners. This can reflect preferential trading agreements and shorter transportation distance as well as some degree of regional preference.

- **Larger economies are less concentrated on average but develop concentrated relationships for selected products, often with nations in the same region.** Notably, in most regions, the country with the lowest import concentration also tends to be the largest importer: Germany in Europe, China in Asia–Pacific, the United States in North America, Brazil in Latin America, and South Africa in sub-Saharan Africa. Nonetheless, even these large economies often develop concentrated relationships with other nations in the region for specific products. For example, the United States and Mexico have high import concentration in trade with each other for specific goods. The United States imports nearly all of its semitrailer trucks and light goods vehicles from Mexico. Mexico imports nearly all of its maize, propane, and refined petroleum products from the United States (see the next section for more detail on the concentration “fingerprints” of six large economies).
- **Smaller economies are, on average, 50 percent more concentrated than larger economies.**<sup>10</sup> Smaller trade volumes make it less feasible for these economies to source goods from a range of partners. At the same time, relative lack of domestic infrastructure may inhibit partner diversification. For example, Vietnam, a net importer of crude oil, receives more than 80 percent of its supply from Kuwait; this oil is then processed in a new refinery, which was built in 2018 by a Kuwaiti-led consortium.<sup>11</sup> The economies of landlocked developing countries are often the most concentrated. Laos, for example, receives about 80 percent of its total import trade from just three land neighbors: China, Thailand, and Vietnam.

<sup>9</sup> Daniel Griswold, *Why are pickups so expensive? Blame the chicken tax*, The Cato Institute, March 2022.

<sup>10</sup> Economies with a total import value below the global median have a value-weighted average import HHI that is 50 percent higher than that of economies with a total import value above the global median.

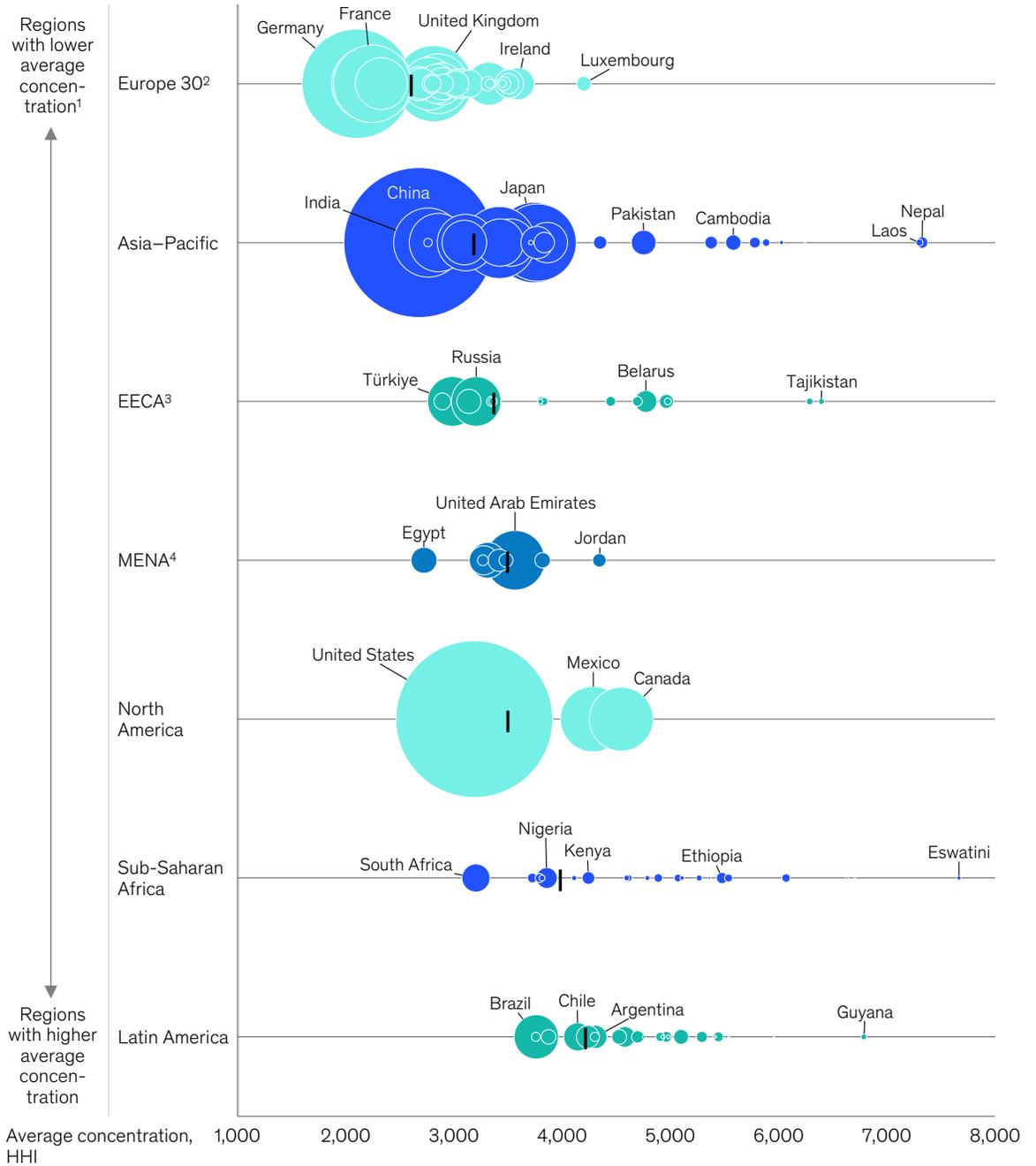
<sup>11</sup> “Nghi Son refinery supplies 20 million tonnes of petroleum to domestic market,” *Vietnam News Agency*, July 28, 2022.

