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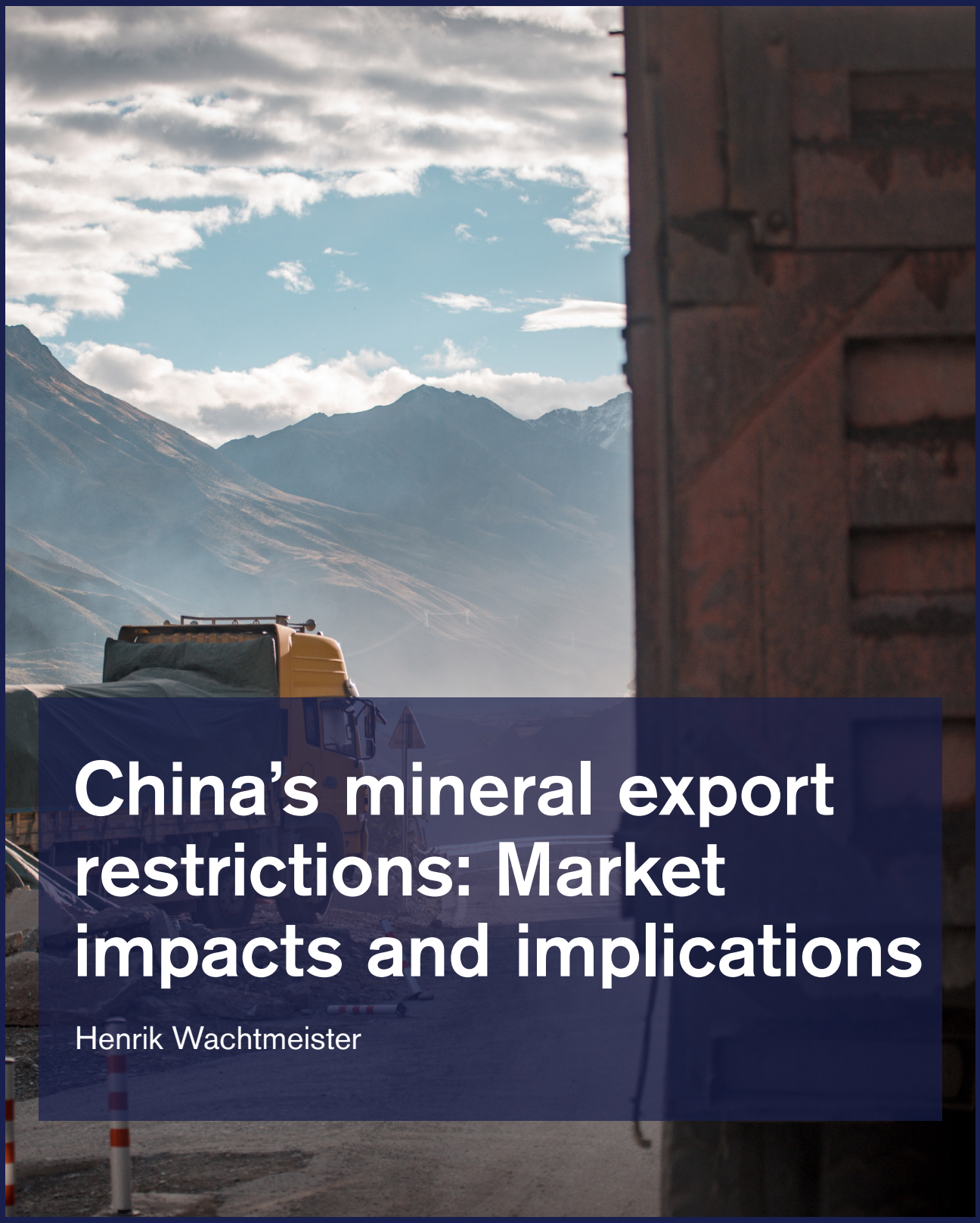

China's mineral export restrictions: Market impacts and implications

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Summary

- This report examines the scope and market impacts of the mineral export controls introduced by China between 2023 and 2025. It summarises the timing and context of the measures and analyses changes in export volumes, destinations and prices, both in China and abroad. Further, it assesses the underlying motives, potential next steps, and implications for Europe and Sweden.
- The report finds that the first wave of Chinese mineral export controls in 2023–2024, covering gallium, germanium, graphite and antimony, was primarily a response to US technology restrictions on semiconductors and advanced computing. The second wave, in 2025, which included controls on rare earth elements, was instead primarily imposed as an additional tool in the broader trade and tariff war with the United States.
- The controls have played an important role in shaping the course and outcome of the US-China technology and trade conflicts so far. They may also have been aimed, in part, at influencing EU trade policy, particularly decisions on electric vehicle tariffs.
- Beyond their use as diplomatic and trade leverage, China's export controls also serve additional objectives, including reinforcing its dominance in global mineral supply chains, promoting domestic value-added production by keeping prices lower at home and higher abroad, and constraining Western defence capabilities by limiting access to critical materials.
- Quantitatively, the global effects of the controls have been significant, reflecting China's dominant role in critical mineral supply. All investigated minerals experienced substantial temporary falls in export volumes following implementation, and several have seen permanent reductions and sharp price increases. Some countries, notably the US and the Netherlands, have faced de-facto complete export bans even before any official bans.
- While the temporary reduction in rare earth magnet exports drew considerable attention in 2025, the first wave of controls has experienced the most significant tightening. Exports of unwrought gallium have been near zero throughout 2025, with prices up by 365 percent in Europe. Wrought germanium exports have fallen by 60 percent, with prices rising 400 percent, while antimony exports have also been close to zero, accompanied by a 437 percent price spike.
- The main determinant of future Chinese export controls in the short to medium term lies in the state of US-China relations. If the truce following the Xi-Trump meeting in October 2025 is upheld, this should lead to an easing of restrictions. However, a breakdown and renewed escalation would likely result in tighter measures, potentially through strengthening of existing controls, expansion to additional minerals, and stricter enforcement of transhipment bans.
- For Europe and Sweden, the controls present both risks and opportunities. Higher prices and potential supply shortages pose risks for several strategic sectors, notably defence, energy, and information technology. At the same time, elevated prices, as well as policy initiatives, create incentives for countermeasures such as diversifying production and refining, building strategic stockpiles, expanding recycling capacity and substitution. With its mineral deposits and relatively low energy costs, Sweden is well positioned to contribute to these developments.
- However, these countermeasures will take time to yield results, leaving a near-term window in which China's leverage remains considerable. During this period, various forms of European economic deterrence may be necessary to prevent supply restrictions. The alternative for securing access to minerals would likely involve policy concessions to China.

Introduction

Trade tensions between China and the West have been escalating in recent years. Measures are increasingly targeting key commanding heights of the 21st century economy: information technology, new energy, and associated critical minerals. The United States has led the charge, employing both offensive and defensive measures, including export controls on semiconductor technology targeting China's high-tech and dual-use sectors, as well as broad tariffs on all Chinese imports. The European Union, by contrast, has mainly introduced defensive measures to protect its domestic industries, and so far on a smaller scale, such as tariffs on electric vehicles.

The Western measures are driven by both security and economic objectives. The official aim of US technology export controls is to maintain US leadership in civilian and military information technology and to contain China's development in these sectors,[1] while the broad tariffs launched in 2025 were framed as addressing trade deficits and non-reciprocal trade practices. European measures are primarily driven by the aim of ensuring fair trade relations and competition, as well as limiting EU dependencies on China in strategic sectors.

China, for its part, has responded by leveraging its dominance in critical mineral supply chains through imposing export controls on several mineral products as well as on related processing equipment and technology. Initially, these restrictions were primarily aimed at defence and high-tech dual-use industries, but minerals essential for new energy technology and other strategic sectors were subsequently restricted as well. China's initial mineral export controls, such as those on gallium and germanium, were seemingly intended to deter military and economic containment resulting from US technology restrictions. In 2025, however, further and more far-reaching controls, including on rare earth elements, were deployed in the broader trade and tariff confrontation with the US, in an apparent expansion of both the scope and the strategic aims of China's mineral export leverage.

This report takes a closer look at the market impacts of China's 2023–2025 mineral export controls. It summarises China's restrictions to date, analyses their market impacts in terms of changes in export volumes and prices, and discusses underlying motives and potential future developments and implications, particularly concerning Europe and Sweden.

The analysis focuses on key minerals subject to Chinese export controls on mineral product exports (in contrast to mineral refining technology and machinery) imposed in 2023–2025. The minerals covered quantitatively are gallium, germanium, graphite, and antimony, as well as a selection of rare earth elements (REE) and products (dysprosium, yttrium, and REE permanent magnets). The market impact analysis relies on public Chinese customs data on trade flows and proprietary commodity price data from Argus. Trends in export volumes, destinations, and unit values are derived from the customs data. In addition, the unit values of Chinese exports are compared with spot prices assessed by Argus in both China and Europe to provide further insights into market impacts.

China's mineral dominance

China dominates the production and refining of many minerals, including several considered critical. According to the British Geological Survey's (BGS) 2024 Criticality Assessment, China ranks among the top three producers in 36 of the mining stages and 29 of the refining

stages of 82 materials analysed by the BGS for their criticality, based on criteria of supply risk and economic importance.[2] Of these 82 materials (individual elements and industrial minerals), 34 are considered critical by the BGS. All the minerals subject to Chinese export controls apart from molybdenum are included among these 34 critical materials. Both the US and the EU have a similar categorisation of critical minerals to the BGS.[3]

Table 1 presents China's share of global production and refining of the investigated minerals subject to export controls, as well as its share in further key downstream production stages and products. China's dominance in gallium and germanium is particularly notable, with over 90 percent of production. Consequently, these minerals consistently rank high in supply risk assessments. China also has a dominant position in graphite, including near-complete dominance in the production of certain key downstream products, in particular battery anodes. Additionally, China holds a dominant position in antimony. For rare earths, China holds a near monopoly, in particular in refining and production of REE magnets. Accordingly, Chinese export restrictions have substantial potential to impact global markets.

