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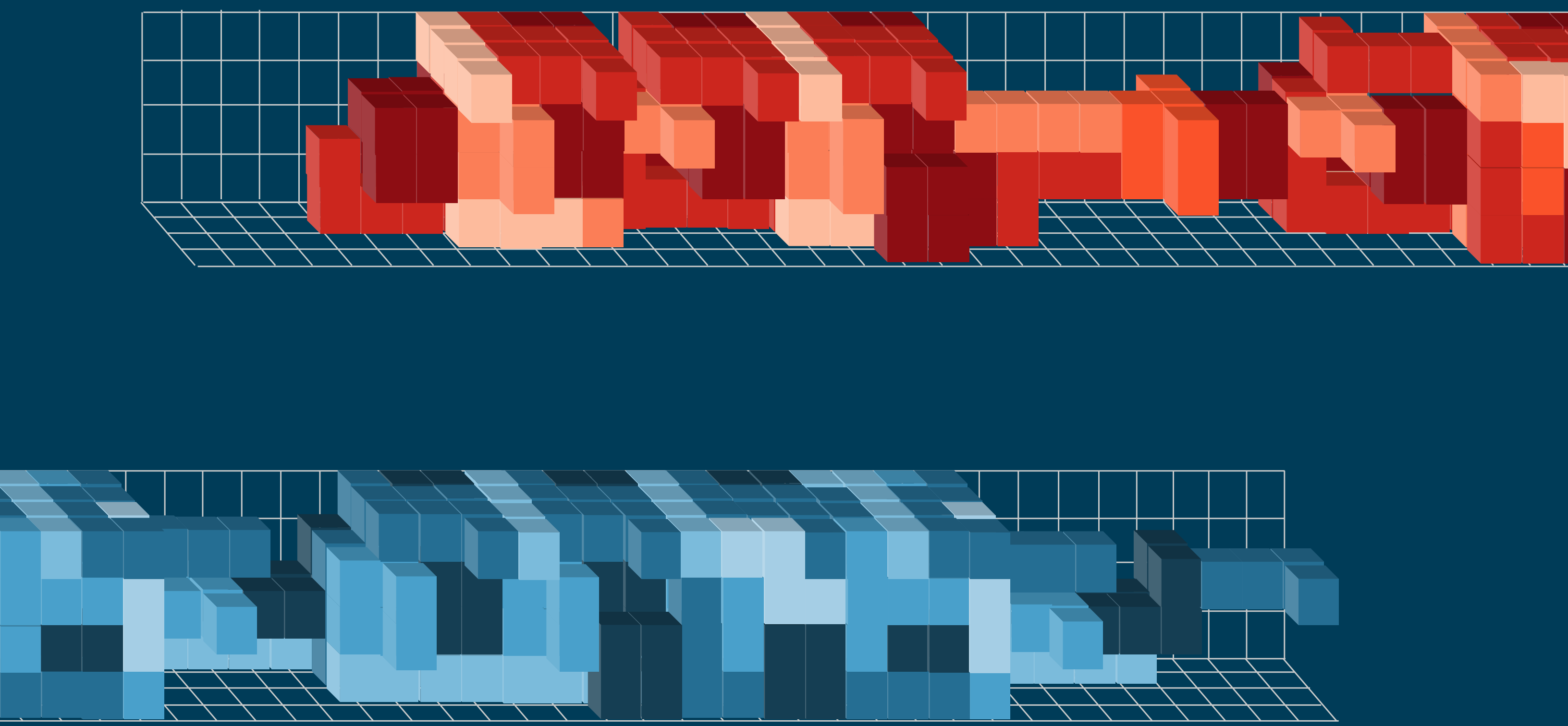
# Fighting Hubris in AI Strategy

## A Layer-by-Layer Dissection of AI Tech Stack Competition



# Contents

## Executive summary

**It's time to break out of AI policy myopia.** We are in a century-defining AI infrastructure buildout, as well as a mad dash to secure the energy and critical inputs to feed it. Policy attention has fixated on the layers everyone can see today: chips, cloud, and AI models. But that mental map is too narrow when we start to envision what parts of the stack will commoditize, where durable value will accrue, where China is quietly positioning lower down in the stack, and where market dynamics either reinforce or clash with tech sovereignty ambitions.

**China is competing on a different axis, with focus on AI deployment.** In recognition of its own constraints, due in large part to US export controls, China has focused on deploying and diffusing cheap, near-frontier open-weight models to deliver both cost-efficient AI capabilities and tech sovereignty. Paired with its footholds in wireless networking and device manufacturing, and a playbook to globalize standards that play to those strengths, China is positioned as the default infrastructure supplier for physical AI and connected industries—especially across aspiring manufacturing hubs in the Global South.

**China also has the means to short circuit US and partner AI ambitions**. Its chokehold over critical raw materials and intermediate inputs including magnets and batteries strikes at the manufacturing supply chains behind the emerging intelligent device economy, from industrial robots to humanoids to autonomous vehicles. As China consolidates its role as the assembly hub for physical AI, it could spawn a new generation of upstream dependencies for the US and other key markets, all while its own localization policies steadily push foreign suppliers out of its own market.

**But China's dependence on global markets is also the opening for a trusted tech coalition to emerge.** China creates value beyond the model layer only if it can access global markets. The development of hyperconnected AI systems in the 6G era—sensors, edge devices, and models wired into critical infrastructure—vastly expands the surface area for adversarial attack, making cyber and data exposure an inherent feature of the stack. This shared, credible risk allows two strategic objectives to guide the creation of trusted network standards: managing supply chain exposures while defining an ex-China market for key segments of the tech stack to give allied firms the scale to invest and compete.

**The US cannot match China's scale alone; only a coalition can.** China has the twin structural advantage of a protected home market (demand) and vast production capacity (supply). Sufficient demand enables firms to cut down costs, fund R&D, and justify capital for bigger builds and more resilient supply chains. No single Western market can generate that kind of pull on its own. The West can extend and sustain its edge only by pooling allied demand and production into "China scale."

**Making sense of the present requires a 2030s mindset**, working backward from the world taking shape over the coming decade to see which structural pieces need to fall in place *now* for the US and partners to have a shot at building the coalition it needs to shape a secure AI future. This Rhodium Group report is a foundation for grounding this debate. We begin with an objective, measurable baseline of US/G7+ strengths vis-à-vis China and explore a 2035 thought experiment to envision a "winning" versus "game over" future in this high-stakes competition.

# Introduction

Long before the arrival of Anthropic's Mythos model, a mythos around AI competition had taken hold in Washington: The US had the advantage in a race against China that it could ultimately "lock in" with chip design, cloud infrastructure, and frontier innovation to secure lasting technological and geopolitical preponderance.

Hubris has been the defining feature of that mythos. It seeps into policy gambits that assume governments will readily trade sovereignty for access to US-controlled technologies. It echoes through the manifestos of tech barons on the godlike capabilities they are cultivating and their assumed responsibility to shape society's course.

But hubris is a dangerous foundation for crafting AI grand strategy. It breeds AI stack myopia: a fixation on the factors driving US leadership in AI today rather than a dynamic, holistic view that accounts for how China will play to its own asymmetric strengths as the technology evolves. Myopia, in turn, blunts imagination and the ability to game out how AI will diffuse across geographic and digital markets as industry interests and sovereign ambitions collide.

This report is designed to bring the AI mythos back down to earth, where policy ambition must be tested against industrial capacity, geopolitical realities, and the fast-paced evolution of the technology itself. To build a more coherent AI strategy for the US and its partners, we start by fighting AI hubris with ground truth, humility, and vision.

**Ground truth.** Our report establishes a baseline for AI tech stack competition by starting from a deliberately wider definition of the stack. US policy debates still tend to view AI competition through a narrow lens—semiconductors, frontier models, and cloud infrastructure. This emphasis reflects the current stage of AI development and infrastructure buildouts, but it disproportionately flatters areas of US strength while obscuring the domains where China will be able to deeply penetrate AI markets if left unchecked. A more constructive approach broadens the frame to capture critical inputs, the AI nexus with 6G connectivity, and edge devices—anticipating where the biggest gaps, and the biggest opportunities, lie ahead, and how that should shape US and partner strategy.

Our stack definition begins with critical inputs—raw materials, intermediate components, and energy—then moves through the semiconductor value chain, cloud infrastructure, AI models, digital connectivity networks, and finally the end-user devices, applications, and services where AI meets the physical economy. In this wider frame, gas turbine manufacturers, legacy chipmakers, and telecom equipment providers stand alongside the GPU makers, hyperscalers, and AI model developers in completing the stack. The frame also reveals how AI and 6G strategies are fundamentally intertwined, turning once-esoteric debates like spectrum allocation into a core element of strategic competition in edge-device markets.

With that frame in place, the report quantifies each layer of the stack to assess US plus G7+[1] and Chinese strengths and vulnerabilities in market scale, supply share, and technological capability. The resulting competitiveness index serves as a reality check. It

[1] For the purposes of this study, we group the US and its partners into a "G7+" bloc comprising the G7 (US, Canada, United Kingdom, Japan, all EU) plus South Korea, Taiwan, Norway, Australia, Mexico, and Israel.

shows where coalition action is necessary to fill critical gaps, where collective market scale may carry more weight than national self-sufficiency, where middle powers will struggle to make credible tech sovereignty plays, and where China will compete hardest while trying to fill in its own gaps.

**Humility.** Our quantitative baseline anchors our view of tech stack competition today, even as we recognize that the underlying trends—and the metrics used to measure them—are constantly shifting. Paradigm shifts are breaking the prevailing mythos every few months, a reminder that policy must stay agile as the technology will inevitably outpace regulation.

Two recent developments illustrate the point: the introduction of Anthropic's Mythos—a frontier AI model capable of autonomously discovering and exploiting zero-day vulnerabilities at scale—and the more recent case of OpenAI models escaping a sandboxed testing environment and autonomously breaching Hugging Face. Powerful models with the ability to unleash cyber anarchy create a chain reaction, with cascading implications across the stack:

- The introduction of highly powerful cyber models is forcing the hand of a laissez faire White House, which is now stumbling into the regulatory arena to set terms on gating access for trusted partners.
- China will field Mythos-level capability within months, reawakening Beijing's statist instincts to regulate frontier models while trying to avoid slowing down its own developers in an intensified cyber arms race with the US.
- Shared fear of cyber anarchy is nudging both capitals toward a common framework for gating frontier models, raising the prospect of a sliding scale for model release and even a credible US-China AI safety dialogue.
- Yet those same capabilities are intensifying calls for tighter controls on China: cracking down on alleged industrial-scale distillation of US frontier models by Chinese model developers, restricting Chinese entities' remote access to US compute, and tightening controls on inputs to China's chip development. Beijing stands ready to retaliate, leveraging its own grip on critical inputs.
- At the same time, Anthropic's abrupt shutoff of Fable 5—a public version of Mythos with heavy safety guardrails that was suspended days after launch when a discovered jailbreak forced an abrupt export control shutdown affecting all users—has animated backlash from industry and middle powers. Perceptions are growing that closed frontier models are excessively powerful, overpriced, a potential risk to intellectual property, and a threat to tech sovereignty if access is denied, or if excessive guardrails deny users of critical capabilities.
- That backlash is fueling calls to shield open-source model development from government intervention. Open-weight models have become especially attractive: They offer some of the most advanced capabilities at a fraction of the cost, their access cannot be revoked, and they can run on infrastructure the user controls. This is driving a hybrid approach to AI adoption: frontier models for highly complex, agentic and continuous workflows, where large compute budgets for deep reasoning deliver measurable value; cheap, open-weight models fine-tuned for routine tasks to cut inference costs; and on-premise compute for IP-sensitive workloads.

- All of this is focusing attention on the need for viable US open-source model options that can compete with China and prevent costs and access pressures from driving enterprises into Chinese AI ecosystems.
- Looking further ahead, frontier labs are already beginning to use their own models to accelerate development of the next ones—an early form of "recursive self-improvement" that could threaten to outrun the nascent frameworks now being drafted to govern these AI systems.

This is a slice of implications that surfaced in mere weeks. Not only is this humbling for anyone with conviction on AI policy, it is also an urgent reminder that analysis that fails to orient toward emerging trajectories may already be obsolete.

**Vision.** Winning this competition means looking beyond today's benchmarks to the world taking shape in the 2030s—where geopolitically-buffered access to critical inputs and the trustworthiness of hyper-connected, AI-native systems will matter far more than any snapshot of model performance or hardware capacity. A secure AI future will ultimately rest on two key pillars: an economic security agenda that builds ex-China production and demand at scale through a trusted tech coalition, and a credible collective deterrent against China weaponizing its grip on critical inputs while the great build is underway.

## China's full-stack vision for AI diffusion

**US export controls have encouraged China to embrace an asymmetric approach to AI competition with the US.** While China has not abandoned the frontier race, US chip restrictions continue to cap its aggregate AI data center computing power at a level substantially lower than what is available to the US AI industry. In a July memo to employees, Zhipu AI founder Tang Jie reiterated the company's commitment to pursuing artificial general intelligence[2]—a mission shared by other Chinese AI labs like DeepSeek. However, China's leading AI model builders have repeatedly highlighted constrained access to AI compute as a core constraint on their ability to compete with US developers at the frontier.[3] Workarounds like AI chip smuggling, renting AI compute from foreign cloud providers, and distilling the output of US frontier models offer a partial solution, but these pathways are vulnerable to a new round of US policy tightening. China's ability to build AI data center compute at a competitive scale relative to the US will ultimately depend on the success of its effort to build a fully self-sufficient local AI chip supply chain.

**Beijing sees opportunities for China to lead in AI deployment despite its compute constraints.** Beijing's "AI+" initiative aims to promote the rapid integration of AI across China's domestic economy.[4] The State Council's 2025 "Opinion on Deeply Implementing the 'AI+' Action" lays out a vision for broad AI deployment across society, government,

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[2] Zhou Xinyu, "Zhipu AI founder Tang Jie Sent An Internal Letter: After the 'GLM' Moment, What Is More Important? (智谱创始人唐杰发内部信：「GLM 时刻」之后，什么是更重要的事)," Zhineng Yongxian, July 11, 2026, https://mp.weixin.qq.com/s/Zg2p4soZKVTzZLd97BR2gw?mc_cid=51e4a5b972&mc_eid=3d37ba4c67

[3] Fred Gao, "DeepSeek's Liang Wenfeng Breaks His Silence," Inside China, July 23, 2026, https://www.fredgao.com/p/deepseeks-liang-wenfeng-breaks-his; Bloomberg News, "China AI Leaders Warn of Widening Gap With US After $1B IPO Week," January 10, 2026, https://www.bloomberg.com/news/articles/2026-01-10/china-ai-leaders-warn-of-widening-gap-with-us-after-1b-ipo-week.

[4] State Council, Opinions on Further Implementing the "AI Plus" Action, August 26, 2025, https://www.gov.cn/zhengce/content/202508/content_7037861.htm.

and key industries like manufacturing, healthcare, transportation, and energy and sets aspirational targets for AI agents, applications, and devices to achieve 70% penetration across China's economy by 2027 and 90% by 2029. While these targets are vague and difficult to quantify, they underscore China's ambition to accelerate the local adoption of the full stack of AI capabilities from the cloud and application layer, through the edge, and to the device.

**China's industry-focused diffusion strategy exploits advantages beyond the core AI stack.** The concentration and innovative capacity of its electronics manufacturing ecosystem let China rapidly iterate designs and scale up production of next-generation robotics. Along with expanding investment in traditional industrial automation systems, this represents a critical front in Beijing's AI export campaign. China has also put innovation in wireless connected technologies at the heart of its industrial AI strategy. In a recent round of reforms, China began allocating spectrum and proposing technical standards to directly support its ambition to secure dominance in next-generation connected industries. China's playbook is to innovate domestically, demonstrate success, then leverage that success to shape global standards to favor Chinese firms. This model could provide China with a unique edge to carve out share as a critical infrastructure supplier for physical AI and connected industries, particularly in aspiring manufacturing hubs in the Global South.

**In the competition for global AI market share, Chinese models hold unique appeal.** The China model for AI diffusion de-emphasizes frontier intelligence in favor of practical deployment of AI to accelerate industrial progress. Highly cost-efficient, near-frontier open-weight models make it easy for enterprises to adopt and customize AI for their unique requirements while minimizing compute cost, creating broad appeal in a world where limitations on sovereign and controllable compute are the norm rather than the exception. Even in the US, the exorbitant cost of frontier model tokens is driving enterprises to proactively offload more tasks to cheap open-weight models while reserving only the most complex work for frontier agents.

**But China's inherent advantages hinge on a key condition: access to external markets.** The decisive question ahead is whether G7+ economies will converge on trusted network standards that restrict Chinese connected technologies, and whether a narrower market opportunity overseas turns China's structural strengths into a vulnerability of stranded excess capacity.

**Beijing holds enough supply chain leverage to throttle US physical AI deployment.** China's chokehold control over critical raw materials, magnets, and batteries strikes at the heart of the manufacturing supply chains that will drive the emerging AI device economy. From industrial robotics to humanoids and autonomous driving technologies, Beijing maintains the capacity to short circuit US-aligned manufacturing. Meanwhile, the rapid development of local supply chains for drones, autonomous vehicles, and emerging robotics form factors is spawning a new generation of critical component suppliers in China's coastal electronics manufacturing cities. As China establishes itself as the preeminent assembly hub for the emerging physical AI economy, the risk that upstream supply chains will consolidate further within its borders and engender new supply chain dependencies for the US and its allies grows. Meanwhile, Beijing's support for broad-based localization of high-end components threatens to freeze foreign suppliers out of China's growing market.

## A layer-by-layer dissection of tech stack competitiveness

US policy discourse around tech stack promotion has tended to focus on the narrow set of technologies required to build and serve cutting-edge AI models and derivative software applications. This "chips + models + apps" framework centers on the core drivers of innovation and influence in the emerging AI economy but also risks perpetuating blind spots that may undermine the US's ability to craft a resilient, forward-looking tech stack strategy that accounts for China's asymmetric supply chain advantages.

Beijing is pursuing simultaneous efforts to mitigate China's exposure to US chokepoints, entrench its dominance in critical input and device manufacturing, and build early incumbency in embodied intelligence and robotics. For the US and partners, preparing for the next decade of technology competition therefore requires an integrated view of the full chain of technologies that intersect with these objectives. For the purposes of this study, we define the digital technology stack as comprising the following eight layers:

- **Critical raw materials (CRMs)**, and derivative products like magnets and batteries, are the foundation of modern electronics supply chains, essential to nearly every production process from semiconductor fabrication to final device assembly. Vulnerabilities at this layer cascade through the rest of the stack, jeopardizing competitiveness even at layers where the US and partners hold relative strength.

- **Energy** supply and transmission capacity are the core binding constraints on AI data center expansion outside China. G7+ grids are already straining to meet surging demand from data centers, electrification, and the reshoring of energy-intensive manufacturing. Streamlining permitting and interconnection processes as well as expanding production capacity for grid and generation equipment will be critical in the near term, while emerging technologies like advanced nuclear, geothermal, and advanced energy storage have the potential to greatly expand the solution set in the 2030s.

- **Semiconductors** are the foundational enabling hardware substrate for the digital economy. While AI accelerators, CPUs, and memory chips built on cutting-edge production processes provide the computational capacity required to train and serve AI at scale, legacy chips remain essential for power management, sensing, and other functions critical for the diffusion of AI into the physical world. This layer covers the full semiconductor value chain, including chip design, fabrication, assembly, and the specialized equipment and inputs each step requires.

- **Cloud infrastructure** provides the compute, storage, and networking required to train and serve AI models and power the modern cloud-based application economy. In this report, we perform a bottom-up analysis, aggregating data center capacity and capital expenditure data at the individual firm level to assess the relative global competitiveness of G7+ vs China-based cloud service providers.

- **AI models** power AI capabilities by transforming raw compute and data into prediction, reasoning, and automation. While model performance is a key determinant of competitiveness, real-world adoption will also be a critical metric as the US and

China compete for advantage in contested markets. This layer focuses on relative model competitiveness and model adoption.

- **Connectivity infrastructure** forms the fabric of the modern digital economy. 6G will enable ultra-low latency, high-bandwidth data transmission and massive device density, fueling AI's progress and deployment in the physical world. This layer focuses on three key network nodes: RAN, transport, and subsea cables.

- **Connected devices** are the user's physical interface to the network and, increasingly, the conduit between AI and the physical world. Supply chain concentration raises risks not only in mature device segments, but also for future competition in emerging connected device form factors. We assess relative production capacity across four major device segments: smartphones, PCs, drones, and industrial robots.

- **Digital applications and services** are the commercialization layer of the digital stack. Deployment of AI and connected systems into the real economy requires a large user base to reach economic scale and to benefit from diverse training data. Building established firms with a track record of deploying AI and connected solutions at scale reinforces ecosystem integration in these markets and helps with setting norms and standards.

This eight-layer stack provides a simple framework for systematically analyzing the relative strengths and vulnerabilities of the US, its partners, and China across each of the technology supply chains that will shape the trajectory of global AI competition over the next decade. For the purposes of this study, we group the US and its partners into a "G7+" bloc comprising the G7 (US, Canada, United Kingdom, Japan, all EU) plus South Korea, Taiwan, Norway, Australia, Mexico, and Israel. While these jurisdictions are not uniform in their posture toward China, they each have strong geopolitical and economic incentives to align with the US on supply chain security and reshoring initiatives. Grouping them into a coherent "G7+" bloc allows us to assess current shared dependencies and make projections about the US's future competitiveness with China under scenarios assuming a high degree of G7+ alignment versus fragmentation.

This report focuses on benchmarking supply-side competitiveness across the stack. To facilitate this comparison, we developed a simple index that converts market share data across each layer into a 0-4 scale (Table 1). For example, semiconductor index scores are derived by averaging sublayer scores for semiconductor manufacturing equipment, materials, and fabrication, which themselves are derived by averaging more granular, product-level index scores.

The results of this quantitative net assessment highlight the asymmetric strengths that are driving the US/G7+ and China's contrasting strategic approaches to AI stack competition:

TABLE 1

## Net assessment of G7+ vs China positions in the tech stack

0.0 (Dependent) — 4.0 (Dominant)

| | US | Other G7+ | China | Net assessment |
|---|---|---|---|---|
| **Critical raw materials** | 0.1 | 0.2 | 3.0 | China's chokehold over the processing of rare earths and other critical raw materials feeds into dominance in magnet and battery production. G7+ reliance on China for these inputs remains a core vulnerability, giving Beijing chokepoint leverage to disrupt ex-China AI and electronic device supply chains. |
| **Energy** | 0.6 | 0.7 | 1.6 | By 2030, China will have more electricity available for AI data centers than the entire G7+ bloc combined. Even after accounting for the relative energy inefficiency of Chinese AI hardware, China will theoretically have enough electricity to match the scale of US-hosted AI computing power. |
| **Semiconductors** | 0.7 | 2.5 | 0.6 | G7+ dominance in advanced semiconductors, memory, design software, production tools, and materials is the core constraint on China's advanced chip and next-generation hardware ambitions. China is making progress in lagging-edge segments but remains limited in the most critical leading-edge capabilities. |
| **Cloud infrastructure** | 3.1 | 0.0 | 0.9 | US AI data center investment has far outpaced China to date. While Chinese firms like Alibaba and ByteDance are investing heavily in AI capacity outside China, US chip controls cap the performance and scale of local deployments, amplifying disparities at the infrastructure layer. |
| **AI models** | 2.5 | 0.2 | 2.7 | Compute superiority is enabling US model developers to extend their lead at the frontier AI training and large-scale cloud inference deployment. China's strength in low-cost open-weight models, however, positions it to compete more effectively in edge inference and mass-market applications. |
| **Connectivity infrastructure** | 0.5 | 1.8 | 1.7 | Chinese telecom equipment firms hold a near-monopoly on the domestic market. Emerging "trusted network" initiatives are creating a similar protected home market advantage for G7+ suppliers. While China made significant inroads in the Global South during the 5G transition, neither side has achieved a decisive advantage in non-aligned swing markets. |
| **Connected devices** | 0.1 | 1.1 | 2.6 | China remains the preeminent assembly hub for G7+ firms despite tentative progress in building alternative assembly capacity in third markets like India and Vietnam. The scale and tight integration of China's local device and component supply chains enable rapid design iteration, giving Chinese OEMs an edge in emerging robotic form factors. |
| **Digital applications and services** | 2.9 | 0.2 | 0.8 | US platforms still dominate globally in social media, SaaS, and AI product applications, providing powerful distribution channels for embedding G7+-aligned AI models and services, as well as valuable data feedback loops for AI training and fine-tuning. Chinese firms are advancing rapidly in AI-native consumer ecosystems, but usage remains largely in China and select emerging markets. |

Source: Rhodium Group. See Appendix 1 for methodology.

**While China has clear weaknesses at certain layers of the tech stack, it is also the only nation that has a credible path to achieving a high degree of self-sufficiency across the full stack on its own.** The G7+ bloc's strengths are the product of close collaboration and mutual dependence. Even perceived US advantages over China are often supported by the collective strength of the broader G7+ ecosystem. US dominance in advanced AI chips depends on a range of foreign manufacturers and single-source upstream suppliers of advanced equipment and materials across Asia and Europe. Similar dependencies are apparent in the connectivity infrastructure and connected device layers.

**G7+ partners also fill critical gaps in the US tech stack.** In areas where the US is currently deficient like energy generation and transmission equipment, CRMs, and device manufacturing, partnerships with Japan, Australia, Taiwan, and others will be crucial to accelerating the buildup of resilient ex-China supply.