Exhibit 3

**Larger economies tend to have lower levels of concentration, but there are marked differences between and within regions.**

**Average concentration for importing economy, 2021**

Circle size = total import value \$100 billion | Region average<sup>1</sup>

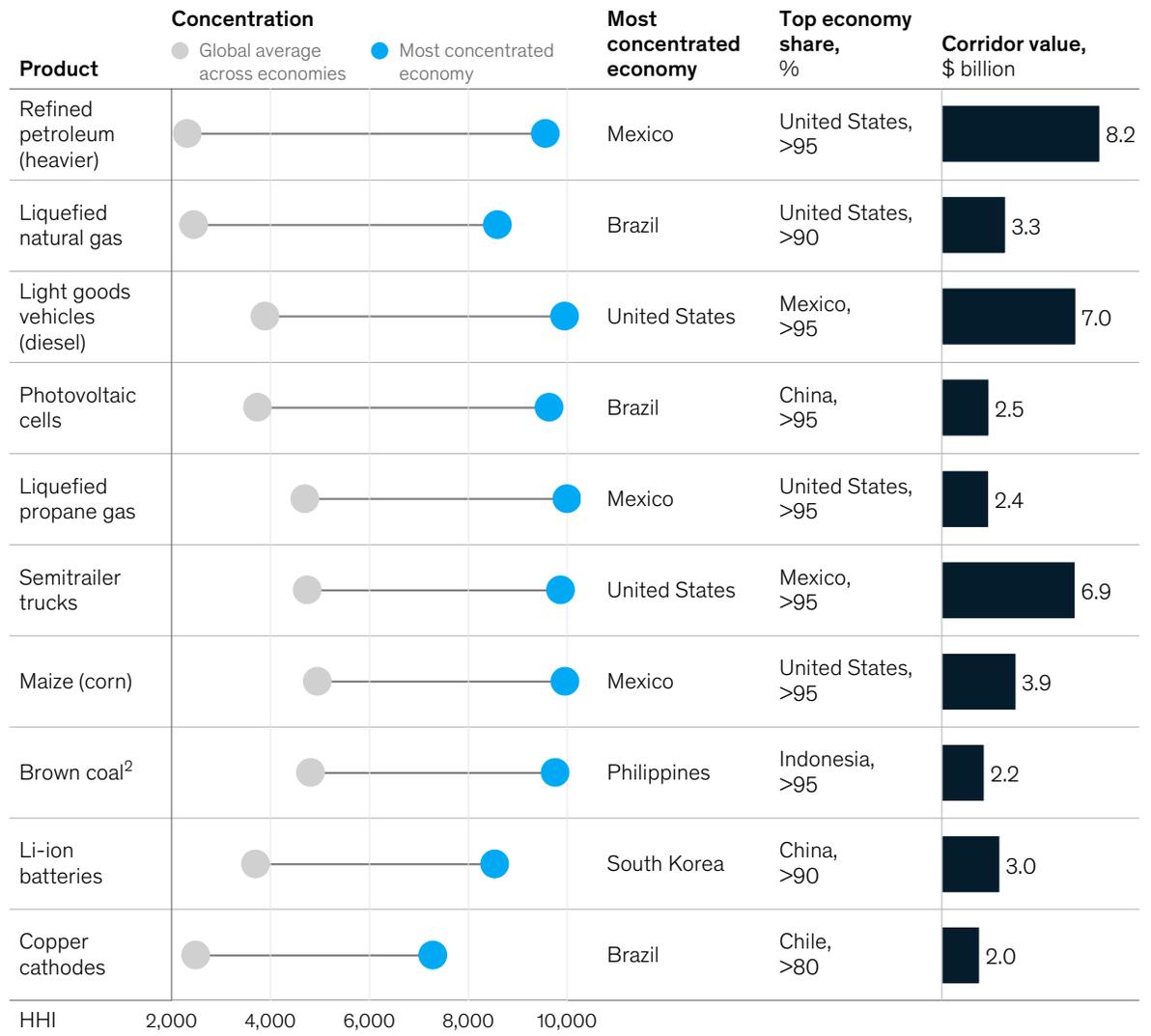


<sup>1</sup>The import value weighted average import concentration across all economies in the region. <sup>2</sup>Europe 30 comprises the 27 European Union member states plus Norway, Switzerland, and the United Kingdom. <sup>3</sup>Eastern Europe and Central Asia (EECA) includes Commonwealth of Independent States countries, Russia, Türkiye, and other European countries not included in Europe 30. <sup>4</sup>Middle East and North Africa. Source: UN Comtrade, 2021; McKinsey Global Institute analysis

Exhibit 4

## Large economies have above-average levels of concentration for certain products.

Overview of largest concentration skews,<sup>1</sup> 2021



<sup>1</sup>Largest 10 skews as measured by difference in HHI between the economy with the highest level of concentration and the average concentration across economies for the product, excluding all trade where the product import value for an economy is less than \$1.5 billion; this represents the top 50 percent of trade by value. Excludes trade flows where the concentrated economy is a significant net exporter of the product, and excludes product codes for unspecified goods or for which data quality is low. Product descriptions are indicative only and differ from exact HS6 specifications.

