Chokepoint Politics:
China's Export Controls in the Era of Great Power Rivalry

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Key Points

- China is strategically using export controls as a geopolitical tool, shifting from mostly economic and industrial policy motivations to national security-driven policies. These controls are now central to its efforts to exercise geopolitical leverage over other countries.
- Export controls have expanded from raw materials to advanced technologies, including dual-use goods and manufacturing know-how. China aims to exert pressure by weaponizing supply chains, while at the same time making sure that it can maintain its role as central node in global value chains.
- The impact of China's export controls extends far beyond the U.S., affecting global industries and economies. European, Japanese, and South Korean companies have faced delays, shortages, and increased costs, highlighting the global collateral damage of these policies.
- Future export control expansions are likely and will target chokepoints where China holds dominance, especially in battery materials, advanced electronics, and clean energy technologies.

China's Export Controls: A Tool for a New World Order

Anyone looking to understand the impact of politically induced supply chain disruptions should consider the case of Chinese graphite exports to Sweden: between 2020 and 2023 graphite exports to Sweden dropped sharply, even as Sweden's overall imports and China's overall exports increased. Although no formal ban was announced, it is plausible that China used this as a means to exert pressure on battery maker Northvolt to surpress a nascent competitor to China's battery giants. A decline in Chinese graphite exports to Sweden has been observable since 2015, which may be linked to the political tensions between the two countries during that period. Other countries in Europe that host Chinese battery makers, such as Hungary and Poland, in contract have seen their graphite imports skyrocket.

Another example of the impact of supply chain disruptions is the case of U.S. drone manufacturer Skydio. Although not directly subject to formal export controls, Skydio was sanctioned as a company, which significantly affected its operations. In response to Skydio's (minor) exports to Taiwan, China sanctioned the company, effectively banning all shipments from China to the company. At the time, Skydio's sole battery supplier was a China-based subsidiary of Japan's TDK.

Cut off from this critical supply, Skydio had to rely on existing stockpiles and began **rationing batteries for new drone shipments**. The company estimated it would take up to six months to qualify a new supplier. This highlights just how deeply geopolitics can affect global supply chains and business continuity.

Export controls and the power over supply chains have now entered the center stage of world politics.

They are now a favored tool in geopolitical competition and economic weaponization, serving for exports what import tariffs do for imports: a tool to control trade for strategic purposes. The U.S. controls on AI chips and semiconductor manufacturing have set a precedent, and more recently expanded to include chip design software and aircraft engines. China has also honed its use of export controls, most recently by targeting rare earth elements (REE). For both countries, export controls are a means to hinder each other's technological advancement and defense capabilities, or to use as leverage to exert political pressure. This strategic use of export controls is now also beginning to affect China's relations with Europe and other countries.

China has established a clear legislative and regulatory framework to respond to U.S. restrictions in a structured and assertive manner.

The foundation of this system is the Export Control Law enacted in 2020, which underpins all of China's current export control measures. China is particularly known for leveraging its dominant position in critical raw materials—such as gallium, synthetic graphite, and REE. By now, it has imposed export controls on many materials where it holds market dominance. Moreover, China is increasingly extending these controls to technologies crucial for global value chains including lithium refining processes, LiDAR, and voice recognition systems.

The Sinolytics team is actively engaged in tracking and forecasting export control measures, supporting corporations in anticipating and mitigating their effects. **This white paper consolidates our analysis of China's export controls and their practical implications. We will also take a look at China's entity lists, which can also be used to restrict exports to certain companies.** It explores how the system functions, what the intentions are, who is impacted, and where China's export control regime may be headed next. It is intended as a guide for corporations, policymakers, and policy experts.

It's About Playing Trump Cards

China's use of export controls is not entirely new.

Since the 1990s, it had already imposed restrictions on the export of several raw materials. In 2010, a sharp reduction in China's export quota for REE sent shockwaves through the global economy, causing prices to soar. An industrial trauma that still evokes painful memories today. This phase came to an end in 2015, when China lost a related dispute at the WTO. Although speculation about a return to stricter controls resurfaced during the Trump administration, China largely held back—until more recently.

The current wave of export controls **differs significantly** from those in the past. Earlier controls were primarily driven by **economic considerations**. As China aimed to move up the value-added ladder, it sought to avoid becoming merely a raw material supplier, instead using its resources to support its own technological advancement. While there have been politically motivated cases—such as the alleged short-term ban on rare earth exports to Japan in 2010—most past restrictions were rooted in economic strategy.

Today, the rationale behind export controls has evolved, complementing the previously dominant focus on industrial policy.

Increasingly, Chinese export controls are tied to **national security concerns** and serve as a **strategic battleground for gaining dominance over competitors**. This is evident in the fact that most of China's recent export controls are based on dual-use regulations. This shift is deeply rooted in the Chinese concept **of 'trump cards' or 'killer weapons'** (杀手锏). About a decade ago, key strategists in Beijing began refining this notion, emphasizing the potential to weaponize strategic assets in geopolitical conflicts. The strategy even involved deliberately increasing foreign dependence on these critical assets.

In its effort to prepare for long-term strategic competition with the U.S., China has built a solid regulatory framework for export controls.

The Export Control Law (出口管制法) is at the center of these efforts. National security is a key term throughout the law. The key effort of that law is to establish the legal basis for a licensing system of dual-use goods.

Public reporting in Western countries often mischaracterizes China's export controls as outright export bans. However, these controls **do not necessarily lead to reduced exports** for all. Instead, the licensing system functions more like a faucet—adjustable to allow more or less flow depending on policy objectives. At times, exports may remain largely unaffected, while at other times they may be subject to strict controls, as is currently the case with REE exports. In only a few cases has China issued a formal export ban, such as on gallium, germanium, and antimony exports to the U.S.

Dual-use Licenses Are The New Normal

The export control procedures are defined in the Regulations on Export Control of Dual-Use Items (两用物项出口管制条例). Under the current framework, export licenses **are issued on a per-shipment basis** and must specify the end user. This allows China to exert **more precise control** over the recipients of its exports. However, exporters with robust internal compliance systems and a track record of "good operations" may apply for a **general license**, which permits multiple exports of a given item to one or more designated end users within a given time frame.

The **Ministry of Commerce (MOFCOM)** is responsible for implementing export controls and issuing licenses. This task is carried out primarily through its subordinate agency, the **Bureau for Industrial Security and Import and Export Controls** (BISIEC, 产业安全与进出口管制局). BISIEC comprises nine internal offices, including two licensing offices (Control License Office No. 1 管制许可一处 and Control License Office No. 2 管制许可二处), one office for policy development, and another for technical assessments of export items.

License applications are initially submitted to **provincial-level MOFCOM** offices. BISIEC then conducts a preliminary review and forwards its recommendation to MOFCOM's leadership for final approval. In cases where an export involves items deemed to have a significant impact on national security, MOFCOM must also **seek approval from the State Council and the Central Military Commission**.

The procedural regulations impose a **45-day time limit** on MOFCOM for processing export license applications. However, there are no specified deadlines for cases requiring additional approval from the State Council and the Central Military Commission. Meeting the 45-day deadline is currently challenging for BISIEC, especially when new export control measures are introduced or when application volumes spike. BISIEC is estimated to have a staff of approximately **40 to 60 personnel**, with each of the two licensing