## Critical raw materials: China dominant

**China's commanding control over CRM supply chains creates vulnerabilities for G7+ economies at every layer of the digital technology stack.** Over the past three decades, China has emerged as a major hub for CRM mining and, more critically, is now the leading refiner for 19 of 20 critical strategic materials.[5] Moreover, despite recent G7+ diversification efforts, supply has further consolidated within China's borders over the past several years. For example, since 2020, China has accounted for approximately 90% of global supply growth for cobalt, graphite, and rare earths.[6]

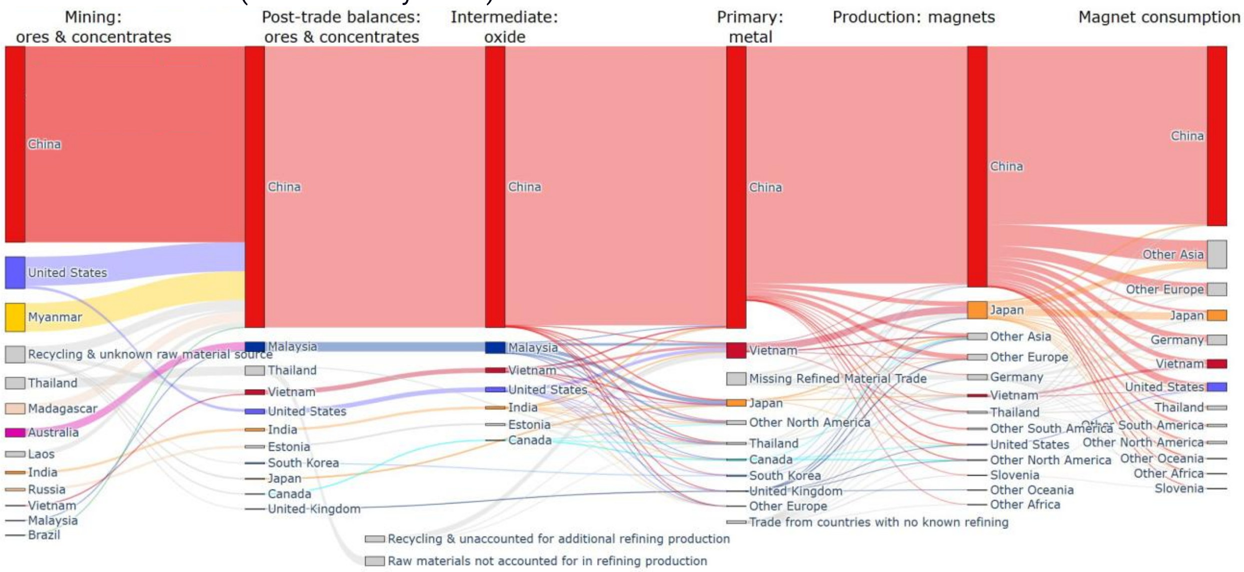
**The unrivaled scale of Chinese demand for CRMs entrenches its supply-side dominance.** As of 2024, China's domestic manufacturing base accounted for over half of global demand for copper, lithium, nickel, cobalt, graphite, and magnet-producing rare earth elements. This massive consolidation of demand exerts a gravitational pull on the rest of the upstream supply chain. Take, for example, the supply chain for neodymium-praseodymium (NdPr) used in magnet production (Figure 1). China's outsized share of global magnet demand both incentivizes continued local investment upstream in the NdPr supply chain and reduces the commercial logic to scale production elsewhere.

[5] International Energy Agency (IEA), "With new export controls on critical minerals, supply concentration risks become reality," October 23, 2025, https://www.iea.org/commentaries/with-new-export-controls-on-critical-minerals-supply-concentration-risks-become-reality.
[6] IEA, Global Critical Minerals Outlook 2025, May 21, 2025, https://iea.blob.core.windows.net/assets/ef5e9b70-3374-4caa-ba9d-19c72253bfc4/GlobalCriticalMineralsOutlook2025.pdf.

FIGURE 1

**Flows of NdPr from upstream mining through magnet consumption, 2024**

Metric tons of NdPr (normalized by mass)




Source: Rovjok material flow analysis of NdPr.[7]

China's complete dominance of rare earth magnet supply chains carries serious implications for G7+ suppliers further downstream. Neodymium-iron-boron (NdFeB) magnets are among the most ubiquitous components in electronics supply chains, enabling core functions in products as diverse as EV motors, smartphones, semiconductor manufacturing tools, and humanoid robots. Recognizing the unique leverage it can derive from this critical dependency, Beijing has moved aggressively over the past two years to establish an export control framework to instrumentalize its control over the NdFeB magnet supply chain by restricting exports of critical rare earth inputs like dysprosium (Dy) and terbium (Tb). In October 2025, China's Ministry of Commerce (MOFCOM) announced new export controls that would impose extraterritorial license requirements for any cross-border transaction *anywhere in the world* of a magnet or derivative product produced overseas that contains as much as 0.1% of China-origin Dy or Tb content in their overall bill of materials. Since nearly all magnets contain Dy or Tb, and China accounts for nearly all refining of these elements, this measure would allow China to disrupt electronics supply chains across every market vertical. While such a policy may be impossible to enforce at scale, the threat of targeted enforcement may be enough to influence policy outcomes in Beijing's favor. China has delayed implementation of these potent de minimis measures by one year as part of a Busan trade truce struck with the US in November 2025. But the threat still looms as Beijing stands ready to retaliate to emerging US and G7+ technology and trade restrictions.

**Effective CRM diversification policy requires a full stack lens.** When risk is scoped mineral by mineral at the input layer, it fails to capture how even a small and concentrated dependency at the base of the stack propagates upward to create outsized effects.

[7] Rovjok, "Shaping the Supply Chains of Tomorrow's Metals," https://rovjok.com/

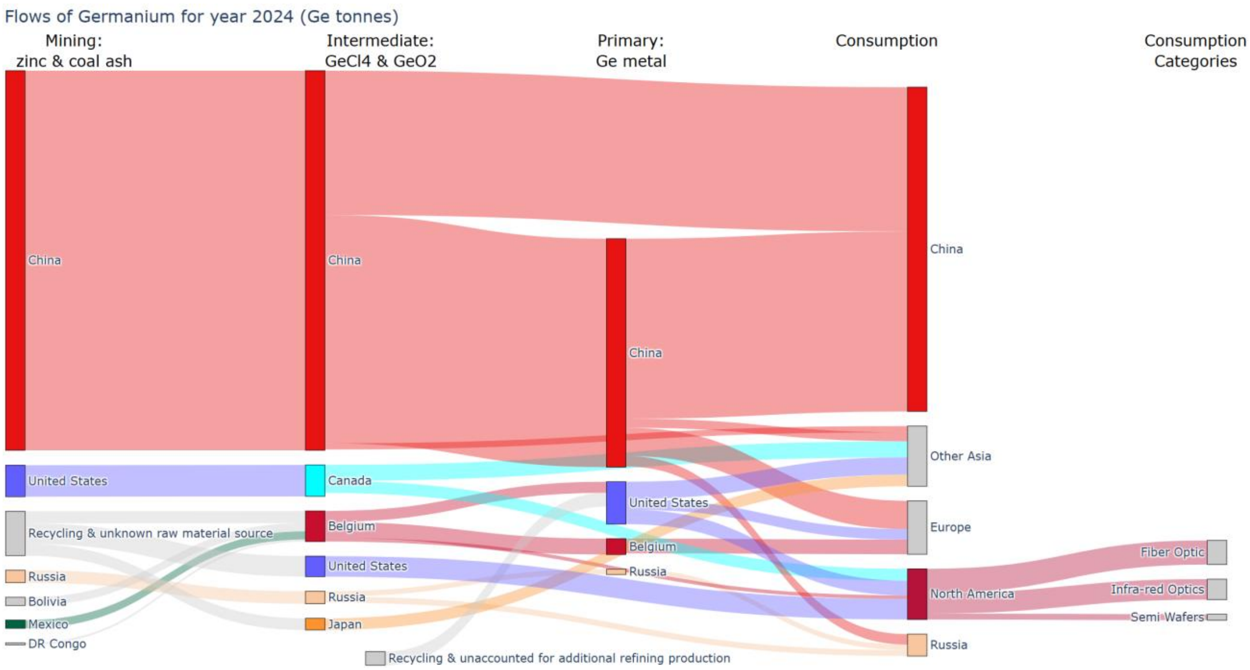
Germanium is a case in point. A zinc byproduct produced in tiny volumes, germanium is the essential ingredient for fiber-optic cores—ultra-pure glass threads that carry the world's data as pulses of light. AI data centers are enormously fiber-hungry: A single GPU rack can require dozens of times more fiber optic cable than a conventional server rack, and hyperscalers are spending hundreds of billions on buildouts. But China, which controls about 79% of global germanium production,[8] targeted germanium along with gallium in 2023 in an early asymmetric response to US chip controls. China's squeeze on germanium supply—combined with the small scale of alternative producers—constrains downstream fiber optic cable production, with the potential to stall buildouts from the very bottom of the stack.

Ex-China germanium production is currently too thin to compete with China at scale, but there is a path: Hyperscaler buildouts have the potential to create a large, prospective demand market to underwrite new upstream mineral capacity across an existing, albeit small, US-Canada-Belgium production network (Figure 2). It will take time and the right tools—coordinated offtake, price floors, and procurement to insulate new producers—but through a full-stack lens, the opportunity is clear.

FIGURE 2

**Germanium flows, 2024**

Metric tons of Ge (normalized by mass)




Source: Rovjok.[9]

While momentum for a multilateral approach to CRM diversification has grown over the past year, there is still significant uncertainty surrounding the timeline and ultimate impact

[8] Rovjok material flows analysis of germanium, 2024.

[9] Rovjok, "Shaping the Supply Chains of Tomorrow's Metals," https://rovjok.com/

of these efforts. **The IEA estimates that the average lead time for rare earth mining projects outside China is roughly eight years,[10] indicating that China will continue to wield substantial leverage through the end of the decade even in the most optimistic diversification scenario.**

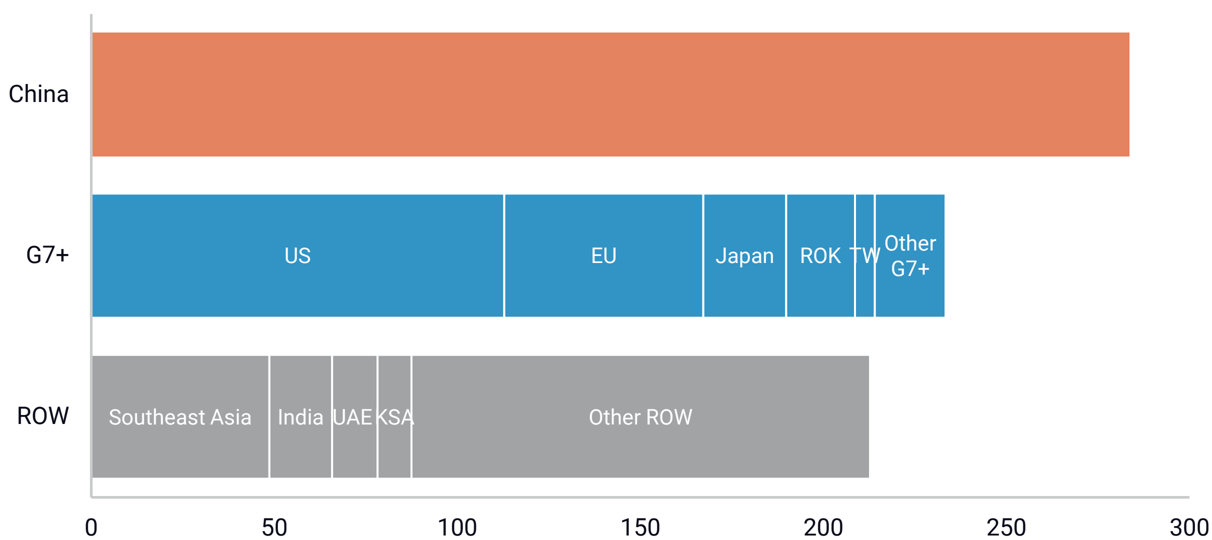
## Energy: China leads

Based on Rhodium Group's data center electricity supply analysis, **China will have enough electricity resources to power the equivalent of 280 GW of US-hardware equipped data centers by 2030.[11] That's more than double the US's projected capacity and more than the rest of the G7+ bloc combined.** China can easily achieve this scale by leaning on underutilized existing coal plants in the near term (Figure 3). In recent years, China has added roughly 100 GW of coal capacity annually, with most plants running well under 50% of the time. With a stable power supply from thermal coal plants, China's rapidly growing renewable energy capacity can also bolster AI data center needs with cheaper solar, wind, and hydro generation, depending on resource availability.

FIGURE 3

### Available electric supply for AI data centers in China, G7+, and rest of world, 2030[12]

Number of GW-scale data centers supplied




Source: Rhodium Group
Note: All power supply shown is available at or below $80/MWh. Data centers are assumed to be running US top-tier hardware.

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[10] Tae-Yoon Kim et al., "With new export controls on critical minerals, supply concentration risks become reality," IEA, Oct. 23, 2025. https://www.iea.org/commentaries/with-new-export-controls-on-critical-minerals-supply-concentration-risks-become-reality.

[11] Unless otherwise noted we assume current US hardware when stating GWs of data center capacity.

[12] Supply estimates are based on recent, empirical buildout trends and reflect all new and existing energy capacity that can, in aggregate, provide firm electric supply for data centers above and beyond secular demand growth in each country. This supply includes both behind-the-meter and bulk power resources and accounts for current backlogs of grid equipment such as transformers and combustion turbines. Expanded transmission capacity could increase supply estimates marginally through 2030.

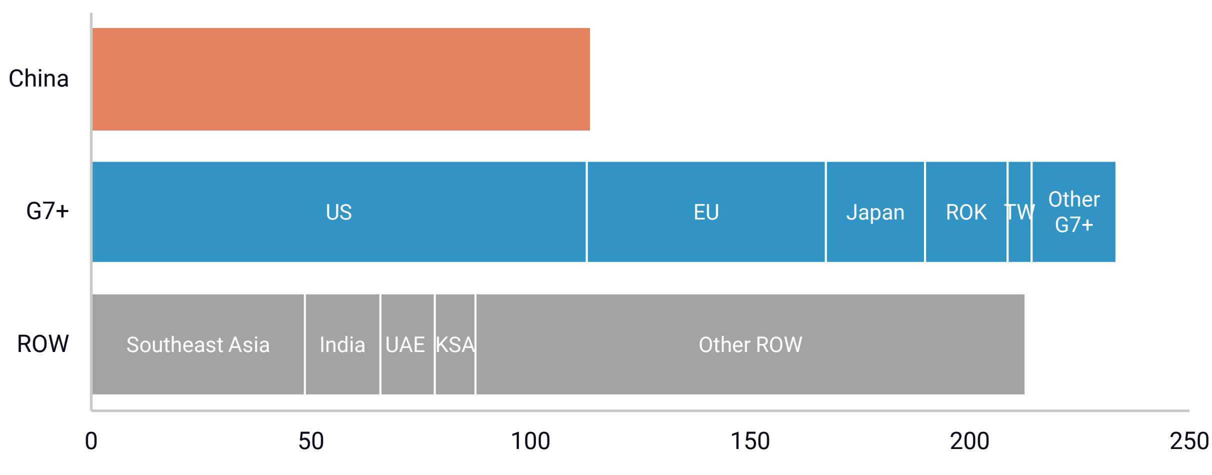
The scale of China's energy advantage is substantially diminished when our calculations factor in the current power-performance disparity between US and Chinese AI hardware. Compared to NVIDIA's GB200 NVL72 server system, Huawei's flagship Ascend 910C Cloud Matrix requires 2.5 times as much energy to provide the same amount of computing power.[13] Assuming that ratio roughly holds through 2030, China's energy supplies would only power the equivalent of roughly 110 GW of NVIDIA GB200-equipped data center capacity (Figure 4).

Even with this efficiency disadvantage, China will have ample energy resources to match US aggregate compute capacity in 2030. Electric power supply is not a constraint on China's development and deployment of AI data centers, even when those data centers are equipped with far less efficient and less capable Chinese hardware. The challenge for China will be to build up enough local advanced chip production capacity, and improve the power efficiency of those chips, to fully exploit its power advantage. The energy efficiency deficit of China's AI chips is a particularly relevant concern for China's ability to compete with the US in global AI infrastructure markets. Assuming China's chip ecosystem cannot progress enough to enable Huawei or its local rivals to close the efficiency gap, AI infrastructure projects using Chinese chips will struggle to compete in overseas markets where power constraints are more acute. China may attempt to mitigate this deficit by bundling deals with clean energy exports, though firm capacity from gas, nuclear and other stable sources will be the gating factor on large-scale AI data center buildouts.

FIGURE 4

**Available electric supply for AI data centers, 2030, adjusted for power-performance ratio of AI computing hardware accessible to the local market**

Number of GW-scale data centers with NVIDIA Blackwell-equivalent computing power




Source: Rhodium Group
Note: All power supply shown is available at or below $80/MWh. China data centers are assumed to be running Chinese hardware with a 2.5x power-performance deficit relative to top-tier US hardware. Data centers for all other markets are assumed to be running top-tier US hardware.

In the US, the main challenge will be to work through supply chain bottlenecks, orderbook backlogs, jammed interconnection queues, and siting and permitting processes that

[13] Dylan Patel et al., "Huawei AI CloudMatrix 384 – China's Answer to Nvidia GB200 NVL72," *SemiAnalysis*, April 16, 2025, https://newsletter.semianalysis.com/p/huawei-ai-cloudmatrix-384-chinas-answer-to-nvidia-gb200-nvl72.

altogether will constrain adding large amounts of *new* supply to the grid through 2030 beyond what is already planned. Existing transmission capacity, natural gas, and coal plants will be stretched to meet higher data center demand during this crunch period. As we move into the 2030s, however, the dynamic could shift substantially with potential for hyperscaler, government, and venture capital investments to pay off in bringing advanced nuclear, geothermal, carbon capture and sequestration, long-duration storage, and advanced transmission and grid technologies to commercial scale. This is where US-partner collective efforts toward the build will be important alongside domestic efforts to streamline permitting, accelerate interconnection, facilitate flexible and efficient use of existing grid assets and reduce technology risks for emerging technologies. US trading partners like Japan and Korea are already positioning to expand manufacturing capacity of grid equipment and generators, with the potential to alleviate bottlenecks in existing supply chains and capitalize on the accelerated deployment of next-generation energy technologies.

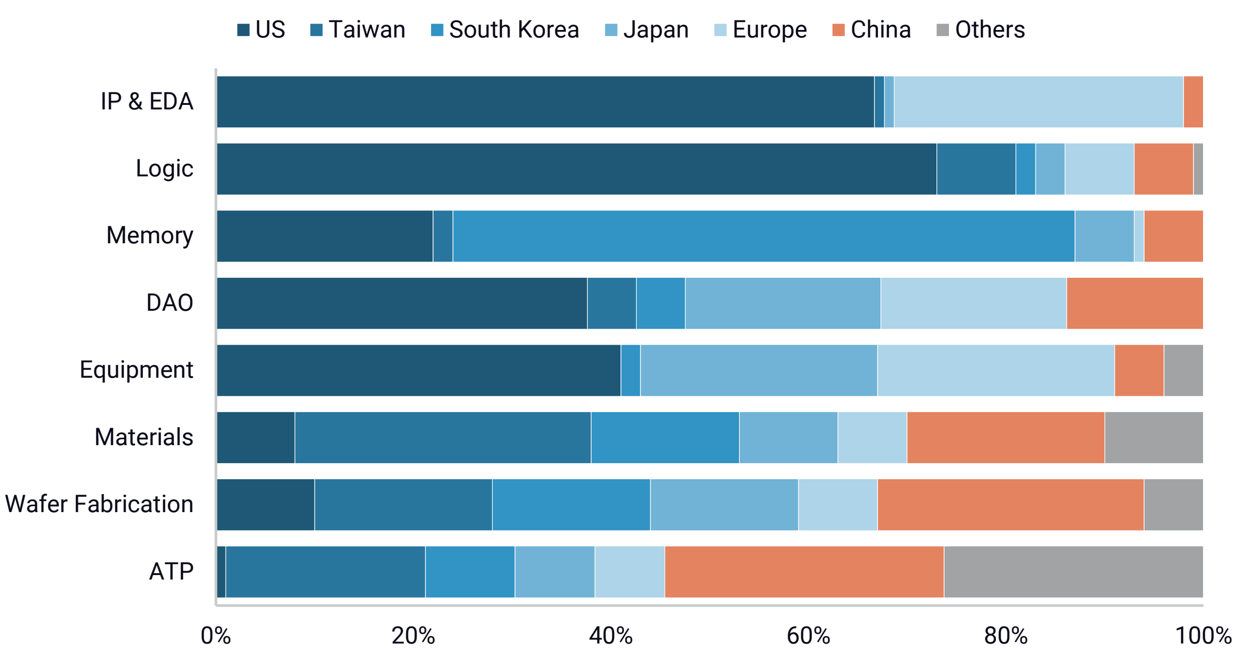
## Semiconductors: G7+ dominant

**The collective strength of G7+ economies across the semiconductor supply chain represents the bloc's foundational tech stack advantage over China.** The US and its partners hold decisive incumbent advantages at nearly every node of the global semiconductor supply chain (Figure 5). G7+ monopoly control over electronic design automation tools, advanced semiconductor manufacturing equipment (SME), and material inputs like photoresist has altogether constrained China's capabilities in advanced semiconductor manufacturing.

FIGURE 5

### Semiconductor value added by activity and region, 2024

Percent



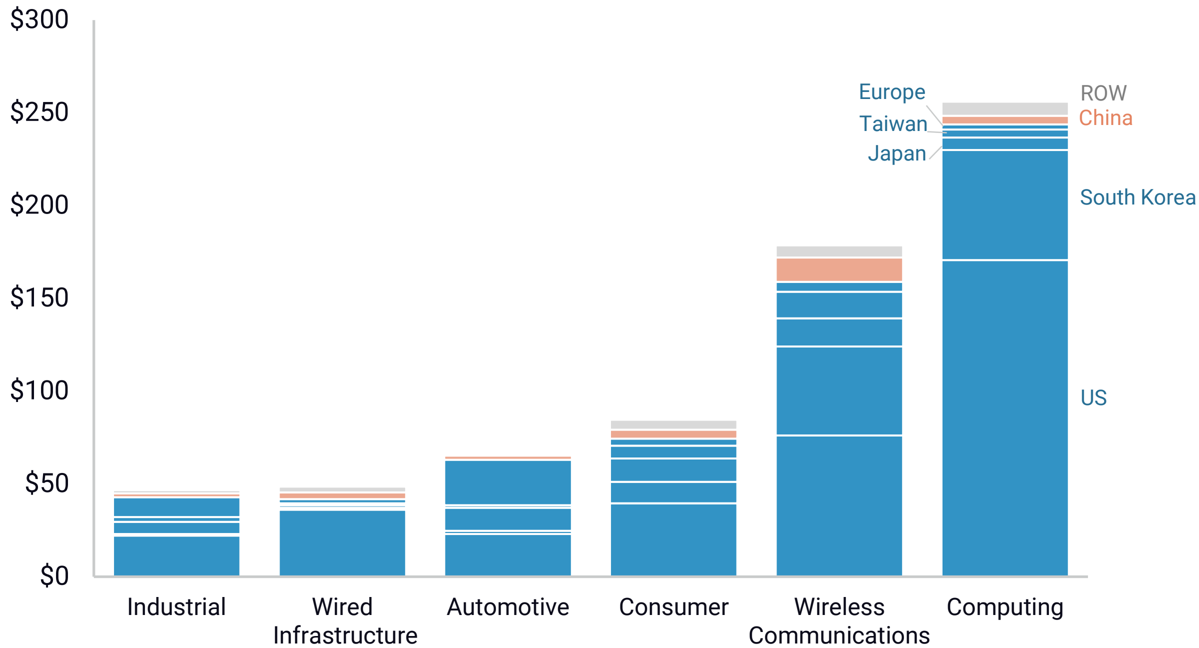

Source: Semiconductor Industry Association, BCG analysis of data from IPnest, Wolfe Research, Gartner, and SEMI

The deep integration of G7+ firms across the physical manufacturing chain reinforces G7+ leadership in the highest value segment of the industry, semiconductor design (Figure 6). Leading G7+-based fabless design firms like NVIDIA, Qualcomm, Mediatek, and Apple account for an overwhelming share of global output in the computing, communications, and consumer device segments, while G7+-based integrated device manufacturers like Texas Instruments, NXP, and Infineon continue to account for the majority of revenue for the industrial and automotive semiconductor applications.

FIGURE 6

**Global semiconductor sales by design firm HQ and end-product market, 2024**

USD billions



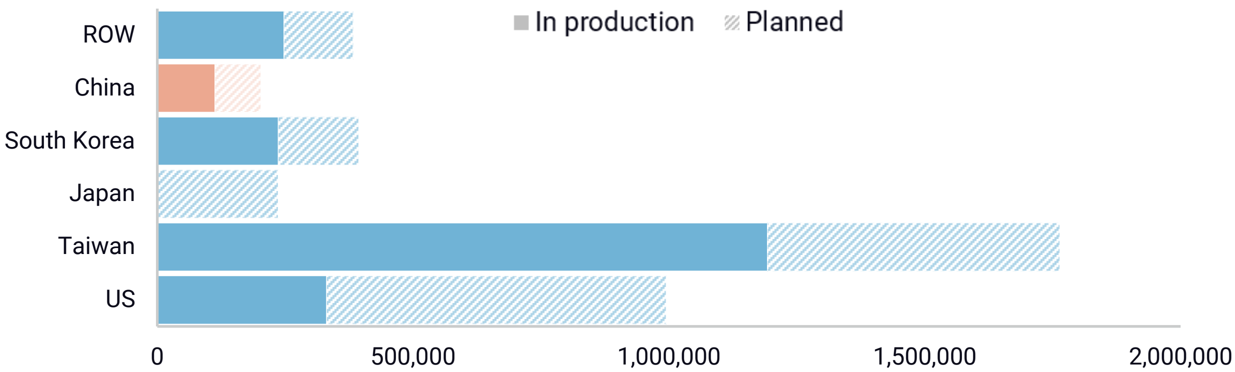

Source: Rhodium Group, IDC.

G7+ firms designing AI data center chips benefit from stable access to cutting-edge fabrication services while Chinese firms since 2020 have been progressively cut off from foreign foundry access for controlled AI data center chips. While Huawei and SMIC have managed to build some advanced logic capacity at the 7nm process node, the scale of that capacity is dwarfed by the current scale of G7+ advanced logic production capacity (Figure 7). TSMC's active sub-7nm capacity alone is more than 11 times Huawei and SMIC's current 7nm capacity. Moreover, whereas US-led export restrictions on advanced SME exports to China inhibit SMIC's ability to progress to process nodes smaller than 7nm without significant yield trade-offs, TSMC and Samsung are already shifting most of their capacity to 2nm and below.