<sup>2</sup>Includes sub-bituminous and lignite coal.

Source: UN Comtrade, 2021; McKinsey Global Institute analysis

## Over the past five years, the largest economies have not systematically diversified the origins of imports

Countries rely most on imports when no domestic supply exists, particularly for critical goods. In this case, concentration—whether global or economy-specific—has the potential to create particularly pronounced vulnerabilities. When concentrated imports are of a discretionary good that is already produced at volume in the domestic market, import concentration may matter less.

Looking at a range of large economies across regions—Brazil, China, Germany, India, South Africa, and the United States—each has a distinctive “concentration fingerprint.” For example, there is no sector for which all six economies rely on imports from concentrated trade relationships. Overall, China and Germany have the fewest sectors in which they are net importers of concentrated goods. The other four major economies analyzed have a broader set of concentrated dependencies. For each of these four, electronics are the largest area of concentrated net imports, while Germany and China are net exporters. Energy resources are a relatively concentrated and import-reliant sector for Germany; China and India are particularly diversified in their energy resources imports (Exhibit 5).

- **Brazil relies on concentrated inputs for many sectors where it is a net importer, notably chemicals and electronics.** Brazil's largest import sector by value is chemicals, which includes critical agrichemicals, such as fertilizers, insecticides, and herbicides. As one of the largest agricultural producers in the world, Brazil is one of the largest importers for all of these products and has established concentrated relationships with just a handful of partners for its supply despite a relatively wider set of available exporting economies. For example, in 2021, Brazil sourced more than 90 percent of ammonium nitrate fertilizer from Russia and about 80 percent of phosphate fertilizer from China and Morocco.

The sector whose concentration has increased the most is electronics, largely due to a sharp rise in imports of photovoltaic cells, which come almost exclusively from China.<sup>12</sup> Between 2016 and 2021, Brazil's imports of photovoltaic cells grew eightfold, making the cells its largest electronics import. Brazil's photovoltaic cell imports were on course to more than double from 2021 levels in 2022.<sup>13</sup>

- **China's concentration profile is shaped by a skew toward globally concentrated mining and agricultural commodities.** China is the largest importer of some globally concentrated commodities, leading to higher levels of concentration. China is the largest global importer of iron ore, importing ten times more than Japan, the second-largest importer. Iron ore accounts for almost two-thirds of China's mining imports. For comparison, in the United States, this figure is 15 percent, and in India about 1 percent. This skew toward iron ore drives concentration in the mining sector. Beyond iron ore, China is also the largest global importer of many other globally concentrated commodities, including cobalt, lithium, and nickel.

A similar picture is seen in agriculture, China's most concentrated sector. These imports are dominated by soybeans, which represent almost half of China's overall agricultural imports and are largely used for pigfeed to sustain rising consumption of pork. Soybeans are globally concentrated, and China is the largest global importer of soybeans, importing almost 20 times more than second-place Argentina. Between 2016 and 2021, soybean imports became more concentrated, with about 95 percent coming from Brazil and the United States in 2021, up from about 75 percent in 2016. The rising concentration prompted concerns in China about security of supply and action to reduce domestic consumption.<sup>14</sup>

<sup>12</sup> In this analysis, electronics includes the computers, consumer electronics, and electrical equipment sectors.

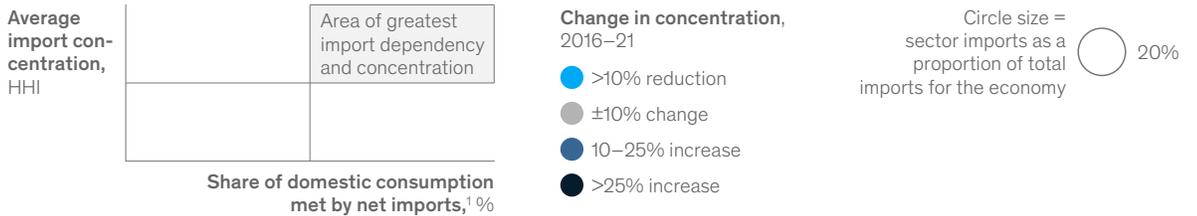
<sup>13</sup> Livia Neves, “Brazil imported 5.2 GW of solar modules in Q1,” *PV Times*, June 1, 2022.

<sup>14</sup> Genevieve Donnellon-May and Zhang Hongzhou, “China's main food security challenge: Feeding its pigs,” *The Diplomat*, July 6, 2022.

