

## China's Export Control Architecture and Its Use of Critical Minerals as Strategic Pressure Points

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### Highlights

- **Since 2020, China has unified its scattered export rules into a single system, centered on the Export Control Law (ECL) and 2024 dual-use regulations.**
- **China gains leverage through its control of rare-earth and critical-mineral refining, which accounts for 70 percent of global capacity, plus targeted rules reaching beyond its borders**
- **These measures have disrupted manufacturers, spurred foreign stockpiling and new suppliers, and given China a flexible tool to adjust pressure for diplomatic goals.**

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## 1. Introduction

Over the past several years, China has turned export control from a relatively fragmented administrative function into a central instrument of national-security policy. As strategic competition with the United States widened from tariffs to semiconductors, critical minerals, and industrial technology, China's control over rare-earth processing and other upstream material bottlenecks became an increasingly important source of geopolitical leverage.

This note examines how that authority has been constructed and deployed. The comparison to the U.S. Foreign Direct Product Rule (FDPR) is useful, but only up to a point. The FDPR projects jurisdiction through dependence on upstream semiconductor design tools and manufacturing equipment. China's regime projects leverage through a different part of the production stack: control over critical materials, processing know-how, and the licensing systems that govern their export. The legal structure now includes some origin-based and extraterritorial features, but China's system remains narrower and more administrative than a full U.S.-style direct-product regime.

The note proceeds in three parts. The first describes the legal architecture of China's export-control framework and the mechanism through which it reaches beyond the border. The second traces policy evolution from the 2020 Export Control Law through the rare-earth measures of 2025 and their calibration in late 2025 and early 2026. The third reviews economic effects on downstream manufacturers, trade flows, and the global push to diversify away from Chinese mineral chokepoints. For clarity, the note distinguishes rare earths from the broader category of critical minerals and related dual-use materials (civilian and military applications), even though they are often grouped together in strategic discussions.

## 2. China's Export-Control Framework: Adaptation and Emerging Extraterritoriality

China's modern export control framework is anchored in the Export Control Law (ECL), adopted in October 2020 and effective that December. The ECL establishes a general statutory foundation for regulating dual-use items, military products, nuclear materials, and other goods, technologies, and services tied to national security or non-proliferation concerns. The 2024 Regulations on the Export Control of dual-use Items subsequently consolidated and standardized the dual use side of the system, clarifying licensing procedures, supervisory authorities, control list administration, and enforcement practices.

As a matter of legal design, the system relies on three principal tools. The first is the control list, which identifies the goods, technologies, and services that require a license for export. The second is temporary control, which allows authorities to impose time-limited restrictions on items not yet formally listed but considered sensitive. The third is catch-all control, which requires exporters to seek authorization for non-listed items when they know, should know, or are formally notified that a transaction may threaten national security, contribute to weapons proliferation, support terrorism, or involve prohibited military end uses.

The closest analogue to the U.S. Foreign Direct Product Rule appears in Article 49 of the 2024 dual-use regulation. The provision authorizes the Ministry of Commerce, in defined circumstances, to require compliance for three types of items located outside China. The first category covers Chinese-origin dual-use items that have been exported and are now abroad. The second includes foreign-made items that contain designated Chinese-origin dual-use inputs. The third covers foreign-made items manufactured using designated Chinese-origin technologies or other dual-use inputs. Together, these categories create a legal basis for extending China's export-control requirements beyond its borders, but only for items and situations that authorities explicitly identify through administrative action. The ECL provided the statutory foundation for this structure, but the clearest FDPR-like authority is the Article 49 mechanism in the 2024 regulation and its October 2025 activation for selected rare-earth items and technologies.

Operationally, the system functions through export licensing, end-user and end-use review, customs enforcement, and catalog-based controls on technology transfer. For dual-use goods, exporters must determine whether an item appears on the control list and whether a proposed transaction raises end-user or end-use concerns. For technology, authorities can also rely on the Catalogue of Technologies Prohibited and Restricted from Export. Additional instruments—such as the Unreliable Entity List and China's anti-sanctions measures—can increase compliance risk for foreign firms, but these operate alongside the export-control regime rather than serving as direct counterparts to the U.S. Entity List.