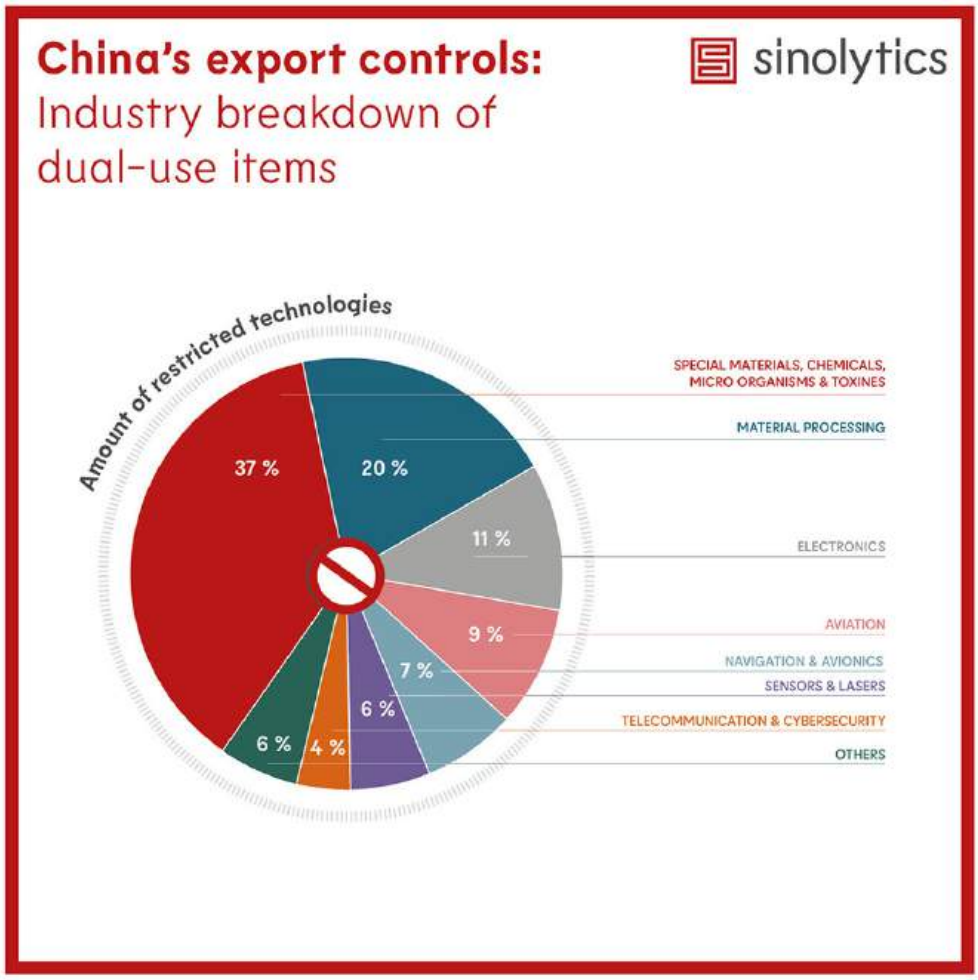
offices staffed by only around five individuals.

In practice, outright denials of license applications are rare. Instead, applications that are unlikely to be approved are often left in **administrative limbo**, with no formal decision issued. This indefinite delay serves as a de facto rejection, allowing authorities to avoid the political or diplomatic implications of an explicit denial.

China's Raw Material Export Controls

China's export controls extend far beyond raw materials.

The Export Control List for Dual-Use Goods (两用物项出口管制清单) enhances transparency and partly aligns China's controls with other dual use export regimes found in other countries and international frameworks. It includes a broad range of items commonly regulated to prevent the proliferation of weapons of mass destruction (see Illustration).



Source: Sinolytics Research, Export Control List for Dual-Use Goods

However, China's extensive export controls on a range of critical materials stand out.

These materials are categorized under "Electronics" due to their broad application across the electronics industry. Notably, China has imposed controls on materials where it holds a dominant position in the global supply chain. The illustration below highlights materials China deems strategic—either because they serve as potential "trump cards" in geopolitical leverage, or because they represent critical bottlenecks where China is heavily reliant on external sources.

A look at China's strategic materials list reveals that the country has now imposed export controls on nearly all materials where it believes it holds a competitive advantage:

Mid-2023
Gallium and Germanium came first

Early 2024
Followed by Graphite

Then controls for Antimony and manufacturing equipment for superhard materials were introduced in September the same year.

February 2025
Tungsten, tellurium, bismuth, indium and molybdenum joined the club

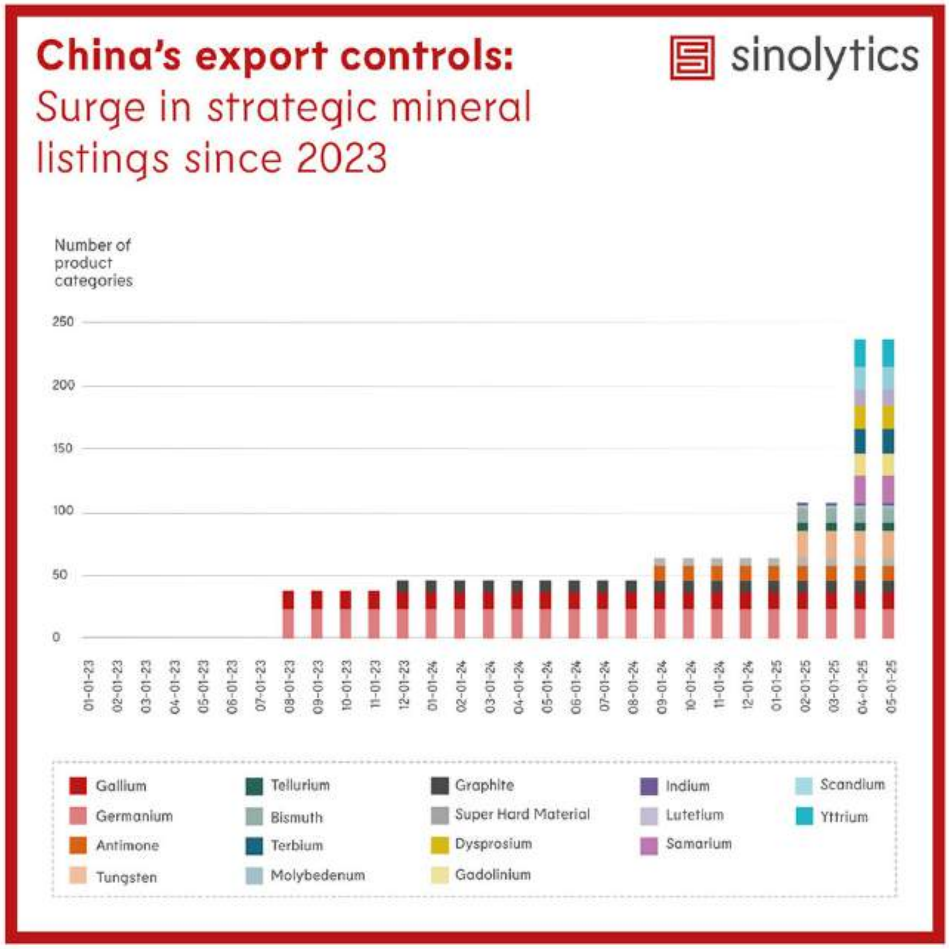
April 2025
Finally, seven REE were included in the controls, including the heavy rare earths samarium, dysprosium, terbium, and gadolinium. Dysprosium and terbium containing magnets are included as well (Magnets that do not incorporate these rare earth elements are excluded from the controls).

Illustration: China's List of Critical Raw Materials. Source: State Geology Institute

While China controls a broad range of materials, its export controls remain relatively precise and targeted.

The inclusion of a mineral on the export control list does not mean that every form or derivative of that mineral is restricted. Minerals undergo multiple processing steps and can exist in numerous forms—including intermediate products, compounds, and alloys. The list of controlled items is highly specific, often defined at the **HS10 code level**, meaning that some variants of a material may be restricted while others remain freely exportable.

For example, certain **indium products** are now controlled, but **Indium Tin Oxide** (ITO), a critical material for touchscreens, remains exempt. As of May 2025, our research indicates that **240 raw material items** have been included in China's export control list, up from zero in early 2023 (see chart on next page). **Recognizing this nuanced approach is essential for accurately assessing the real impact of China's export controls.**



Source: Sinolytics Research, Export Control List for Dual-Use Goods

Controls Mainly Target Defense and Aerospace

The U.S. defense and aerospace sectors are clearly among the primary targets of China's export controls.

The export controls primarily focus on **dual-use products**—materials with both civilian and military applications, but particularly significant for defense technologies.

A closer look at the list of restricted items highlights this strategic intent. For example:

- **Gallium nitride (GaN)**, critical for advanced radar systems in jet fighters and satellites
- **Isotropic graphite**, used in rocket nozzle throats
- **Samarium-cobalt (SmCo) magnets**, essential for high-performance servo motors in missile guidance systems

The impact on the defense industry, particularly in the U.S., but also in other countries, is significant.