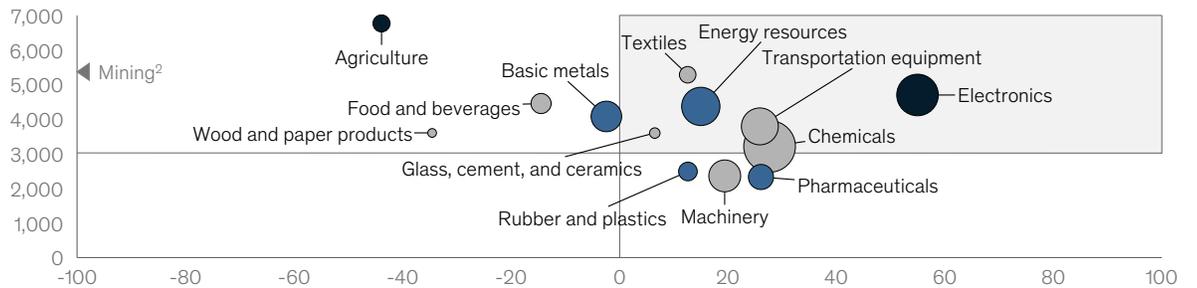
Exhibit 5

## The largest global economies have distinctive concentration ‘fingerprints.’

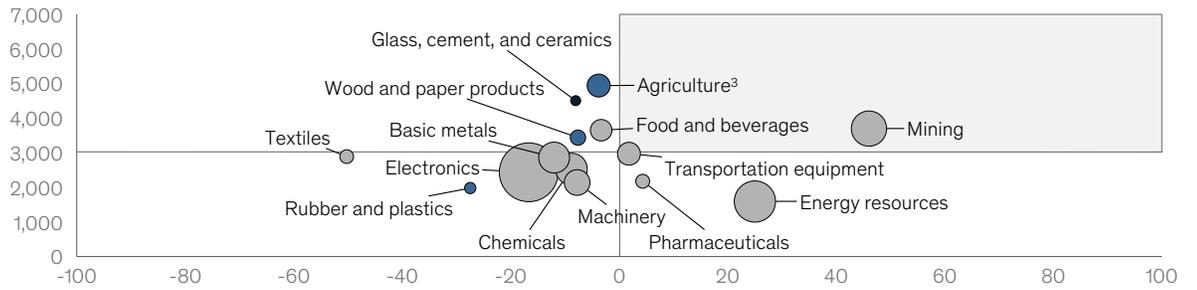
### Average import concentration by sector, 2021 or latest available



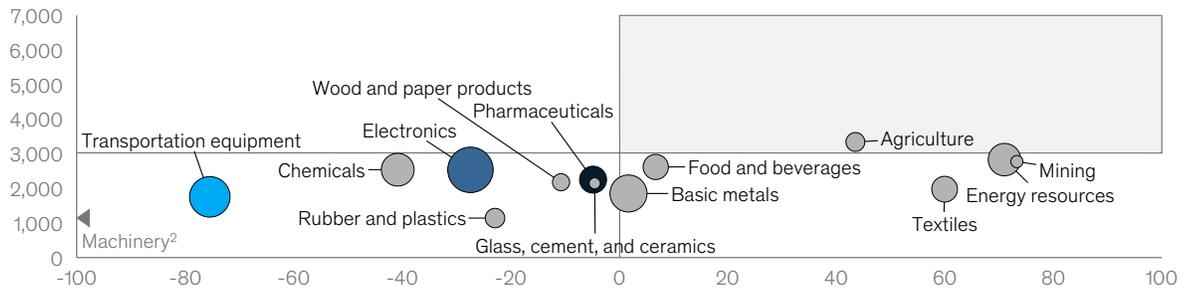
#### Brazil A range of more concentrated sectors, with concentration increasing in electronics



#### China Agriculture and mining are the largest concentrated sectors



#### Germany Agriculture and energy resources sectors are relatively large, concentrated, and dependent on imports

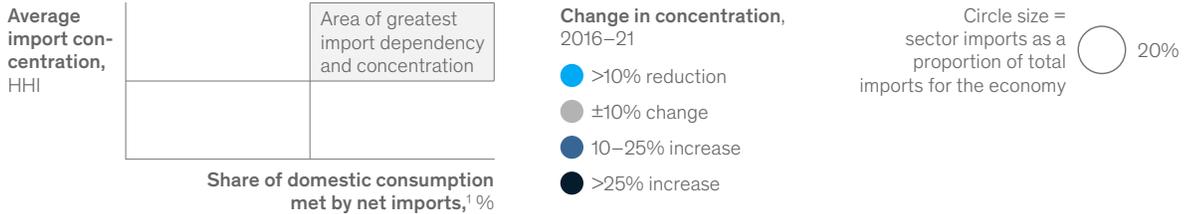


<sup>1</sup>Share of domestic consumption met by net flows (ie, imports minus exports divided by total domestic consumption) in value added terms.  
<sup>2</sup>Share of domestic consumption met by net imports is below -100% and not displayed to conserve scale. Concentration level as displayed.  
<sup>3</sup>China has a nuanced net position in agriculture trade. It is a net exporter of agriculture products in value-added terms. However, it is net importer of key crops in gross terms. In 2021, China was the largest global importer of agriculture products in gross terms.  
 Source: UN Comtrade, 2021; OECD TiVA, 2020; BP Statistical Review of World Energy, 2021; McKinsey Global Institute analysis