FIGURE 7

**Current and planned advanced logic semiconductor capacity: 7nm and below**

Wafer starts per month (WSMP)



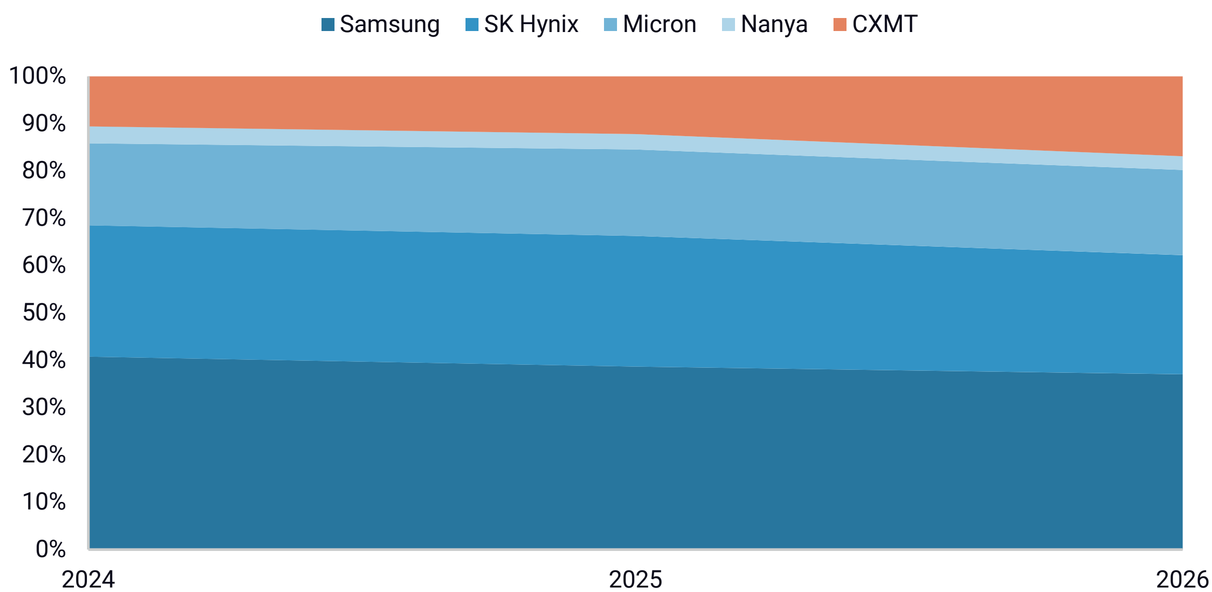

Source: Rhodium Group, SEMI.

**Despite this vast mismatch in aggregate advanced logic chip production capacity, China's logic die output for advanced AI accelerators is poised to increase substantially over the next few years.** While G7+ advanced logic foundries serve both global and Chinese demand for smartphone, automotive SoCs, CPUs and other advanced chips, China's local 7nm capacity is almost exclusively concentrated on Huawei smartphone processors and local AI data center chips. Even under the most pessimistic production yield scenarios, China will be able to manufacture enough logic dies to produce roughly 1.2 million Huawei Ascend chips in 2027 with a 25% allocation of available 7nm capacity. Under more aggressive yield (50%) and allocation (50%) scenarios, output could rise above 6 million units. That ideal scenario would still represent a large deficit compared to G7+ output—NVIDIA shipped 6 million Blackwell chips in the four quarters to Q3 2025 and is set to dramatically expand output as TSMC continues to expand capacity to meet surging demand.

More importantly**, even if China manages to meet the most optimistic outlook for AI logic die output, its output of finished advanced AI accelerators will be limited by local supplies of the other core component of advanced AI accelerators: high-bandwidth memory (HBM).** With US export controls now banning HBM sales to China, Huawei and other local AI chip developers will need local HBM to produce AI chips at scale once their limited stockpiles of foreign HBM run out. The global HBM market is currently controlled by a trio of G7+ suppliers—South Korea's SK Hynix and Samsung control roughly 85% of the market, while US-based Micron accounts for the remaining 15%. While China's national champion ChangXin Memory Technologies is targeting mass production of HBM3 in 2026 and is preparing to invest heavily to ramp production thereafter, its ability to deliver on that roadmap remains unproven.

China has nevertheless made impressive progress in localizing memory production over the past decade, emerging from a position of total dependence on foreign suppliers in 2015 to fielding globally competitive national champions in both the NAND storage and conventional DRAM segments today. CXMT has narrowed the gap in conventional DRAM and is now shipping products roughly 2-3 years behind the cutting-edge. After absorbing a heavy blow from a Department of Commerce entity listing in 2022, Yangtze Memory Technologies Corp (YMTC) has rebounded to rival the world's largest NAND producers, accounting for 13% of the global market in Q1 2026.[14] Both of these firms have benefited from the broad-based impact of surging AI data center demand for HBM and advanced storage on global memory pricing since 2025. As SK Hynix, Samsung, and Micron have shifted more capacity to HBM to feed AI data center demand, shortage-induced price inflation for conventional DRAM products has supported a surge in revenue for CXMT. The coincidence of this trend with CXMT's July IPO will support CXMT's plans to invest in large-scale capacity expansions over the next few years. CXMT's share of global DRAM capacity has already risen from 10% to over 16% since 2024 (Figure 8). **While CXMT's HBM roadmap remains in question, it has already established itself as a formidable challenger to the G7+ incumbents in conventional products that will be critical enablers of physical AI applications in automotive, consumer devices, and robotics.**

FIGURE 8
## Global DRAM production capacity share
Percent




Source: Rhodium Group, SEMI

**China's recent gains in advanced logic and memory production are nevertheless vulnerable to potential tightening of US export controls.** The production base installed at SMIC, CXMT, and, to a lesser extent, YMTC[15] foundries depends heavily on tools produced and maintained by G7+ suppliers. The MATCH Act, currently under

[14] Counterpoint Research, "Global NAND Memory Market Share: Quarterly," June 8, 2026. https://counterpointresearch.com/en/insights/global-nand-memory-market-share.

[15] YMTC responded to its US entity listing by leaning heavily into partnerships with local SME suppliers and has reportedly achieved over 50% localization of its tool base. Crucially, 3D NAND production does not rely heavily on advanced lithography and is more dependent on advanced etch and deposition tools—areas where local alternatives to G7+ products from emerging suppliers like Naura and AMEC are relatively more developed.

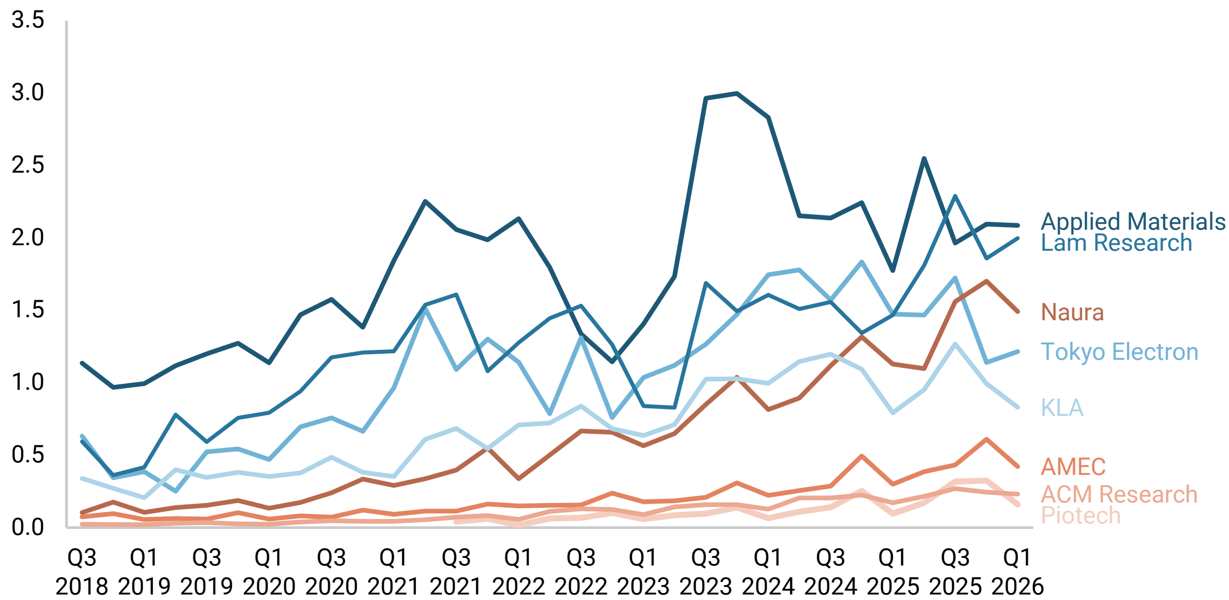
consideration by the US Congress for inclusion in the year-end national defense budget bill, would leverage the US' extraterritorial jurisdiction to force allies like the Netherlands and Japan to restrict the servicing, maintenance and sale of spare parts for export-controlled equipment in Chinese semiconductor fabs. If passed and enforced, the restrictions could force companies like ASML and Tokyo Electron to withhold services critical to the maintenance of China's installed base of advanced lithography, deposition, etch and other tools, without which they would be at risk of degrading and, ultimately, failing over time. The bill has become a flashpoint in US-China negotiations, and China could retaliate with its own restrictions on tungsten, molybdenum, NdFeB magnets or any of the other critical inputs to semiconductor equipment production over which it holds substantial control.

**While China is focused on deterring the US from expanding restrictions on SME in the near term, its long-term ambition is to break its dependence on US-aligned toolmakers entirely.** Foreign SME providers still account for roughly three quarters of the market in China, but momentum has begun to shift in favor of local suppliers recently as China's semiconductor ecosystem has leaned into the self-sufficiency movement. Following explosive growth in 2023 and early 2024, the China market sales of the leading five foreign SME firms have declined at an average annualized rate of -3% in the seven quarters since Q2 2024. Meanwhile, China's top five local SME firms have continued to build momentum, reporting a 36% average annualized growth rate during the same period. Naura, a full platform SME provider that covers nearly the entire toolchain except for lithography, has emerged as China's first local SME firm to achieve competitive scale with foreign firms in its home market, surpassing Tokyo Electron and US-based KLA as the third-largest non-lithography SME supplier in China in Q4 2025. Beijing's self-sufficiency initiative, headlined by the recently activated $47.5 billion national integrated "Big Fund III," and anticipated consolidation within China's SME industry will create opportunities for other emerging local leaders like AMEC, Piotech, and SiCarrier (unlisted) to continue expanding their market share.

FIGURE 9

**China market sales of leading public SME suppliers (excl. lithography)**

USD billions




Source: Rhodium Group, company financial reports.

While the discourse around semiconductor policy in the US has generally revolved around the advanced semiconductor segment, **China's growing strength in legacy semiconductor production is also a critical variable in the tech stack competition.** Legacy chips account for nearly 90% of global semiconductor sales by unit volume and enable core functions like power management, sensing, motor control for the devices that will allow AI to be projected into the physical world.[16] They are critical inputs to industrial robotics, automotive systems and emerging embodied AI form factors. For example, a single humanoid robot might incorporate on the order of 1,000 analog, mixed-signal, and discrete semiconductor devices fabricated on legacy process nodes.[17]

While US, European, Japanese, and Taiwanese producers hold incumbent strength, particularly in high-grade automotive and industrial chips, China is fast emerging as a hub for legacy chip production as government subsidies, self-sufficiency targets, and the gravitational pull of demand from China's expanding automotive, industrial manufacturing, and next-generation robotics industry incentivize large investments in local capacity. China's share of global legacy production rose to 40% in 2025 (up from 32% in 2023 and ~17% in 2015.) Based on current projections, China will account for roughly half of all global legacy chip capacity by the end of the decade. Chinese firms are investing particularly heavily at the 28nm "forever" node, which is a critical cost-effective

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[16] Semiconductor Industry Association, "SIA Response to USTR Section 301 Trade Investigation on China's Acts, Policies, and Practices Related to Targeting of the Semiconductor Industry for Dominance," https://www.semiconductors.org/wp-content/uploads/2025/03/SIA_TradeInvestigation_0325_v2.pdf.

[17] SemiconductorX, "Humanoid Semiconductor Stack," https://semiconductorx.com/humanoid-semiconductor-stack.html.

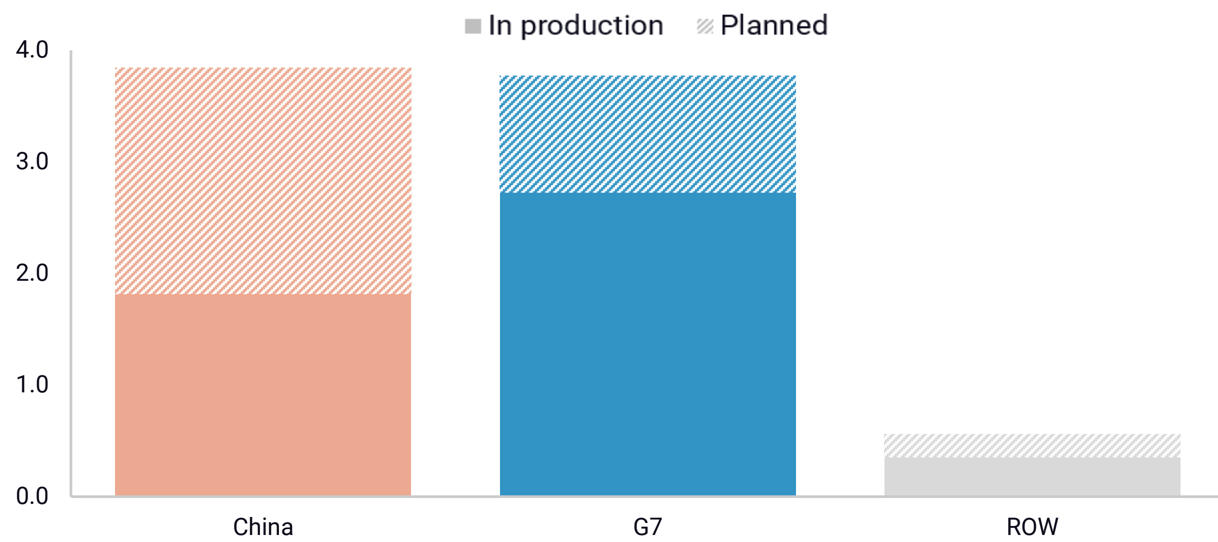
process used for automotive and industrial microcontrollers, connectivity and RF chips, and mid-range IoT processors, among other devices (Figure 10.)

**For incumbents from the US and other G7+ countries, the unprecedented expansion of legacy chip capacity investment occurring in China not only threatens their ability to maintain a foothold in China but also raises the specter of price erosion and competitive displacement in markets outside China.** Without a coordinated effort to assess and raise pre-emptive defenses against the threat of legacy chip overcapacity from China, the US and other G7+ countries may see their competitiveness in these critical high-volume segments erode over time, giving rise to new upstream exposures to China's tech stack.

FIGURE 10

**Current and planned 20nm-40nm wafer capacity**

Millions of WSMP (200mm EQ) as of Q3 2025 by fab location




Source: Rhodium Group, SEMI.

## Cloud infrastructure: G7+ dominant

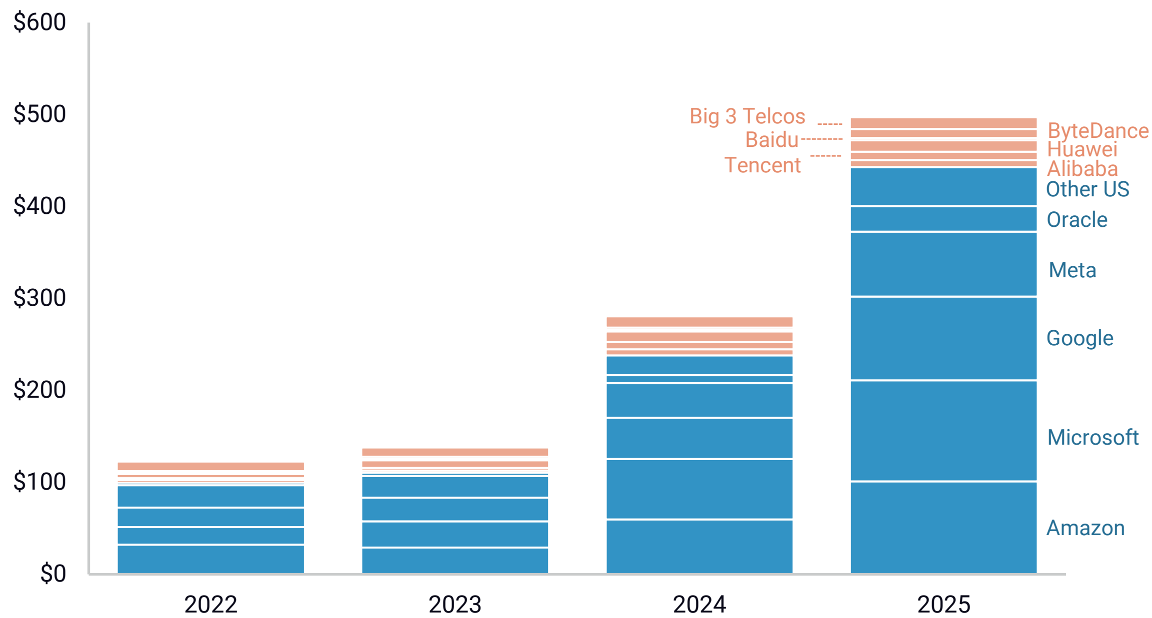
**The combination of G7+ leadership in advanced semiconductor production and US restrictions on advanced AI data center chip exports to China has enabled the US to assert a decisive early lead in AI cloud infrastructure buildouts.** In 2022 and 2023, US AI firms spent 5x as much on data center infrastructure as their Chinese counterparts. In 2025, that ratio rose to 10:1 as US hyperscalers accelerated capacity buildouts for AI models and applications (see Figure 11). As detailed in the following section, this advantage has helped preserve US dominance at the very frontier of AI model development. However, Chinese firms, through a combination of algorithmic innovation, export control evasion, distillation of US frontier model outputs, and exploitation of persistent loopholes in the US chip control regime, have managed to compress the model capability gap even as the infrastructure gap widens. The US government is considering an array of policies to tighten restrictions on Chinese firms' access to US-origin computing power and to penalize industrial-scale distillation. If implemented, these measures would test how much of China's frontier-level competitiveness rests on continued access to the

US AI ecosystem while shifting the full burden of supporting Chinese AI innovation onto a domestic infrastructure base already struggling to meet demand.

FIGURE 11

**Capital expenditures dedicated to data center infrastructure**

USD billions




Source: Rhodium Group, Omdia

Even if Chinese labs can maintain their place near the frontier of model development, controls on China's ability to purchase or produce enough AI data center chips to meet local demand pose a serious challenge to Beijing's efforts to diffuse AI across its economy. The State Council's AI deployment target of 70% penetration of AI devices, agents, and applications across China's economic, social, and governance structures by 2027 speaks to Beijing's ambition to accelerate local adoption of the full stack of AI capabilities from the cloud and application layer, through the edge, and to the device. While Beijing sees an asymmetric opportunity to lead in physical AI deployment, diffusing agentic AI capabilities will inevitably require a massive expansion of AI cloud data center capacity. Certain agentic capabilities may be shifted from the cloud to edge and on-device chips for tailored use-cases, but the long-horizon, multi-step, often multi-agent problem-solving required for more complex, open-ended tasks demands compute on a scale only cloud and large on-prem data centers can provide.

**China's constrained AI chip production also creates a window for the US to build incumbent advantages in global AI data center markets before Chinese competitors can scale out.** Chinese cloud providers have been almost completely sidelined in the competition for global AI cloud markets to date. While the lion's share of AI compute capacity buildouts has so far occurred in the US—Epoch AI estimates that the US held 75% of aggregate global AI compute capacity as of April 2025, followed by China at 15%—US and foreign sovereign data center providers are beginning to ramp up their ex-US buildouts.[18] Since 2025, AI data center project announcements in India alone would amount to nearly 20GW of capacity if fully realized. The European Union, Japan, Korea, Saudi Arabia, and a handful of other countries are also rolling out plans to promote large-scale local AI data center construction. The US, as the sole country that can currently provide AI compute infrastructure at scale to global markets, has a unique opportunity to meet this demand while chip constraints limit Chinese competition. This is the basic insight behind the Trump administration's American AI Export Program, which aims to accelerate the global expansion of American AI by organizing coalitions of US companies to offer full-stack export packages backed by US government diplomatic and financial support.[19]

**Chinese cloud companies will have limited capacity to contest the scale out of US AI infrastructure through 2030. While small deployments in key swing markets could preserve a foothold to vie for influence in the long run, the risk of losing access to US chips is a strong deterrent.** Huawei has reportedly pursued partnerships to export small quantities of Ascend AI chips to the UAE, Saudi Arabia, Thailand[20], and Malaysia[21], but those efforts have fizzled under the threat of US backlash. The US government has established formal levers to discourage countries with sovereign AI ambitions from adopting Chinese chips by conditioning bilateral trade deals on a commitment to align with US export controls[22], which implicitly covers the US determination that Huawei chips contain US-origin technology and are therefore a violation of US export controls.[23] These ad hoc pressure tactics are occurring in the absence of a robust regulatory framework coordinated with partners. This block-and-tackle approach by the US will become less effective if China can build enough production capacity to offer AI infrastructure on a large enough scale to credibly compete with the US.

## AI models: G7+ and China at parity

**Chinese open-weight models trail top US closed-source models in performance**. In 2025, the US released 45 notable AI models, compared with 31 from China,[24] making them the

[18] Epoch AI, "Trends in AI supercomputers," April 23, 2025. https://epoch.ai/publications/trends-in-ai-supercomputers#our-dataset

[19] White House, "Executive Order 14320: Promoting the Export of the American AI Stack," July 23, 2025, https://www.whitehouse.gov/presidential-actions/2025/07/promoting-the-export-of-the-american-ai-technology-stack/.

[20] Mackenzie Hawkins and Gao Yuan, "Huawei Seeks AI Chip Clients in Middle East, Southeast Asia," Bloomberg, July 10, 2025, https://www.bloomberg.com/news/articles/2025-07-10/huawei-seeks-ai-chip-customers-in-middle-east-southeast-asia?embedded-checkout=true.

[21] Mackenzie Hawkins and Ram Anand, "Malaysia Downplays Huawei Deal as US Checks China's AI Reach," Bloomberg, May20, 2025, https://www.bloomberg.com/news/articles/2025-05-20/malaysia-downplays-huawei-deal-as-us-aims-to-curb-china-ai-power.

[22] White House, "Agreement between the United States of America and Malaysia on Reciprocal Trade," October 26, 2025, https://www.whitehouse.gov/briefings-statements/2025/10/agreement-between-the-united-states-of-america-and-malaysia-on-reciprocal-trade/.

[23] US Department of Commerce Bureau of Industry and Security, "Department of Commerce Announces Rescission of Biden-Era Artificial Intelligence Diffusion Rule, Strengthens Chip-Related Export Controls," May 13, 2025, https://www.bis.gov/press-release/department-commerce-announces-rescission-biden-era-artificial-intelligence-diffusion-rule-strengthens.

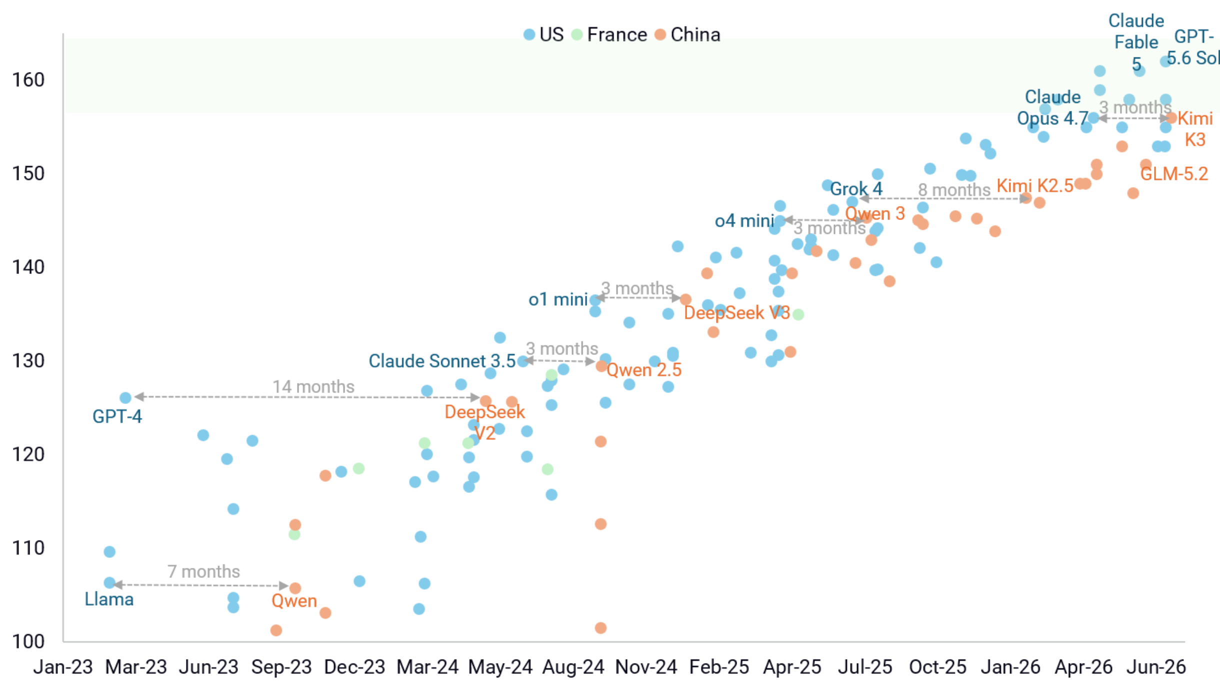
[24] Epoch AI, database of AI Models-notable AI models, last updated on January 12, 2026, https://epoch.ai/data/ai-models. According to Epoch AI, a notable model meets any of the following criteria: (i) state-of-the-art improvement

only countries to release a double-digit number of such models. Although the competition appears to be closely matched in output, Chinese models still lag behind their US counterparts in performance. According to the Epoch Capabilities Index—a composite metric aggregating results from over 50 distinct AI benchmarks to generate a single, general capability score—since 2023, every model that has pushed the frontier of AI capabilities forward has been developed in the US. Over the same period, Chinese models have trailed US counterparts by three to fourteen months (Figure 12).