In 2022, the Pentagon suspended deliveries of new F-35 fighter jets after discovering that a magnet in the turbomachine pump contained a samarium-cobalt alloy sourced from China. In response, the Biden administration mandated the removal of Chinese REE magnets from U.S. defense systems by 2026, and all related materials by 2027. However, implementing this policy is extremely challenging, as key elements such as **samarium, dysprosium, and terbium** are almost exclusively refined in China.

But Impacts Are Strongly Felt Beyond Defense

Defense accounts for only a **marginal share of the overall demand** for these materials. In the case of rare earth elements, the U.S. defense supply chain represents less than 0.1% of total consumption. Therefore, the impact of export controls **extends far beyond the defense sector** (see a list of affected industries in the annex).

The impact of export restrictions, particularly on REE, is significantly affecting various industries. Among these, the **automotive sector** is experiencing especially severe consequences. **Neodymium, dysprosium and terbium** are critical for the high-performance permanent magnets (NdFeB) used in electric vehicle (EV) motors. Despite a decade of global efforts to diversify away from Chinese REEs and to reduce dysprosium content in magnets, dependence on China remains largely unchanged. The magnets are also essential to industries such as **wind turbines, hard drive discs, electronics, and robotics**.

What sets these controls apart from previous ones is the inclusion of **intermediate products**, specifically magnet materials that contain dysprosium and terbium. This marks a rare instance where not just raw materials, but also partially processed goods, fall under export restrictions, amplifying the challenge for downstream industries like EV manufacturing.

Many Chinese magnet exporters, suppliers, and manufacturers were caught off guard when the export controls took effect. **Exports were halted immediately**, with no grace period. There have even been reports of logistics companies facing smuggling allegations after arriving at ports too late for scheduled exports. In many cases, stockpiles of permanent magnets were only sufficient to cover a few months of production. As a result, real concerns have emerged across the industry about magnet shortages and potential delays in electric motor deliveries.

The semiconductor industry has also been impacted by China's export controls on gallium, which began in 2023.

Japanese chemical and trading companies such as Mitsubishi Chemical and subsidiaries of Dowa Holdings, which rely heavily on gallium imports from China, have voiced serious concerns about potential supply shortages. The volume of gallium secured by these firms has dropped significantly. While there is no clear evidence yet of a shortage in GaN chips, used in fast chargers, adapters, power converters, inverters, amplifiers, and power supply units, the supply situation remains fragile due to continued dependency on Chinese sources.

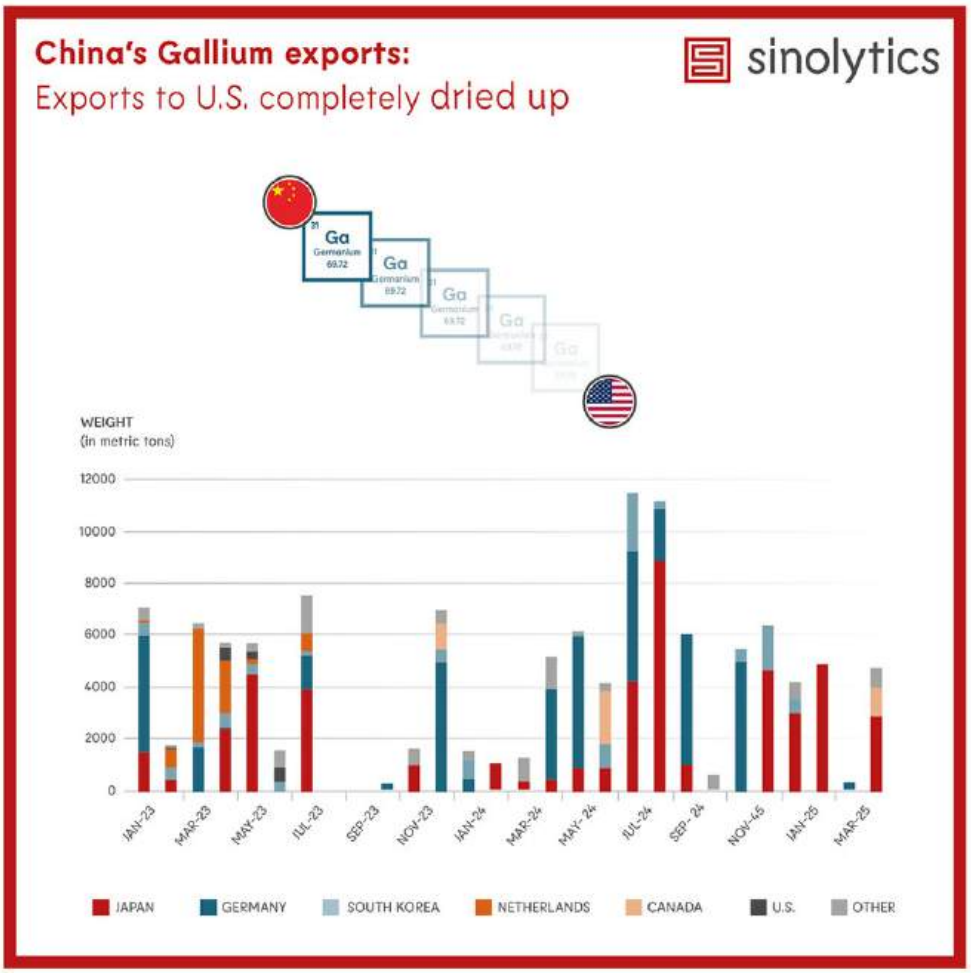
U.S. Sources Are Drying Up – But Not Completely

Export controls are a crucial tool in the bilateral dispute and trade negotiations between China and U.S. China's export controls on REE have particularly impacted the U.S., highlighting the vulnerability of American industries to China-controlled materials. Recognizing the lack of viable alternatives to Chinese supplies, this realization was one of the factors that prompted the U.S. to return to the negotiation table. However, after the negotiations in Geneva in May 2025, China chose to maintain its export controls. This decision led to retaliatory measures from the U.S., which imposed export controls on electronic design automation (EDA) software and aircraft engines, specifically targeting China's C919 aircraft program.

Export controls serve as **bargaining chips** in geopolitical negotiations; if concessions can be secured in return, they may also be lifted: China promised to ease its controls on rare earth elements (REE) for something in return. Following the talks between Xi and Trump in early June 2025, and ahead of the trade discussions in London in June 2025, China accelerated the licensing process for suppliers to three U.S.-based original equipment manufacturers (OEMs): Ford, GM, and Stellantis. In London, U.S. and Chinese delegations agreed on dropping the export controls.

Despite these licenses, which are limited to six months, and the London agreement, the **supply situation for U.S.-based customers and other countries remains tense**. Any further developments in this area will likely depend on the intensity of tensions between the U.S. and China. China is now fully aware that the REE controls remain a very powerful tool in its arsenal.

In other cases, however, China's export controls effectively amounted to **a de facto ban**. While the U.S. was never a major importer of Chinese gallium (most of the material was directed to other countries) there were still some modest imports. However, following the implementation of China's export controls in **August 2023**, all direct gallium exports to the U.S. ceased entirely (see illustration).



Source: China Customs

Unlike Germany, Japan, and South Korea—where exports resumed two to three months later under newly issued licenses, at least for a while—**U.S. gallium imports never recovered**. The same pattern applied to **antimony**: exports to the U.S. dropped to a minimum by **September 2024** and halted completely in the months that followed. This created a de facto embargo, which was formalized in **December 2024 for gallium, germanium, and antimony**.

On the other hand, China has not adopted an expansive interpretation of its export controls to the U.S. in some cases.

Rather than applying them broadly across similar materials or end-uses, it has **adhered to the specific scope** outlined in the official regulations. For example, restrictions on graphite target certain grades used in **rocket and missile applications**, but do **not extend** to all graphite products used in civilian industries. As a result, companies like **General Motors** have continued to import **synthetic graphite powder** from their Chinese supplier **Shanshan**, as they were able to import graphite under an HS Code that is not controlled by China.

Even for banned materials, imports from China may not entirely cease.