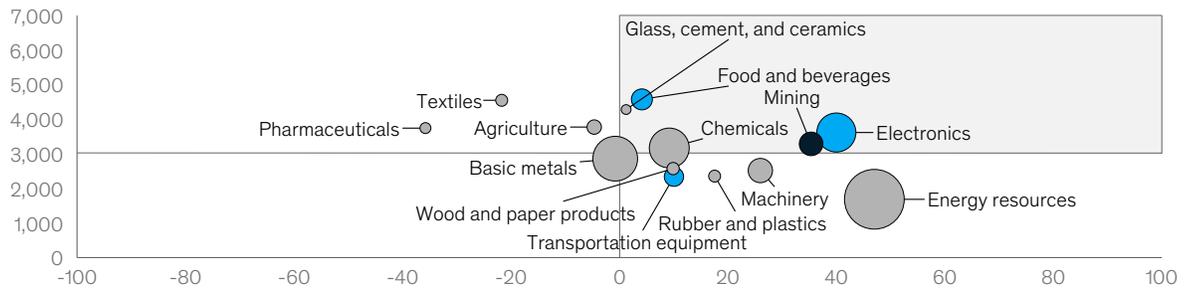
Exhibit 5 (continued)

## The largest global economies have distinctive concentration ‘fingerprints.’

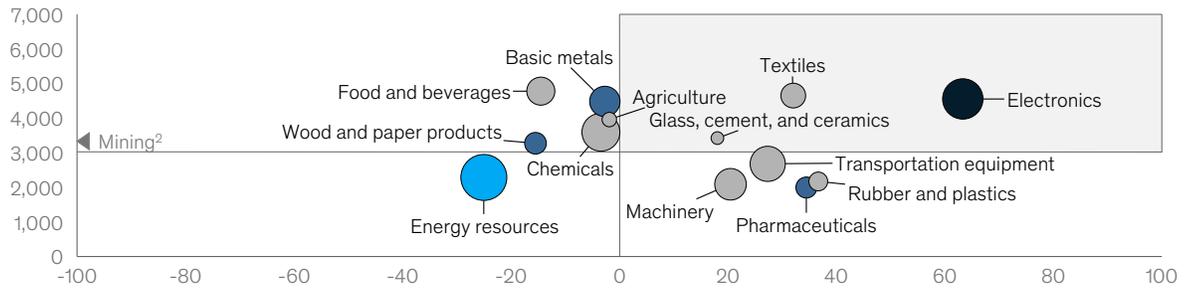
### Average import concentration by sector, 2021 or latest available



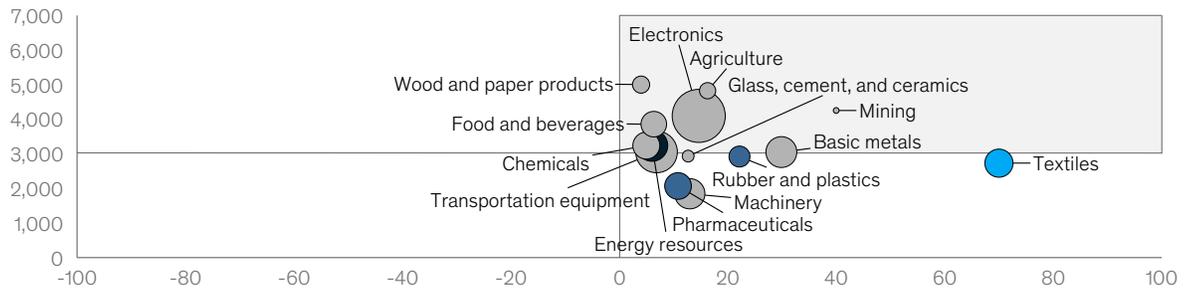
#### India Reducing concentration in large, import-dependent sectors, such as food and electronics



#### South Africa The electronics sector relies the most on imports and has seen rising concentration



#### United States The electronics sector is relatively large, concentrated, and dependent on imports



<sup>1</sup>Share of domestic consumption met by net flows (ie, imports minus exports divided by total domestic consumption) in value added terms.  
<sup>2</sup>Share of domestic consumption met by net imports is below -100% and not displayed to conserve scale. Concentration level as displayed.  
 Source: UN Comtrade, 2021; OECD TiVA, 2020; BP Statistical Review of World Energy, 2021; McKinsey Global Institute analysis

- **Germany is the economy with the most diversified import relationships, but pockets of concentration are found across sectors.** On average, Germany has the most diversified import patterns of the 128 economies in our analysis. However, in agriculture and energy resources, as of 2021 it had concentrated relationships and met domestic demand through net imports. Germany's concentration in agriculture is low relative to other economies; indeed, the sector is less concentrated than in 90 percent of other economies in the analysis. Concentration in Germany's energy resources sector in 2021 owed largely to its dependency on pipeline natural gas, which accounted for 40 percent of energy resources imports, the highest share out of any large economy.

In the pharmaceuticals sector, concentration has increased noticeably. This largely reflects sourcing of vaccines during the pandemic. About 75 percent of vaccine imports in 2021 came from Belgium, one of Europe's largest producers of the Pfizer BioNTech vaccine, on which Germany relied most heavily (and which was originally codeveloped by a German company).

- **India's fingerprint is more concentrated than most in the food sector, and increasingly concentrated in mining.** India's most concentrated sector is food and beverages, largely due to vegetable oils, which account for about 80 percent of its imports in this sector. India depends on imports to meet domestic demand and is the world's largest importer of vegetable oils, with significant imports of palm oil, 90 percent of which is supplied by Indonesia and Malaysia, and sunflower oil, 75 percent of which came from Ukraine. This concentration fingerprint proved problematic after Indonesia banned palm oil exports and the war impeded Ukrainian sunflower oil exports.