This distinction is important when comparing China's system to the U.S. Foreign Direct Product Rule. The FDPR is enforced primarily through technological dependence at the design and fabrication stages of semiconductor production, reinforced by coordination with allied governments and by financial and supply-chain self-policing. China's approach remains more administrative and grounded in control over physical resources. Its most effective coercive tools are customs licensing, state oversight of major producers, and the concentration of refining and magnet-making capacity within China. In practical terms, China's leverage stems less from a broad doctrine of automatic extraterritorial jurisdiction and more from the fact that many downstream manufacturers still cannot readily replace Chinese inputs.

### 3. China's Export Policy Evolution

Table 1 traces the evolution of China's export controls. The current framework emerged gradually, building on lessons from earlier failures. Before 2020, mineral and technology restrictions were scattered across outdated rules and sector-specific lists, creating an inconsistent system vulnerable to international challenge. The 2010s showed the limits of China's quota-based approach. The 2010 rare-earth export crisis triggered global backlash, and the 2014 World Trade Organization (WTO) ruling found China's quotas discriminatory, forcing their elimination. These experiences proved that broad quotas were diplomatically expensive and legally weak. This led China to build a more durable foundation: a national security-based legal system that was both defensible internationally and flexible for strategic use. The 2020 Export Control Law marked this shift from ad hoc measures to a unified, statute-backed framework.

**Table 1: China's Rare Earth and Critical Mineral Export Control Policy — A Chronology (2020–2026)**

Phase	Date	Policy Action
Phase 1 Legal Foundation	December 2020 January 2021	China's Export Control Law (ECL) came into force in December 2020, consolidating export-control authority under the Ministry of Commerce (MOFCOM) and introducing an explicit extraterritorial dimension — allowing China to regulate foreign-made products incorporating Chinese-origin inputs. In January 2021, the Ministry of Industry and Information Technology (MIIT) issued draft Regulations on Rare Earth Management covering the entire rare-earth element (REE) supply chain, proposing strategic reserves, supply-chain tracking, and a prohibition on foreign investment in REE exploration, mining, and processing.
Phase 2 First Wave: Operational Benchmarks	July 2023 October 2023	July 3, 2023: Licensing requirements introduced for gallium and germanium — key semiconductor materials for radar, satellite, and 5G components — of which China produces approximately 98 percent of the world's refined supply. Beyond restricting access, the controls enabled MOFCOM to map sensitive technology flows by monitoring buyers, volumes, and end uses. August 1, 2023: The rules took effect. October 20, 2023: Controls extended

Phase	Date	Policy Action
		to high-purity graphite, the key material for EV battery anodes, extending China's leverage from semiconductors into the broader electrification supply chain.
Phase 3 Second Wave: Locking the Upstream	December 2023 August 2024	December 21, 2023: China banned the export of technology for rare earth extraction, separation, and smelting — the core processing know-how required to transform mined ore into usable materials. The move extended leverage beyond the minerals themselves to the knowledge that makes global rare earth production possible, mirroring the logic of U.S. restrictions on semiconductor manufacturing equipment. August 15, 2024: Export limits imposed on antimony, a material used in ammunition, infrared sensors, and flame retardants. Chinese antimony exports subsequently fell by approximately 97 percent and global prices for antimony trioxide roughly doubled, demonstrating the precision of export licensing as a pressure tool.
Phase 4 Escalation: Seven Heavy REEs and the 0.1 percent Rule	December 2024 April 2025 October 2025	December 3, 2024: China issued a directive prohibiting, in principle, exports of gallium, germanium, antimony, and superhard materials to the United States, escalating earlier licensing requirements into an outright prohibition for the U.S. market. April 4, 2025: Seven medium and heavy rare earths — including terbium, dysprosium, samarium, gadolinium, lutetium, scandium, and yttrium — added to the export control list. These elements are essential for high-temperature permanent magnets used in wind turbines, advanced motors, and defense systems. October 9, 2025: China introduced its most comprehensive restrictions to date, modelled explicitly on the U.S. FDPR. Any foreign-made product reportedly containing 0.1 percent or more of Chinese-origin rare earths, or manufactured using Chinese processing technologies, now requires a license — extending Chinese regulatory authority across global supply chains. Technology transfer restrictions, including intellectual property (IP) licensing and technical exchanges, were also added.