Table 1. China's share of global mine production and refining of selected minerals

Mineral	Mine production	Refining	Additional stages
Antimony	48%	63%	
Gallium	*	95%	
Germanium	*	92%	
Graphite (natural)	64%	**	
Spherical graphite	-	-	99%
Natural graphite anode	-	-	79%
Graphite (artificial)	69%***	69%	
Artificial graphite anode	-	-	97%
Rare earth elements	69%	91%	
Rare earth magnets (NdFeB)	-	-	93%

Source: BGS, USGS, IEA.

Note: * = produced as refinery by-product only, ** = used in mineral form, *** = coke production

Tit-for-tat timeline

Trade relations between the United States and China have a long and complex history. Since the first Trump administration, however, these relations have deteriorated significantly, with escalating and retaliatory measures from both sides spiralling into what many describe as a full-blown trade war.[4] In parallel, China has developed and formalised a sophisticated system of export controls, enabling it to weaponise supply chains, including for specific critical minerals.[5] Central to this system is the Export Control Law, which entered into effect

in December 2020. The following section outlines the key events in the trade war so far, with a particular focus on US technology restrictions and China's mineral export controls.

In 2018, during the first Trump term (2017–2020), Washington launched a broad tariff war, with duties of up to 25 percent on a wide range of Chinese goods. Beijing responded with its own tariffs, primarily targeting US agriculture, energy, and vehicles. Negotiations eventually produced the Phase One agreement in early 2020, but its commitments were never fully implemented and most tariffs remained in place.

The first Trump administration also acted on the technology front. In 2019, it targeted Huawei by restricting its access to US-made computer chips and excluding it from the US market.[6] US officials described the aim of the measures as preventing US technology from being used by foreign entities in ways that could undermine US national security or foreign policy interests. The Trump administration then followed up with further restrictions and extended measures to other Chinese companies.[7]

Technology vs mineral restrictions, 2022–2024

The Biden administration (2021–2025) continued on the same trajectory as the previous administration. It kept existing tariffs in place but chose not to expand them. Instead, it increased technology restrictions. The recent series of escalations in the technology-mineral trade conflict began on **7 October 2022**, when the US announced extensive export controls on semiconductor manufacturing equipment and advanced computing to China.[8] Again, the stated aim was to protect US national security and foreign policy interests. According to the US Department of Commerce's Bureau of Industry and Security (BIS), the export controls aimed to "restrict the PRC's ability to obtain advanced computing chips, develop and maintain supercomputers, and manufacture advanced semiconductors".[9] According to a BIS October statement, these items and capabilities are used by China to "produce advanced military systems including weapons of mass destruction; improve the speed and accuracy of its military decision making, planning, and logistics, as well as of its autonomous military systems; and commit human rights abuses".[10]

In **March 2023,** the Netherlands – home to ASML, a leading producer of advanced machines for microchip manufacturing – joined the US export control initiative.[11] Later the same month, Japan also joined the restrictions, although neither country explicitly named China as the target.[12] The US, the Netherlands, and Japan are the primary countries capable of manufacturing the machines necessary to print the most advanced high-end microchips.

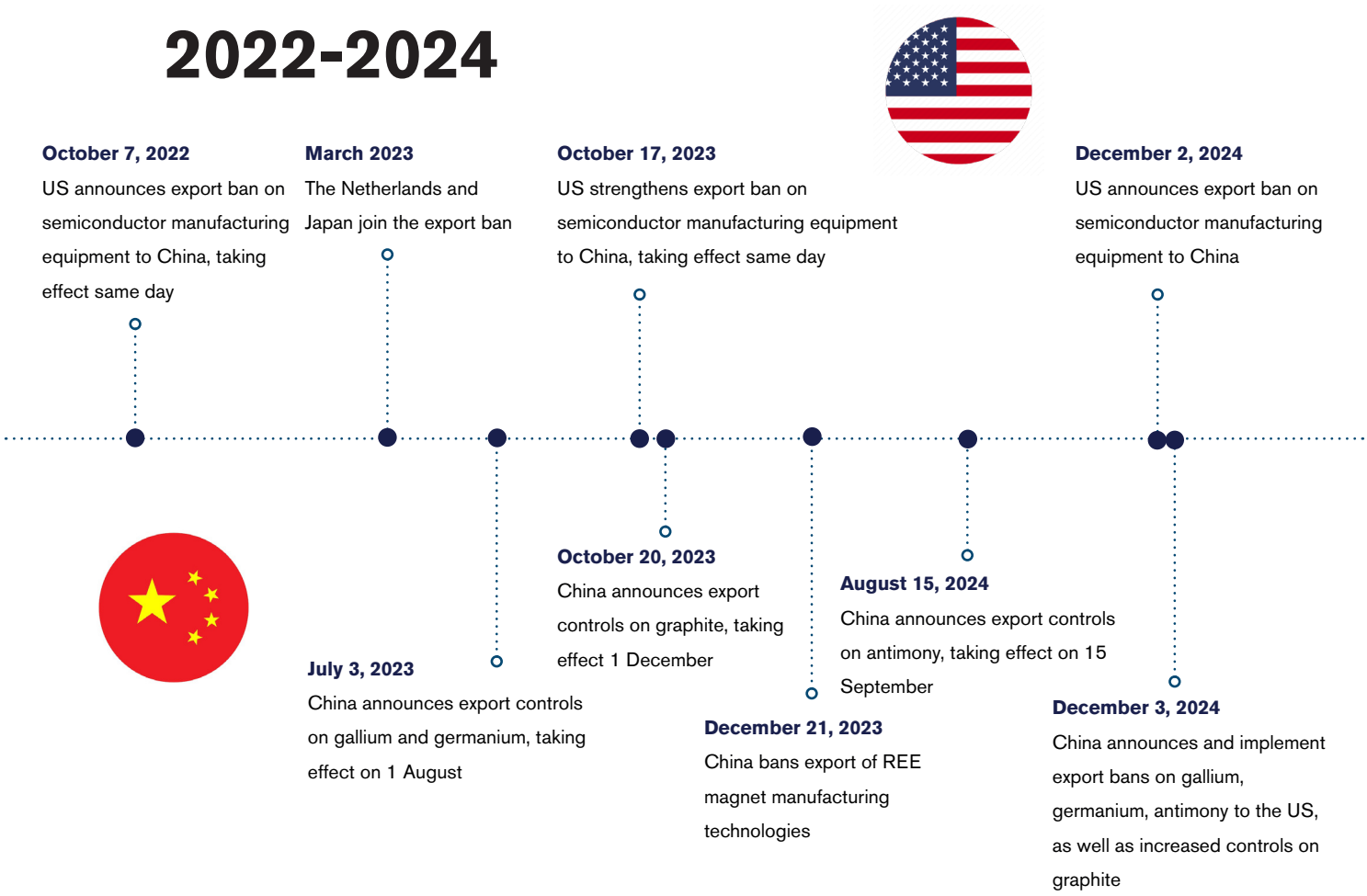

Figure 1. Timeline of US-China technology and mineral trade restrictions, 2022–2024

Note: Not to scale. The timeline is not comprehensive; it highlights selected key events, with a focus on mineral-related measures.

The first significant Chinese response came on **3 July 2023**, when China's Ministry of Commerce (MOFCOM) announced export controls on several gallium and germanium items that are critical for manufacturing advanced semiconductors and communications equipment, effective 1 August 2023.[13] According to MOFCOM's statement, the export controls were implemented to safeguard national security and interests, in accordance with the Export Control Law. Officially, the controls were not outright bans, but required Chinese exporters to apply for licences to export. Nor did the controls officially single out any particular destination country or region. Observers noted the information-gathering potential of the control regime, possibly in preparation for future, more stringent measures.[14]

On **17 October 2023**, the US strengthened its restrictions on advanced semiconductors and manufacturing equipment further.[15] Three days later, on **20 October 2023**, China imposed export controls on graphite, a material crucial for various applications, particularly as an anode material in lithium-ion batteries but also in semiconductors. The restrictions covered both natural and synthetic graphite items, including spheroidized graphite, the processed form used in anodes. Once again, MOFCOM cited the need to "safeguard national security and interests" as the motive.[16]

On **21 December 2023**, China banned the export of technology for manufacturing rare earth magnets (used for example in EVs, wind turbines and electronics), complementing an existing ban on technology for extracting and separating rare earth materials.[17]

On **15 August 2024**, China added several antimony items to the list of materials subject to export controls, as well as antimony smelting and separation technology. Antimony is used in semiconductors and energy technology, but also in munitions. In its official announcement, MOFCOM cited "fulfilling international obligations such as non-proliferation" as an additional motivation for the measure, alongside the previously stated goal of safeguarding national security and interests.[18]

On **2 December 2024**, the US announced another package to further impair China's capability to produce advanced semiconductors, which according to the BIS statement "can be used in the next generation of advanced weapon systems and in artificial intelligence and advanced computing, which both have significant military applications".[19] BIS stated that the action was a proactive measure aimed at impeding China's ability to procure and produce the technologies necessary for its military modernization. The day after, on **3 December 2024**, China tightened its trade restrictions on gallium, germanium and antimony further with an explicit complete ban on exports to the US, as well as warnings of stricter end-use reviews on graphite exports to the US. The MOFCOM order also included a de facto transhipment ban to the US.[20]

Tariff and mineral escalation in 2025

In 2025, with the new US administration and its more aggressive trade policies, China's use of mineral export controls entered a new phase. On **4 February 2025**, the US imposed an additional 10 percent tariff on almost all Chinese imports under President Trump's 1 February executive order "Imposing Duties to Address the Synthetic Opioid Supply Chain in the People's Republic of China".[21]

On the same day, China announced export controls on five additional metals used in defence, electronics, new energy, and other industries: tungsten, indium, bismuth, tellurium, and molybdenum (these are not covered quantitatively in this report).[22] In addition, China responded with similar tariffs of 10–15 percent on selected US goods, including coal, liquefied natural gas, and crude oil.[23]

On **3 March 2025**, the US increased its tariffs from 10 to 20 percent, based on the opioid executive order, citing China's failure to act.[24] China responded the following day with 10–15 percent tariffs on agricultural goods and some other additional measures.