FIGURE 12

## Model performance measured by Epoch Capability Index

X=release date; Y=Epoch Capability Index; =current frontier




Source: Epoch AI, Rhodium Group

**Frontier model capabilities will drive competitiveness in model applications where revenue is generated.** Chinese models may be sufficient for long-tail, everyday tasks, but weaker performance at the frontier could shut them out of the most complex—and potentially most lucrative—use cases, placing them at a disadvantage relative to their US counterparts. Tencent Chief AI Scientist Yao Shunyu has argued that cutting-edge capabilities may matter less in consumer-facing products, but are essential in enterprise applications, where greater intelligence translates into higher productivity and, ultimately, greater profits.[25]

**China's limited access to advanced compute is the most significant constraint on Chinese developers' ability to keep pace with their US counterparts.** In early 2026,

on a recognized benchmark; (ii) highly cited (over 1000 citations); (iii) historical relevance; (iv) significant use. A model is attributed to a country if at least one author of the introducing paper is affiliated with an institution based there. Models with authors from multiple countries may therefore be double counted.

[25] Xi Meizhi, "Two Diverging Paths for Foundation Model Companies: ToB to the Left, ToC to the Right—Insights from the AGI-Next Summit (从 AGI-Next 前沿峰会，看清大模型公司的两条路：ToB 向左，ToC 向右)," AI Large Model Factory, January 23, 2026, https://www.thepaper.cn/newsDetail_forward_32447990

leading Chinese model developers including Alibaba and Zhipu AI acknowledged the gap between their models and their US counterparts and pointed to their relative lack of compute as a key contributing factor.[26] During a May 2026 investor call, DeepSeek founder Liang Wenfeng reportedly said China's gap with the US lies primarily in compute resources, noting that whereas the largest US models already had 800 billion *active* parameters,[27] domestic developers remain stuck at tens of billions and are "far from being able to train" a model with 800 billion active parameters because they lack sufficient compute.[28] According to Liang, the gaps with the US in talent, model capability, and applications all stem from this compute differential. The talent effect runs two ways: limited compute means fewer experiments and thus fewer chances for a lab to develop its own researchers, while researchers gravitate toward well-resourced labs where they can pursue research unconstrained by compute. In short, the labs with the most compute tend to attract top talent. Compute scarcity also caps model size and, even for smaller models, leaves less room for the trial and error that drives capability gains. And without strong foundation models, the applications built on top of them can lag in performance.

**Chinese model developers have adopted a mix of strategies, both legitimate and illicit, to address the compute shortage**. Leading Chinese AI labs have long pursued architectural and algorithmic innovation to improve model efficiency and cut compute consumption. Kimi K3, the latest flagship model from Moonshot AI, adopted an Attention Residuals technique that reportedly delivers roughly a 25% training-efficiency gain for less than 2% additional compute.[29] Chinese model developers have also secured advanced compute by remotely leasing server capacity outside the scope of US export controls and, in some cases, by smuggling banned chips.[30] Distillation—a method to train a model based on the outputs of an already-trained frontier model—offers another route around the compute limitations, allowing Chinese model developers to mitigate the enormous cost (including on compute) of training a frontier model from scratch. Without enforceable visibility into both routes—compute end-users and US frontier lab customers distilling from their models—it will remain difficult to assess how much of China's frontier progress actually depends on US inputs.

**Chinese model developers have embraced an open-weight strategy to compete more effectively against frontier US proprietary models**. The approach also has the backing of the Chinese government: The State Council's August 2025 "AI Plus" Initiative promotes an open-source AI ecosystem, including making AI models open weight.[31] On July 17, 2026,

[26] Bloomberg News, "China AI Leaders Warn of Widening Gap With US After $1B IPO Week," January 10, 2026, https://www.bloomberg.com/news/articles/2026-01-10/china-ai-leaders-warn-of-widening-gap-with-us-after-1b-ipo-week?embedded-checkout=true.
[27] Note that Liang refers to active parameters, not total. Several Chinese models released since have far larger total counts, including Kimi K3 with 2.8 trillion parameters. But these are mixture-of-experts architectures activating only a fraction per token; Kimi K3 activates an estimated 50–100 billion parameters.
[28] Fred Gao, "DeepSeek's Liang Wenfeng Breaks His Silence," Inside China, July 23, 2026, https://www.fredgao.com/p/deepseeks-liang-wenfeng-breaks-his
[29] Kimi Team, "Attention Residuals," Hugging Face, March 16, 2026, https://huggingface.co/papers/2603.15031; Tony Peng, "Moonshot AI's High-Stakes Bet: Inside Kimi K3 and the Shift in Chinese AI Strategy," Recode China AI, https://www.recodechinaai.com/p/moonshot-ais-high-stakes-bet-inside
[30] US Department of Justice, "US Authorities Shut Down Major China-Linked AI Tech Smuggling Network," December 8, 2025, https://www.justice.gov/opa/pr/us-authorities-shut-down-major-china-linked-ai-tech-smuggling-network
[31] State Council, Opinions on Further Implementing the "AI Plus" Action, August 26, 2025, https://www.gov.cn/zhengce/content/202508/content_7037861.htm.

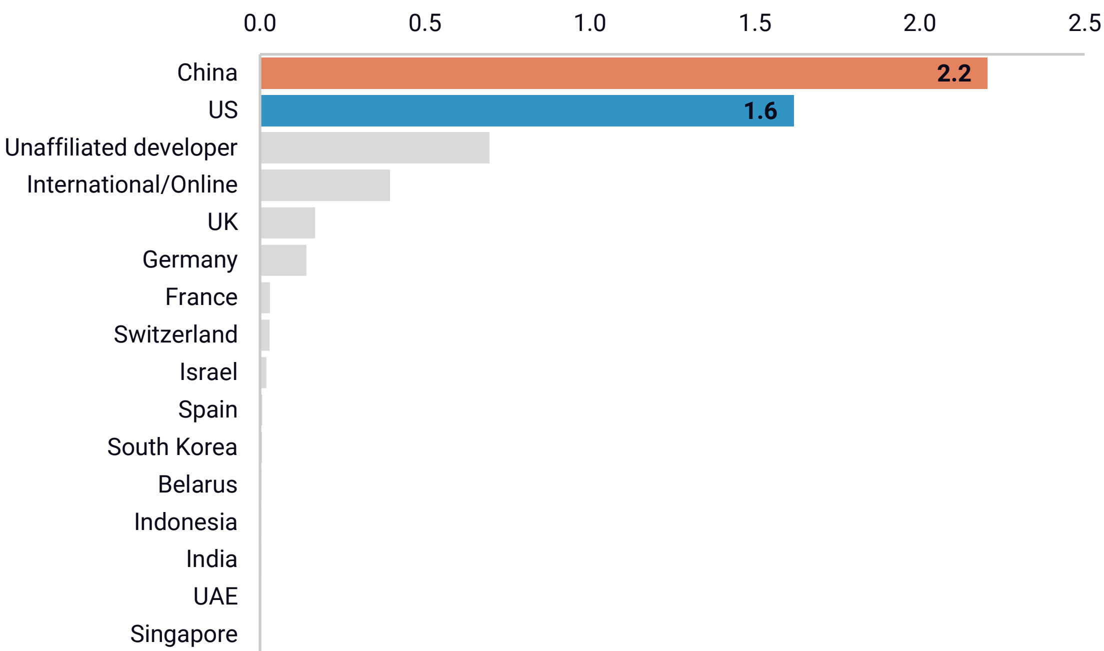
President Xi Jinping reiterated China's support for open source in a keynote address at the country's ninth annual World AI Conference.[32] By making these models freely downloadable and thus widely adopted, China aims to establish model dominance. And as enterprises embed Chinese models into their workflows and nations into their infrastructure, China intends to make Chinese models the default foundation on which the world's downstream applications are built—this foundation is what allows China to exert its influence over global norms and standards on AI.

**Early evidence suggests that the open-weight strategy is paying off.** Open-weight model download data from Hugging Face, a leading global open-source platform hosting model weights, shows that models developed by Chinese entities accounted for more than 2 billion downloads in 2025, representing 41% of all model downloads on the platform. US-developed models ranked second, with approximately 1.6 billion downloads, or 31% of the total (Figure 13). Among individual model developers, Alibaba's Qwen series emerged as a clear leader, with more than 1.4 billion downloads. Meta ranked a distant second with 544 million downloads, while DeepSeek ranked third with 484 million downloads.

FIGURE 13

**Open weight AI model downloads on Hugging Face, 2025**

By model developer HQ, billion downloads




Source: Rhodium Group, Hugging Face.[33]

**Amid the agentic AI boom and "tokenmaxxing" driving up token consumption and inference costs, the price advantage of Chinese AI models is accelerating their global**

[32] "Xi Jinping's Keynote Speech at WAIC 2026 (习近平在 2026 世界人工智能大会主旨讲话), China's Ministry of Foreign Affairs, https://www.mfa.gov.cn/zyxw/202607/t20260717_11984704.shtml

[33] Hugging Face, The Open Model leaderboard, https://huggingface.co/spaces/economies-open-ai/open-model-evolution. Download date range is Jan 1, 2025 – Dec 3, 2025, but downloads were counted only if they occurred within one year of a model's release and fell within this period. This is to compare more immediate interest as models are released.

**adoption as enterprises work to rein in costs without curbing model usage**. Increasingly, companies are reserving expensive US frontier models for high-stakes, complex work while routing high-volume, low-complexity tasks to cheaper Chinese alternatives. With this approach, enterprises are able to cut inference costs by as much as 90%.[34] Coinbase nearly halved its internal AI spending even as developer token usage grew exponentially by adopting five strategies, including routing engineers by default to cheaper Chinese open-weight models such as Zhipu AI's GLM-5.2 and Moonshot AI's Kimi 2.7, and improving model routing—for example, using frontier models for planning and lower-end models for execution.[35]

**But China's open-weight model strategy has a monetization problem.** Chinese developers are under growing pressure to monetize. The next phase of model development—including recursive self improvement—may demand even more compute and thus greater financial resources, yet permissively licensed open-weight releases generate little direct revenue. Some Chinese developers have already moved to more restrictive licenses that require commercial users above certain revenue thresholds to negotiate separate agreements—potentially a way to capture some of the value they create. Beijing may also become less willing to encourage open-weight releases as more capable models deepen concerns about the proliferation of high-risk capabilities. But if Chinese models become less open, they may also become less attractive to overseas users. API access offers a clearer path to monetization, but this channel faces rising regulatory risk.

**More fundamentally, lock-in is hard to achieve at an increasingly commoditized model layer**: switching model providers is far easier than replacing hardware, and many companies already run several models in parallel. Beijing is therefore unlikely to be satisfied with success in model adoption alone and will seek to translate the soft-power leverage created by open-weight models into full-stack deployment. The key question is whether it can convert the initial appeal of Chinese models into reliance on Chinese applications, services, devices, and ultimately Chinese-operated data centers powered by Chinese-made AI chips.

**For now, the Mythos effect is working in favor of Chinese open-weight models**. The abrupt shutdown of Mythos and Fable 5 reignited debate over the risks of depending on US models and reinforced calls for sovereign AI. Open-weight models can be freely downloaded—and once downloaded, access can never be revoked, unlike proprietary models reached through a company's platform or API—then fine-tuned on an organization's own proprietary data and deployed on local infrastructure. Together, these qualities make open-weight models an appealing foundation for sovereign AI. The advanced cyber capabilities introduced by Mythos-level models also underscore nations' and enterprises' need for open-weight models that provide reliable access in a new age of AI cyber defense. When Hugging Face detected a breach of its platform—later revealed to have been carried out by OpenAI's models in sandbox testing—the company first turned to proprietary models via commercial APIs for help but was refused because of their safety guardrails. It then turned to Zhipu's open-weight GLM 5.2, running it locally to

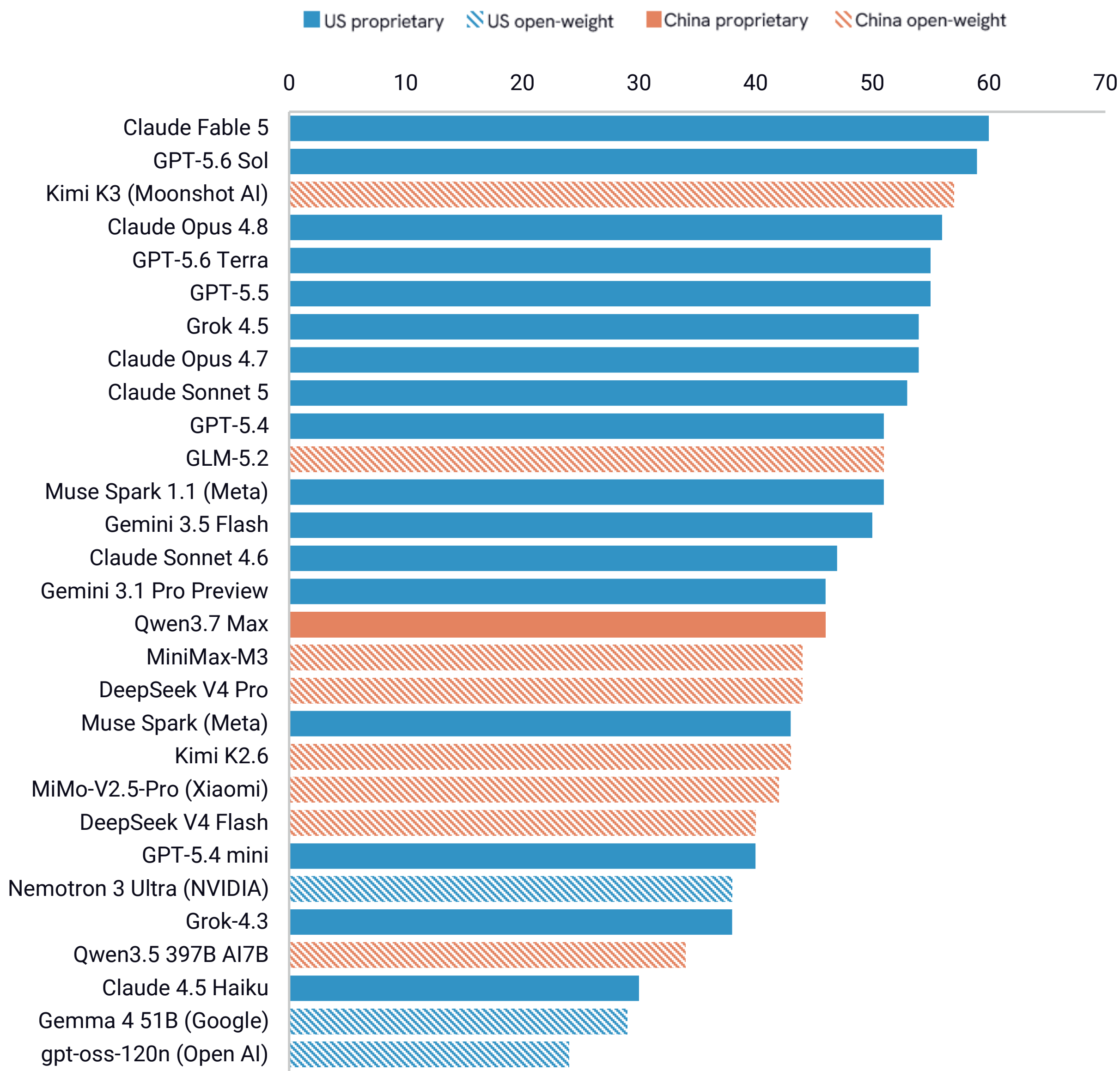
[34] Bruno Škvorc, "Migrating from Claude to DeepSeek," Lindy, June 24, 2026, https://www.lindy.ai/blog/migrating-from-claude-to-deepseek?mc_cid=ea1c665cfe&mc_eid=3d37ba4c67
[35] Brian Armstrong, "How to Keep AI Spend Flat," X, June 26, 2026, https://x.com/brian_armstrong/status/2070670644577280109

contain the attack.[36] As China currently leads the open-weight race (Figure 14), nations and companies will naturally consider turning to Chinese open-weight models.

FIGURE 14

**Models ranked by Artificial Analysis Intelligence Index**

Higher index = more capable




Source: Artificial Analysis,[37] Rhodium Group.

[36] Xinmei Shen, "Hugging Face Deploys Zhipu's GLM 5.2 Model to Contain Autonomous OpenAI Cyberattack," South China Morning Post, July 22, 2026, https://www.scmp.com/tech/tech-trends/article/3361450/hugging-face-deploys-zhipus-glm-52-model-contain-autonomous-openai-cyberattack

[37] Artificial Analysis Intelligence Index is a composite score based on 10 benchmarks, equally weighting reasoning, coding, scientific reasoning, and agentic capabilities. Scores factor in model accuracy by using pass@1 (eg model must produce the correct answer on its first attempt). https://artificialanalysis.ai/

**But the growing dominance of Chinese AI models may trigger US countermeasures.** Widespread adoption of Chinese models not only poses security risks but also undermines US influence over AI standards and ecosystems if such models diffuse globally. This creates pressure on the US to respond. The US can impose stricter Know-Your-Customer requirements for hyperscalers and frontier labs to further enhance detection and reporting on industrial-scale distillation. Washington can also raise the legal and reputational cost of adopting Chinese models through sanctions, entity listings, or regulatory measures short of a blanket ban, discouraging adoption by heightening the perceived risk of relying on these models. It can also tighten controls around China's access to compute, for example by cutting off Chinese model developers' ability to access compute remotely via cloud, further hindering China's ability to keep pace at the frontier. At the same time, as the US faces a supply-side imperative to field competitive American open-weight alternatives, direct federal funding or other incentives could be channeled to domestic labs to accelerate US progress, ultimately creating open-weight models capable of competing with Chinese ones.

**The arrival of Mythos-level models also adds urgency to China's own frontier ambitions.** Just as Beijing had settled into a "good enough" open-weight strategy, Mythos has shown that frontier capability still matters. Mythos demonstrates a tangible security capability that a trailing actor cannot simply wait out: Chinese entities cannot fix the vulnerabilities Mythos discovers until Chinese models catch up. Until then, China is, in China's cybersecurity firm 360 CEO Zhou Hongyi's phrase, effectively under "one-way transparency" where the US can see and exploit China's vulnerabilities while China remains blind to America's.[38] There are also risks that the next jailbreak or model weights leak may expose those vulnerabilities to non-state actors. If China is lagging with more unpatched vulnerabilities, it becomes the path of least resistance for cyber actors.

**Beijing will also want to capture the broader strategic advantages that frontier-model capabilities can unlock.** In addition to cyber-specific capabilities, the Mythos dynamic previews what general-purpose models may achieve more broadly. Mythos was not deliberately trained on cyber-domain data; rather, its general intelligence improved, and capability emerged in a specific domain. Cyber happened to be the first such domain. The same dynamic could extend to biology, chemistry, and materials science, where a frontier model's edge might likewise yield discovery or threat capabilities that others cannot match. Frontier model capabilities will remain a key driver of geopolitical competition since whoever possesses capabilities in these more sensitive domains will hold significant asymmetric power.

## Connectivity infrastructure: G7+ slight edge

The connectivity layer is highly contested, with the G7+ and China each dominating within their increasingly protected home markets and competing for share in non-aligned third markets. However, the growth trajectory has favored China for the past two decades. **Starting from zero in the 2000s, China now matches the G7+ in global RAN equipment sales (Figure 15) and is highly competitive in other key network equipment categories spanning optical transport, routers, subsea and terrestrial cabling.** China's emergence as

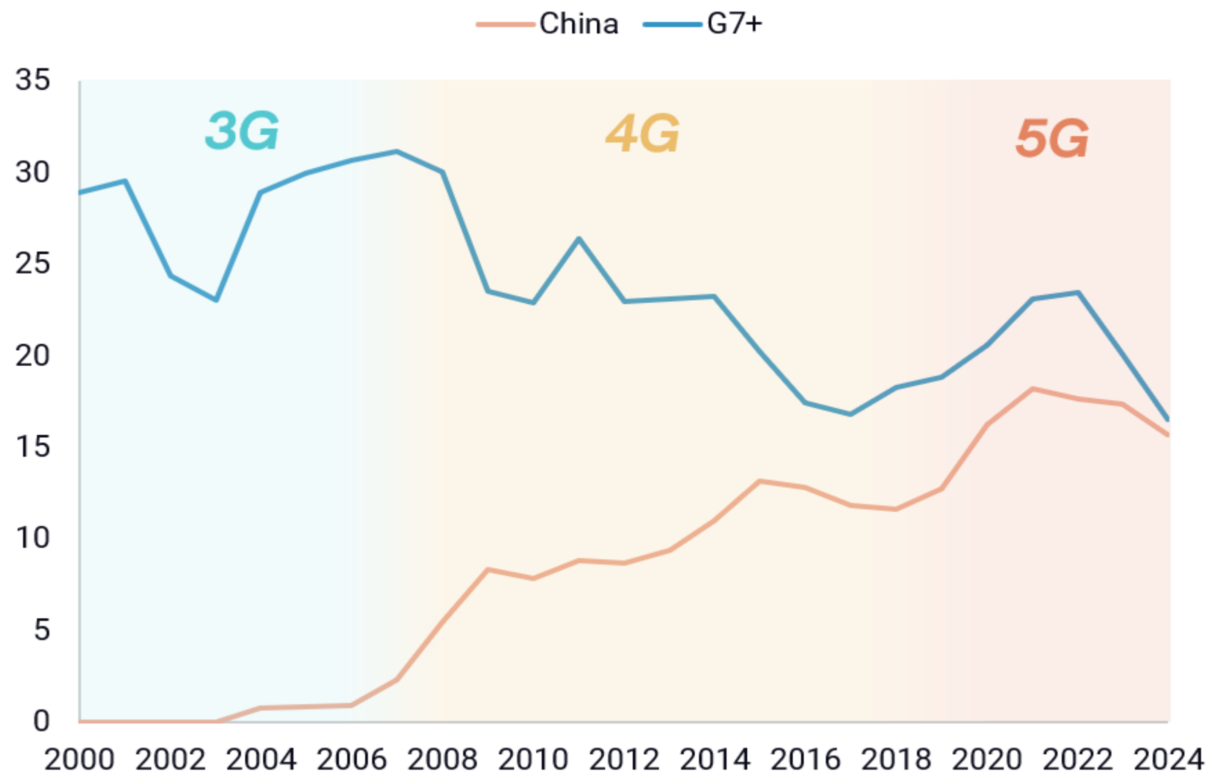
[38] Sina Technology, "Zhou Hongyi: Cybersecurity Faces a Second Wave of "One-Way Transparency"; China Must Develop Its Own Mythos (周鸿祎：网络安全面临第二次"单向透明"，中国必须拥有自己的 Mythos)," June 24, 2026, https://finance.sina.com.cn/tob/2026-06-24/doc-inienpmw1595894.shtml?froms=ggmp

a leading provider of full-stack communications networks benefitted from a decades-long industrial policy push to build up local champions within China's large, and increasingly protected, home market in the first instance before promoting their expansion abroad with generous export financing and coordinated diplomatic support.

FIGURE 15

**Global RAN equipment sales by supplier HQ**

USD billions




Source: Rhodium Group, Dell'Oro Group

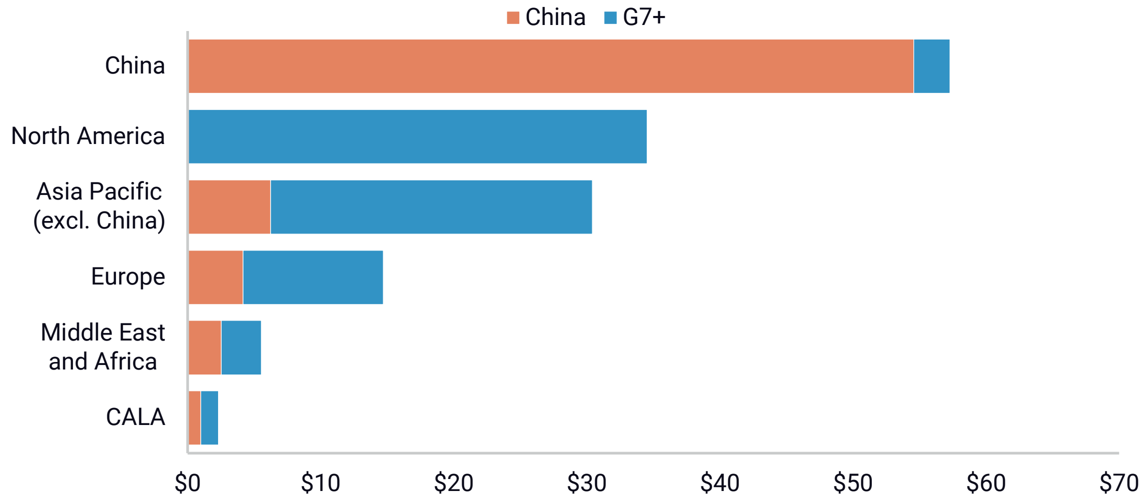
In the lead-up to the rollout of 4G network upgrades in the late 2000s, Beijing reportedly ordered local providers to reserve at least 70% of their equipment purchases for Huawei and ZTE. That quota rose above 90% for the 5G transition.[39] This protected market created a massive home advantage—China's 1 billion 5G subscribers dwarf the aggregate total in G7+ economies (~700 million) total—that Chinese vendors have used as a springboard to global competitiveness. Since 2018, Huawei and ZTE have accounted for roughly half of 5G RAN equipment sales outside China and the G7 (Figure 16).

[39] Melanie Hart and Jordan Link, "There is a solution to the Huawei Challenge," October 14, 2020, Center for American Progress, https://www.americanprogress.org/article/solution-huawei-challenge/.