India's increasing concentration in its mining sector is due to changing patterns in diamond sourcing. The country is the world's largest importer and exporter of diamonds, and diamonds account for two-thirds of its mining imports by value. Between 2016 and 2021, the import concentration of unworked diamonds increased significantly. This was driven by increasingly close trading ties with

Belgium and the United Arab Emirates—in 2021, India received about 80 percent of its supply of unworked diamonds from these two economies. This has driven an increase in concentration of India's mining imports.

- **South Africa's electronics sector is both concentrated and the sector most reliant on imports.** Concentration in this sector increased significantly between 2016 and 2021. The change largely reflects an increased share of laptops and mobile phones in South Africa's electronics import mix: both are globally concentrated, largely supplied by China.

In the two other manufacturing goods sectors with the highest levels of concentration—textiles and basic metals—South Africa's main partner is also China. Many imports of textiles products, from shoes to jerseys, come largely from China. In basic metals, the majority of South Africa's flat-rolled iron and steel imports are from China. These are all examples of economy-specific concentration. In other concentrated sectors, such as agriculture and food, there are cases of economy-specific concentration, but with a different set of partners. For instance, three-quarters of frozen chicken imports come from Brazil and the United States, and more than 90 percent of rice comes from India and Thailand.

- **The United States' concentration fingerprint has remained stable in recent years; electronics, the largest import sector, remains relatively concentrated.** US electronics imports are particularly concentrated in comparison with other large economies such as China and Germany. This mainly reflects strong trading ties with China for laptops (more than 90 percent of imports) and mobile phones (about 80 percent of imports). Moreover, the United States has built economy-specific concentrated ties with Mexico in some electronics products, including televisions. Close ties with its North American neighbors also drive relatively high levels of concentration in agriculture and in wood and paper products. Neighbors account for about half of US imports in these two sectors. For example, Mexico supplies 85 percent of two of the largest US agricultural imports, avocados and tomatoes, while Canada supplies more than 95 percent of US sawn wood, one of its

largest exports to the United States by value. In minerals, the United States relies on net imports for a broad set of critical commodities. Overall, it imports more than 70 percent of its consumption needs for more than 30 mineral commodities.<sup>15</sup>

Two sectors stand out among the ways the US concentration profile has changed in recent years. First, imports of energy resources have become more concentrated. As the United States became a net exporter of petroleum, it reduced imports from most of its partners except for Canada, leading to higher levels of concentration. Second, textiles imports have become less concentrated. Indeed, this is the only sector that diversified by more than 10 percent in recent years, due to increased sourcing from Southeast Asia and a reduced share from China. However, diversification could be less pronounced than it may seem; Southeast Asian economies often rely on China upstream in their own textile value chains. Indeed, when measured from a value-added perspective, China has maintained a constant share of the total flows of textiles into the United States, at about 45 percent.<sup>16</sup>

These fingerprints are not immutable, but they change only slowly. From 2016 to 2021, concentration patterns were largely stable across sectors. In the six large economies analyzed, most sectors did not register more than a 10 percent change in concentration as measured by the HHI in that period. The four largest economies reviewed—China, Germany, India, and the United States—experienced stable concentration levels in at least ten of 14 sectors analyzed (Exhibit 6).

Almost every sector has become more concentrated in at least one economy, but no sector has become more concentrated across all economies. This suggests that where concentration increased, it was due to idiosyncratic drivers specific to a particular economy—as in the case of soybean imports to China or US crude oil imports. The only case of a systemic increase of concentration appears to have been in pharmaceuticals, where increased concentration was more widespread due largely to a rise in the concentration of vaccine imports likely associated with COVID-19.

All six large economies experienced a rise in concentration of more than 25 percent in at least one sector, often in areas where the economy is relatively reliant on imports for domestic supply; examples include India's mining sector and the electronics sector in Brazil and South Africa.

In summary, the drivers of increased concentration are often idiosyncratic. Overall, large economies are not generally moving toward greater overall diversification. However, there are some early indications that political and economic disruption may have started to trigger shifts in this direction. In a recent McKinsey survey of global supply chain leaders, the proportion of those reporting a dual sourcing strategy for raw materials increased 26 percentage points between April 2021 and April 2022.<sup>17</sup> Multinational corporations, which account for about two-thirds of global exports, are an integral part of each nation's concentration fingerprint through their sourcing and sales networks, and will therefore be decisive in shaping how these fingerprints evolve.

**Concentration 'fingerprints' are not immutable, but they change only slowly. From 2016 to 2021, concentration patterns were largely stable across sectors.**

<sup>15</sup> *Mineral commodity summaries 2022*, United States Geological Survey, 2022.