On **2 April 2025**, the US announced its sweeping global "reciprocal" tariff policy (*Liberation Day)* introducing a 10 percent baseline tariff on all imports and additional, higher tariffs on selected countries. On China, the measure included an extra **34 percent tariff**, increasing total US tariffs on Chinese goods to **54 percent**.[25]

Two days later, on **4 April 2025,** China imposed export controls on seven rare earth elements (samarium, gadolinium, terbium, dysprosium, lutetium, scandium, and yttrium) under the Export Control Law.[26] In addition to mineral forms, the controls also covered rare earth permanent magnets and other finished products. MOFCOM's official justification was identical to earlier control announcements (to safeguard national security and interests and fulfil international obligations such as non-proliferation). However, the move came as part of

a broader Chinese response to the US tariffs, most importantly a 34 percent additional tariff on all US goods.[27]

On **9 April 2025,** the US increased tariffs on China by an additional 50 percentage points to 104 percent. China matched the increase on the same day, increasing final tariffs to 84 percent. The US, also on the same day, increased tariffs further to 125 percent, and clarifying that it really meant 145 percent **on 10 April**.[28]

On **11 April 2025**, China increased tariffs to 125 percent and announced that it would no longer respond to any further tariff hikes.[29]

Following this tariff escalation, a series of additional trade measures, threats, tariff exemptions, and partial retreats unfolded in parallel with negotiations throughout the spring and summer. For a detailed chronology, see for example the timeline published by China Briefing.[30] The key steps, with a focus on minerals, are summarised below.

On **12 May 2025,** China and the US agreed to reduce reciprocal tariffs to 10 percent during a 90-day "tariff pause".

On **27 June 27 2025,** US and Chinese officials announced an agreement to accelerate approval of export licences for rare earth materials.

On **3 July 2025,** the US lifted the export ban on key chip design software and related technologies it had introduced in late May 2025.

On **12 August 2025,** the US-China tariff truce was extended for another 90 days, until 10 November.

On **19 September 2025,** Presidents Trump and Xi held a phone call and agreed to meet at the APEC Summit in South Korea at the end of October.

Following this period of relative détente, tensions rose sharply when China introduced new mineral export controls in October. While the US had imposed some earlier measures, including global tariffs on vehicles and wood products, as well as targeted port fees on Chinese-owned vessels, the 9 October announcement was widely viewed as a significant escalation by China ahead of the planned Xi–Trump meeting.

On **9 October 2025,** MOFCOM announced several new export controls, including on rare earth elements. Five additional REEs were added to the control list (holmium, erbium, thulium, europium and ytterbium), to take effect from 8 November 2025 – after the planned Trump-Xi meeting. New controls were also announced on a wide range of equipment for processing REEs. The new controls required export licences even for goods containing small amounts of restricted Chinese-origin materials, and even if the goods were produced abroad. China also imposed export controls on lithium-ion batteries and graphite anode materials.

On **10 October 2025,** Trump threatened to impose 100 percent tariffs on China and to cancel the Xi-Trump meeting in retaliation for the new rare earth controls. Intensive negotiations followed in the run-up to the meeting.

On **30 October 2025,** the US and China reached a compromise and a "one-year truce" during the Trump-Xi meeting in Busan. The agreement included a one-year pause or partial rollback of several of the recently imposed measures, including reduced tariffs, the suspension of certain mineral export controls, and the lifting of port-fees.

2025

February 4, 2025
US imposes 10% tariff on all Chinese imports

February 4, 2025
China imposes export controls on tungsten, tellurium, bismuth, indium and molybdenum as well as 10-15% tariffs on certain US goods

March 3, 2025
US raises tariffs to 20%

April 4, 2025
China imposes export controls on seven rare earth elements, inc REE magnets, and +34% tariffs on all US goods

April 2, 2025
"Liberation Day", US raises tariffs for China by +34% to 54%

April 9, 2025
US raises tariffs to 125%

April 9, 2025
US raises tariffs +50% to 104%

April 9, 2025
China raises tariffs +50% to+84%

April 10, 2025
US clarifies, raises tariffs to 145%

April 11, 2025
China raises tariffs to 125%

May 12, 2025
Agreement to reduce tariffs to 10% over 90 days

China will also withdraw other measures since April 2, 2025 (REE)

May 29, 2025
Export ban on semiconductor and chip software and materials

27 June, 2025
Agreement to accelerate licenses for REEs

3 July, 2025
US lifts export ban on chip design software and technology from May 2025

August 12, 2025
US-China "tariff pause" extended

New deadline: November 10, 2025

September 19, 2025
Trump-Xi phone call, agreed to meet in October

October 9, 2025
New extensive REE export controls. Additional REE minerals and products added. Extraterritorial controls. Controls on lithium-ion batteries and anode materials.

October 30, 2025
Trump-Xi meeting in Busan and "one year truce"

Figure 2. Timeline of US–China technology, trade and mineral restrictions in 2025

Note: Not to scale. The timeline is not comprehensive; it highlights selected key events, with a focus on mineral-related measures.

Market impacts: trade flows and prices

The following sections provide a quantitative analysis of market impacts in terms of changes in trade flows and prices for each covered mineral before and after the implementation of export controls. Table 2 summarises the main quantitative findings.

As seen in Table 2, global Chinese export volumes of gallium, germanium, and antimony have decreased significantly, accompanied by substantial price increases in Europe. The situation for graphite is different. Exports of many graphite items remain at pre-tariff and control levels or even higher. Falling Chinese export unit values and only limited increases in the European spot price indicate a relatively well-supplied graphite market. The price increases for gallium, germanium, and antimony are to be expected due to China's dominance in these relatively limited markets and its significant restrictions on export volumes. The graphite markets are larger, however, with some additional suppliers. Moreover, the export controls have coincided with reduced demand linked to lower-than-expected growth in the EV sector. Exports of rare earth permanent magnets have recovered relatively quickly, but exports of raw elements (dysprosium and yttrium) have decreased significantly, with large price increases in Europe.

Table 2. Changes in global Chinese export volumes, export unit values and spot prices in Europe before and after implementation of export controls as well as countries facing apparent de facto export bans (countries where exports have been zero since implementation).

Mineral	HS code	Export volume	Export unit value	Spot price Europe	Full ban
Gallium, unwrought	8112 9290	*-66%*	*-19%*	365%	US, Netherlands
Gallium, wrought	8112 9990	*-4%*	*-1%*	-	US, Netherlands
Germanium, wrought	8112 9910	*-60%*	*56%*	400%	US, Netherlands
Graphite, natural	2504 1010	*2%*	*-30%*	15%	
Graphite, artificial	3801 1000	*19%*	*-45%*	-	
Graphite, spherical	2504 1091	*-19%*	*-28%*	-	US, May 2025
Graphite, spheroidized	3801 9010	*-17%*	*-17%*	-	
Antimony, oxides	2825 8000	-80%	*116%*	437%	US
Antimony, unwrought	8110 1010	-94%	131%	-	US
Rare earth magnets	8505 1110	25%	-19%	-	
Dysprosium, oxide	2846 9015	-29%	-12%	289%	US
Yttrium, oxide	2846 9011	-50%	-13%	-	

Source: China customs, Argus, Fastmarkets.

Notes: 1) The pre- and post-control periods differ by mineral. For gallium and germanium, 6 months after implementation are excluded from the average calculation; for graphite, 5 months; for antimony, 4 months; and for rare earth elements, 3 months. 2) Export volume and export unit value are based on Chinese customs data and associated HS codes and show the average change in the post-control periods. 3) Spot price Europe shows the maximum price increase in the post-control period, not the average. Spot prices in Europe refer to the following Argus series: Gallium min 99.99% cif Main Airport spot, USD/kg, cif; Germanium metal min 99.999% cif main airport Europe spot, USD/kg, cif; Antimony Regulus Trioxide grade min 99.65% Sb du Rotterdam spot, USD/t, in warehouse; Dysprosium oxide min 99.5% cif Europe spot, USD/kg, cif. Spot price Europe for natural graphite is based on Fastmarkets' Graphite flake 94% C, -100 mesh, cif Europe, $/tonne as reported in public articles.[31]

Gallium

Figure 3 shows that Chinese gallium exports were temporarily halted following the implementation of export controls on 1 August 2023, but slowly began to resume in October that year as Chinese authorities processed and began to grant export licences. For unwrought gallium, export volumes were significantly lower than before controls, with apparent further tightening in 2025, including several months with zero or near-zero exports. Average monthly exports of unwrought gallium were 66 percent lower in the post-control period (January 2024–October 2025) than in the pre-restriction period (January 2022–June 2023). The transition period (July–December 2023) is excluded from the comparison due to volatility around the implementation date. Exports of wrought gallium were 4 percent lower over the same period.