A key challenge in enforcing export controls is the possibility of **re-exports via third countries**. For example, U.S. import data shows significant volumes of **gallium** arriving from **Belgium**—a country that may act as a **transshipment hub**, importing gallium from China and then re-exporting it to the U.S.

Another significant challenge is **outright smuggling**. Given that many of these critical raw materials are exported in **very small physical volumes**, detecting illicit shipments is particularly difficult. Recognizing this risk, China's Ministry of Commerce (MOFCOM) recently convened a conference focused on **cracking down on export control circumvention**.

Widespread collateral damage

While the export controls are clearly targeted at the United States, their impact is being felt globally.

Countries and regions like Europe, South Korea, Japan, and India have reported difficulties obtaining licenses and disruptions to their supply chains. The export controls on REE introduced in April 2025 have had **drastic impacts across multiple countries and continue to do so**. It appears that China's willingness to use export controls as political leverage, or at least accept collateral damage beyond its dispute with the U.S., has notably increased in recent months.

There is enormous collateral damage to other countries, particularly through delays in export license approvals, which can significantly disrupt supply chains. The introduction of any new control typically brings exports to a halt for all countries until new licenses are issued, a process that can take several months. For example, it took approximately two to three months for gallium exports to resume. Even after exports resumed, the licensing process remained complex for everyone, in part because MOFCOM's licensing team is relatively small, leading to continued delays.

However, the implementation of REE export controls seems to be **facing a bureaucratic gridlock**, causing delays in approvals. This situation suggests a potential failure in the execution of China's export control regime. As of June 2025, the small licensing team at the Ministry of Commerce (MOFCOM) reportedly has to process tens of thousands of license applications, contributing to the bottleneck.

This bottleneck is not the same for everyone. Some **corporations with good relations to MOFCOM were able to get licenses for their suppliers**. Especially Chinese manufacturers abroad received preferential treatment. For instance, Chinese subsidiaries in Vietnam, including Tongwei, Goertek, Luxshare and Chervon did not face any supply disruptions for NdFeB magnets containing dysprosium.

In some cases, such as with REE, controls were implemented **so abruptly** that importers had **little to no time to prepare**. Companies that had not preemptively built stockpiles were caught off guard. Even without malicious intent, **the suddenness of these measures** created situations where **regular exporters risked being accused of smuggling**, simply due to procedural delays or confusion. In some cases, end-use requirements have compelled companies in Europe to disclose sensitive business information, including trade secrets and confidential engineering designs such as motor design.

Currently, the automotive OEMs and their suppliers face severe shortages of REE and permanent magnets for the manufacture of electric vehicles (see illustration).

Stockpiles at automotive OEMs and their suppliers can manage disruptions of a few months, but not more. Although licenses have been granted to some suppliers of Volkswagen, GM, Stellantis, and Ford, the situation remains very tight. Only few licenses to magnet manufacturers supplying European carmakers were granted. Many suppliers and carmakers are on the brink of stopping production at some plants, as of June 2025.

It's not just the automotive industry feeling the impact—sectors such as wind energy and machinery are also under pressure. For example, the production of **Tesla's humanoid robot, Optimus, could face disruptions**. While the machinery sector typically uses NdFeB magnets in lower-temperature applications—making the addition of dysprosium unnecessary and thus avoiding export controls—even these dysprosium-free magnets have experienced significant delays due to extensive spot checks on their material composition.

Company	Public Reaction to REE shortages
BMW	No disruption to production yet, but part of supplier network affected
Mercedes	No disruption to production yet
Volkswagen	No disruption to production yet
Ford	Shut down production of Explorer SUV for a week in May
Suzuki	Stopped production of PHEV Swift
Maruti Suzuki	No direct impact yet
Bajaj Auto	Warned shortage of magnets could impact EV production in July 2025
Clepa	Some automotive suppliers stopped production of some parts
AAI	Raised alarm over shortage of magnets
Bosch	Rare earth bottleneck is affecting its suppliers
ZF	Effect on some of its suppliers
Tesla	Production of Optimus humanoid robot is affected
Magnosphere	The whole car industry is in full panic. They are willing to pay any price.
Heraeus	Magnet recycling operating only at 1% capacity and has to close if sales do not increase

Illustration: Reports from the automotive industry and suppliers on supply disruptions (as of June 2025).

Risk of Weaponization Beyond the U.S.

In early June 2025, China has signaled to speed up license approval in a "green channel" for the EU, after a meeting between commerce minister Wang Wentao and and trade commissioner Maros Sefcovic. The key question is now whether that will lead to any tangible results. If it does, China can probably claim this is due to a protracted process. But a strong sense of dependency on China and vulnerability to Chinese policy motives will remain.

China's exact intentions remain speculative. But if the delays further persist, they can only be interpreted as a **deliberate and assertive move against economy of industrial competing powers in Europe and elsewhere**.

Any delays or restrictions of licenses could be aimed at pressuring the Dutch government to lift export restrictions on ASML's lithography machines, or at securing concessions on tariffs imposed on China-made electric vehicles.

Looking at the timing of the controls, it could also serve as pressure on the EU to not cooperate with the U.S. in excluding China from certain supply chains, as is currently negotiated in the on-going trade talks between the EU and the U.S. Alternatively, it may also reflect a broader economic strategy to undermine the competitiveness of European car manufacturers. This suggests that targeting foreign competitors or reducing exports to countries beyond the U.S. is an **intentional feature of China's export controls**. For this reason, governments and companies outside the U.S. must remain vigilant.

There is also fundamental market distortion and industrial policy at work. Given China's **dominant position** in the production of many critical raw materials, these controls have had a **significant impact on global prices**. The result is a growing **price disparity** between Chinese and international markets. For example, buyers in Europe are paying **273% more for bismuth** than their counterparts in China. **For antimony, the premium reaches 171%, and for gallium, over 160%**. These differences translate into a structural disadvantage for European manufacturers, putting them at a competitive disadvantage compared to their **Chinese peers**.

The defense industry outside the United States is also a clear target of China's export controls.

License application documents explicitly prohibit the use of REE magnets in defense-related applications. This restriction aligns with similar moves by Beijing to curb exports of other critical materials used in military technologies, such as **gallium and germanium**. Gallium and germanium imports have become much more difficult in Europe and in **March 2025**, **China's gallium exports dropped markedly, while germanium supplies were nearly depleted.**

Technology Export Controls: Keeping Chinese Manufacturing Capabilities Within China

As China advances technologically, **raw materials are no longer the only chokepoint** it controls in global value chains. Increasingly, **Chinese companies provide technologies that would be difficult to replace if China were to cut off access to foreign firms.**