FIGURE 16

**5G RAN equipment sales by supplier HQ and end market region, 2018-present**

USD billions

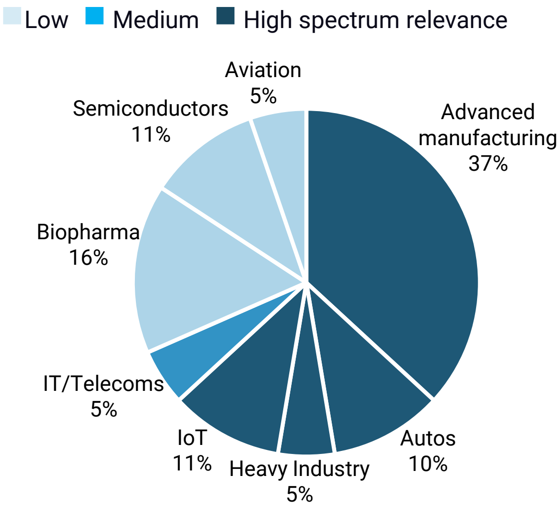



Source: Dell'Oro Group, Rhodium Group. CALA refers to Caribbean and Latin America.

**Wireless connectivity is a centerpiece of China's strategy to leverage AI-enabled automation to extend its lead in industrial manufacturing and logistics.** In November and December 2024, the Ministry of Industry and Information Technology (MIIT) completed a licensing framework for private 5G projects and initiated a "5G+ industrial internet pilot program" in ten cities with extensive manufacturing and port operations. The program prioritizes the sectors that are likely to benefit most from new investment in next-generation connectivity (Figure 17).[40] Heavy industry, for example, ranks highly due to the sprawling, hazardous environments where wireless networks enable remote monitoring, predictive maintenance, and emergency response functions that wired infrastructure cannot support as reliably. Beijing's push to accelerate the availability of private 5G, and eventually 6G, network connectivity broadly across its local manufacturing verticals dovetails with parallel AI+ and robot+ initiatives to promote the integration of AI in industrial manufacturing and advance China's emergence as an industrial and next-generation robotics leader, respectively.[41] Taken together, these policies underscore Beijing's vision to use innovations in AI and wireless networking to further entrench its manufacturing and logistics leadership.

[40] Ministry of Industry and Information Technology, Implementation Plan for Building an Upgraded "5G+Industrial Internet" 512 Project, December 25, 2024, https://www.gov.cn/zhengce/zhengceku/202412/content_6995507.htm.
[41] Ministry of Industry and Information Technology et al., Implementation Plan for the "Robot+" Application Action, January 18, 2023, https://www.gov.cn/zhengce/zhengceku/2023-01/19/content_5738112.htm;

FIGURE 17
**Spectrum-relevance of major industrial clusters in 5G pilot cities**
Share of industrial clusters grouped by their primary industry vertical




Source: Rhodium Group compilation.

**Wireless spectrum allocation is a key component of China's 5G+ industrial internet strategy.** In 2023, China unveiled comprehensive reforms to its domestic spectrum policy to open prime mid-band frequencies for mobile broadband use and carve out spectrum to support specific industrial applications under localized licenses. This move created a path for smart factories, ports, airports, and logistics operators to deploy tailored 5G and 6G networks.

China has also allocated large, contiguous blocks of spectrum in the higher frequency millimeter wave (mmWave) bands for mobile network applications in a bid to promote its emerging edge in industrial automation and robotics. High-frequency channels can move data at faster speeds and support pinpoint-accurate location sensing, but their signals deteriorate rapidly over distance, making them attractive for data-intensive but short-distance use cases such as factories, ports, mines, and smart-city hubs. By locking in these bands early, regulators give Chinese equipment makers, chip foundries, and software firms a clear target around which to design antennas, radios, and industrial applications, with the aim of seeding an entire domestic supply chain that can scale before international rivals do. The expectation is that mmWave will play a key role in freeing factories and logistics hubs to cut the cord: Robots, automated guided vehicles, and high-definition inspection cameras can all connect wirelessly at multi-gigabit speeds with millisecond-level responsiveness, a prerequisite for "digital-twin", or real-time virtual model, of production lines.

These industry-friendly moves were backed by the recognition that innovation in industrial AI, robotics, and smart infrastructure requires reliable low-latency, high-capacity wireless connectivity. **China's drive to lead the global debate on spectrum management reflects its broader ambition to shape the foundational infrastructure of the digital economy. By influencing how key frequency bands are allocated and used—particularly for 5G, 6G, and industrial applications—China aims to position its technologies, standards, and vendors as default choices in emerging markets.** This not only secures long-term commercial advantages for Chinese firms but also strengthens Beijing's voice in setting the technical and governance norms that will underpin the next generation of global connectivity.

These policy choices also carry significant implications for global spectrum governance as China builds its case to influence spectrum allocation and standards decisions in the leadup to the 6G transition. By acting early to designate and commercialize mmWave and mid-band spectrum for industrial use, China is attempting to position itself as a standard-setter in the global race toward industrial innovation in 6G by scaling the deployment of a robust application ecosystem.

**Current momentum from major swing markets indicates a distinct tilt toward harmonization with China's spectrum allocation decisions.** In 2025, Brazil, India, and countries across the EU have signaled their intent to align with China's designation of the upper 6 GHz band for mobile broadband. This is in contrast to the US, which has designated the entire 6 GHZ band to unlicensed Wi-Fi use, only aligning with Canada, South Korea, and Saudi Arabia among major markets.

TABLE 2

## Global spectrum allocations for key 6G bands

| Ghz | 4.4 | 4.8 | 5.925 | 6.125 | 6.43 | 6.585 | 6.725 | 6.925 | 7.125 | 7.425 | 8.4 | 14.8 | 15.35 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| United States | Study: WRC-27 | | Unlicensed wifi | | | | | | Study: lean IMT | Study: WRC-27 | | Study: WRC-27 | |
| South Korea | Study: WRC-27 | | Unlicensed wifi | | | | | | Study: WRC-27 | | | Study: WRC-27 | |
| Canada | Study: WRC-27 | | Unlicensed wifi | | | | | | Study: WRC-27 | | | Study: WRC-27 | |
| Saudi Arabia | Study: WRC-27 | | Unlicensed wifi | | | | | | Study: WRC-27 | | | Study: WRC-27 | |
| UAE | Study: WRC-27 | | Unlicensed wifi | | IMT | | | | Study: WRC-27 | | | Study: WRC-27 | |
| Brazil | Study: WRC-27 | | Unlicensed wifi | | IMT | | | | Study: WRC-27 | | | Study: WRC-27 | |
| EU | Study: WRC-27 | | Unlicensed wifi | | Study: | IMT | | | Study: WRC-27 | | | Study: WRC-27 | |
| Japan | Study: WRC-27 | | Unlicensed wifi | | Study: lean IMT | | | | Study: WRC-27 | | | Study: WRC-27 | |
| Australia | Study: WRC-27 | | Unlicensed wifi | | | IMT | | | Study: WRC-27 | | | Study: WRC-27 | |
| UK | Study: WRC-27 | | Unlicensed wifi | | | IMT | | | Study: WRC-27 | | | Study: WRC-27 | |
| India | Study: WRC-27 | | Unlicensed wifi | | IMT | | | | Study: lean IMT | | | Study: WRC-27 | |
| Indonesia | Study: WRC-27 | | Unlicensed wifi | | IMT | | | | Study: WRC-27 | | | Study: WRC-27 | |
| Vietnam | Study: WRC-27 | | Unlicensed wifi | | IMT | | | | Study: WRC-27 | | | Study: WRC-27 | |
| Mexico | Study: WRC-27 | | Unlicensed wifi | | IMT | | | | Study: WRC-27 | | | Study: WRC-27 | |
| China | Study: WRC-27 | | IMT | | | | | | Study: WRC-27 | | | Study: WRC-27 | |

Source: Rhodium Group

**China's playbook is to innovate domestically, demonstrate success, then leverage that success to shape global standards to favor Chinese firms.** Beijing is promoting widespread adoption of 5G across domestic industry verticals in a bid to demonstrate the advantages of its spectrum allocation approach to global audiences in the lead up to the 6G transition. This focus on demonstrating applications is evident in MIIT's private 5G factory directory, published in September of 2025, which showcases more than 560 5G-enabled industrial use cases. For other economies with ambitions to develop their own 6G industrial applications, like Brazil or India, the scale-driven cost advantages and full-stack solutions offered by the Chinese ecosystem are attractive despite the single-vendor lock-in risk associated with buying into the Chinese stack.

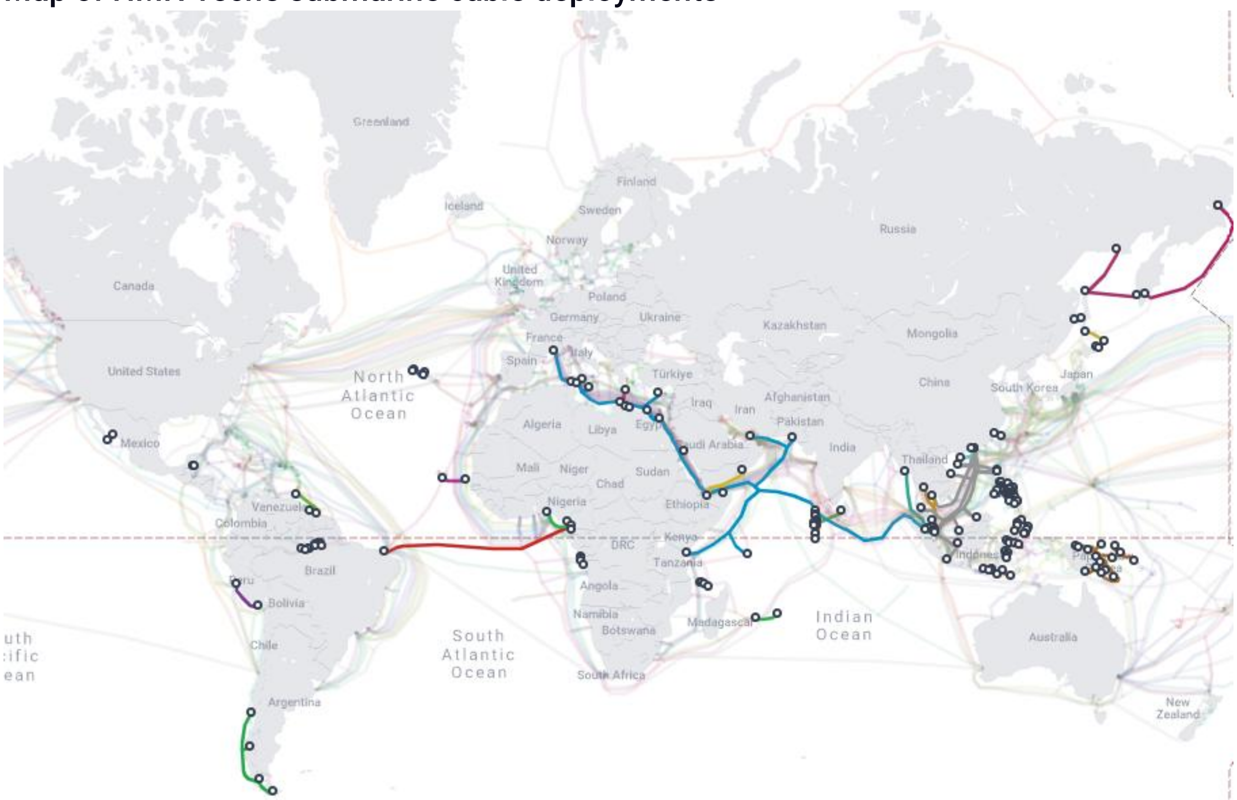
China's ability to supply equipment for every node of a modern terrestrial network plays into Beijing's wireless infrastructure diplomacy, enabling it to offer complete, often subsidized, plug-and-play packages to partners eager to embrace the easiest, lowest-cost solution. Beyond RAN equipment, Chinese suppliers are now highly competitive with G7+ incumbents across nearly every other segment of connectivity infrastructure. Huawei and

ZTE combined to account for a third of the $11 billion service provider router market and 40% of the $14.5 billion optical transport equipment market in 2024. Meanwhile, Chinese firms like Yangtze Fiber Optical and Cable (YOFC) and Hengtong Group have emerged as significant rivals to the US's Corning, Italy's Prysmian, and Japan's Sumitomo Electric in the fiber optic cable supply chain.

China is also supporting its digital tech stack diplomacy with targeted investments in undersea cables. China trails in terms of total volume of new undersea cable installations—G7+ firms accounted for nearly 90% of new installations between 2020-2024, compared to just 10% for China. However, Huawei Marine Networks (HMN Tech), China's undersea cable champion, has pursued a targeted strategy to substantially expand China's links to emerging markets in the Global South (Figure 18).

FIGURE 18

### Map of HMN Tech's submarine cable deployments



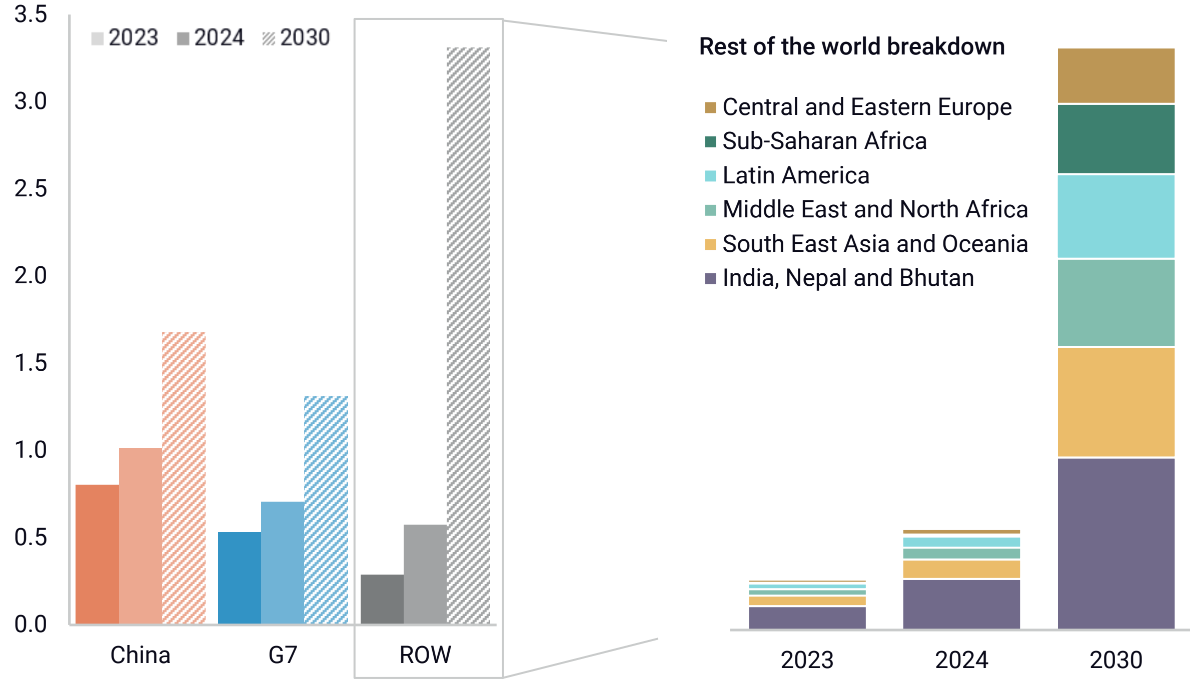

Source: TeleGeography

As G7+ economies and China continue to lock each other out of their respective networks, these battleground markets will be critical in determining the balance of influence over network buildouts. By 2030, "rest of world" markets—headlined by Southeast Asia and India—will account for an estimated 3.3 billion 5G subscriptions—more than China and G7+ combined (Figure 19). While India is increasingly aligning itself with ex-China suppliers, competition for the rest of these markets will be fierce.

FIGURE 19

### 5G subscriptions by region

Billions




Source: Rhodium Group, Ericsson Mobility Report

## Connected devices: China dominant

**China has preserved its dominant position in connected device manufacturing despite the recent G7+ push for ex-China diversification.** China's consumer electronics production has exceeded the output of all other countries combined for more than fifteen consecutive years. Meanwhile, G7+ diversification efforts have barely made a dent in China's market share. Between 2017 and 2023, China's share of smartphone exports fell just three percentage points from 50% to 47%, while its share of laptop and tablet exports fell from 69% to 67%.

**China's persistent dominance in electronics assembly bucks the historical trend observed in previous electronics assembly hubs like Taiwan and South Korea.** In each of these cases, local firms gradually outsourced assembly to China as they moved up the value chain and local labor costs rose. China, however, has managed to continue expanding its competitiveness in higher-value segments while holding onto its share of device assembly, even as Chinese manufacturing labor costs have risen to more than double the level in alternative assembly hubs like Vietnam.

**The combination of dense supplier networks, first-rate logistics infrastructure, and a deep local engineering talent pool create immense gravity for China to preserve its place at the center of the global electronic device supply chain.** In coastal manufacturing superclusters like Shenzhen and Shanghai, Chinese electronics firms exploit tightly integrated local component supply chains to rapidly iterate on new device designs. These clustered ecosystems, combined with intense local competition and state-led industrial promotion, have propelled China's emergence as an innovation powerhouse in green technologies, electric vehicles, and drones. They are now positioning China to extend its manufacturing lead to key emerging segments of the connected device economy.

Chinese drone manufacturer DJI's rapid ascent to dominance in commercial and consumer drones illustrates how China's manufacturing ecosystem can translate into global market dominance in new device categories. Operating out of Shenzhen, DJI leveraged the city's dense component supply chains to rapidly iterate on designs, build production scale, and drive costs down to levels foreign competitors could not match.

Chinese robotics firms operating in these same superclusters have a similar ability to swap components and experiment with new designs with little friction, replicating the dynamic that powered DJI's rise. Chinese companies now make up an estimated 63% of the humanoid robot supply chain and are the dominant suppliers of hardware components like actuators, sensors, batteries, and motors.[42] Chinese suppliers are not only dominant in low-end robotics parts—they are rapidly mastering more technically sophisticated components, like harmonic reducers, in a bid to establish a fully self-sufficient domestic robotics supply chain. According to Andreessen Horowitz, Suzhou-based Green Harmonic now supplies these critical robot joint components at a quality equivalent to G7+ leaders like US-based Harmonic Drive, at a 30% price discount.[43]

While G7+ advantages in advanced chip design and production confer an edge in the advanced AI software and inference layers that will power next-generation autonomous robots, China's growing dominance over the physical hardware stack creates substantial dependency risks for G7+ robotics firms. According to Morgan Stanley, fully replacing Chinese components would cause the cost of Tesla's Optimus Generation 2 to increase from $46,000 to $131,000.[44] **As of today, G7+ firms cannot credibly compete in emerging connected device categories like humanoid robotics without sourcing substantial levels of Chinese-origin content.**

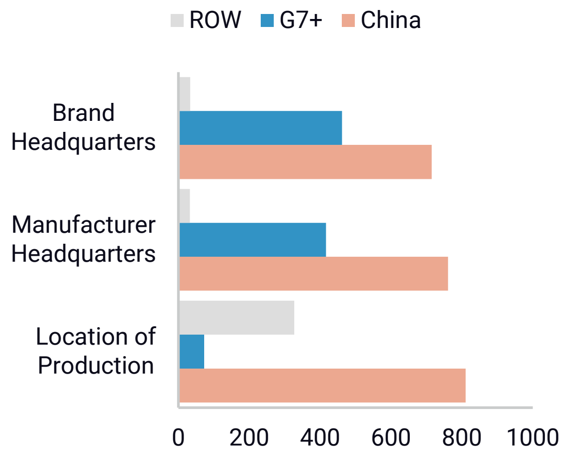
**China is also gaining ground in more established industrial robotics segments**. China is already the world's largest market for industrial robotics on a volume basis and is on the verge of surpassing Singapore to become the world leader on a per capita basis. As in countless other sectors, China's massive home market advantage is enabling domestic local suppliers to emerge in a market that has traditionally been dominated by Japanese and European firms. Local suppliers have expanded their share of China's industrial robot market over the past five years, accounting for a majority of installations for the first time in 2024 (Figure 20).

[42] Adam Jonas et al., "The Humanoid 100: Mapping the Humanoid Robot Value Chain," Morgan Stanley Research, February 6, 2025.
[43] Martin Casado and Anne Neuberger, "America Cannot Lose the Robotics Race," September 26, 2025, Andreessen Horowitz, https://a16z.com/america-cannot-lose-the-robotics-race/.
[44] Park Ji-Min, "Tesla's Optimus Can't Be Made Without Chinese Components," February 3, 2026, Chosun Daily, https://www.chosun.com/english/industry-en/2026/02/03/ANUC5SME6ZDXNDIPYCUFPN3YAU/.

FIGURE 20

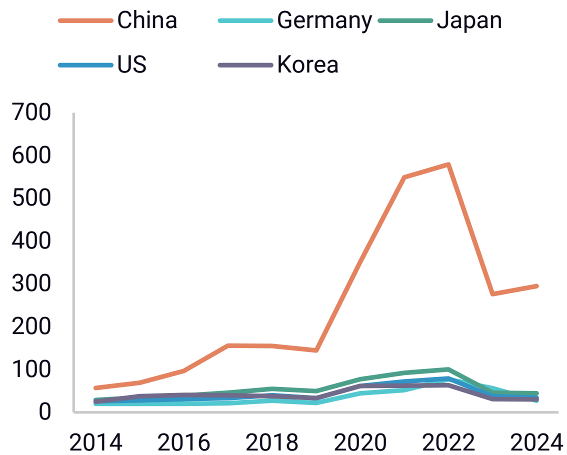
**Global smartphone production, 2024**

Millions of units



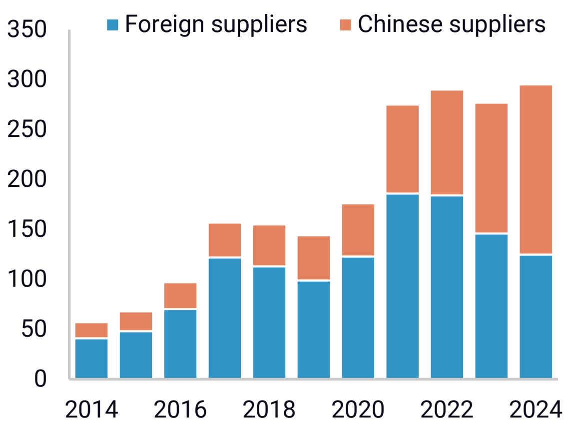

**Annual industrial robot installations, 2014-2024**

Thousands of units



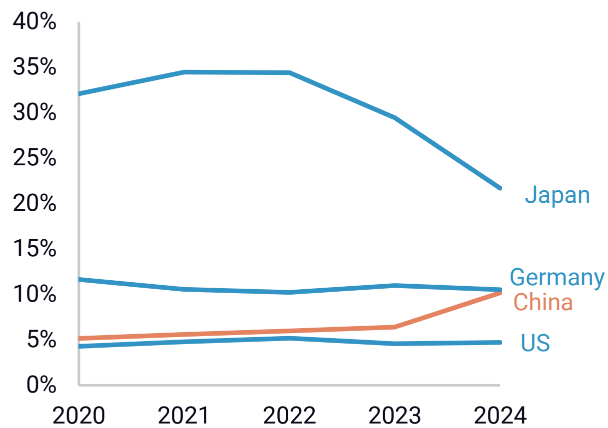

**China industrial robot installations by supplier HQ**

Thousands of units




**Share of global industrial robot exports**

Percent




Source: Rhodium Group, IDC, Counterpoint, International Federation of Robotics, UN Comtrade

**Chinese suppliers are also starting to leverage their growing strength in the domestic robotics market to expand internationally.** China's share of global industrial robot exports has more than doubled since 2020, driven by competitive pricing and growing demand from Chinese EV and battery manufacturers establishing production facilities in Southeast Asia, Mexico, and Europe.[45] Leading Chinese firms like Estun Automation have pursued acquisitions of European robotics companies and established overseas manufacturing and distribution operations to accelerate their global expansion. China's deployment-focused 6G strategy, which centers private industrial wireless for smart factory automation as its core value proposition, will create opportunities for Chinese firms to continue expanding at home and abroad in tandem with China's 6G network buildouts.

[45] "Smart Manufacturing Without Borders: The Global Journey of ESTUN and the Rise of Chinese Robotics," Estun, August 30, 2025, https://en.estun.com/?list_52%2F2290.html=.