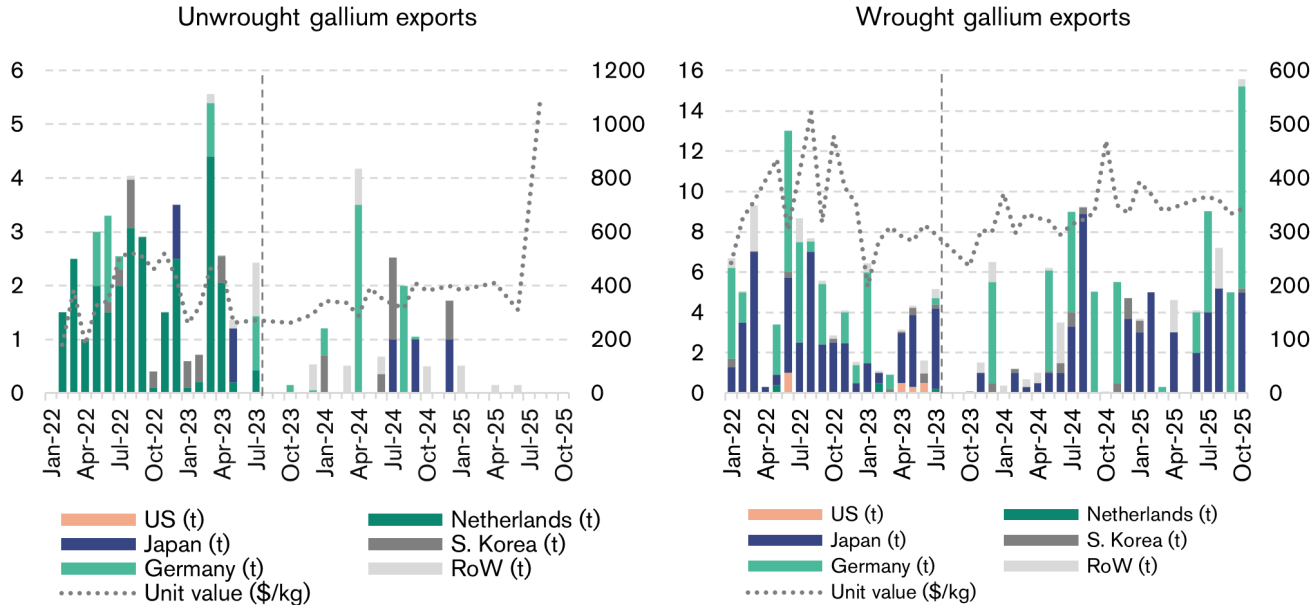

Figure 3. Unwrought and wrought gallium export volumes by destination country (bars, 1000 kg, left axis) and export unit value (line, $/kg, right axis)

Note: Vertical line shows the implementation date of export controls. *Source*: China customs.

The destination countries have also shifted following the introduction of controls. Most notably, exports of both unwrought and wrought gallium to the US and the Netherlands have ceased altogether. Before the restrictions, the majority of Chinese unwrought gallium exports went to the Netherlands. Post-controls, Japan, Germany and South Korea received some shipments before exports largely dried up in 2025.

For wrought gallium, the primary pre-control destinations were Japan and Germany, with the US only importing minor volumes. Following the temporary interruption, exports to Japan and Germany resumed.

The average export unit value (or average "export price") derived from Chinese customs data shows a price decrease of 19 percent for unwrought gallium and 1 percent for wrought gallium, comparing the pre- and post-control periods. Since export volumes were down 66 percent and 4 percent, respectively, a unit value increase might have been expected, all things being equal. However, export unit value prices have some limitations, in particular if we are interested in the effects in, for example, Europe. The unit value price is based on

the product's value at the point of export before transport and other additional costs, which can vary over time. Furthermore, the total export value represents a weighted average of all transactions, with no distinction between spot prices and long-term contract prices.

Immediate market effects are better reflected by spot prices derived from information on individual spot transactions. Gallium spot prices in China and Europe (Figure 4) show a significant price response following the implementation of export controls. In Europe, gallium prices rose immediately after the announcement of controls and increased further following the implementation date. A subsequent surge occurred after the tightening of measures and the official US ban on 3 December 2024, as well as during the summer and fall of 2025. Comparing prices before the announcement with the post-control peak shows a total increase of 365 percent in Europe.

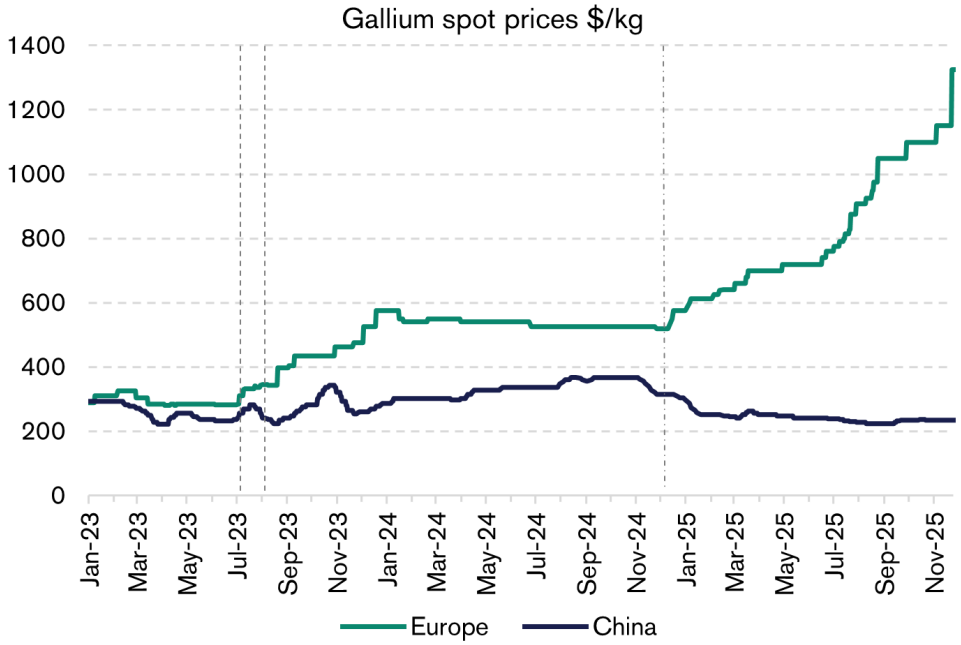

Figure 4. Spot prices for gallium metal in Europe and China, along with the timing of Chinese export control measures (vertical lines)

Note: From left to right, the vertical lines represent the announcement, implementation, and subsequent strengthening of controls.
Source: Argus. Notes: 'Europe' refers to Argus price series 'Gallium min 99.99% cif Main Airport spot, USD/kg, cif' and 'China' to 'Gallium min 99.99% ex-works China spot, CNY/kg, ex-works' converted to USD/kg with constant CNY/USD rate of 0.14.

In contrast, Chinese spot prices have experienced a much smaller increase, with prices even declining during the latter part of the period. Since China overwhelmingly dominates global gallium production (95 percent), the price divergence is not straightforward to explain. However, despite China's control over most of production, some stockpiles and trader inventories can, in the short term, provide a source of "non-Chinese" supply. These trading dynamics, combined with the small size of the market, the prioritization of non-Chinese sources and additional stockpiling by Western buyers, may contribute to the observed price divergence. In addition, changing transportation costs and other expenses, on top of Chinese prices, may have contributed to the elevated European prices. In any case, gallium spot prices are currently significantly lower in China than in Europe, providing a competitive advantage to China-based users.

Germanium

Similar to gallium, the export of (wrought) germanium was temporarily halted following the implementation of export controls and resumed a few months later, in October, albeit at a lower level (Figure 5). As with unwrought gallium, total germanium exports were subsequently reduced again in 2025. Comparing monthly averages for the pre- and post-restriction periods, the decrease was 60 percent. Exports of unwrought germanium were negligible even before the controls and are not covered here.

Before the controls, the US was one of the major importers of Chinese germanium. Like gallium, germanium flows to the US ceased completely following the implementation of controls. The Netherlands imported some small volumes of germanium before the restrictions, but these also ceased following introduction of the restrictions. Japan, a major importer, has seen a significant reduction in its imports from China post-restrictions. Germany, also a major importer, initially kept its imports relatively steady once licences were granted, but since mid-2024 these have been reduced. Belgium (part of the Rest of the World category) significantly increased its imports following the introduction of restrictions but these have fallen to zero since May 2025. Belgium is home to Umicore, an important refiner and manufacturer of germanium products. Previously relatively high exports to Hong Kong have also ceased since the introduction of controls, perhaps indicating that this flow was mainly re-exported to now restricted destinations.

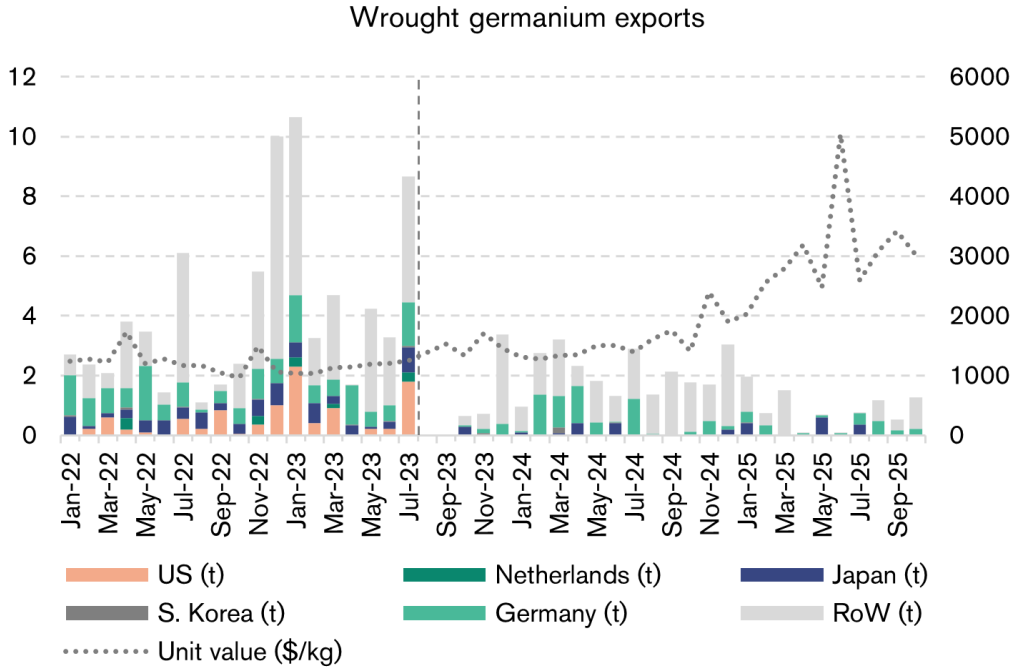

Figure 5. Wrought germanium export volume by destination country (bars, 1000 kg, left axis) and export unit value (line, $/kg, right axis)

Note: Vertical line shows the implementation date of export controls. *Source*: China customs.