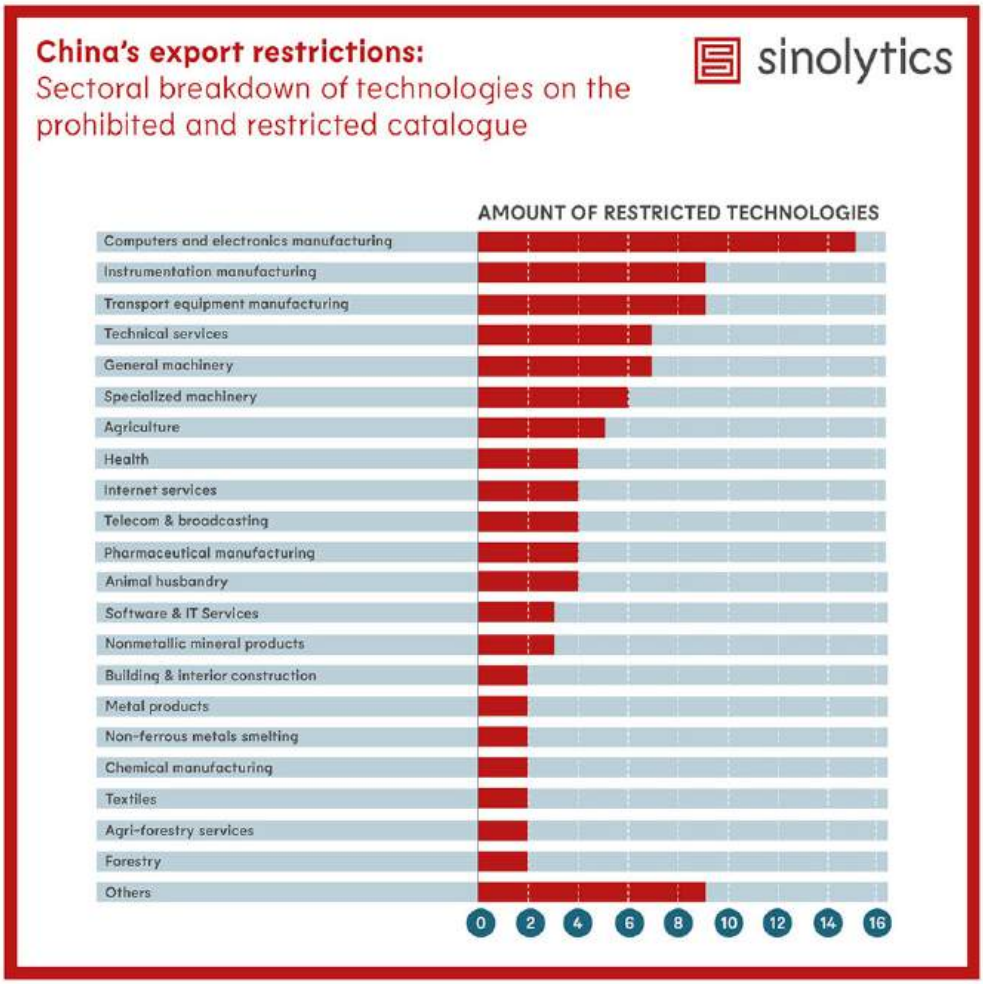
China's export controls are continually evolving to match a shifting trade and technology landscape. At the same time, officials are steadily enhancing the legal tools required to enforce restrictions on foreign companies' supply chains. One key mechanism is the set of dual-use export restrictions, which target goods with both civilian and military applications discussed above.

In parallel, however, **MOFCOM and the Ministry of Science and Technology (MOST)** maintain a separate framework: the Catalogue of Prohibited and Restricted Export Technologies (中国禁止出口限制出口技术目录). This list focuses on technologies whose export could threaten "national security, public interest, or public morality." It distinguishes between technologies that are outright prohibited from export and those that are restricted, for which export licenses may be granted.

The vague language of the regulation allows Chinese authorities significant leeway in interpreting what qualifies for inclusion, covering not just military or security concerns, but also economic considerations.

Indeed, the most recent version of the catalogue, updated in 2023, includes technologies from sectors like agriculture, forestry, and animal husbandry—areas far removed from traditional security concerns. However, the largest focus remains on **sectors critical to China's manufacturing base** (see graphic below), especially:

- Computers and electronics manufacturing, such as robot manufacturing technologies
- Instrumentation manufacturing, such as manufacturing technologies of thermal measuring instruments and meters
- Transport equipment manufacturing (rail, air, etc.), such as ship design and testing technologies



Source: Sinolytics Research, Catalogue of Prohibited and Restricted Export Technologies

These inclusions underscore Beijing's determination to keep high-value manufacturing and processing technologies within China.

This likely serves to prevent technology diffusion of Chinese manufacturing capacities as Chinese firms expand globally, thereby maintaining the country's dominant manufacturing base.

A prime example is the prohibition on exporting REE refining and processing technologies. China still controls 92% of refined rare earth output, making it indispensable in global supply chains. Restricting the export of refining technologies helps prevent the development of competing capabilities abroad. The fact that this technology is in the prohibited rather than the restricted category underscores its strategic sensitivity.

How potent China's manufacturing chokepoints can be, has been recently demonstrated by the **case of Apple's diversification strategy into India**. In a bid to keep manufacturing of iPhones within Chinese borders, Chinese government officials have reportedly restricted the export of equipment to India, where Foxconn and Apple are aiming to build up more manufacturing capacity to decrease reliance on China. Additionally, China has implemented exit bans on engineers, which would set up the equipment in India. The episode showed how difficult diversification away from China can be, especially if China continues to ramp up export controls on crucial manufacturing equipment. Reportedly, even Chinese companies such as BYD have been affected by Chinese restrictions.

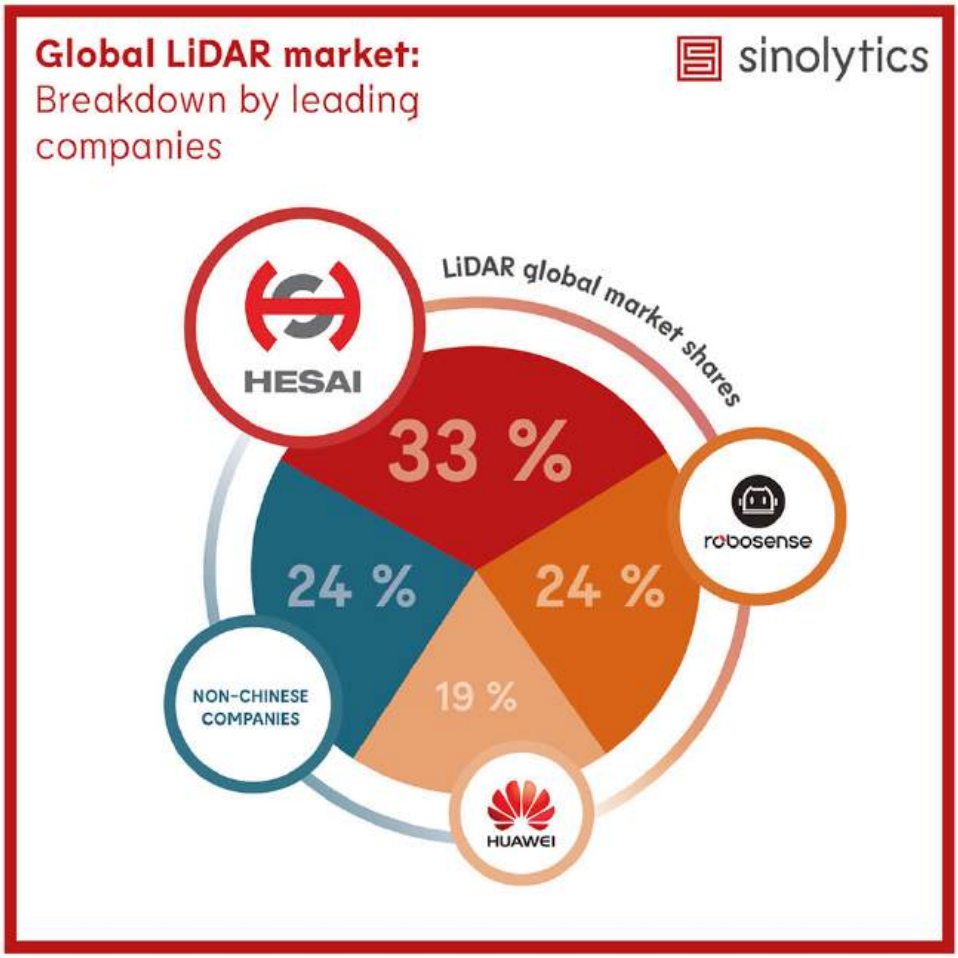
China's Technology Export Control Catalogue – A Living Document

The Catalogue of Prohibited and Restricted Export Technologies (中国禁止出口限制出口技术目录) has **undergone several revisions**, reflecting China's response to global developments. After remaining unchanged since 2008, the catalogue was substantially updated in 2020 – coinciding with the introduction of China's Export Control Law and amid deteriorating U.S.–China relations. Subsequent updates were issued in 2023, with a further draft published in January 2025.

While Chinese authorities emphasize that the number of technologies listed has declined – from 164 in 2020 to 134 in 2023 – this reduction masks important shifts in the focus of the list.

Many of the **technologies removed are "legacy" sectors** where China no longer sees strategic value, or where domestic firms have not yet achieved technological leadership. For example, the 2025 draft removes technologies for traditional Chinese building techniques. Similarly, medical diagnostic technologies were removed in 2023, reflecting the lack of Chinese international dominance and the sector's continued reliance on foreign high-tech imports.