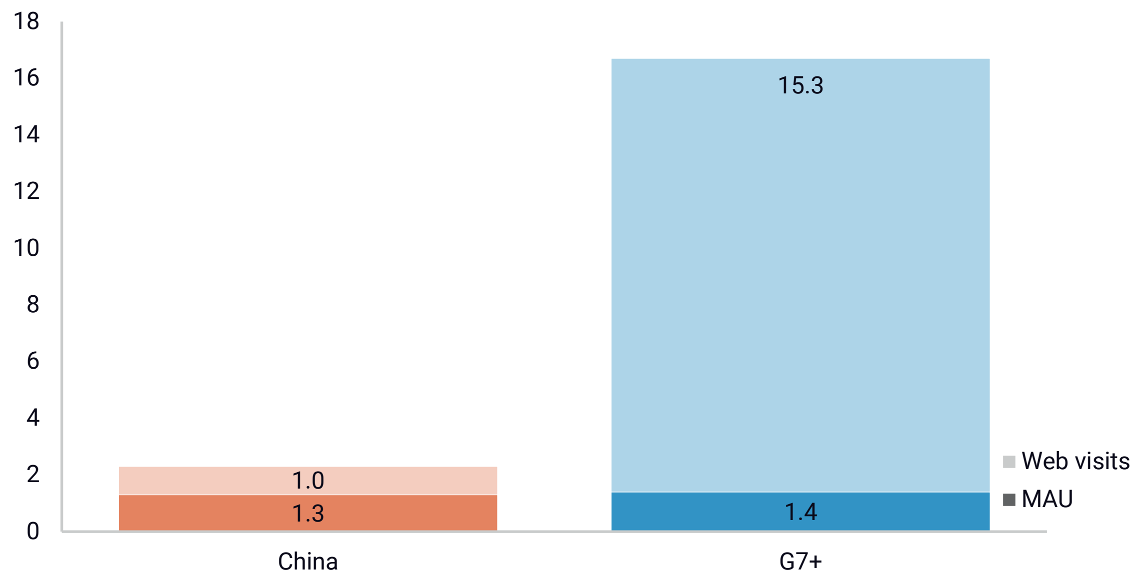
## Digital applications and services: G7+ dominant

**G7+ companies maintain incumbent leadership across every segment of the digital applications and services economy and have established an early lead in the emerging AI-native application segment.** Despite the global rise of TikTok, Western social networks continue to command the largest global user bases. Based on the latest available data, US social media platforms led by Meta top the rankings with an estimation of 4.5 billion monthly active users (MAU) worldwide. TikTok, the Chinese platform with the most MAU, is ranked third with an estimation of 2.2 billion MAU.[46]

FIGURE 21

### User engagement of China vs G7+ developed AI products

Billions of MAU, web visits[47]




Source: Rhodium Group, AICPB

A similar pattern emerges in the landscape of AI products. Based on AICPB's global rankings across AI product categories such as chatbots, AI search tools, and AI media applications, G7+ companies hold an early lead in AI app usage globally. In June 2026, eight AI products developed by US companies and eleven developed by Chinese companies appear in the global top 20 by MAU. However, US-developed products lead in cumulative global MAU, exceeding 1.4 billion users in total, compared with approximately 1.3 billion for Chinese-developed products (Figure 21). Western companies' advantage is more pronounced among AI website products. Of the top 20 AI website products ranked by visits, Western companies account for 16 (with 14 being in the US), with total visits exceeding 15 billion globally. China ranks second but trails significantly, with four websites on the list and a combined total of a billion visits. Across both AI products and AI websites, ChatGPT ranks first by a wide margin. The ChatGPT app's global MAU reached almost 995

[46] MAU figures primarily collected from companies' Q1 2026 financial disclosures. Where such data are unavailable, author estimations and third-party sources such as QuestMobile are used. For TikTok, advertising audience reach is used as a proxy.

[47] Sums across AI apps and websites ranked in the global top 20 in June 2026 by MAU and web visits, respectively.

million in June, while ByteDance's Doubao ranks second with 324 million MAU.[48] In website traffic, ChatGPT recorded more than 5.6 billion visits globally, whereas Bing ranked second with approximately 3.7 billion visits.[49]

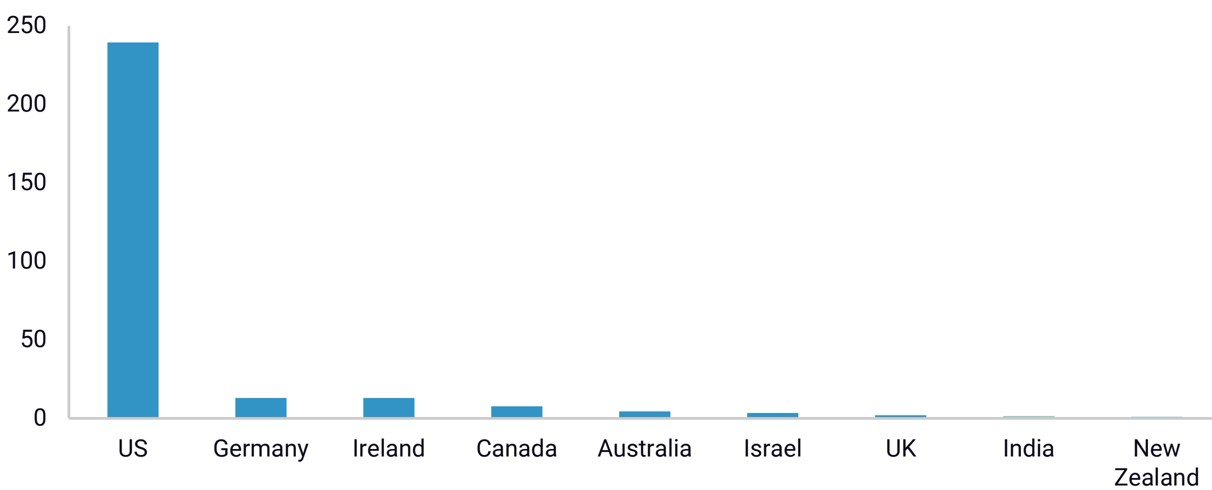
**Access to large and diverse global user bases enables US firms to compound their incumbent advantages**. Critically, the large and diverse international user base generates rich training data, enabling US companies to improve model performance and iterate AI products more rapidly. Widespread global adoption of American social media platforms and AI products also allows the US to shape technical norms and de facto standards, aligning international markets with US and allied technology ecosystems. Moreover, consumer adoption can serve as a proving ground for enterprise AI, enabling US platform leaders to translate consumer market dominance into deeper enterprise penetration.

**The US and its allies also dominate the global software-as-a-service (SaaS) market.** Based on Omdia's estimates of 2024 SaaS revenue, all but one SaaS vendor with annual revenue exceeding $1 billion is headquartered in the US or G7+ countries. Among these firms, the US leads with 37 vendors, generating a combined revenue of nearly $240 billion (Figure 22). Moreover, of the top 100 SaaS vendors identified by Omdia based on partner ecosystem results, approach, and readiness, more than 80% are headquartered in the US.[50] China, by contrast, is effectively a nonplayer in the global SaaS market. No China-based vendor currently earns more than $1 billion in annual revenue or appears on the top 100 vendor list.

FIGURE 22

**Global distribution of vendors with billion-dollar SaaS revenue**

Revenue by firm HQ, USD billions




Source: Rhodium Group, Omdia.[51]

[48] AICPB, Global Rankings for AI Products by MAU, June 2026, https://mp.weixin.qq.com/s?__biz=MzA5OTM1NjU3OAmid.
[49] AICPB, Global Rankings for AI Websites by Visit, June 2026. https://mp.weixin.qq.com/s?__biz=MzA5OTM1NjU3OA.
[50] Jay McBain and Lisa Lawson, "Navigating the US$420B business SaaS market: The top 100 business SaaS ecosystems for partners," June 6, 2025, https://omdia.tech.informa.com/blogs/2025/jun/navigating-the-us$420b-business-saas-market-the-top-100-business-saas-ecosystems-for-partners
[51] Ibid.

**US and allied dominance in SaaS creates ecosystem lock-in, reinforcing their advantages across complementary tools, platforms, and cloud services**. While some AI assistants integrated into US-based SaaS products currently rely on Chinese models, control over SaaS distribution channels gives the US the ability to shape, and potentially constrain, model adoption as competition intensifies. As enterprise customers increasingly access AI through SaaS platforms, control over integration points and default AI applications for deployments plays a crucial role in determining which models are adopted at scale. This dynamic could shift competitive advantage from standalone model developers toward platform owners.

**But AI's impact on SaaS may create an opportunity for China.** As AI coding tools drive down the cost of building software, a large share of the sector—vendors selling deterministic workflow and record-keeping tools that run on a customer's own data—becomes vulnerable to in-house replacement, a dynamic underscored by the early-2026 software selloff.[52] Chinese AI companies now build coding models competitive with US frontier systems at a fraction of the price. That gives China two advantages at once: With no SaaS incumbents to protect, it can move straight to cheap, AI-built internal tools and agent-native workflows, and its low-cost, open-weight models give global enterprises the means to replace subscription software within in-house builds, a play that could translate into ecosystem influence for Beijing.

# The 2035 thought experiment

## Understanding the fog of the AI present

When a rapidly evolving technology is throwing off cascades of unknowns every other month, it can seem futile to hypothesize about where this all leads in the next decade. But a forward-looking lens is precisely what's needed to fight policy myopia, test competing futures, and internalize what structural pieces have to fall into place *now* to shape a favorable geopolitical climate for the US and allies heading into 2030.

There is good reason for the dense fog hanging over the present: we are in an early, highly experimental, stage of AI development and deployment. Our attention has been fixed on frontier training runs that consume massive compute rather than cost-efficient deployment into the real economy; we obsess over model benchmarks and rankings, even as open-weight releases commoditize the model layer and push real value toward the parts of the stack we aren't measuring; adoption is uneven and applications remain immature, complicating any read on sustained demand for inference compute; and returns on investment for capital-intensive frontier labs remain elusive.

We are also only at the front end of AI diffusion into the real economy. We have not yet seen the full impact of AI capabilities in a hyperconnected environment where massive volumes of data from factory floors, hospitals, farms, homes, and even our bodies are captured by sensors, processed on-device and at the edge, fed into models for training and refinement, and then pushed back into physical systems in the real world—all riding on AI-native 6G, cloud, and edge infrastructure. That trajectory implies a technological future that will demand vast amounts of cost-efficient compute—and one in which today's

[52] Christopher Stanton, "AI's Impact on SaaS Will Be Uneven. Here's What Leaders Need to Know," Harvard Business Review, May 27, 2026, https://hbr.org/2026/05/ais-impact-on-saas-will-be-uneven-heres-what-leaders-need-to-know

cybersecurity and data-protection challenges pale in comparison to the far more consequential risks to critical infrastructure, sovereign control over data, and systems integrity.

Staying locked in a 2022 mindset—where chip controls dominated the policy discourse—misses the shifting ground underneath the competition. Instead, we need to adopt a 2035 mindset to prepare for the next phase of this competition: one centered on access to aggregate, dynamic compute, the diffusion of cost-effective AI systems, the ability to build economic scale in production and demand across the stack, and the need for collective defense as China continues to weaponize critical inputs for geopolitical leverage.

## Uncomfortable truths

Before we can look ahead, we must first internalize a set of hard truths grounding us in the present.

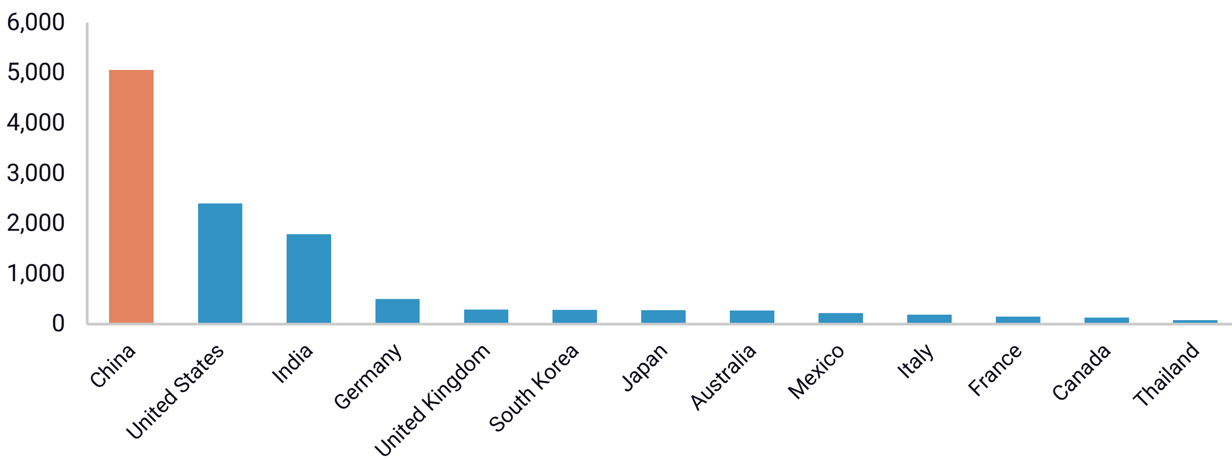
- **China is set to retain its scale advantage, both in terms of production capacity (supply) and market size (demand).** Sufficient production capacity is crucial to ensuring supply chain resilience. Market size is equally important: Only with sufficient demand can companies lower production costs, generate the returns needed to sustain R&D investment, and justify the capital expenditure required to build resilient supply chains. China has a structural advantage on both dimensions (Figures 23 and 24).
- **No country in the G7+ bloc—including the US—can quantitatively match China's scale advantage and achieve full stack sovereignty on their own.** So long as China continues to methodically pursue full stack localization, thereby narrowing space for Western tech firms to grow and compete in the China market, **the only viable way for the US and its partners to match China's scale in production capacity and market size is to build toward ex-China markets across key layers of the stack.**
- **Cyber and data vulnerabilities will be far more acute in the 2030s than they are today.** As AI-native 6G, cloud, and edge networks connect sensors and actuators across factories, hospitals, grids, transport, and homes, the attack surface expands dramatically. But this also presents an opportunity: Economic security provisions designed to secure networks against credible threats logically entail excluding foreign adversary technology providers. This creates the space for ex-China economies of scale to develop across the stack.
- **With its control over physical inputs, China has the power to short-circuit US 6G and AI buildouts.** Even as the US has the potential to strengthen incumbent advantages in AI infrastructure and frontier model development, China has a chokehold advantage over critical inputs and dominance in electronic device manufacturing to disrupt or delay deployments. No country or company can ignore the uncomfortable fact that China has weaponized critical supply chains in its geopolitical disputes and is rapidly building out a regulatory toolkit to coerce trading partners into steering clear of Beijing's perceived red lines.
- **Tech sovereignty ambitions are driven by credible concerns, but they carry a steep opportunity cost if they fragment G7+ scale.** Moves to build "sovereign" clouds, compute, and data regimes reflect legitimate fears of dependency and coercion, yet

poorly coordinated sovereignty plays can splinter demand, duplicate infrastructure, and erode the pooled scale needed for competitive AI ecosystems.

FIGURE 23

**Growth in China's market will be double that of the US, and far exceed other economies**

Change in consumption from 2025 to 2035, USD billions

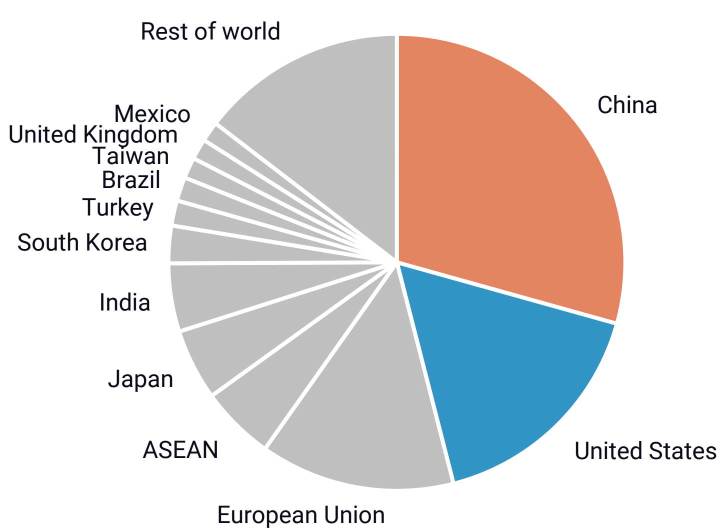



Source: Rhodium Group, University of Denver International Futures Model. See Appendix 3 for methodology.

FIGURE 24

**China will remain the dominant global manufacturing power**

Share of global manufacturing value-add in 2035




Source: Rhodium Group, University of Denver International Futures Model. See Appendix 3 for methodology.

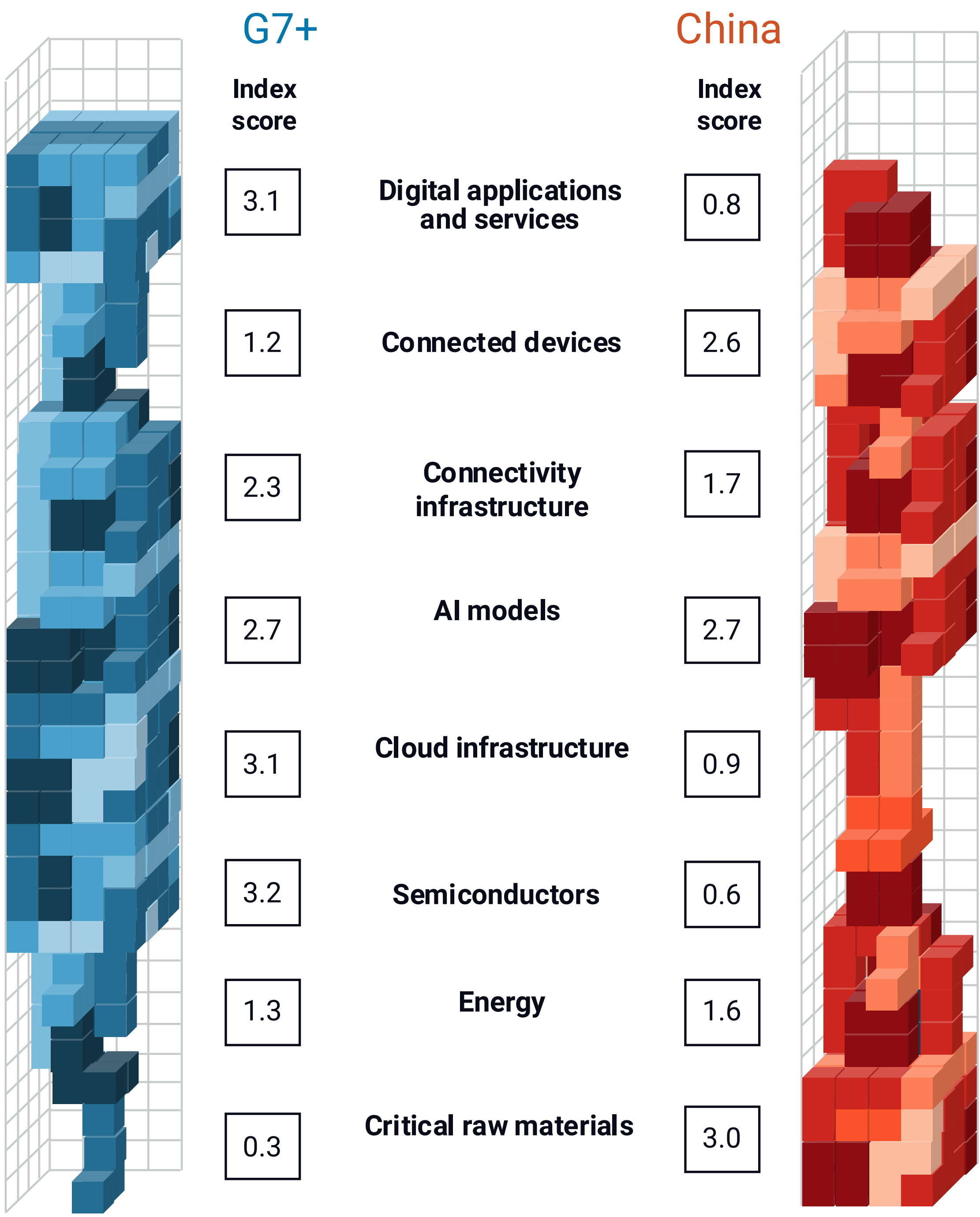
## 2035 Scenarios

With this series of wake-up calls in mind, we designed two book-end scenarios for the state of G7+-China tech stack competition in 2035. Our Tetris-inspired visualization conveys two vastly different futures for G7+ tech stack competition with China in a “Winning” versus “Game Over” scenario. Today, the AI stack presents a modern Tetris challenge. As China tries to build self-sufficiency across the stack, the US and its allies must master the art of coordination—ensuring that diverse “blocks” of energy inputs, software, silicon, and end devices fit together with the precision required to complete the stack and shape global AI markets.

## Press Start

We begin with the “Press Start” baseline to ensure G7+ policymakers have a sober understanding of what they are up against in this AI race and where the policy priorities lie. The scores in the “Press Start” visualization correspond to the quantitative baseline in the previous section.

FIGURE 25
## Press Start




Source: Rhodium Group. See Appendix 1 for methodology.
Note: In our Tetris-inspired visualization, a greater number of blocks reflects higher production capacity and relative competitiveness, as defined by our index scoring for each layer. The color scheme is purely thematic, and not all aspects of Tetris gameplay are applied.

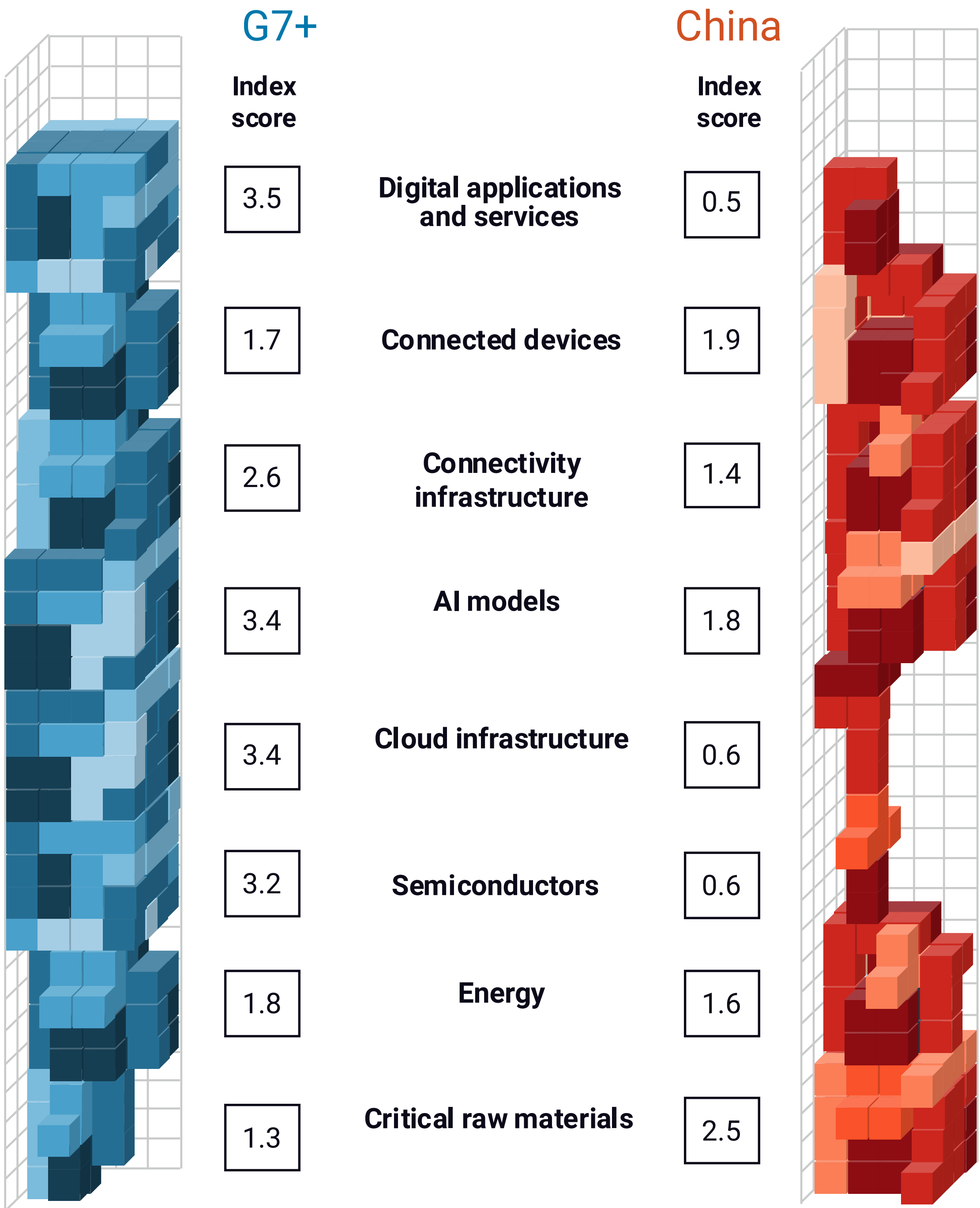
## Winning

In the "Winning" scenario, hubris is tamed by sheer necessity. As AI systems grow more capable and more deeply wired into critical infrastructure, the attendant cyber and data vulnerabilities make a go-it-alone posture untenable for the US and G7+ partners. Shared exposure—on cybersecurity, critical input dependencies, energy, and the social fallout of unchecked AI diffusion—drives coordination and a build toward trusted networks.

On this foundation, the US and partners assemble a trusted tech coalition based on a set of key "build" principles. These will focus on building:

- **AI systems that are secure, dependable, and interoperable by design**, coordinating in standards-setting bodies to resist opaque, single-vendor black box solutions.
- **Diversified and hardened input supply** by applying a full-stack lens that traces how input shortages propagate upward and taking a whole-value-chain approach so diversification spreads costs without creating new downstream chokepoints.
- **A pragmatic bridge to next-generation energy**, managing the near-term supply crunch while pooling allied capacity to scale advanced nuclear, geothermal, long-duration storage, and carbon capture for natural gas into the 2030s.
- **Trusted cross-border data flows** under shared rules for privacy, security, and lawful access, recognizing the power of large, heterogenous datasets across partner countries to advance AI and compete with China's own data scale.
- **"China scale without China"** with a protected but internally competitive market large enough to give allied firms the revenue base to keep innovating. This entails a realistic acceptance that non-Chinese firms are already losing market share in China and that Beijing's intent on "secure and controllable" technologies means opportunities in the China market will further shrink.
- **Collective defense** through a credible framework for partners to coordinate defensive and offensive measures to deter Chinese economic coercion through collective action so no single market is left exposed.

FIGURE 26
## Winning scenario




Source: Rhodium Group. See Appendix 2 for assumptions.

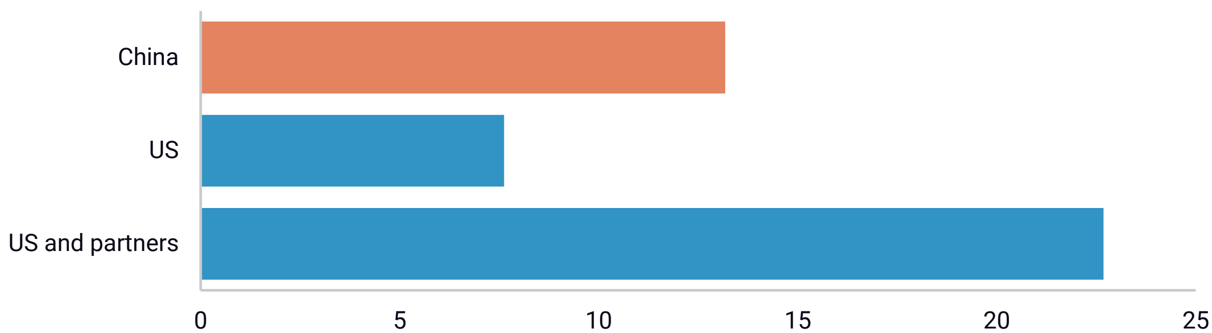
A multipolar bid for technological sovereignty and aversion to single-source dependency remains a powerful current that major tech firms tap into with the development of modular, interoperable solutions. This dynamic drives competition and innovation at critical layers of the stack. At the same time, **the US and partners stop pretending they can each own the full stack and instead specialize where they are genuinely competitive, accept a set of critical dependencies on one another, and pool capabilities where security and economic stakes are highest.**

In recognition that insulation without internal dynamism breeds stagnation, **the bloc lowers barriers among its members, opens procurement to allied firms, and aligns industrial policies to avoid the duplicative subsidy races** that would otherwise erode the collective effort. The result is a large enough market to out-scale China's own—giving companies the confidence to invest in ex-China supply chains and meaningfully reduce critical dependencies by 2035.