The average export unit value derived from Chinese customs data increased by 56 percent for wrought germanium when comparing the pre- and post-control periods. Germanium spot prices in Europe rose even more, increasing by 400 percent from before the announcement to their post-restriction peak (Figure 6). A major part of the European price increase occurred a year after the implementation date, in parallel with rising Chinese spot prices. After the ban

on Chinese exports to the US, European prices have moved higher, in particular from mid-2025, while Chinese prices have fallen back somewhat.

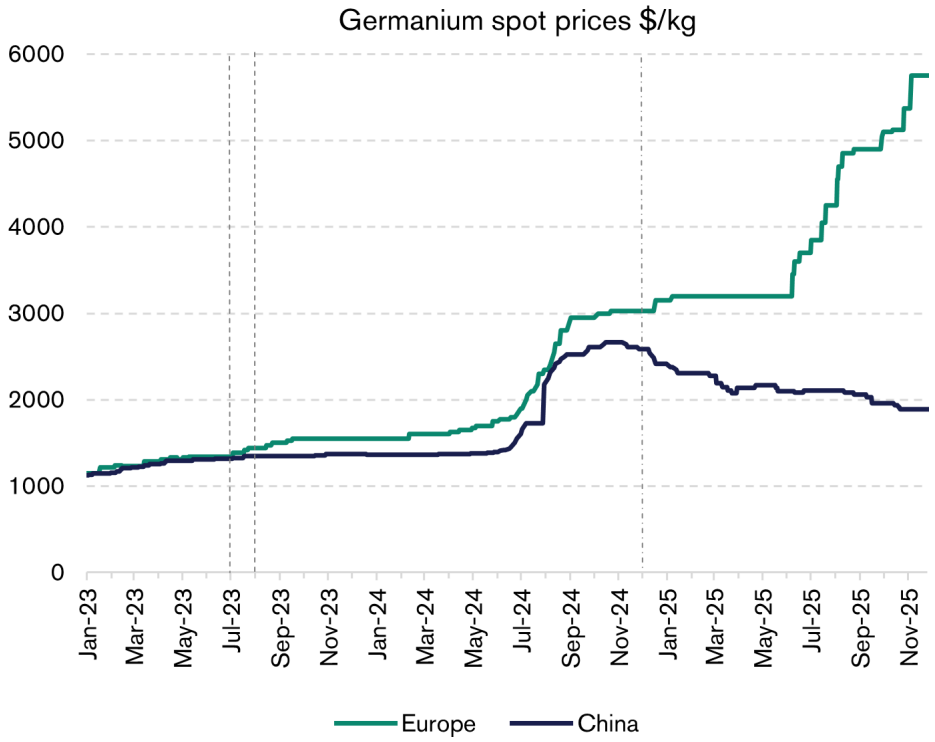

Figure 6. Spot prices for germanium metal in Europe and China and timing of Chinese export control measures

Note: From left to right, the vertical lines represent the announcement, implementation, and subsequent strengthening of controls.
Source: Argus. *Notes:* 'Europe' refers to Argus price series 'Germanium metal min 99.999% cif main airport Europe spot, USD/kg, cif' and 'China' to 'Germanium metal (zone refined ingot) min 99.999% ex-works China spot, CNY/kg, ex-works' converted to USD/kg with constant CNY/USD rate of 0.14.

Graphite

Similar to gallium and germanium, export volumes of several covered graphite items fell following the implementation on 1 December 2023, but rebounded relatively quickly, in many cases back to or above pre-control levels (Figure 7). Since the graphite controls were announced in October 2023, several items saw increased exports in November, the final month before the implementation date. This surge was likely due to traders stockpiling and last-minute buying ahead of the controls.

For natural graphite in flakes, global exports rebounded to pre-restriction levels in June 2024. Comparing average monthly exports during the period January 2022–September 2023 with March 2024–October 2025, volumes were up 2 percent while export unit value was down 30 percent. Exports to the US and the Netherlands resumed post-controls, but at reduced levels. Major importers Japan, South Korea, and Germany continued their imports unabated. Notably, exports of natural graphite to major importer India have completely ceased following the implementation date.

For spherical graphite, a key material for battery anode production, global exports rebounded to somewhat similar levels in March 2024, although down 19 percent compared to the pre-

control period, while unit value was down 28 percent. Initially, there were no significant shifts in the distribution among importing countries, with exports continuing to the three major importers South Korea, Japan, and the US. At the end of 2024, Indonesia emerged as a major importer, while exports to the US ceased completely in May 2025.

Spheroidized graphite produced by surface treatment (also known as coated spherical graphite), another key material for battery anodes, saw exports fall by an average of 17 percent, while unit values declined by 17 percent. Major importers US, Japan, South Korea, and Hungary continued their imports following the initial implementation dip. However, exports to the US shrank to near zero from April 2025.

For artificial graphite, there was no significant drop in global exports around the implementation date and exports even increased by 19 percent post-controls, while unit value fell by 45 percent. Exports have continued to the US, one of the leading importers, as well as to the Netherlands, Japan, South Korea, and India.

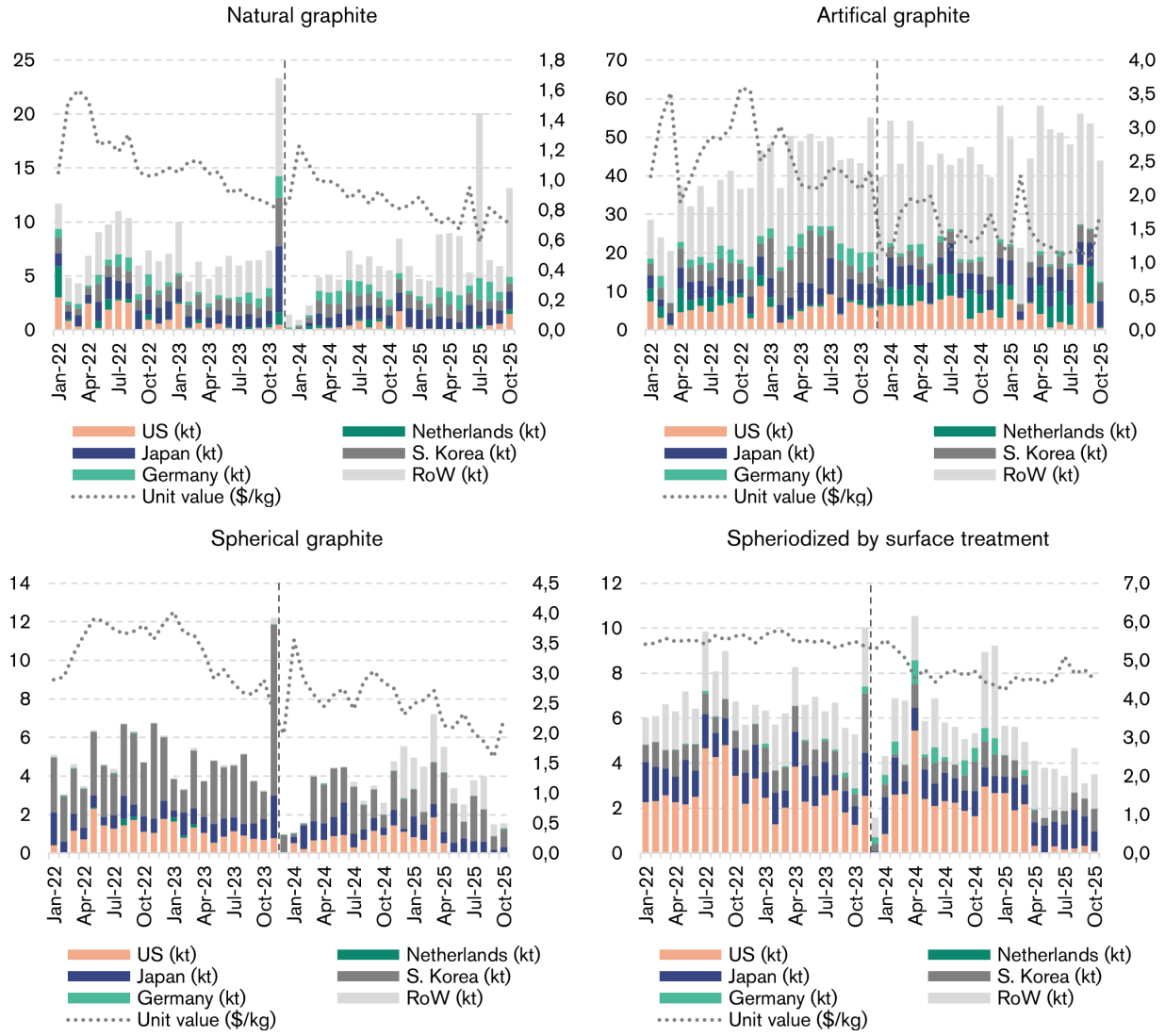

Figure 7. Export volumes by destination country (bars, million kg, left axis) and export unit values (lines, $/kg, right axis) for natural graphite, artificial graphite, spherical graphite and spheroidized graphite by surface treatment

Source: China customs.