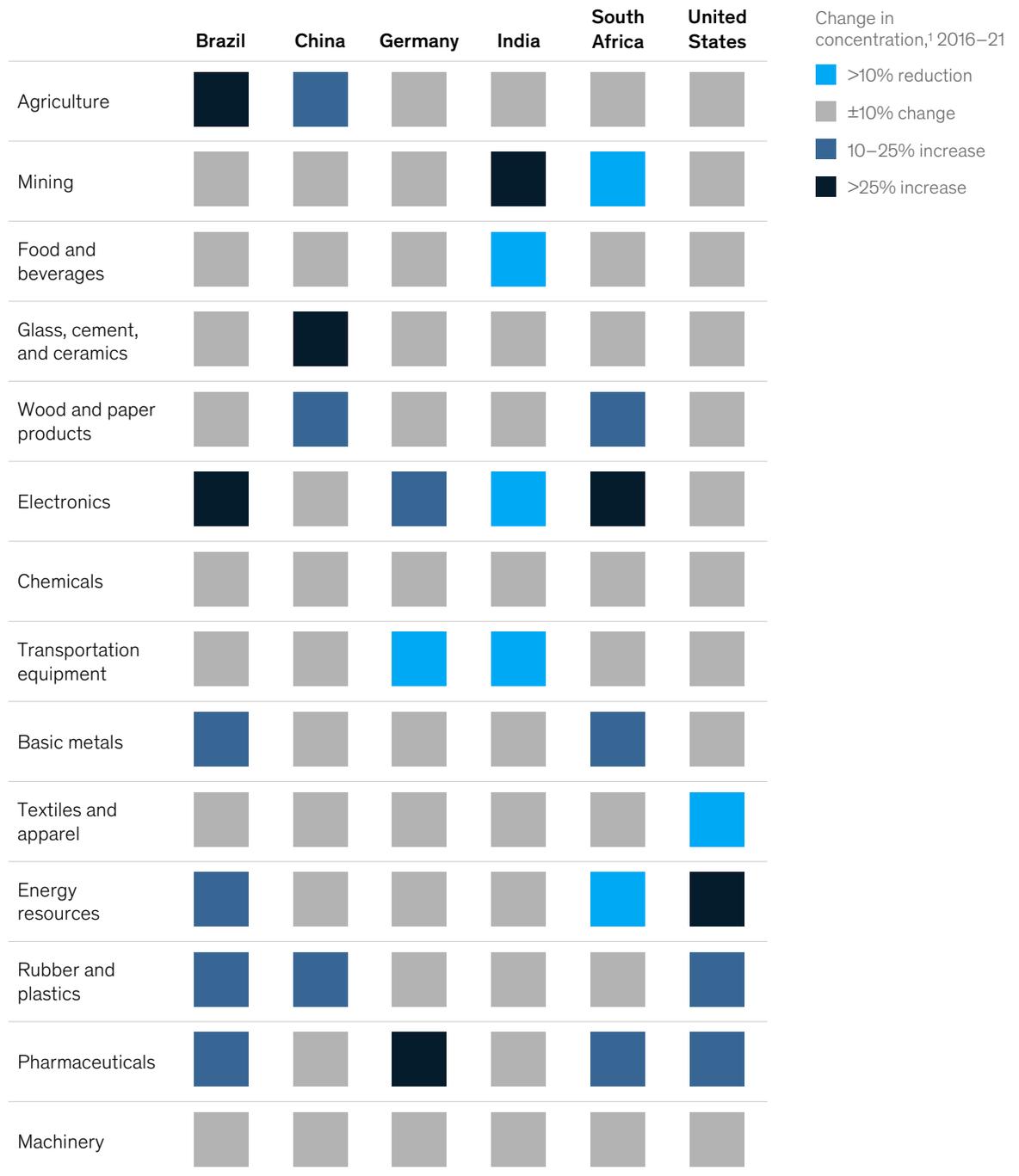
<sup>16</sup> Based on OECD Trade in value added data between 2016 and 2020.

<sup>17</sup> Knut Aliche, Edward Barriball, Tracy Foster, Julien Mauhourat, and Vera Trautwein, "Taking the pulse of shifting supply chains," McKinsey & Company, August 26, 2022.

Exhibit 6

**Concentration has broadly remained stable, but each large economy has seen shifts driven by its individual needs.**

**Change in import concentrations by sector for selected large economies, 2016–21**



<sup>1</sup>The change in value-weighted average of concentration, as measured by the Herfindahl-Hirschman Index, for all products in the given sector for the importing economy.  
Source: UN Comtrade, 2021; McKinsey Global Institute analysis

## Informed reimagination of global trade requires a granular approach

Recent events have demonstrated the potential fragility of supply chains. MGI's previous research highlighted the importance for companies of mapping supply chains to understand their supplier ecosystems to bolster resilience. A single large multinational corporation can have tens of thousands of suppliers, with direct suppliers sometimes making up less than 10 percent of the total number of indirect suppliers for some of the largest multinationals.<sup>18</sup> To manage this complexity, it is important to get the basics right. McKinsey's latest survey of supply chain leaders revealed that inventory management strategies, digitization and visibility of supply chains, and talent management continue to be areas of focus for most firms when bolstering their overall resilience.<sup>19</sup>

The current research highlights a complementary angle—understanding the countries on which value chains rely. National interdependencies are increasingly at the forefront of many decision makers' minds. Not every concentrated relationship is a source of vulnerability. Nor can every product be substituted. But understanding country-level concentration will help business leaders and policy makers to better gauge their exposure to country-level risks, such as those that may arise from geography-specific shocks (for example, natural disasters and disease outbreaks) or policy-related shocks. As these considerations become increasingly relevant, where inputs come from is of particularly acute interest.