By contrast, **newly added technologies** typically represent areas where China has attained **global leadership**. One prominent example is **LiDAR** (Light Detection and Ranging) technology. In 2023, China added this to its restricted list, recognizing the country's dominant global position: Chinese firms hold 77% of the global market, with Hesai alone controlling 33%, followed by Robosense (24%) and Huawei (19%).



Source: Hesai

The technology is important for advancements in autonomous driving, an area where Chinese companies are seeking global technology leadership. Restricting the export of advanced LiDAR technology from China in a targeted way could give Chinese automotive companies an advantage in **bringing AD quickly to market across the globe**. Additionally, if China completely restricts exports in a crisis scenario, it would have **significant implications for global supply chains of foreign automotive and industrial sectors**, providing China significant leverage.

The newest 2025 **draft** of the technology controls further tightens restrictions, now including lithium processing technologies, such as:

- LFP (Lithium Iron Phosphate) Cathode Material Preparation Technology (电池正极材料制备技术);
- LMFP (Lithium Manganese Iron Phosphate) Cathode Material Preparation Technology (池用磷酸锰铁锂制备技术);
- Phosphate Cathode Raw Material Preparation Technologies (磷酸盐正极原材料制备技术).

These lithium-related technologies represent a particularly potent chokepoint from Beijing's perspective for three reasons:

- **Monopolistic position:** Chinese companies have a monopolistic position in the global value chain, accounting for 98% of global LFP active material production.
- **Limited impact on current supply chains:** Since most lithium processing already occurs in China, restricting export of the underlying technologies won't significantly disrupt downstream industries. However, as with REE refining technologies, the major goal of export restriction is to prevent build-up of processing capacity outside of China that could diminish China's dominant position.
- **Strategic leverage:** These technologies are critical to the battery industry, a linchpin for electric vehicles and energy storage. Limiting foreign access could pressure downstream industries, such as automotive manufacturing, amplifying China's geopolitical leverage.

The analysis shows that China strategically exploits dependencies with great precision.

The objective is to identify technologies for which export restrictions will not significantly harm its own domestic economy, yet effectively **safeguard its dominant position in global markets**, especially with regards to manufacturing capabilities. This selective approach allows China to maintain leverage over critical supply chains while minimizing potential disruptions to its own industrial growth – demonstrating a calculated balance between protectionism and economic pragmatism.

Limiting Exports Through Sanction Lists

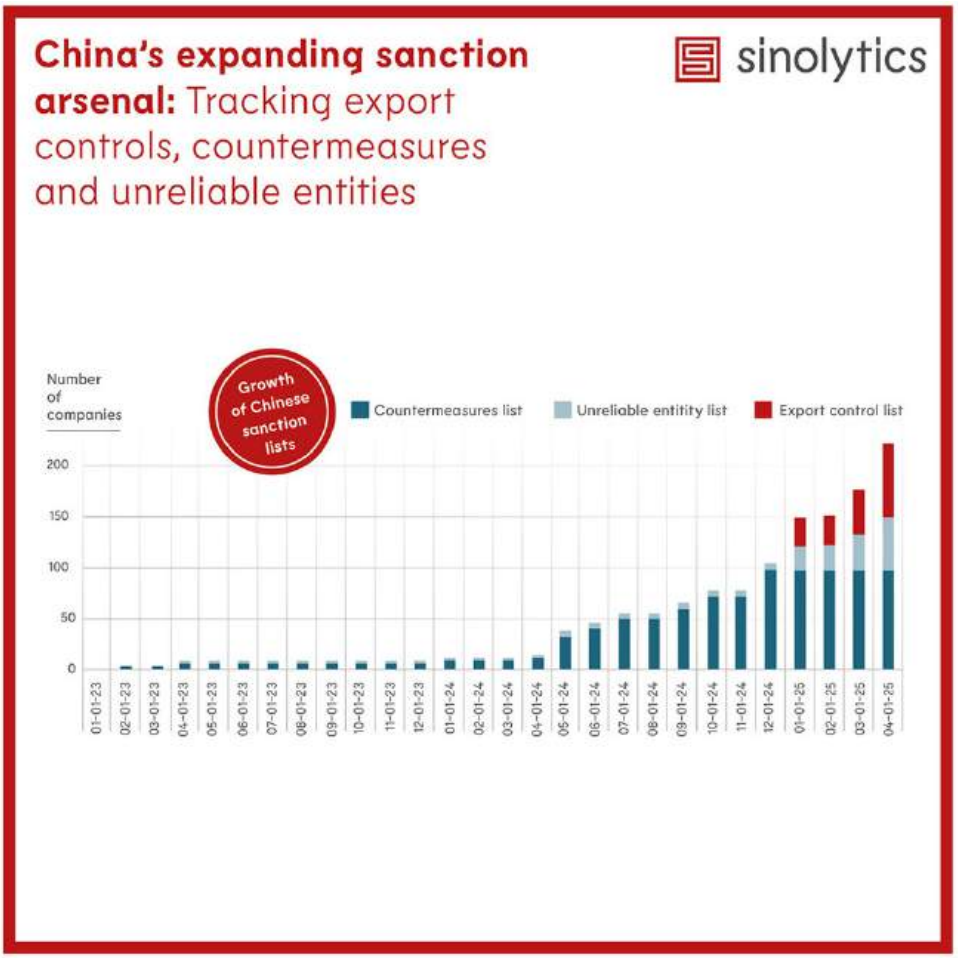
Learning from the U.S., China is also significantly expanding its sanctions regime.

China now maintains **three separate sanctions lists with different scope and targets**. The oldest one is the so-called **Unreliable Entity List** (不可靠实体清单). It was introduced in 2019 in response to the U.S. including Huawei on its Entity List and serves as the counterpart to the U.S. list. Companies included on the list are not allowed to import into or export from China, are prohibited from investing in China, and could face fines or other legal actions (e.g. personnel get visas revoked). The justification for inclusion on the list is harm to China's national security.

In 2020, China followed up with the introduction of its **Export Control Law**, under which MOFCOM maintains the Export Control List (出口管制管控名单). Entities listed are not allowed to purchase any controlled item without a special approval from MOFCOM. The scope of the list only covers dual-use goods and restricted / prohibited technologies, making it less potent than the Unreliable Entity List.

Lastly, starting in 2021 Chinese agencies started implementing the **Countermeasures List** (反制清单) under its Anti-Foreign Sanctions Law. This list is promulgated by the MFA and allows the freeze of assets within China and a prohibition of transacting with Chinese organizations and individuals. As such its scope is comparable with the Unreliable Entity List, but is targeted to mostly counter foreign sanctions.

China currently uses all three lists to exert **targeted pressure on individual companies**, rather than using broad strokes as with its general export controls. As tensions with the U.S. have ratcheted up, increasingly more companies are included in the lists (see illustration), oftentimes companies being added to several lists at once. The Unreliable Entity List, for example, has grown from two entries in early 2023 to 51 in 2025. The Countermeasures List has seen even larger growth, rising to a total of 98 listed companies since its inception in 2021. After securing an interim deal with the U.S. in April, China has also **paused sanctions on a few U.S. companies**, directly drawing a connection between these companies inclusions on the sanctions list and the ongoing tariff escalation. This has further made it clear that inclusion on these lists for companies hinges not only on their own actions, but is dependent on overall geopolitical considerations.



Source: Sinolytics Research, Unreliable Entity List, Countermeasures List, Export Control List

Even though China's use of sanctions has increased, it is still a very targeted use of these instruments.

First, **only U.S. companies** have been included on any of these lists so far. Most of these companies are included either in retaliation to U.S. sanctions or for their participation in weapons sales to Taiwan. Second, the companies included in the lists are mostly situated in the **defense or aerospace** industry, such as subsidiaries of Boeing, Raytheon or Lockheed Martin. These companies mostly did not have major footprints and imports into China anyway, minimizing the harm inflicted on Chinese companies. However, as the inclusion of Skydio mentioned in the beginning shows, the inclusion on these lists can have **major implications for the listed companies**, even if they don't sell into the Chinese market.