Similar to export unit values, spot prices for natural graphite in China have been falling since January 2023, with only a brief uptick following the announcement of export controls in October 2023, according to Argus spot price data. European spot prices (available from reports in published articles) increased by roughly 15 percent in the half-year following implementation but began to fall back to pre-control levels in September 2023.[32] The fall in graphite prices has been explained by traders as a result of weaker global demand, while the price difference between China and Europe is due to the preference for non-Chinese supply.[33]

Antimony

Exports of unwrought antimony have been zero or near zero since the implementation of controls in October 2024 (Figure 8). The monthly export volume average is down 94 percent (including the exemption of a four-month transition period). Meanwhile, the export unit value has increased by 131 percent. Exports to the US and Europe have ceased completely, apart from a tiny shipment to Belgium in March. Only Japan, South Korea and Thailand have received shipments since the introduction of controls.

Exports of antimony oxides rebounded temporarily to around half of previous levels after the initial drop following implementation. However, since May 2025, exports have been near zero again. The monthly average is down 80 percent, while the unit value is up 116 percent when comparing the pre- and post-controls periods. Exports to the US have been zero since controls were introduced. Exports to Europe has been close to zero, with only two months showing small shipments to Germany and Spain. Exports to India, a major importer, also ceased at the time of implementation.

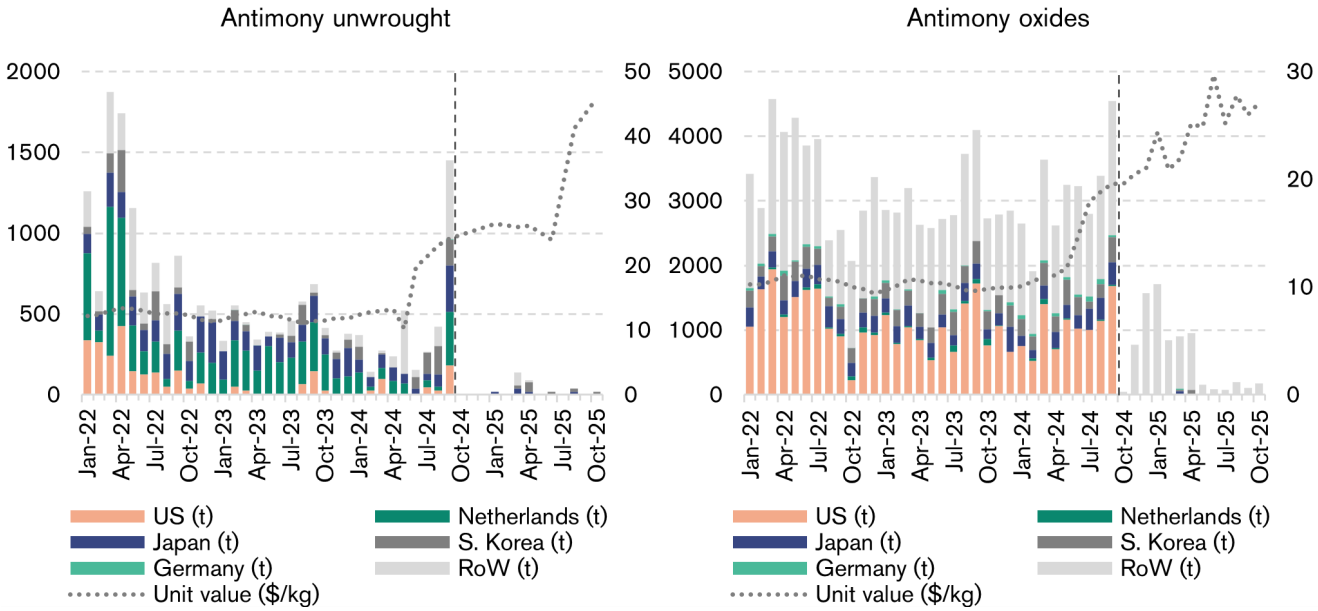

Figure 8. Export volumes by destination country (bars, 1000 kg, left axis) and export unit values (lines, $/kg, right axis) for unwrought antimony and antimony oxides

Source: China customs.

Both Chinese and European spot prices rose in parallel before the announcement of export controls, possibly in anticipation of the measures (Figure 9). Following the announcement

and implementation, European prices continued to increase, while Chinese prices remained lower. Peak European prices in June 2025 were 437 percent higher than in January 2023. Since then, prices have declined; the latest data point, from 26 November 2025, was still 261 percent higher than January 2023 levels.

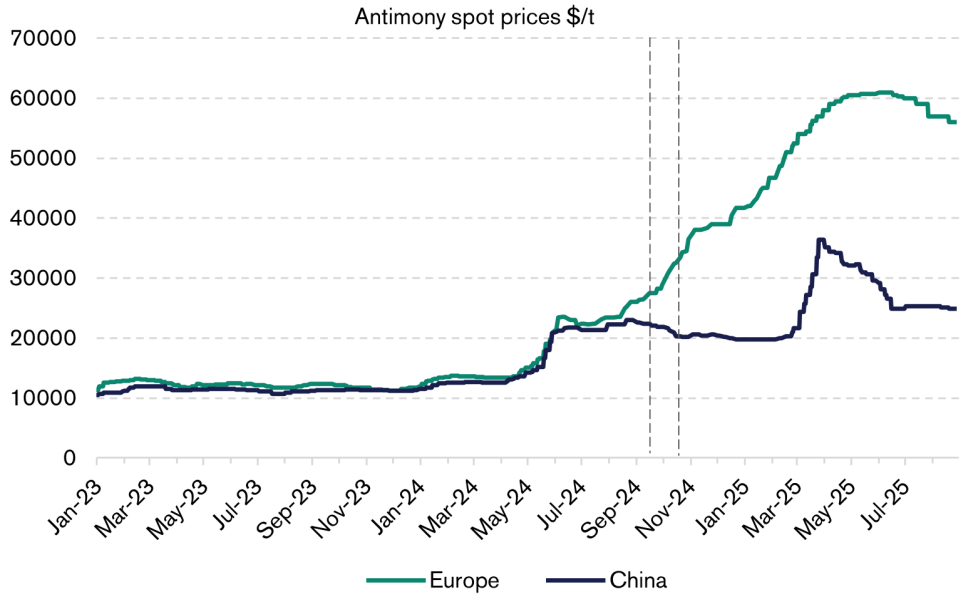

Figure 9. Spot prices for antimony in Europe and China and the timing of Chinese export control measures

Source: Argus. *Notes:* 'Europe' refers to Argus price series 'Antimony Regulus Trioxide grade min 99.65% Sb du Rotterdam spot, USD/t, in warehouse' and 'China' to 'Antimony ingot min 99.65% ex-works China spot, CNY/t, ex-works' converted to USD/kg with constant CNY/USD rate of 0.14.

Rare earth elements

Turning to the group of minerals that has perhaps garnered the most attention: rare earth elements (REEs). The REE item of most importance, at least in terms of value, is REE permanent magnets. Following the announcement and implementation of controls on 4 April 2025, exports of magnets decreased by 73 percent in May (Figure 10). However, by July and August, exports had rebounded, with the monthly average even 25 percent higher compared to the pre-restriction period. Export unit prices have increased somewhat but remain 19 percent lower than the historical average over the entire pre-restriction period. No major shift in destination countries is evident since the recovery, and major importers (the US, Germany, South Korea, Japan, and India) have resumed imports.

Permanent magnet spot prices in China had increased by 25 percent as of the end of November compared to April 2025, according to the Argus time series for NdFeB N45H. Anecdotal reports in the media from July 2025 indicate large premiums for non-Chinese supply, with prices around 30 percent higher than Chinese prices.[34]

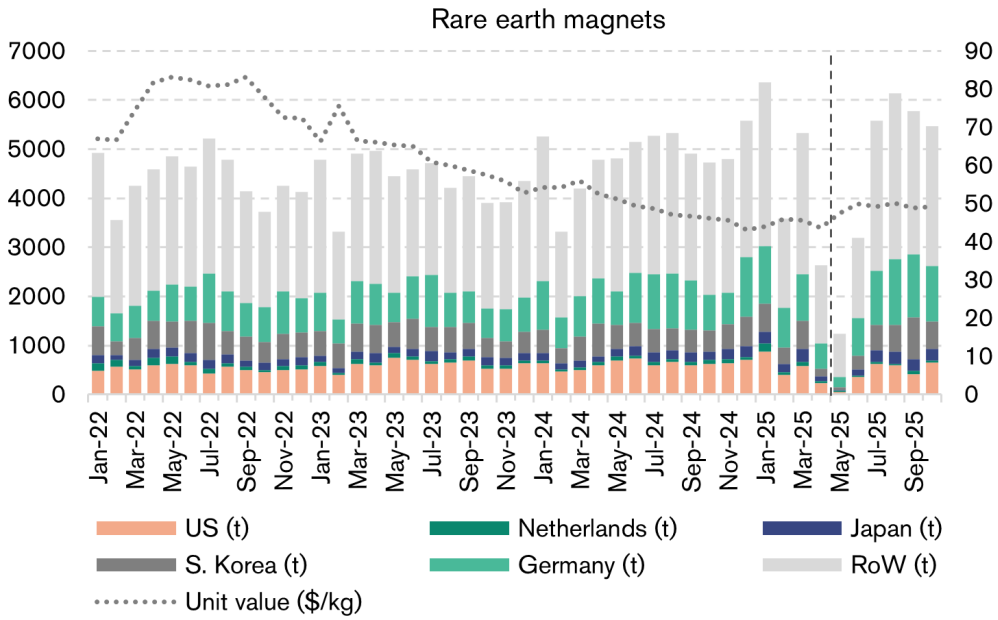

Figure 10. Export volume by destination country (bars, 1000 kg, left axis) and export unit value (line, $/kg, right axis) for rare earth permanent magnets

Source: China customs.