Phase	Date	Policy Action
Phase 5 Temporary Pause	October 2025 (suspended until Nov. 2026)	On September 29, the Bureau of Industry and Security (BIS) published the Affiliates Rule; ten days later China responded with six coordinated MOFCOM announcements. Both sides pulled back at the APEC summit in Busan (October 30, 2025), and over the following ten days formalized a mutual stand-down: China suspended its October 9 measures until November 2026, and the BIS suspended the Affiliates Rule for the same period. The exchange constitutes the clearest expression to date of mutual recognition of escalation risks: both sides acknowledging the destructive potential of their respective instruments and agreeing to temporary mutual restraint.
Phase 6 New Supply Chain Security Rules	January 2026 April 2026 (extended)	January 1, 2026: The updated Export Licensing Catalogue added controls on rare-earth compounds (samarium, gadolinium, lutetium), silver, and additional materials; extraterritorial enforcement under the October 2025 measures remained delayed until November 2026. March 31, 2026: State Council Order No. 834 promulgated the Provisions on the Security of Industrial and Supply Chains — China's first dedicated supply-chain security framework. The Provisions integrate export controls, countermeasures, data security obligations, and investment screening under a unified national security mandate, creating whole-of-firm compliance obligations for all entities operating within China's jurisdiction.

By 2023, this legal foundation translated into the first modern mineral controls. Licensing requirements for gallium, germanium, and later graphite converted China's upstream market position into a formal end-user and end-use screening mechanism. These measures signaled a move away from blunt quotas toward a system that could selectively slow, condition, or deny access to critical inputs.

In late 2023 and 2024, China expanded from materials to process know-how. Revisions to the technology-export catalogue restricted rare-earth extraction, separation, and magnet-manufacturing technologies, and new controls on antimony and superhard materials widened the perimeter. By

December 2024, China applied explicit pressure to the United States by barring exports of several controlled minerals and tightening scrutiny of graphite shipments. This phase marked the point at which China began using its new legal architecture to target specific foreign jurisdictions.

The April 2025 measures elevated rare earths into China's primary coercive instrument. Adding seven medium and heavy rare-earth elements to the dual-use control list shifted the chokepoint from raw-material trade to deep industrial dependencies in magnet production and advanced manufacturing. Licensing delays quickly exposed the vulnerability of automakers, aerospace firms, chip producers, and defense contractors to disruptions in Chinese processing capacity.

The October 2025 package represented China's first experiment with extraterritorial reach. New controls on additional rare earths, mining and refining equipment, and rare-earth-related technologies were paired with Announcement 61, which applied Article 49 to certain foreign-made items containing Chinese inputs or produced using Chinese technology. Announcement 62 broadened the definition of technology transfer to include licensing, investment, joint research, and employment. These measures were the closest China has come to adopting mechanisms analogous to U.S. *de minimis* (exempting foreign products below content thresholds) and direct-product rules, though they remained narrowly scoped rather than forming a comprehensive extraterritorial regime.<sup>2</sup>

The Trump–Xi de-escalation package in October 2025 produced the sequence's most consequential adjustment: China suspended the October rare-earth measures for one year while leaving the April controls and the broader licensing architecture fully intact. This selective pause underscored that China's system could be recalibrated without weakening its structural foundations. In early 2026, Beijing redirected elements of the dual-use framework toward Japan, prohibiting exports to Japanese military users and tightening scrutiny of third-country transfers. Even during periods of nominal *détente*—such as the May–August 2025 tariff truce—China's rare-earth licensing continued to disrupt U.S. manufacturers, demonstrating that the system's coercive levers retained operational bite despite diplomatic fluctuations.