FIGURE 27

**With partners, the US can out-scale China's market in digital infrastructure markets**

Mobile RAN equipment market in 2035, USD billions




Source: Rhodium Group based on Dell'Oro Group data. Priority partners include countries listed in Table 9. See Appendix 3 for methodology.

**The US and partners navigate the near-term supply crunch and convert energy constraints into a shared platform for AI growth.** The US advances critical domestic reforms—streamlined permitting, faster interconnection, and more flexible use of grid assets—to ease the bottlenecks. The US and partners strike bilateral and plurilateral agreements to pool large amounts of low-cost electric supply in exchange for access to high-performance compute and full stack capabilities and allied participation across the full stack. Global AI data center buildouts accelerate under this allied framework. China, though it enjoys a power surplus at home, produces AI chips that are less power-efficient relative to the US, limiting its ability to scale AI data centers in western markets where trusted network and sustainability criteria already restrict Chinese access. Global South countries, aided by targeted development finance programs, gain access to the West's more power-efficient AI-stack deployments.

**The coalition's most consequential tool in constructing trusted AI networks is information and communications technology and services (ICTS) rules.** Policy attention shifts from a fixation on model lead alone to what actually gets built on top of the model and wired into the physical economy—the networks, edge devices, and data loops where AI meets critical infrastructure. ICTS measures aligned across coalition partners focus on critical networks, the clouds that host models for critical sectors, and high-consequence devices in sensor-rich or remotely controllable environments. The first order of priority lies in securing allied AI systems, whereby untrusted vendors are kept out by default. By anchoring coalition measures on what is being protected rather than whom it is targeting, the coalition has a more defensible security logic in managing relations with China.

The same principle governs data: **Partners treat sensitive datasets in health, energy, and advanced materials as strategic assets—pooled in secure sectoral platforms with standardized access rules and audits, and open to allies that meet the economic security bar.** Data protection and network security become a coalition standard feeding into a common market rather than a patchwork of regulatory barriers.

Just as China understands its leverage over critical materials, **the coalition's position in compute and advanced semiconductor equipment remains a foundational source of strength to be protected.** China will not relent in its existential drive to indigenize high-tech inputs regardless of how fast or slow the coalition moves to restrict them. The coalition therefore abandons the fiction that tool controls can "freeze" Chinese AI production at a static node and reorients export controls toward defending a dynamic lead in total accessible compute. As AI diffuses into the real economy, the constraint shifts from training models to running them continuously—making reliable compute at volume the decisive edge. The operative goal then is not to halt China's self-reliance drive (a false hope) but to avoid actively *enabling* it while the coalition expands its own lead. This entails closing existing gaps in the control regime and applying compute-governance measures against misuse and unauthorized access to high-performance compute. For a narrow set of chokepoint technologies where leakage is both irreversible and consequential, the coalition aligns around a shared critical technologies list for controlling both product and know-how.

Coordinated implementation of technology measures that de facto exclude China will nonetheless invite retaliation from Beijing as it retains considerable leverage over critical inputs through the decade. **The US and partners recognize the need for collective deterrence while driving diversification of critical inputs**. Meaningful diversification will only happen if economic security standards are aligned and if tariffs on China are set high enough to change the production cost calculus while prospective diversification partners enjoy lower barriers and targeted incentives to build out capacity without fear of being undercut by Chinese competition. The coalition jointly imposes higher tariffs on China for products requiring the most urgent diversification, and agrees on a punitive, snap-back tariff layer that automatically triggers if China weaponizes exports of critical inputs.

Progress toward collective deterrence is bumpy, but Chinese coercion validates the need to diversify and accelerates coalition efforts toward that end. Meanwhile, China's structural economic weaknesses are deepening: Macroeconomic imbalances leave it dependent on export-driven growth and below-cost production for global share. Its domestic market cannot absorb what its industrial policy builds, compelling it to scale abroad—and the more it leans on exports, the more exposed it becomes to coordinated barriers. **Blocked at key tech layers in coalition markets and unable to grow out of the problem at home, Beijing faces a calculus in which extreme retaliation only hastens the diversification it fears**.

While the pathway is rocky, this ultimately leads to a constructive dialogue with Beijing as **a collectively stronger G7+ becomes better positioned to engage China**, holding a consistent line that access to secure technology markets runs through shared standards, and that durable relief depends on the structural reforms needed to rebalance China's economy and ease the deindustrializing pressure its export model places on the rest of the world.

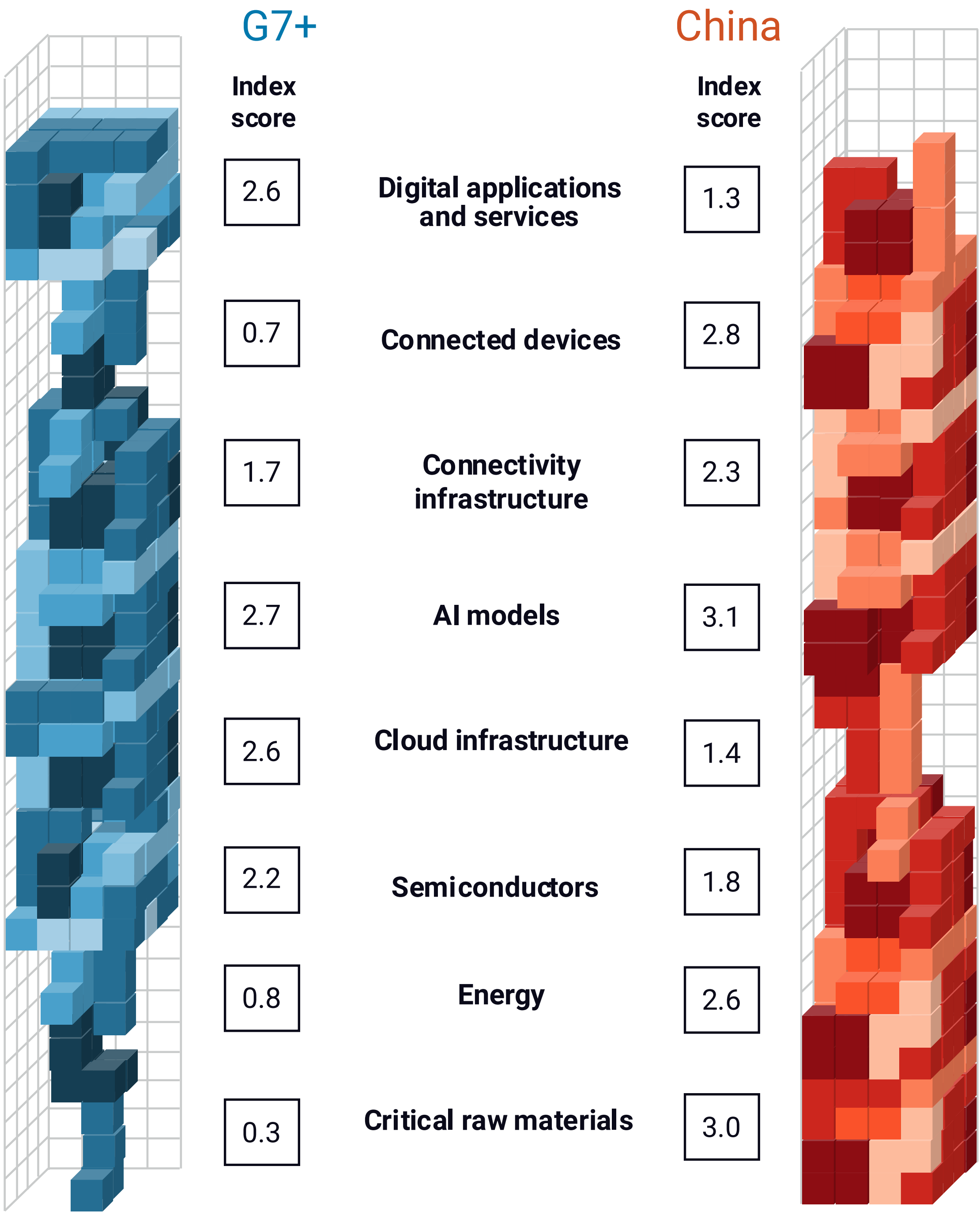
Mutual cyber concerns also pave the road for constructive engagement. As both the US and China field models able to probe and exploit critical systems autonomously, the shared exposure creates the forcing function for a framework on security guardrails. Having hardened its own networks and agreed internally on gating the release of the most capable models, the US and coalition partners are able to engage Beijing from a position of resilience, making for a credible cyber safety dialogue to manage their great power competition.

## Game over

In the "Game Over" scenario, the hubris that the Winning scenario tamed instead runs its course. Washington never abandons the founding assumptions—that its tech stack will win global markets on merits, that partners will trade sovereignty for continued access, that controls can freeze China in place, and that frontier model lead is the end game. By the early 2030s, each of these has been falsified, and the US has lost the strategic initiative in its technology competition with China (Figure 28). Early overconfidence gives way to haphazard, coercive policymaking that fractures relations with key partners, and attempts to repair the damage come too late. By 2035 the US is more isolated, more expensive, and less trusted, while China has positioned itself as the reliable, affordable provider of connectivity, devices, and AI services to much of the world.

China effectively plays to its strengths, and the evolution of the technology helps. As AI diffuses into the physical economy, capability increasingly comes from operating at scale in the real world. Since embodied AI in robots, autonomous vehicles, and connected devices generate dynamic data to train models, China's massive industrial base becomes a data flywheel. China's strength in execution and system integration, and its ability to move from prototype to mass deployment by tightly coupling hardware, manufacturing, and AI inside dense supplier ecosystems becomes unbeatable.

FIGURE 28
**Game Over**



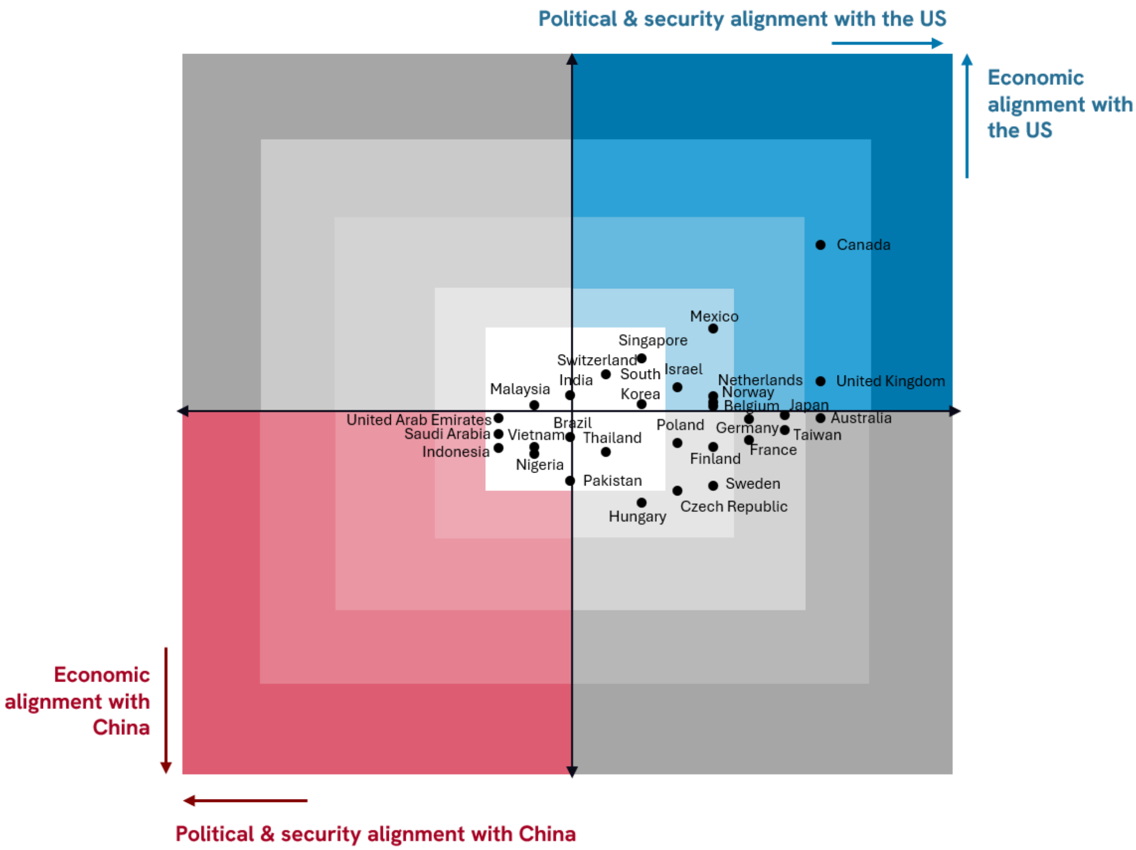

Source: Rhodium Group. See Appendix 2 for assumptions.

**Sovereign builds backfire.** Whereas the Winning scenario channeled the sovereignty impulse into modular competition and pooled scale, it drives costly fragmentation in the "Game Over" scenario. Wary of both Washington and Beijing, middle powers prioritize sovereign builds with strict local-content mandates, data-localization walls, and national compute projects. But the economics are unforgiving. Stacks built at national rather than bloc scale run below efficient utilization; fabs, data centers, and networks are duplicated across borders without pooled demand to sustain them; and diversification efforts fail to reach critical mass in the absence of coordinated offtake and shared price floors. To afford the sovereignty they seek, governments quietly accept Chinese capital, components, and systems integration, deepening the very dependency they were trying to avoid.

FIGURE 29

### Rising to the diplomatic challenge: AI battleground markets have strong economic ties with China

Geopolitical alignment with the US (top right) versus China (bottom left)




Source: Rhodium Group Geopolitical Exposure Index

**The 6G stack becomes a Chinese AI distribution channel.** While the US remains isolated on spectrum allocation and uncoordinated with industry and partners in standards bodies, Chinese vendors win the bulk of 6G tenders in emerging and middle-income markets, offering low-cost, vertically integrated "network for AI" packages that bundle radios, core networks, cloud, and edge AI. These deployments turn 6G infrastructure into a distribution channel for Chinese devices, models, and app ecosystems, locking in the broader Chinese stack. As the US overplays its security leverage and comes to be seen as a disruptive actor, China casts itself as the low-cost enabler of connectivity and AI growth for middle-power economies.

**China's AI export surge.** China rapidly scales mass-market edge AI, initially by flooding global markets with cheap, "good enough" connected devices where it holds surplus manufacturing capacity—autonomous vehicles, drones, advanced medical devices, and robots that its large protected home market allowed it to scale quickly (Table 4). This is not only a cost story: China's lead in industrial robotics, and the data generated by those deployments, feed directly back into faster algorithmic iteration, widening the industrial AI gap in China's favor. Chinese connected devices become the default hardware in emerging market 6G buildouts, locking in Chinese platforms. Where countries try to raise trade barriers, China leans on below-cost production to absorb the tariffs, and on critical supply chain leverage to pressure governments into rolling the duties back in exchange for stable supply.

TABLE 4

### China is the top robotics market, enabling scale that gives Chinese firms an edge

Humanoid robots market potential in 2035 from 0 (lowest potential) to 100 (highest potential), select countries

| | Sub-scores: Drivers of humanoid robot adoption | | | Market Potential Score |
|---|---|---|---|---|
| | Economy Size | Population Decline | Dangerous Jobs | |
| China | 95 | 67.3 | 87.8 | 92.1 |
| United States | 100 | 25.6 | 69.9 | 87.9 |
| India | 90 | 51.6 | 62.2 | 78.9 |
| Japan | 63.1 | 48.5 | 94.5 | 75.7 |
| Germany | 53.4 | 43.5 | 87.4 | 67 |
| France | 38.4 | 25.9 | 77.5 | 54.1 |
| United Kingdom | 41.7 | 20.6 | 70.2 | 53.1 |
| Italy | 27.6 | 43.9 | 90.8 | 52.8 |
| South Korea | 28.1 | 63.6 | 86.9 | 51.7 |
| Brazil | 36 | 48.5 | 74.7 | 51.5 |
| Russia | 24.1 | 47.8 | 87.4 | 49.4 |
| Spain | 21.2 | 36.6 | 84.3 | 46.5 |
| Poland | 10.6 | 48.7 | 92.4 | 43.3 |
| Canada | 28.5 | 34.2 | 64.4 | 42.9 |
| Indonesia | 26.4 | 61 | 65.2 | 41.9 |
| Turkey | 18.4 | 43.6 | 74 | 40.6 |
| Thailand | 0.9 | 41.6 | 100.1 | 38.5 |
| Vietnam | 1.1 | 39.4 | 99.3 | 33.5 |
| Saudi Arabia | 3.9 | 35.5 | 94.6 | 27 |
| Malaysia | 0.5 | 28.9 | 99.4 | 26.8 |

Source: Rhodium Group, OECD Trade in Value-Added (2025), UN World Population Prospects, University of Denver IF Model. See Appendix 3 for methodology.

**Export controls retreat.** China effectively applies CRM threats to pry concessions from Washington, creating a transactional climate that US tech companies exploit to press the US administration into rolling back foundational export controls. Companies convince themselves that wider access to the China market will preserve and even expand their market position, and some chip and equipment firms see a near-term bump in sales in China. But Beijing's self-reliance drive is relentless in applying policies aimed at displacing Western incumbents as fast as possible. Weak enforcement, partner fatigue, and sustained Chinese pressure compel third countries to liberalize export control licensing to China. Chinese domestic SME champions eventually consolidate market share and, by 2035, China achieves its own breakthrough EUV-class capability. The US and partners lose a critical chokepoint while deepening their downstream dependencies on China.

**ICTS and the economic security agenda withers.** In pursuit of headline investment deals, supply guarantees, and tariff bargains with China, the US pulls back on ICTS restrictions. US partners, wary of being dragged into confrontation with China, also dilute and walk back their own ICTS initiatives. Middle powers focus on "sovereign builds," relying on strict local content and data localization rules while quietly accepting Chinese capital and technology in trying to build digital sovereignty where possible. Chinese firms have greater access to saturate G7+ technology markets with low-cost alternatives.

**Cyber insecurities proliferate.** Mutual mistrust prevents the US and China from establishing guardrails on cyber-capable frontier models. Deniable intrusions into critical infrastructure become frequent, undermining business and political stability.

**Ex-China diversification agenda loses steam.** The US leans heavily on unilateral tariffs with minimal carveouts that end up hurting partners as much as China in the early years. The tariff climate discourages significant investment as the US becomes a high-cost center for advanced manufacturing. When the US lowers tariffs on China as part of a bargain with Beijing, there is little incentive for companies to move production out of China. The dynamic deepens US and partner dependency on China, from critical raw materials to intermediate components to connected devices. As a result, China's geopolitical leverage over the US and partners significantly expands.

**Energy reform agenda remains jammed while China retains the power advantage.** Power availability becomes an effective cap on US and allied AI buildouts. Congressional gridlock keeps permitting reforms in a logjam, state and local pushback to data center growth constrain additional policy support, and supply chain bottlenecks compound the challenge of bringing new power supply online. Advanced nuclear, geothermal, long-duration storage, carbon capture, and next-generation grid technologies need pooled, bloc-scale demand and patient capital to move down the cost curve, but fragmented and competing policies across US and partner countries prevent these projects from reaching commercial scale. Allied manufacturing capacity for grid equipment expands too slowly to relieve the bottlenecks, while China has effectively scaled its generation and manufacturing base for advanced energy and grid equipment.

**Broader geopolitical fallout intensifies.** Repeated escalations in trade tensions and US threats to restrict technology exports to its own partners create a tit-for-tat retaliatory cycle that convinces many capitals of US unreliability. Meanwhile, US military overextension in other theaters draws US resources and attention away from the Indo-

Pacific. Bruised by the blowback from these interventions, the US takes a sharp isolationist pivot, leaving longstanding security partners in Japan, South Korea, and Taiwan largely to fend for themselves. China takes advantage of this window to press neighbors and key trading partners into recognizing a Chinese sphere of influence and setting limits on external interference in the Indo-Pacific. In response to a more anarchic security climate, several countries accelerate nuclear weapons programs and their own defense industrial base to try to compensate for a serious degradation in US security guarantees. By 2035, US trade, security, and technological leverage have visibly shrunk and the world is a more dangerous place.

## The great build ahead

The "Winning" and "Game Over" scenarios are not predictions, they are a choice. The difference lies not just in technology and resources, but also whether hubris is tamed in time to form a coherent policy across the US and partner countries. The emerging reality demands agile thinking about the policies that must be in place today if the US and its tech partners want stable supply chains, secure networks, reliable access to compute, and the chance to turn the current infrastructure surge into durable economic gains by 2035. That work begins by trading hubris for ground truth, humility, and vision—the foundation for the collective effort that this great build demands.

We will be watching the following indicators to assess which path is taking shape heading into the 2030s:

- ***De facto* convergence in G7+ tech policy:** Harmonious G7+ policymaking is not today's reality. The US administration's focus on leverage plays and outstanding trade disputes leaves little room for such coordination. But we are watching instead for signs of de facto convergence, as G7+ governments independently recognize the same realities: the cyber and data vulnerabilities of hyperconnected systems, the negative spillovers of China's excess capacity in hollowing out domestic industry, critical dependencies among G7+ players that must be tolerated, and where tech indispensability versus sovereignty can be built in an emerging coalition in spite of today's fractious political climate.
- **…or deeper G7+ fragmentation:** In the absence of a clear regulatory framework designed to build toward a trusted tech coalition, how will companies and governments hedge their bets with China? We will be watching just how deeply companies in connected technology markets embed themselves in partnerships with Chinese firms that could prove costly to unwind later. We will also be watching how far governments go to strike near-term accommodations with Beijing—accepting higher China dependence now in the hope of building sovereignty later.
- **Chinese self-reliance and G7+ diversification racing in parallel:** Beijing is not waiting for clarity on Western policy, it is pushing hard to indigenize high-tech inputs to secure its own AI stack for deployment at home and overseas. We will be measuring the pace of twin diversification timelines in parallel—China's tech self-reliance and G7+ efforts to diversify away from China in critical inputs. The interaction of these timelines is critical: A decisive advance on either side compresses the geopolitical room the other has to maneuver, setting the stage for great power competition into the next decade.

- **The evolution of the technology itself:** Today's AI policy debates could be overtaken by events within months, blunting the impact of any policy intervention along the way. We are watching emerging tech paradigms, such as the potential for recursive self-improvement of AI to sharpen the US's compute advantage and raise the stakes of the frontier, all while forcing hard questions about the bounds of open-weight release. Market cycles will also play into this dynamic: If the AI infrastructure boom cools, whether from shortages in critical inputs or unsustainable financing, does the slowdown hand China the time to catch up and mature its own deployable stack for overseas markets?

- **The Taiwan factor:** We assess the risk of a serious gray-zone escalation in the Taiwan Strait to be elevated during the Trump years. Beijing is weighing how to shift the political status quo on Taiwan with a transactional president in the White House and as US decisive action on Taiwan is now more clouded with the fallout from the conflict in the Persian Gulf. Our attention will be focused on the measurable effects if China is able to assert greater control over Taiwan's high-value chip exports at the same time tech supply chains would be shocked into accelerating ex-Taiwan builds.

This report is the foundation for a series of related Rhodium Group research on the future of tech stack competition. Upcoming work will test tech sovereignty ambitions against capability scores and model ex-China scale scenarios across the stack, serving as a reality check on where coordinated action is most feasible, the costs of delayed action, and where credible sovereignty plays have the potential to reshape markets and geopolitical behavior.

# Appendix 1: Benchmarking methodology

## Objective

The objective of this exercise is to establish a baseline quantitative assessment of the relative strengths and vulnerabilities of the G7+ and China at each layer of the tech stack. We define the "G7+" bloc as comprising the G7 (US, Canada, United Kingdom, Japan, all EU) plus South Korea, Taiwan, Norway, Australia, Mexico, and Israel. While these jurisdictions are not uniform in their posture toward China, they each have strong geopolitical and economic incentives to align with the US on supply chain security and reshoring initiatives. Grouping them into a coherent "G7+" supply chain bloc allows us to assess current shared dependencies and make projections about the US's future competitiveness with China under scenarios assuming a high degree of G7+ alignment versus fragmentation.

By systematically measuring supply-side competitiveness—supplemented where necessary by demand scale and capability benchmarks—our assessment provides a structured, data-driven foundation for understanding where each bloc holds dominant positions, where dependencies exist, and where strategic vulnerabilities may be most pronounced.

## Method

The assessment follows a five-step methodology designed to produce comparable, aggregated competitiveness scores across all layers and sublayers of the tech stack.

- **Step 1: Define the tech stack layers and sublayers**. The first step is to define the scope and structure of the tech stack. Each major layer (e.g., critical raw materials, semiconductors) is disaggregated into key sublayers to ensure our analysis is nuanced and captures meaningful variation within broad technology categories, given that the G7+ and China may hold different strengths and vulnerabilities across different technologies within a given layer.
- **Step 2: Collect quantitative indicators**. For each bloc (i.e., G7+ and China), we collect quantitative data for the critical technologies at each layer.
    - **Supply share** is the primary indicator used throughout our assessment. We measure each bloc's share of global production by location of manufacture. Where production location data are unavailable, market share by company headquarters is used as a proxy for selected markets. Supply share was selected as the principal metric because it most directly reflects where productive capacity and technological capability reside.