Exports of certain REEs in raw form have shown more persistent changes (Figure 11). Exports of dysprosium oxide only resumed significantly in August 2025, with shipments limited to South Korea and Japan. Almost all volumes were destined for South Korea and only a small share going to Japan – far below Japan's import levels prior to the controls. Exports to the US, which were very low before the controls, and to Germany and the Netherlands have not resumed.

Exports of yttrium oxide resumed at a lower level in July 2025, with most shipments going to Japan and South Korea. Exports to the US, the Netherlands, and Germany have not resumed since implementation.

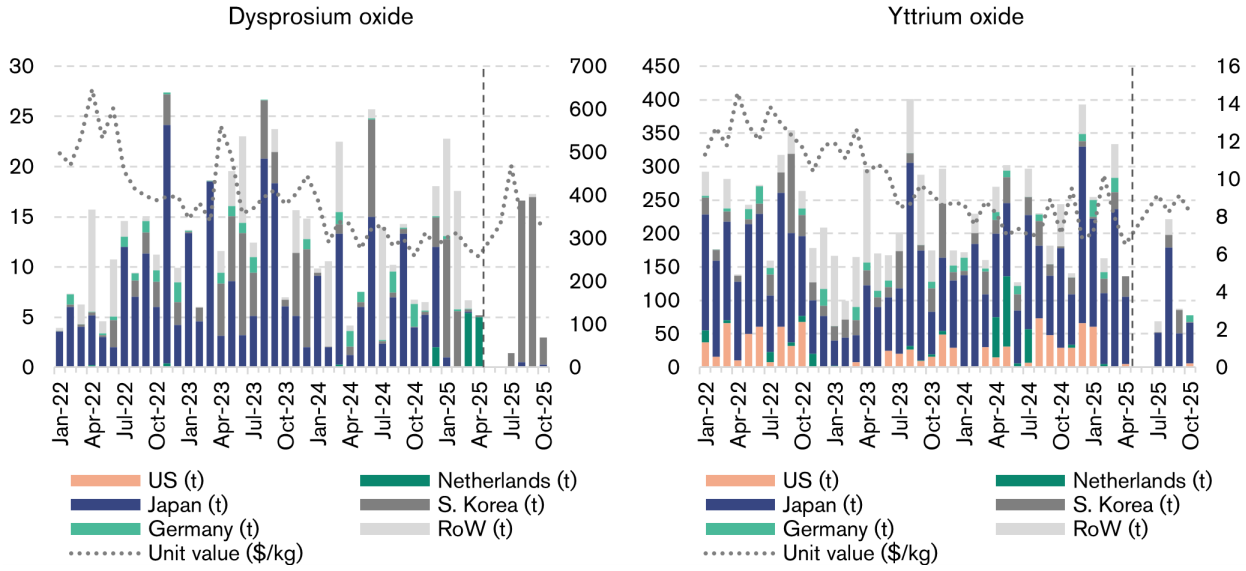

Figure 11. Export volumes by destination country (bars, 1000 kg, left axis) and export unit values (lines, $/kg, right axis) for dysprosium oxide and yttrium oxide

Source: China customs.

Available price data on dysprosium oxide spot prices reveal a significant price increase in Europe compared to China, with prices 289 percent higher post controls (Figure 12).

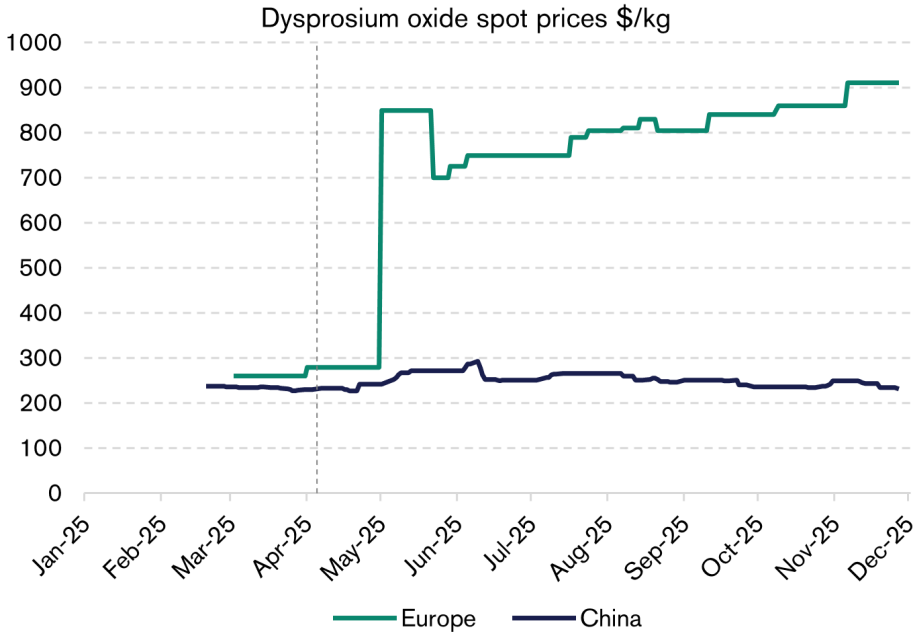

Figure 12. Spot prices for dysprosium oxide in Europe and China and the timing of China's export control implementation (vertical line)

Source: Argus. Notes: 'Europe' refers to Argus price series 'Dysprosium oxide min 99.5% cif Europe spot, USD/kg, cif' and 'China' to 'Dysprosium oxide min 99.5% fob China spot, USD/kg, fob'.

Interpreting China's moves and motives

The official US motive for its technology export controls on China was explicit: to limit China's access to the most advanced information technology in order to contain its military capacity and dual-use sectors.[35] These efforts were part of the Biden administration's "small yard, high fence" strategy.[36] China, for its part, has been less straightforward regarding the official motives for its first wave of mineral export controls in 2023 and 2024. According to MOFCOM's announcement on gallium and germanium controls, the reason was to "safeguard national security and interests", in accordance with the Export Control Law.[37] The announcement of antimony controls added the aim to "fulfill international obligations such as non-proliferation", probably referring to the military applications of antimony.[38] During its regular press conference on 22 August 2024, MOFCOM reiterated that the export controls were targeted at dual-use items, that the policy was not aimed at any specific country or region, and that exports that met the relevant requirements would be approved.[39] However, as the customs data shows, the controls on gallium and germanium were immediately implemented as de facto complete export bans to the US and the Netherlands from the implementation date of 1 August 2023. The same pattern was observed for antimony: an immediate end to exports to the US and the Netherlands followed implementation.

Later, the US was explicitly singled out in China's 3 December 2024 export ban announcement, formalizing the earlier de facto bans in an official ban.[40] This also made it possible to officially implement a new transhipment ban to the US via third countries. This order took effect immediately on publication, in contrast to previous steps where there had been a lag between

announcement and implementation. Notably, China's countermeasures came just one day after the US strengthened its export restrictions on semiconductor technology to China.

The tit-for-tat timing and escalation of China's initial responses suggests that their primary aim was to deter further US measures on technology controls and containment, even though the initial official justifications were rather vague. At the very least, this was the likely intended signal. Other motives might also have been in play, as discussed below.

The second wave of controls in 2025, first on tungsten, tellurium, bismuth, indium and molybdenum on 4 February, and then on rare earths on 4 April, came as part of a wider response to the Trump administration's broader tariff war. This demonstrates that the "mineral weapon" was now being deployed as part of the general trade war with the US, rather than confined to the technology battle.

The US-China negotiations in 2025, which were marked by tariff pauses, partial US reversals on technology restrictions and China's easing of some rare earth export controls, indicate that the combined effects of China's mineral export controls have played a significant role in shaping the course and outcomes of the trade war.

Additionally, the export controls on graphite could also be interpreted as partially targeting Europe, for example by serving as a warning in response to its EV subsidy probe and subsequent tariffs.[41]

Beyond their use as leverage in diplomatic and trade relations, there are at least three other potential motives that may have driven China to impose these controls, regardless of the trade war.[42]

First, China might be seeking to preserve and strengthen its dominance in global mineral supply chains by restricting foreign access and making it more difficult for other countries to build independent supply capabilities. The controls on processing technology for rare earth elements and lithium are a case in point, as is the tendency for China to permit exports of more processed products further down the value chain while more tightly restricting raw materials, such as the strict limitations on unwrought gallium compared to wrought gallium.

Second, building on the first point, China might want to incentivise production within its own borders, thereby retaining more value-added segments of supply chains rather than exporting raw materials. By restricting exports, China increases prices abroad while keeping them lower domestically. Moreover, the more processed the product, the greater control China can maintain over its end-use.

Third, there may be a hard military-strategic motive, to constrain Western rearmament efforts, as many of these minerals are critical for defence-related applications.

These alternative motives are not mutually exclusive with the goal of deterring US trade measures and could all form part of a broader strategic calculus of Chinese decision makers.

What's next?

Based on the timing and design of the Chinese mineral export controls, it appears likely that the first wave of restrictions in 2023 and 2024 was primarily a response to US-led technology containment efforts. With the 2025 restrictions, however, China demonstrated

its willingness to use minerals also in the broader escalating trade conflict with the US. Furthermore, as controls targeted many important minerals for new energy technology, the measures could also – at least as a side-effect – be aimed at Europe, in an attempt to influence its policies on trade in general, and on energy technology in particular.