The March 2026 Provisions on the Security of Industrial and Supply Chains (State Council Order No. 834, issued March 31) represent the framework's capstone evolution. By elevating supply-chain security to a national security imperative, these Provisions unify export controls, investment screening, data security, and counter-sanctions within a single legal regime. For foreign firms, this integration means export-control

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<sup>2</sup> The U.S. *de minimis* rule under the Export Administration Regulations (EAR) deems foreign-made items with less than 25 percent U.S.-origin content as non-U.S.-origin, exempting them from most licensing requirements. In contrast, China's Announcement 61 applies a far stricter 0.1 percent threshold to rare-earth content in certain foreign-made items (MOFCOM, 2025).

compliance now intertwines with cybersecurity and procurement strategies—transforming supply-chain security into a holistic, firm-wide obligation that spans subsidiaries, partners, and upstream suppliers.

The Provisions complete China's architectural buildout since 2020: the ECL provided statutory bedrock; successive mineral and technology controls—e.g., 2026 licensing expansions—converted upstream dominance into targeted leverage; and the Provisions now deliver seamless coordination across tools and domains. The outcome is a regime optimized not for isolated commodity shocks but for adaptive, multi-domain escalation, where future export restrictions can operate within an expansive supply-chain security envelope.

#### 4. Economic Effects

The economic impact of China's controls differs widely across minerals and across the stages of production they touch. Early actions on gallium, germanium, graphite, and antimony tightened supply and pushed prices up, but they did not stop trade outright. Importers could still draw on inventories, reroute shipments, or look for alternative suppliers. Even so, the disruptions were real. U.S. Geological Survey reporting indicates that China's 2024 antimony announcement was followed by a near doubling of global prices, and graphite shipments slowed in early 2024 as exporters waited for licenses. After China's December 2024 ban on shipments of gallium, germanium, and antimony to the United States, some buyers reportedly shifted purchases through intermediaries. More precise figures underscore the scale of the effect: Chinese antimony exports fell by roughly 97 percent after the August 2024 restrictions, while global prices surged approximately 200 percent (effectively tripling). Enforcement at the border also tightened, with reported rare-earth-related customs cases rising from 91 to 317 in 2025.

Rare earths produced a far stronger impact because China dominates the stages of the chain where alternatives are scarcest — especially processing and magnet manufacturing. China's April 2025 controls on medium and heavy rare earths and on rare-earth magnets disrupted supply lines for automakers, aerospace firms, semiconductor manufacturers, and defense contractors. By June 2025, firms were warning that the licensing system could trigger production delays and temporary shutdowns. Evidence available by late 2025 showed that the pressure came not only from the existence of licensing, but from the combination of shipment-level review, unclear documentation requirements, and the simple fact that China's processing capacity dwarfs that of any other producer.

The costs were not confined to foreign firms. Chinese exporters faced heavier compliance demands as well. Publicly posted enquiries to the Ministry of Commerce rose sharply in 2025, and exporters reported

unclear classifications, longer review periods, and delayed shipments. By November 2025, Reuters reported that only slightly more than half of roughly 2,000 export-license applications filed by European Union firms had been approved. In this respect, China's system resembles the FDPR in one important way: it can impose meaningful pressure abroad, but it also creates adjustment costs at home.

China's restrictions also reshaped behavior across allied economies. Governments and firms accelerated stockpiling, diversified suppliers, signed new offtake agreements, and expanded state-backed investment in non-Chinese refining and magnet-manufacturing capacity. These efforts will take years to mature, but they are already visible in industrial-policy programs, long-term purchasing commitments, and new capital spending across the United States, Australia, Canada, Europe, and Japan. As with the FDPR, leverage at a critical production stage pushes affected countries to build redundancy. The difference is that China's position is unusually hard to replicate: it rests not only on ore access, but also on processing know-how, environmental tolerance for refining, economies of scale, and an integrated magnet-manufacturing ecosystem that competitors have not yet matched.