A notable exception to the focus on the defense sector is the inclusion of the PVH Cooperation, a luxury clothing company. The justification for the inclusion in the Unreliable Entity List is the company's **market discrimination due to dropping suppliers situated in Xinjiang** for human rights abuses. Another exception is the case of Illumina, a U.S. biotech company, which has been added to the list in a **tit-for-tat for the exclusion of Chinese biotech company BGI** from the U.S. market. The examples show that national security concerns are highly intertwined with economic and political considerations in the usage of China's sanctions regime.

China's evolving sanctions regime reflects a strategic shift toward a more structured and assertive use of economic statecraft.

By establishing three distinct sanctions lists China has created a multi-tiered framework that mirrors U.S. tools while maintaining its own legal and political logic. Although the application so far remains targeted, focusing almost exclusively on U.S. firms in sensitive sectors like defense and aerospace, it is likely that China will broaden the scope to more industries and other countries in the future. The growing use of sanctions by China to retaliate should also concern European companies. If tensions with the EU rise, companies need to brace for retaliation by the Chinese government.

What To Expect Next

China is far from finished when it comes to export controls – there remains significant **untapped and developing potential.** How aggressively China will use these tools depends on the intensity of geopolitical tensions. As seen in recent months, export controls and sanctions are increasingly becoming a **tool of tit-for-tat escalation** as with the U.S. export halt of EDA software and aircraft engines, much like tariffs before them. Chinese tools are primarily developed in response to the U.S., but as recent events have shown, China may also be willing to use them to exert pressure on the EU and other countries.

As China's innovation ecosystem matures and combines with its powerful manufacturing base, the country will also **likely gain control over more critical technologies – and could restrict their export accordingly**. Anticipating such moves will become essential for both companies and policymakers in Europe. Understanding where new dependencies might emerge – and where China is likely to assert control – will be key to ensuring resilience in global value chains.

Whether an industry becomes a candidate for export controls depends on four key factors that shape its strategic value:

- **Chokepoint Leverage:** China is likely to focus on areas where it dominates critical raw materials or technologies, allowing it to hold a decisive chokepoint in global supply chains.
- **U.S. Vulnerability:** Export measures will target sectors where the U.S. has not yet developed meaningful resilience or alternative sources, with the defense sector remaining the primary target.
- **Limited Domestic Blowback:** Beijing will avoid restrictions that would significantly harm its own high-value industries, especially those positioned for global growth and technological leadership.
- **Public and Market Impact:** Measures that trigger media attention or market disruptions — even beyond the directly affected industries — are more likely to be used, as they heighten the perceived threat and psychological impact on the U.S. and its allies.

Based on these criteria, we identify a range of possible measures, segmented into three categories (without claiming to be exhaustive). **Base case** measures are those likely to be implemented under the current level of tensions, causing limited harm to China's own industries while pressuring global technology value chains.

irst, China still has not exhausted its potential for restricting raw materials.

For example, it can add more types of REE, indium, graphite, etc. In addition, it can add other materials, such as magnesium, fluorspar, or mica sheets, where it has dominant mining capacity. Attention may also shift to materials where China's dominance is less pronounced, such as tin and zinc.

An area, where China has significant room to exert leverage due to its dominant position in the supply chain, is in r**aw materials and products for battery and energy storage**. China could restrict upstream materials and products, such as more types of synthetic graphite, as well as lithium hydroxide, lithium hexafluorophosphate and cobalt hydroxide, but also various chemicals necessary for the battery production. China could also expand its technology restrictions to **cathode and anode manufacturing** to prevent the build-up of significant manufacturing capacities for the battery sector outside China.

China may also choose to restrict the export of advanced materials and chemicals such as graphene, advanced polymers and composites, cerium and cerium oxide slurry for Chemical Mechanical Planarization (CMP), and tantalum powder for capacitors due to their **strategic importance in high-tech industries and national security**. These materials are critical for the production of semiconductors, lasers, aerospace components, and advanced electronics—sectors where technological leadership is closely tied to economic and military power.

Critical Minerals and Raw Materials **Expansion of currently controlled raw materials**	• Magnesium • Fluorspar • Mica sheets • Zinc • Tin
Battery and Energy Storage **Battery-grade and other products of synthetic graphite**	• Lithium hydroxide • Lithium hexafluorophosphate • Cobalt hydroxide • Battery Cathode and Manufacturing Technology • Chemicals (e.g. lithium hexafluorophosphate) • High-Purity Alumina
Advanced Materials and Chemicals **Graphene**	• Advanced polymers and composites • Cerium and Cerium Oxide Slurry for CMP • Yttrium aluminum garnet • Tantalum powder for capacitors

Illustration: Potential export control expansions in a base case scenario

Heightened and **extreme** scenario measures reflect options that might be considered in the context of a **significantly escalating trade conflict** with the U.S. These would entail greater costs to China's own economy and may conflict with other strategic goals, such as the global expansion of China's own national champions.

In a **heightened scenario**, we could for example see China restrict materials that would **significantly harm its own electronics industry**, which is heavily reliant on exports. Examples in this category are **inverters, sensors, electric motor components** (beyond magnets), and silicon carbide wafers. The logic would be to keep as much value-add within the country while still allowing finished end products to be exported. In this scenario, China could also restrict exports of goods that would provide high leverage but would also **entail significant international reputational damage**, such as goods and components in the biotech sector. Examples are active pharmaceutical ingredients and precursors, but also vaccines, and antibiotics and antivirals.

Another area in which China leads, but that would entail high reputational costs if China restricts it, is in the **clean energy sector.** China has built up significant capacity in manufacturing clean energy components, such as solar cell manufacturing technology, **PV glass, and inverters.** Restricting these goods would lead to significant problems in the clean energy transition of other countries and give China considerable leverage, albeit at high cost.

Lastly, China might restrict exports of **printed circuit boards** (PCBs) and copper clad **laminates**, to protect its strategic position in the global electronics industry. PCBs are foundational to all electronic devices, and China is a leading supplier. Restricting these technologies could cause significant damage in many downstream industries, but could also hurt Chinese own electronics companies.

Biotechnology	• Active Pharmaceutical Ingredients (API) and precursors • Vaccines • Antibiotics and antivirals • Gene Sequences • CRISPR Gene Editing Tools • Medical imaging isotopes
Clean Energy and Power Electronics	• Solar cell manufacturing technology • Photovoltaic glass • Inverter • Electric motor components
Electronics components	• Printed Circuit Boards and copper clad laminate • Tellurium Cadmium Crystals • Drone components • Silicon Carbide Wafers • Sensors
Emerging Technologies	• Components for quantum computing components

Illustration: Potential export control expansions in a heightened scenario

In an **extreme scenario**, in which China would basically enforce a decoupling from the Western hemisphere, it could also restrict the export of technology in which Chinese companies have become technology leaders. We believe that as a last resort, China might fall back on prohibiting exports of **battery cells and modules** – basically disrupting global expansion plans by CATL – as well as drones – significantly hurting DJI and others (Drone exports are currently restricted, but can still flow with export licenses). Furthermore, China could decide to also restrict global companies access to China's manufacturing capacities in extremely sensitive areas, such as **legacy chip manufacturing, semiconductor backend manufacturing, or smartphone / electronics manufacturing**. These measures would be nuclear options, hurting Chinese companies as much as foreign ones and would lead to a de facto decoupling

Electric Vehicles and Battery Supply Chain	• Battery cells and modules • Electric vehicle platforms/components
Electronics and Consumer Devices	• Smartphone parts • Electronic products across the board • Fiber optic components
Industrial and Automation Systems	• Industrial automation systems
Defense and Surveillance Technologies	• Drones
Semiconductor Supply Chain	• Semiconductors assembled and packaged in China • Legacy chip (>28nm) manufacturing capacity

Illustration: Potential export control expansions in an extreme scenario

Strategic Supply Chain Resilience

Mitigating the impact of export controls and strengthening the resilience of supply chains is a **critical challenge shared by both corporations and governments**. In the current environment, many responses are reactive—focused on **short-term fixes to secure immediate access to critical inputs**. However, effective action also demands a long-term strategy to insulate supply chains from geopolitical risk. Developing such strategies is inherently complex and must be tailored to the specific circumstances of each company and government. Nonetheless, several general principles can help guide this process:

Corporations Are at the Frontline of Chinese Usage of Export Controls

In today's increasingly tense geopolitical climate, companies must be **proactive in managing their exposure to potential disruptions**, including those stemming from Chinese export controls. These controls can be sudden and far-reaching, affecting not only direct suppliers but also the deeper layers of global supply chains. To prepare effectively, businesses need a **structured and strategic approach** to identifying and mitigating these risks.