As such, key factors influencing future developments in Chinese mineral exports include further US-led technology restrictions, further escalation of the broader US-China trade war and EU trade policies, especially in the green technology sector. At present, the dominant factor is developments in US-China relations. If the truce following the Xi–Trump meeting in October 2025 is maintained, this should lead to an easing of restrictions. However, any breakdown or renewed escalation would be likely to result in tighter measures. Several additional Chinese mineral-related measures are possible in such an escalation. China could tighten current export controls, either targeting the US and its allies specifically or more broadly limiting its global mineral exports to drive up world prices still further.

The transhipment ban to the US could also be more strictly enforced. Such a ban could have major implications. If fully adhered to, the US will struggle to source key materials in the short to medium term. A recent study by the US Geological Survey estimates that a complete restriction on China's net exports of gallium and germanium could reduce US GDP by $3.1 billon (with lower and upper estimates of $1.7 to $8.2 billion) in the short term.[43] Although the economic effects represent an insignificant share of total US GDP, a more critical impact would be the constrained production of specific key products, especially those crucial for the military. Adherence to a transhipment ban could also cause tensions between the US and its allies.

On the other hand, if the transhipment ban is challenged, and if China effectively enforces it, more countries and companies will face difficulties sourcing materials, resulting in an even larger global supply shortfall. Ultimately, this situation will put many companies and countries in a difficult position, compelling them to prioritize their economic and political ties with either the US or China. Whether China has the capacity for such enforcement is uncertain, however, given the practical challenges and the potential for widespread circumvention.

China also has dominant positions in many other minerals that it could add to its export control list. A February 2024 analysis by the China-focused consultancy Trivium sought to predict which mineral export controls China might implement next, based on an assessment of which mineral controls were most in its interest.[44] The key criteria in the assessment of China's choice of mineral export controls were: the criticality of the minerals to strategic competitors, including the US, Japan, and Europe, China's dominance in supply chains, and avoiding undermining its domestic industries. It assessed 74 critical minerals and identified nine as being at the highest risk of future control. Gallium, germanium, and graphite had already been restricted at the time of the analysis but were ranked 2nd, 4th, and 5th, respectively (see Table 3). Since the assessment, antimony (ranked 8) has been restricted as well as tungsten, indium and bismuth (ranked 1st, 9th and 12) and rare earth elements (ranked 3rd).

An analysis by the National Bureau of Asian Research (NBR) from January 2025[45] derived a similar list using a similar approach but with a somewhat different methodology (see Table 3). This scoring system considered China's dominance in extraction or production, China's dependence on exports overseas, the impact on US priorities (materials considered important by the US) and chokepoints (US import diversification and China's market share). Nine minerals appear on both lists. Trivium includes three minerals not on the NBR list and

the NBR analysis lists seven minerals not on Trivium's list. Since publication of the NBR study, export controls have been imposed on tungsten and rare earth elements, as well as on lithium extraction technology and lithium-ion battery products.

Table 3. Minerals at risk of export controls according to the Trivium assessment (February 2024) and Rafaelof et al. (January 2025).

	Mineral	
Rank	***Trivium (2024)***	***Rafaelof et al. (2025)***
1	**Tungsten****	**Graphite***
2	**Graphite***	Manganese
3	**Rare earth elements^****	**Rare earth elements^****
4	**Germanium***	Cobalt
5	**Gallium***	**Germanium***
6	Vanadium	Nickel
7	Magnesium	**Tungsten****
8	Copper	**Antimony***
9	**Indium****	Magnesium
10	Titanium	**Lithium^^****
11	**Antimony****	Quartz
12	**Bismuth****	Chromium
13		Copper
14		**Gallium***
15		Tantalum
16		Titanium

Notes: Bold=mineral with product or extraction technology export control, *=mineral export controls announced at the time of publication, **=mineral export controls announced after publication, ^technology export control announced at the time of publication, ^^=technology export control announced or proposed after publication.

These lists appear to have some predictive potential, which suggests that their underlying scoring systems capture some of the considerations of Chinese decision makers.

With further deteriorating relations, including in response to potential European trade policies perceived as hostile by Beijing, it is possible that mineral restrictions will increasingly target energy technology. Controls on graphite are already in place, and their relatively relaxed implementation could change, resulting in steeper export cuts. Export controls on rare earth elements, which ranked high in both studies, have subsequently also been implemented.

Lithium, a key mineral for green technologies, has also become subject to restrictions. China has imposed controls on lithium processing technologies (announced in January 2025) as well as on finished lithium-ion batteries, artificial graphite anode materials, and related items (announced in October 2025 but suspended until 10 November 2026). If implemented strictly, these controls could have significant impacts across multiple sectors, particularly the electric vehicle industry.

Copper appears on both lists and warrants special attention. Unlike many of the smaller, niche-market minerals critical to specific technologies, copper is a bulk material. A significant fall in Chinese copper exports could have a substantial impact on the world economy, since it is used in high volumes across many sectors, such as power transmission and generation, motors, communications, electronics, and construction. Its wide-ranging applications mean that it will perhaps be reserved for higher escalation scenarios.

Implications for Europe and Sweden

The future level of conflict between the US and China, as well as between the EU and China, will be major determinants of the *likelihood* of further Chinese mineral export restrictions. The EU will face a difficult balancing act going forward in relation to the potential escalation of US-China trade wars, as well as its own trade relations and agenda with China. The desired path is not clear-cut and even if it were, the triangular dynamic will be difficult to influence in the preferred direction.

However, the *impact* of potential mineral restrictions will depend on a number of factors that can be more easily influenced, even by smaller countries, at least in the medium term. These include the extent of dependencies on Chinese supplies, as well as resilience or adaptability capacities. Specific measures include, for example, strategic mineral stockpiles, investment in domestic mineral production and refining or such activities in reliable countries, recycling, and investment in substitute technologies and materials. Additionally, increasing such capacities would alter the cost-benefit calculations of the trade war participants, and ideally deter the imposition of restrictions by reducing their effectiveness.

For Sweden, as a frontrunner in the development and deployment of green technology and mining, there are both further risks and opportunities ahead. With extensive dependencies on China for supply chains in for example wind and solar power, electric vehicles and batteries, Sweden could be negatively affected by further mineral export restrictions targeted at green technology rather than semiconductors, microchips, and dual-use items.

Since 2020, there have been reports of a “shadow ban” on some types of Chinese graphite exports to Sweden.[46] However, according to both Chinese and Swedish customs data, there have been some graphite exports to Sweden during this time, albeit at significantly reduced levels compared to before 2020. Moreover, graphite supplies, presumably from other countries, have not been a problem, according to Swedish importers. However, if the EU as whole were targeted with graphite restrictions, accompanied by an enforced transhipment ban, this would seriously hinder domestic European battery production.

In a similar vein to the alleged Swedish shadow ban, export restrictions could be implemented more subtly within the current export controls. For example, graphite exports to domestic European battery makers could be stopped or made more expensive, while Chinese-owned companies within the EU could be exempted, skewing competition towards both mainland and overseas Chinese production and investments.

In terms of opportunities, as an advanced mining nation with significant estimated resources of minerals affected by current and potential future Chinese export controls, Sweden could emerge as a new supplier for both domestic and European markets. Sweden also has a leading position in metal recycling, which could be expanded. Furthermore, Sweden currently

has Europe's lowest electricity prices, making it well-positioned to host energy-intensive mining, refining and recycling industries.

On 25 March 2025, the European Commission published a list of strategic mineral projects as part of the implementation of the Critical Raw Materials Act of 2023.[47] The Act sets goals for the EU to mine 10 percent of its strategic raw materials, process 40 percent and recycle 25 percent by 2030. Projects considered strategic will benefit from streamlined permitting processes (a maximum of 27 months for mining and 15 months for processing and recycling) and coordinated support for access to financing and off-takers. Five of the selected projects are located in Sweden.

- LKAB: ReeMAP Project: Malmberget (Gällivare). Extraction of rare earth elements and phosphorus from iron mining.
- LKAB: Luleå Industrial Park for Critical Minerals (Luleå). Refining of REE and phosphorus.
- LKAB: The Per Geijer Deposit (Kiruna). Extraction of REE from iron ore deposit with high concentrations of REE and phosphorus.
- Talga AB: Talga Natural Graphite ONE (Vittangi). Natural graphite extraction for battery-grade graphite.
- Northvolt Revolt AB: NorthCYCLE (Skellefteå). Recycling of battery metals manganese, lithium, graphite, nickel, and cobalt.

With higher prices due to Chinese export controls and the political ambitions to reduce vulnerabilities in the EU in the face of potential further trade tensions, the viability of these and other mineral projects has increased. Nonetheless, many challenges remain, not least aligning the streamlined permitting processes with existing national regulations and local interests.

However, structural countermeasures will take time to yield results, leaving a short-term window during which China's leverage remains considerable. During this period, various forms of European economic deterrence might be necessary to prevent supply restrictions. Here, one option lies in collective trade measures, such as the use or the credible threat of use of the EU's Anti-Coercion Instrument. Another option involves managed interdependence, where deterrence is supported by maintaining or deepening trade with China, but in sectors and concentrations less exposed to coercion.

The alternative, in order to secure access to minerals, would be likely to involve making policy concessions to China, such as rolling back EV tariffs or adopting a more neutral stance in the US-China trade conflict. In either case, navigating this short-term window when China's leverage remains strong will be challenging, in particular if coordination with the US proves difficult.

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About the Swedish National China Centre

The Swedish National China Centre was established in 2021 as an independent unit at the Swedish Institute of International Affairs (UI). The Centre conducts policy-relevant research and aims to contribute to a long-term improvement in the state of China-related knowledge in Sweden. UI's publications undergo internal quality control. Any views expressed are those of the author.

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