Historical evidence underscores the difficulty of substitution. Alfaro et al. (2025) find that China's 2010 rare-earth shock triggered a surge in global REE-related patenting and expanded downstream production outside China, but innovation did not close the gap quickly. Howard and Underwood (2024), using confidential U.S. Census firm-level data, estimate that switching costs for critical-mineral suppliers run into billions of dollars per firm, with decoupling simulations projecting first-year operating-profit losses of 15–50 percent. CFR (2026) reaches a similar conclusion: meaningful processing independence requires sustained investment at a scale not yet fully mobilized, implying a long-term effort rather than a short adjustment cycle.

Firm-level financial evidence remains limited. Existing research is stronger on shipment delays, price movements, licensing bottlenecks, and policy responses than on balance-sheet outcomes, which require more time to observe. Even so, a consistent pattern is emerging: when China controls a key processing stage, licensing authority can quickly translate into operational disruption abroad and bargaining leverage for Beijing.

The enforcement model differs from the U.S. approach. U.S. implementation of the FDPR relies on control over essential design tools: firms worldwide need continuous licensed access to a small set of U.S. EDA providers, giving Washington visibility and leverage before production begins. China's system relies on restricting physical supply, backed by its near-monopoly in processing. Because refining occurs on Chinese

soil, border control is usually enough. Once materials leave China, however, they are difficult to trace — rare earths become indistinguishable once processed or alloyed. The United States reinforces its enforcement through the global dollar-clearing system, which provides insight into cross-border transactions that China's renminbi-based infrastructure, including cross-border interbank payment system (CIPS) and the digital yuan, cannot yet match. The gap is real but not fixed: Beijing's investments in alternative payment systems and traceability tools are aimed at narrowing it.

### 5. Conclusions

China's export-control regime has evolved from fragmented commodity rules into a unified national security instrument. The 2020 Export Control Law, 2024 dual-use regulations, rare-earth administration rules, and technology-export catalogue now form an integrated system that can be activated, adjusted, or redirected with minimal lead time.

China's framework serves as a strategic counterpart to the U.S. FDPR, though the mechanisms differ fundamentally. The FDPR extends jurisdiction through global dependence on U.S. semiconductor design tools. China leverages dominance in rare-earth processing, magnet production, and related technologies. China's newer extraterritorial provisions (Article 49) are significant but remain more narrowly targeted than the U.S. direct-product model. The systems produce similar coercive effects through different production stages.

The regime's value lies in its durability and flexibility. China can intensify, delay, suspend, or redirect controls without altering underlying legal authority. The late-2025 Busan pause suspended October measures but preserved April rare-earth controls and core licensing infrastructure — demonstrating restraint rather than retreat. The early-2026 measures reinforce this pattern: the January catalogue expansion added rare-earth compounds and other materials to the control list, and State Council Order No. 834 integrated export controls, countermeasures, and data security obligations into a unified supply-chain security framework — expanding the regime's scope even while extraterritorial enforcement remained suspended.

China's enforcement faces structural limits relative to the United States. While the FDPR polices design-stage access through continuous EDA software licensing and dollar-clearing visibility, China must rely on licensing discretion for physical supply—yet struggles with post-export traceability. Beijing is investing in CIPS, digital yuan, and materials tracking to close this gap.

The 2025 mutual suspension marked reciprocal recognition of escalation risks, not resolution. Controls remain active and retaliatory capacity persists. Order No. 834 signals that China is now building the institutional architecture to operate across multiple regulatory domains simultaneously — export controls, data governance, and counter-sanctions — rather than relying on restrictions over individual materials alone. Meaningful non-Chinese rare-earth processing capacity remains a decade away by most estimates. Until alternatives scale, the current equilibrium of mutual restraint is likely to hold, with selective pressure more probable than full escalation

### AI Disclosure

The authors used large language models (LLMs)—including ChatGPT, Claude, Gemini, Copilot, and Perplexity— to assist in language editing and summarizing notes under human supervision. The authors take full responsibility for the content.

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