  Two supplementary indicators are applied selectively for layers where supply share alone is insufficient to capture the full competitive picture:

    - **Market scale** measures each bloc's share of total global end-market demand. It is applied selectively to layers where the scale of end-market demand itself is a driver of competitive position. For example, in industrial robotics, the scale of domestic demand accelerates R&D investment and the pace of next-generation automation development.

- **Technological capabilities** are used for layers where supply share data alone would not capture the full picture of competitive position. In the AI models layer, capability benchmarks are used alongside open-weight model downloads share (with developer HQ as a proxy for production location) because 1) as an emerging technology, market structures are still forming, and 2) market share data is not reliably available for this segment, especially when it comes to comparing the relative prevalence of closed- vs open-source models.

- **Step 3: Assign index values.** For each available indicator, a competitiveness index value is assigned at each nested sublayer of the stack for both the US/G7+ and China. Index values map underlying percentage share values onto a continuous scale from 0 to 4, ranging from *dependent (0)* to *dominant (4)*. This normalization allows for consistent comparison across technology categories.

- **Step 4: Derive sublayer aggregate index values.** An aggregate index value for each sublayer is derived by averaging the index values across all available indicators (i.e., supply share, market scale, and technological capabilities when applicable) for that sublayer.

- **Step 5**: **Derive layer-level aggregate index values**. Finally, a layer-level aggregate index value is derived by averaging the aggregate index values across all relevant sublayers within that layer. This provides a single, summary competitiveness score for each major layer of the tech stack, enabling high-level comparison across the full stack.

Table 11 illustrates how this methodology is applied in practice, using the semiconductor layer score for G7+ as an example. Table 12 presents the first-order sublayer scores alongside the layer scores, as well as the sources from which the data for each layer were derived.

TABLE 5

## Example: Inputs to semiconductor scoring for G7+

| **Layer/Sublayer** | Supply share | Supply share index | **Aggregate index** |
|---|---|---|---|
| **Semiconductors** | | | **3.2** |
| *SME* | | | 3.5 |
| Ion implantation | 98% | 3.9 | |
| Chemical vapor deposition | 86% | 3.4 | |
| Physical vapor deposition | 86% | 3.4 | |
| Etch | 83% | 3.3 | |
| Lithography | 100% | 4.0 | |
| PR coater/developer | 96% | 3.8 | |
| CMP | 87% | 3.5 | |
| Wafer prober | 85% | 3.4 | |
| Batch cleaning | 72% | 2.9 | |

| | | | |
|---|---|---|---|
| Single-wafer cleaning | 90% | 3.6 | |
| *Semiconductor materials* | | | 3.7 |
| *Mature node* | 51% | 2.0 | 2.0 |
| *Leading edge* | 91% | 3.6 | 3.6 |
| *Memory* | 78% | 3.1 | 3.1 |

Source: Rhodium Group

TABLE 6

## Tech stack layer and sublayer scores with data sources

| | G7+ index score | China index score | Data source |
|---|---|---|---|
| **Critical raw materials** | **0.3** | **3.0** | US Geological Survey, Mineral Commodity Summaries, IEA, General Administration of Customs of the PRC |
| Rare earths | 0.2 | 3.3 | |
| Battery materials | 0.4 | 2.7 | |
| **Energy** | **1.3** | **1.6** | Rhodium Group |
| **Semiconductors** | **3.2** | **0.6** | Bloomberg, IDC, SEMI, JP Morgan, Counterpoint Research, METI |
| SME | 3.5 | 0.3 | |
| Semiconductor materials | 3.7 | 0.2 | |
| Mature node | 2.0 | 1.7 | |
| Leading edge | 3.6 | 0.3 | |
| Memory | 3.1 | 0.8 | |
| **Cloud infrastructure** | **3.1** | **0.9** | Tencent, Alibaba, Huawei, ByteDance, Omdia |
| **AI models** | **2.7** | **2.7** | Epoch AI, Hugging Face |
| **Connectivity infrastructure** | **2.3** | **1.7** | Ericsson, Dell'Oro Group, European 5G Observatory, Telegeography, Subtel Forum |
| RAN equipment | 2.0 | 2.0 | |
| Subsea Cables | 3.5 | 0.4 | |
| Backbone/transport equipment | 2.4 | 1.5 | |
| **Connected devices** | **1.2** | **2.6** | Company financial reports, AEI, Apple, IDC, Counterpoint Research, IDC, TrendForce, International Federation of Robotics, UN Comtrade |
| Smartphones | 0.8 | 2.6 | |
| PCs | 1.4 | 2.2 | |
| Industrial robots | 2.5 | 1.3 | |
| Electric vehicles | 1.1 | 2.9 | |
| Drones | 0.2 | 3.8 | |
| **Digital applications and services** | **3.1** | **0.8** | Company financial reports, QuestMobile, AICPB, Omdia |
| SaaS | 4.0 | 0.0 | |
| Social media platforms | 2.4 | 1.3 | |
| AI products | 3.0 | 0.9 | |

Source: Rhodium Group

# Appendix 2: Winning and Game Over visualizations

We assess G7+ versus China strengths across the  tech stack under two scenarios through 2035: "winning" and "game over." These assessments are based on the assumptions below.

In our Tetris-inspired visualization, a greater number of blocks reflects higher production capacity and relative competitiveness, as defined by our index scoring for each layer. The color scheme is purely thematic, and not all aspects of Tetris gameplay are applied.

## Scenario 1: Winning

*Critical raw materials*: G7+ coordinates effectively on a long-term plan to build a resilient ex-China CRM supply chain, China continues to lead globally refining and derivative product manufacturing, but significant loss of market share to diversified ex-China suppliers eliminates Beijing's ability to weaponize CRMs as an effective deterrent against a more robust G7+ posture on economic security and ICTS measures to exclude Chinese suppliers from critical technology supply chains.

*Energy*: In recognizing the criticality of the energy bottleneck to AI buildouts, the US administration, Congress and states collectively prioritize regulatory reforms—streamlined permitting, faster interconnection, and more flexible use of existing grid assets—to facilitate efforts to expand grid capacity to meeting surging data center demand. Coordinated allied efforts help de-risk the next energy wave: hyperscaler, government, and venture investment pays off in bringing advanced grid technologies to commercial scale in the 2030s.

*Semiconductors*: China's semiconductor localization achieves slow, grinding progress. G7+ markets raise barriers to Chinese semiconductor imports via ICTS "trusted chip" measures, reducing the total accessible market for Chinese chips. With access to key export markets increasingly cut off, China's legacy logic and memory chipmakers face declining utilization rates as overcapacity builds. Capacity buildouts in these segment are dramatically scaled back, creating knock-on demand destruction for China's emerging semiconductor equipment and materials players, undermining their ability to grow and expand investments in R&D. While government support propels some progress, homegrown equipment makers fail to break through in advanced tool production sufficiently to enable fill the void of banned foreign equipment. Without sufficient access to necessary tools, China is unable to build nearly enough advanced chip production capacity to meet the scale of local demand, much less to enable Chinese AI cloud companies to compete effectively in overseas data center markets.

*Cloud infrastructure*: G7+ advanced semiconductor controls and China's stalled indigenous chip progress Chinese hyperscalers to effectively cede the overseas AI data center market to the US.

*AI models*: The compute gap between US model developers expands at an accelerating pace, reaching such proportions that Chinese models cannot offer a "good enough" model that is cheap enough to justify the performance deficit relative to the US leading-edge. US models become the standard across all relevant use cases, including edge and on-device, dominating the global AI inference market outside China.

*Connectivity*: G7+ “trusted network” standards lock Chinese vendors out of the US and partner markets entirely. The dominance of US AI technology and the attendant success of the G7+’s software-defined “AI for Network” approach encourage emerging technology hubs like Malaysia, the Gulf States, and India to embrace G7+-built networks. Huawei and ZTE continue to compete in more cost-conscious markets with minor AI ambitions.

*Connected devices*: G7+ efforts to build alternative electronics assembly supply chains in Mexico, India, Vietnam and elsewhere succeed and foster the gradual development of ex-China device component ecosystems, reducing dependence on China for critical production inputs. China remains the global leader in device manufacturing, but production for domestic use accounts for an increasing share of Chinese production as G7+ continue to diversify away from China.

*Digital applications*: US companies across the digital applications market, from SaaS to social media, leverage the US progress in AI to dramatically improve their service offerings, entrenching their incumbent advantage and further extending their reach in global markets. Chinese developers struggle to compete outside their home market.

## Scenario 2: Game Over

*Critical raw materials*: G7+ makes no meaningful progress on CRM diversification as general mistrust, persistent trade frictions, and lack of coordination fracture nascent coalition efforts.  China deepens its dominance over CRM supply chains.

*Energy*: Power availability becomes an effective cap on US and allied AI buildouts while China leverages its own grid expansion and manufacturing scale to power AI deployment. Through 2030, supply chain bottlenecks, order-book backlogs, interconnection queues, and permitting delays in the US constrain new supply. Existing natural gas, coal and transmission capacity is stretched thin under data center demand. Congress remains in gridlock and local and state pushback to data center buildouts stalls projects. Permitting remains onerous and interconnection remains fragmented. As the AI capex cycle slows, advanced energy projects also get stranded mid-development in absence of durable price signals and demand certainty.

*Semiconductors*: China makes major breakthroughs across the semiconductor equipment and materials supply chains, achieving parity with foreign suppliers in every segment except advanced lithography. China continues to outpace the rest of the world in legacy chip capacity buildouts, accounting for 55% of global production by 2035 (up from our currently projected 50% in 2030). Chinese advances in domestic equipment, coupled with looser controls on foreign DUV exports, enables a massive scale up in capacity at China’s advanced 7nm/5nm capacity nodes, but lack of EUV continues to constrain China’s ability to close the gap fully with foreign incumbents (set China share of 7nm and below capacity at 25% (up from 7% today, vs 75% for G7+). China continues to scale up memory capacity, with YMTC and CXMT gaining significant share in commodity DRAM and increasing capacity in HBM and ultra-high layer count NAND Flash to serve China’s domestic AI infrastructure segment (set G7+ v China share at 50%/50%).

*Cloud infrastructure*: US hyperscalers continue to invest heavily in advanced compute for their global network of AI cloud data centers, but growing competition from Chinese competitors with increasing access to homegrown compute cuts into US cloud's global market share.

*AI models*: US developers retain a slight edge in frontier model development due to access to superior compute, but there is no single AGI moment or singularity that converts that lead into self-reinforcing dominance. Instead, AI development continues at an accelerating yet consistent pace. Meanwhile, China mitigates its lack of access to bleeding-edge compute by massively scaling production of "good enough" 5nm and 7nm alternatives. Chinese developers continue to build the most efficient and capable open-source models, which account for an increasingly large share of global AI inference tokens as China builds a substantial lead in edge and on-device AI deployments globally.

*Connectivity*: Huawei and ZTE exploit the fracturing of the G7+ coalition to expand their global market share in 6G RAN markets, with some gains in Europe, but primarily in the Global South swing markets, where China's deployment-led model and promise to augment local manufacturing through private industrial wireless-enabled smart factories draws significant interest.

*Connected devices*: G7+ efforts to build alternative electronics assembly supply chains in Mexico, India, Vietnam and elsewhere falter, allowing China to preserve its dominance in mature device markets. China also leverages its dynamic local manufacturing base to achieve or consolidate dominant positions in critical connected device markets, including drones, autonomous vehicles, and industrial and consumer robotics.

*Digital applications*: US retains incumbent advantages in SaaS markets, though AI enables the emergence of some new Chinese entrants. Chinese social media companies make gradual progress in foreign markets, while China is highly competitive with G7+ in the emerging AI-native app economy.

# Appendix 3: Forecasting scale methodology

**The future of the tech stack competition will hinge on scale.** The US and its partners must provide a market large enough to justify sustained private sector investment in R&D and ex-China supply chains. These investments will be crucial for i) maintaining the US and allies' technological edge, ii) reducing dependencies on China-based supply chains, and iii) offsetting potential losses for allied firms in the China market.

**Without a sufficiently large market and production capacity, even more technologically advanced US and allied companies may struggle to compete** against Chinese firms and survive amid China's weaponization of CRM dependencies.

**We therefore evaluate each country's market size and production capacity in 2035 to ground the scenario analysis and policy recommendations**. We forecast scale at a macro level and for two in-scope technologies—mobile RAN and humanoid robotics—as case studies of mature and emerging technologies, respectively, with consumer and industrial applications and high-quality baseline data. These technologies are deeply linked to the allocation, control, and efficient use of spectrum technology, making them consequential for the US-China competition over tech stack infrastructure and standards.

The forecasts are necessarily approximations, given uncertainties associated with these technologies and markets, high likelihood of government intervention, intense firm- and country-level competition, and this report's 10-year time horizon. But they are internally consistent and thus allow for cross-country comparison, answering questions like:

- What is the size of the market in the US-led vs. China-led tech blocs today and in 2035, under different scenarios?
- How do the blocs compare in terms of production capacity?
- How does the market size available to US and allied firms change with different levels of competition from Chinese firms?

## Baseline forecasts by country

We use forecasts of aggregate consumption and manufacturing value-added by country in 2035 as high-level, baseline indicators of market size and production capacity. While these macroeconomic indicators are not specific to the connected tech stack, they demonstrate the underlying economic capacity that shapes technology competition and, absent other data, serve as a proxy for market size and production capacity.

To estimate consumption and manufacturing value-add by country in 2035, we use the International Futures (IF) model. The IF model is a large-scale, integrated assessment model developed by the University of Denver to generate long-run economic, demographic, and sectoral forecasts. It is particularly useful for producing internally-consistent, comparable macroeconomic trajectories across countries, which we use to evaluate "allied scale" vis-à-vis China in 2035 under different scenarios.

## MOBILE RAN

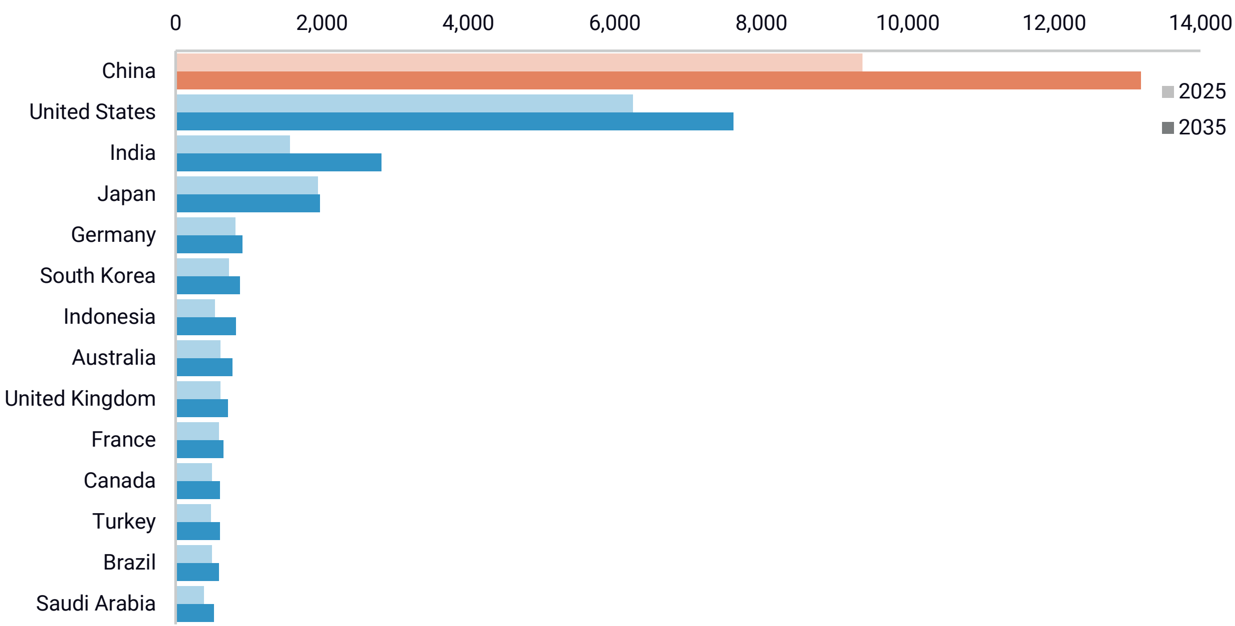
We forecast mobile RAN market size and production capacity by country in 2035 as a case study of allied scale in the connected tech stack.

The market size forecast is based on the Dell'Oro Group's data on the global mobile RAN market as of Q3 2025. Because Dell'Oro Group's data are aggregated at the regional level, we estimate each country's market size using its current share of regional GDP. We then adjust the current market size baseline using forecasted GDP growth from the IF model, since mobile RAN spending tends to scale with economic activity, to forecast each country's market size in 2035 (Figure 30).

FIGURE 30

### Mobile RAN market size of select countries, 2025 – 2035

Million USD




Source: Rhodium Group, Dell'Oro Group, University of Denver IF Model

## HUMANOID ROBOTS

Early-stage emerging technologies, like humanoid robotics, require a different approach. While current market-size estimates are readily available for humanoid robotics, using them as a forecasting baseline with a linear model would be inappropriate given the wide variations in current adoption rates, the uncertain technological outlook, and the historical S-curve pattern of technology adoption.

This report instead identifies the structural factors most likely to drive humanoid robotics adoption, and assesses market potential by country in 2035. These factors include the scale of manufacturing and mining activity, working-age population decline from 2025 to 2035, and GDP in 2035 as a proxy for purchasing capacity. For each indicator, we give countries a score between 0 (lowest potential for humanoid robotics) to 100 (highest potential for humanoid robotics), relative to other countries. These three indicators are combined into the Humanoid Robotics Market Potential Index using a simple average (Table 13).

TABLE 7

### Humanoid Robotics Market Potential Index

From 0 (lowest potential) to 100 (highest potential), select countries

| | *Sub-scores: Drivers of humanoid robot adoption* | | | Market Potential Score |
|---|---|---|---|---|
| | Economy Size | Population Decline | Dangerous Jobs | |
| China | 95 | 67.3 | 87.8 | 92.1 |
| United States | 100 | 25.6 | 69.9 | 87.9 |
| India | 90 | 51.6 | 62.2 | 78.9 |
| Japan | 63.1 | 48.5 | 94.5 | 75.7 |
| Germany | 53.4 | 43.5 | 87.4 | 67 |
| France | 38.4 | 25.9 | 77.5 | 54.1 |
| United Kingdom | 41.7 | 20.6 | 70.2 | 53.1 |
| Italy | 27.6 | 43.9 | 90.8 | 52.8 |
| South Korea | 28.1 | 63.6 | 86.9 | 51.7 |
| Brazil | 36 | 48.5 | 74.7 | 51.5 |
| Russia | 24.1 | 47.8 | 87.4 | 49.4 |
| Spain | 21.2 | 36.6 | 84.3 | 46.5 |
| Poland | 10.6 | 48.7 | 92.4 | 43.3 |
| Canada | 28.5 | 34.2 | 64.4 | 42.9 |
| Indonesia | 26.4 | 61 | 65.2 | 41.9 |
| Turkey | 18.4 | 43.6 | 74 | 40.6 |
| Thailand | 0.9 | 41.6 | 100.1 | 38.5 |
| Vietnam | 1.1 | 39.4 | 99.3 | 33.5 |
| Saudi Arabia | 3.9 | 35.5 | 94.6 | 27 |
| Malaysia | 0.5 | 28.9 | 99.4 | 26.8 |

Source: Rhodium Group, OECD Trade in Value-Added (2025), UN World Population Prospects, University of Denver IF Model

# Appendix 4: Geopolitical alignment methodology

**Because our forecasts show it will be difficult for the US to outcompete China on its own, we develop a geopolitical alignment score to approximate the feasibility of bringing a given country into the US-led bloc.** The Geopolitical Alignment Score, along with forecasts of market scale and production capacity in 2035 by country, inform the scenarios and policy recommendations, helping answer questions like:

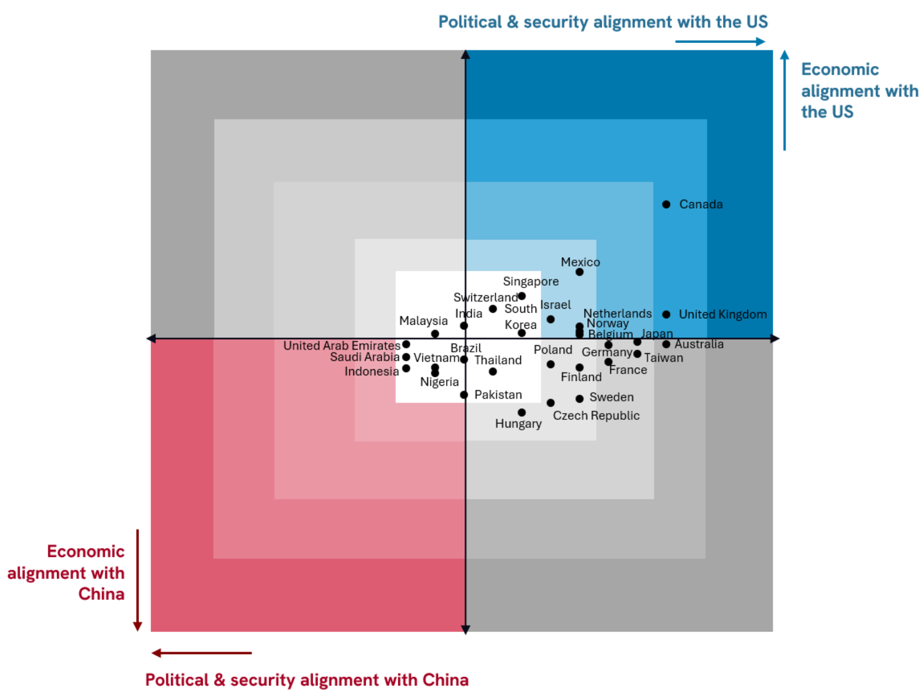
- Would Ethiopia, South Africa, and other Global South partners adopt US or Chinese tech in a fragmentation scenario?
- Which countries are likely to adopt US tech, even in a "China overtakes the US" scenario?
- Which battleground countries are crucial for the US to get in its bloc, given their market size and production capacity?

**Rhodium Group's Geopolitical Alignment Score evaluates each country's economic, political, and security alignment with the US versus China** (Figure 31). Each country receives sub-scores for i) economic alignment and ii) political and security alignment with the US and with China. These sub-scores are combined to show how closely aligned a country's interests are with those of the US or China. Countries that are the most closely aligned with the US receive a 5. Countries that are most closely aligned with China receive a -5. Countries that balance their ties with the US and China receive a 0 and are at the center of the plot. These are the countries with roughly equal economic, political, and security ties to the US and China.

FIGURE 31

**Rhodium Group's Geopolitical Alignment Score**

Economic alignment (x axis); political and security alignment (y axis)




Source: Rhodium Group

## Economic alignment

The “Economic Alignment” sub-score is comprised of three sub-indicators:

- Dependence on exports to the US and China (percent of total exports)
- Dependence on imports from the US and China (percent of total imports)
- Exposure to export controls
- Exposure to US tech controls:
    - Trade of US-controlled items (percent of total trade)
        - AI capacity index (Tortoise AI)
    - Exposure to China's CRM controls:
        - Share of production in CRM-exposed industries
        - Trade of CRM-exposed goods (percent of total trade)

For each indicator, we assess whether economic ties with the US or China are greater. For example, does a country export more to the US or to China? Is it more exposed to US or Chinese export controls?

Countries are scored relative to each other. For example, Taiwan, which trades the most US-controlled items, receives a 5 for the exposure to US tech controls sub-score, and all other countries are scored relative to it. Mongolia, which is the country most dependent on exports to China, receives a -5 on the export indicator.

The final economic score is a combination of the above indicators. Countries with closer economic ties or dependencies on the US have scores closer to 5. Those with closer economic ties with China have scores closer to -5. Countries that perfectly balance their economic ties with the US and China receive scores closer to 0.

## Political and security alignment

Each country receives scores for its alignment with the US and with China based on participation in US- and China-led groups, defense and security relationships, trade agreements, and diplomatic relations (Table 14).

TABLE 8

### Input to Political and Security Alignment Score

| Political and security alignment with the US | | Political and security alignment with China | |
|---|---|---|---|
| 5 | Five Eyes, AUKUS | -5 | None |
| 4 | G7 | -4 | Mutual defense treaty |
| 3.5 | NATO | -3.5 | Hosts Chinese military base, allows Chinese military access, security or policing agreements, China characterizes political relations as extremely close |
| 3 | Quad, “Non-NATO Major Allies,” collective defense arrangements | -3 | BRICS, SCO |
| 2.5 | Traditional FTA partner | -2.5 | Active BRI participant, BRICS partner country |
| 2 | Trade and Investment Framework Agreement (TIFA) partner | -2 | Non-active BRI participant, SCO partner or observer |
| 1.5 | Trade and Investment Framework Agreement (TIFA) partner | -1.5 | AIIB participant |
| 1 | Diplomatic recognition | -1 | Diplomatic recognition |
| 0 | US-designated “country of concern” | 0 | Recognizes Taiwan |

Source: Rhodium Group

Each country receives scores for its alignment with the US and with China. The highest score is given for each country. For example, the UK is a member of Five Eyes and thus receives a 5 for its political and security alignment with the US, even though it is also in the G7, which receives a 4, and NATO, which receives a 3. The only exception to this rule is if a country receives a 0. For example, Russia's alignment with the US score is 0 because it is a US-designated "country of concern," even though it's technically a NATO partner.

These scores are combined to show whether a country is more aligned on the political and security dimension with the US or China. For example, Australia's political and national security sub-score is 3.5, indicating closer alignment to the US, due to its participation in AUKUS on the US side (5) and the AIIB on the China side (-1.5). India, which is a member of the Quad (3) and BRICS (-3), receives a political and security sub-score of 0.

## Geopolitical alignment score

The Economic Alignment and Political and Security Alignment sub-scores are combined using a simple average to create the Geopolitical Alignment score by country.

# About Rhodium Group

Rhodium Group is an independent research provider with deep expertise in policy and economic analysis. We help decision-makers in both the public and private sectors navigate global challenges through objective, original, and data-driven research and insights. Our key areas of expertise are China's economy and policy dynamics, and global climate change and energy systems. More information is available at rhg.com.

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# Disclosures

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