The first step is to gain a **clear understanding of your company's dependencies on China**. This means **going beyond the surface level of tier-1 suppliers and mapping out the full supply chain**, including sub-tier suppliers that may not be immediately visible. Many critical inputs—such as REE, specialty chemicals, or electronic components—are often sourced indirectly from China, even when the immediate supplier is located elsewhere. Without this visibility, companies risk being blindsided by disruptions that originate deep within their supply networks. **Once these dependencies are identified, it is essential to adopt a geopolitical mindset**. Building resilience in the supply chain often involves **additional costs**. While these measures may seem inefficient from a traditional cost-optimization perspective, they are in fact strategic investments and like an insurance premium. When disruptions occur, resilient supply chains can prevent production halts, revenue losses, and reputational damage.

However, resilience cannot be built everywhere at once. Attempting to overhaul the entire supply chain simultaneously would be prohibitively expensive and operationally overwhelming. Instead, **companies should focus their efforts on the most critical areas** – those where a disruption would have the most severe impact on operations, customer commitments, or regulatory compliance. Prioritization should be based on a combination of factors, including the level of dependency on risk countries, the availability of alternatives, and the potential economic consequences of a supply interruption.

A key component of this targeted approach is **geopolitical inventory management.** Traditional just-in-time models, while efficient under stable conditions, leave companies vulnerable in times of crisis. Inventories are a common tool for managing supply chain disruptions, but they are often built in response to market-driven factors, with geopolitical risks still playing a limited role in inventory planning. For high-risk materials, it is advisable to maintain buffer inventories that cover at least three to six months of supply. This provides a crucial cushion against sudden export restrictions or logistical bottlenecks, especially for inputs that are difficult to source elsewhere or require long lead times.

In parallel, companies should **actively diversify their sources of supply.** This means not only identifying additional suppliers in other countries but also ensuring that these alternatives do not rely on the same Chinese sub-suppliers. A superficial action at the tier-1 level may not eliminate the underlying risk if the deeper supply chain remains unchanged. A thorough risk assessment should therefore include sub-tier mapping and verification of the entire supply chain's resilience.

Ultimately, what is needed is a continuous monitoring and update of risk categories emanating from Chinese export controls. Identifying threats from changing geopolitical realities will distinguish successful companies from the rest to anticipate and prepare for imminent risks.

Public Actors, Especially the EU, Need to Play a Supporting Role

In light of China's expanding use of export controls and sanctions, the European Union should adopt a clear and strategic approach to safeguard its economic and geopolitical interests. As global supply chains become more politicized, the EU cannot afford to remain reactive or fragmented in its response. We see two primary layers for the EU to respond to Chinese export controls – **deterrence and cooperation.**

The EU has begun **developing tools to counter economic pressure**, such as the Anti-Coercion Instrument. However, export controls remain largely under national control and lack integration into a broader EU strategy. While avoiding an uncontrolled escalation is crucial – especially given the tit-for-tat dynamic between the U.S. and China – the EU must be ready to respond decisively to any expansion of Chinese restrictions and export controls. A firm, but measured approach is essential to deter future pressure.

A key element of this strategy should be the **identification of strategic chokepoints** – areas where the EU holds significant leverage in global supply chains. These chokepoints should be selected carefully to maximize geopolitical impact while minimizing collateral damage to European industries and consumers. This requires a nuanced understanding of both the EU's strengths and the vulnerabilities of its trading partners.

Finally, the EU must communicate its actions with **clarity and purpose**. It should be made explicitly clear that any restrictive measures are direct responses to China's efforts to build economic leverage and are intended to restore balance, not provoke confrontation. Transparent and principled communication will help maintain international support and reduce the risk of misinterpretation or escalation.

While deterrence is important, it is equally important to engage China constructively on its use of export controls. A central priority should be to demand that China **refrain from further expanding its controls**. In parallel, the EU should seek assurances that existing export controls will not be used discriminatorily against European companies. This includes pushing for greater transparency in China's export licensing process, such as regular reporting on the number and scope of licenses issued. Transparency would help reduce uncertainty for EU businesses and foster a more predictable trade environment.

To further ease trade frictions, the EU should advocate for **simplified licensing mechanisms for European customers**. This could include one-time licenses – which would apply to a specific customer or product without repeated applications – or even general licenses that automatically cover all EU countries. These mechanisms would reduce administrative burdens on China's side and signal goodwill in maintaining open trade channels.

Finally, beyond reactive measures, the EU's efforts to become less vulnerable will require the **emergence of European mining champions** – well-capitalized firms capable of investing internationally, building integrated supply chains, and driving innovation. Without such players, Europe will struggle to compete with state-backed enterprises from other regions and will remain dependent on external sources for critical input.

Annex: Industries Affected by Chinese Export Controls
(only selected items)

Controlled Item	Auto	Chemicals	Data Center	Defense / Aerospace	Energy	Electronics	Machinery	Medical Devices / Goods	Metallurgy	Pharmaceuticals	Semiconductors	Telecommunication
Gallium												
Gallium Nitride	✓		✓	✓	✓	✓		✓			✓	✓
Gallium Arsenide	✓		✓	✓	✓	✓		✓			✓	✓
Indium Gallium Arsenide	✓		✓	✓		✓		✓			✓	✓
Germanium												
Germanium Dioxide		✓	✓	✓	✓	✓					✓	✓
Germanium Tetrachloride			✓	✓							✓	✓
Graphite												
Synthetic Graphite*	✓		✓	✓					✓		✓	
Natural flake graphite	✓		✓	✓					✓		✓	
Antimony												
Antimony Metal				✓		✓					✓	
Trimethylantimony		✓		✓						✓	✓	
Indium Antimony				✓		✓						
Tungsten												
Ammonium Paratungstate		✓		✓					✓			
Tungsten Oxide	✓	✓		✓		✓					✓	
Tungsten Carbide				✓			✓					
Tungsten Alloy				✓				✓				
Tungsten Nickel Iron				✓			✓	✓				
Tellurium												
Cadmium Telluride				✓	✓	✓						
Zinc Cadmium Telluride				✓				✓				
Mercury Cadmium Telluride				✓								
Bismuth												
Bismuth Metal				✓					✓	✓	✓	
Bismuth Germanate				✓				✓				
Triphenylbismuth		✓								✓		
Molybdenum												
Molybdenum Powder				✓	✓	✓			✓			
Indium												

Annex: Industries Affected by Chinese Export Controls

(only selected items)

Controlled Item	Auto	Chemicals	Data Center	Defense / Aerospace	Energy	Electronics	Machinery	Medical Devices / Goods	Metallurgy	Pharmaceuticals	Semiconductors	Telecommunication
Indium Phosphide	✓	✓		✓	✓						✓	✓
Trimethylindium				✓	✓	✓					✓	
Triethylindium				✓							✓	
Samarium												
Samarium Cobalt				✓			✓	✓				
Samarium Ferroallay				✓			✓					
Gadolinium												
Gadolinium Metal				✓				✓				
Gadolinium Oxide		✓		✓				✓				
Gadolinium-Aluminium	✓			✓								
Terbium												
Terbium Metal	✓		✓	✓		✓						
Terbium Cobalt	✓			✓		✓						
Terbium Oxide				✓	✓	✓						
Dysprosium												
Dysprosium Metal	✓		✓	✓	✓	✓						
Dysprosium Oxide						✓						
Lutetium												
Lutetium Metal		✓		✓		✓		✓				
Scandium												
Scandium Aluminum				✓								
Scandium Magnesium				✓								
Yttrium												
Yttrium Metal				✓		✓			✓			
Yttrium-Nickel				✓	✓							
Yttrium-Aluminum				✓		✓						

*Specifications are defined in a way synthetic graphite for automotive battery anode material is often not controlled and less affected

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