How can decision makers approach the changing landscape and derisk their growth? Making the right trade-offs in their trading relationships requires understanding both the potential for disruption and where concentration might exacerbate such disruptions. Some of MGI's previous research has focused on the former.<sup>20</sup> To further develop understanding of where exposure to concentration lies, decision makers might consider the following:

- **Decision makers can map their concentrated trade relationships to identify risks and opportunities.** Business and public-sector leaders need to understand the (different) nature of their many interdependencies. This requires evaluating each of the products they source through multiple complementary lenses, including the level of concentration and dependency, the criticality of their use case, the perceived reliability of the economies that supply them, potential alternative sources, and additional upstream dependencies, among others. This “map” can be a useful starting point to judge options for managing trade relationships. In some cases, a watchful waiting posture may be sufficient. For example, some concentrated flows may have a reliable backup that can act as insurance against any potential disruptions, or the specialization and cost benefits of concentration outweigh potential resiliency benefits. However, other flows may have no plausible alternative source of supply, and some partnerships may be less robust in the context of a shifting geopolitical landscape.
- **A scenario-based approach enables stress testing and prioritization of action.** To make informed choices, decision makers need to understand interdependencies in their value chains. For example, the war in Ukraine simultaneously led to disruption to agriculture (including wheat), agrichemicals (mainly potash), and energy (natural gas and oil). Scenario analysis can help identify correlated risks that might unfold in parallel. Indeed, McKinsey research has indicated that, while scenario planning is not universally used, it can enable greater resilience in the face of disruption. About one-third of companies reported having implemented scenario planning in their supply chain planning, with those that did reporting lower levels of disruptions.<sup>21</sup> A scenario-based approach can be used to stress-test and refine initial findings from the concentration mapping, and help identify and prioritize areas for action.

<sup>18</sup> *Risk, resilience, and rebalancing in global value chains*, McKinsey Global Institute, August 2020.

<sup>19</sup> Knut Alicke, Edward Barriball, Tracy Foster, Julien Mauhourat, and Vera Trautwein, “Taking the pulse of shifting supply chains,” McKinsey & Company, August 26, 2022.

<sup>20</sup> *Risk, resilience, and rebalancing in global value chains*, McKinsey Global Institute, August 2020.

<sup>21</sup> *Ibid.*

— **Decision makers can develop a portfolio of actions to derisk growth.** For each prioritized area for action, decision makers can adopt one of the following three broad options:

- **Double down.** Some concentrated trade relationships are, in themselves, sources of competitive advantage, such as when they provide access to technologically advanced inputs. In such cases, businesses may opt to reinforce the relationships to make them more resilient, seeing concentration as an opportunity rather than a risk. For example, the most advanced semiconductor players in the world rely on imports of advanced lithography equipment, almost exclusively manufactured in the Netherlands, for leading-edge chips. In turn, these lithography machines rely on lenses manufactured by a single supplier based in Germany. The players involved in these sectors have historically had long-standing cooperation agreements, and sometimes even equity-participation deals, to reinforce what are some of the most concentrated trade relationships in advanced technologies.<sup>22</sup>
- **Decouple.** In some cases, for instance if policies restrict flows between countries, concentrated trade relationships may create levels of risk beyond the appetite of the business. Parts of the business exposed to such flows may be spun off or divested, or new domestic sources of production may be pursued.
- **Diversify.** Diversification may be an option especially for the substantial portion of concentrated trade that is largely driven by economy-specific factors. For example, over the past decade, Singapore identified that its

natural gas imports were highly dependent on a few pipelines. It therefore proactively diversified its natural gas supply, building a liquefied natural gas terminal to gain access to the seaborne market.<sup>23</sup> When alternative supply is not an option, such as when trade is globally concentrated, businesses and policy makers may look to partner to create alternative solutions. In some cases, these may involve the creation of wholly new supply bases. For example, a joint venture by a Singaporean conglomerate, a China-headquartered aluminum producer, and a leading mine operator is trying to expand the global supply of high-grade iron ore in a new mine in Guinea.<sup>24</sup> Businesses and policy makers may also find opportunities to partner to pool their sourcing risk. In other cases, the solution may be in the form of product innovation to reduce dependency on a selected input. For example, the US Department of Energy has supported specialty chemical and battery manufacturers in their efforts to develop low cobalt cathode formulations for lithium-ion batteries.<sup>25</sup>

Recent global events have encouraged decision makers to reexamine their global interdependencies. By having a clear-eyed view of concentration, decision makers can decide when and where to double down, decouple, or diversify, and how to reimagine rather than retreat from their global footprints. The benefits of doing so do not solely relate to managing risk. Many economies may find new opportunities from the diversification of global trade, enabling more participation across the globe. Organizations that demonstrate thoughtful management of concentrated exposures are likely to be more resilient in a changing world.

<sup>22</sup> ZEISS and ASML strengthen partnership for next generation of EUV lithography due in early 2020s, ASML, November 3, 2016; Baek Byung-yeul, "Samsung deepens chip cooperation with Dutch equipment firm ASML," *Korea Times*, June 6, 2022.

<sup>23</sup> Kelvin Wong, Tan Wee Meng, and Yeo Boon Kiat, *Oil and gas regulation in Singapore: Overview*, Thomson Reuters Practical Law, October 1, 2020.

<sup>24</sup> *Singapore mining consortium inks a US\$15bn deal to develop Guinea iron ore mine*, Nanyang Technical University Singapore, April 21, 2022.

<sup>25</sup> *Reducing reliance on cobalt for lithium-ion batteries*, US Department of Energy, April 6, 2021.

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