



High Fences, Hidden Gates: The Reality of AI Export Controls

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Since 2022, by implementing export controls, the United States has been applying increasing pressure on China's technological pursuits, weaponizing its dominance in advanced AI chips to limit Beijing's military and economic advancement. Washington's latest salvo? Even stricter controls on chips, equipment, and talent, all under the banner of "national security." Faced with escalating restrictions, Chinese firms have turned to the cloud, by tapping into domestic and U.S.-based services to access high-performance computing power and keep their AI ambitions alive. This adaptation has allowed Chinese firms to offset some of the sanctions' intended effects, adding complexity to the ongoing U.S.-China tech rivalry.

U.S. Enforces Full Ban on High-end AI Chips to China, Citing National Security

Amid intensifying technological competition, U.S. export controls on advanced AI chips have drawn global attention. Citing national security, the United States has launched sweeping measures to block China from accessing cutting-edge technologies that could enhance its military strength and tech dominance. As AI continues to revolutionize

industries like finance, healthcare, and transportation, advanced chips have become indispensable assets. In response, Washington has steadily tightened its grip, expanding restrictions to ensure American innovations aren't leveraged in ways that jeopardize U.S. and allied security.

The U.S. government has actively coordinated with allies to broaden the scope of its export restrictions, boosting the effectiveness of the containment measures. The restrictions now

encompass more technologies and countries, barring companies like Nvidia and AMD from exporting AI chips to over 40 nations across the Middle East, Africa, and Asia, thereby preventing the technology from reaching China through third-party intermediaries. Recently, the U.S. has also shifted its focus to the Persian Gulf region, planning to impose strict export licensing limits on Saudi Arabia and the United Arab Emirates.

Chinese Companies Bypass U.S. Chip Ban via Cloud Services

In response to the escalating technology embargo, Chinese companies swiftly adapted their strategies. As early as 2023, Chinese firms faced accusations of purchasing cloud services or illegally smuggling high-end U.S.-restricted chips. This year, the U.S. identified at least 11 Chinese entities, including Shenzhen University and Sichuan University, which have utilized cloud services to access restricted American technology. By partnering with U.S.-based or Chinese cloud service providers, these entities have accessed computing resources for AI model training and data analysis, acquiring necessary computational power without directly violating the export bans.

Chinese companies have kept a low profile amidst ongoing U.S. restrictions. Undeterred by U.S. bans, firms like iFlytek and SenseTime quietly lease Nvidia's high-end chips, keeping their AI projects alive despite mounting obstacles.

Major Chinese tech giants like Alibaba, Baidu, ByteDance, Huawei and Tencent have introduced AI models, showcasing their resilience despite U.S. sanctions. This adaptive strategy has, to some extent, undermined the original intent of U.S. sanctions, adding new complexities to the ongoing U.S.-China tech rivalry.

Chip Ban Loopholes Test U.S. Limits

Since October 2022, the U.S. has imposed targeted restrictions on Nvidia chip exports. To adapt, Nvidia developed downgraded versions—like the A800, H800, and H20—compliant with regulatory standards. Additionally, both the U.S. federal government and the California state government have implemented measures including the Know Your Customer (KYC) protocols for cloud services and AI safety bill, to prevent unauthorized foreign access to advanced American technology. While these ongoing U.S. efforts to close loopholes may slow China's R&D, increase development costs, and create commercialization barriers, these effects may only be short-lived. However, technology is still a field of science with multiple pathways to the same objectives, achievable through legal or alternative means. The long-term effectiveness of U.S. restrictions may ultimately be limited and difficult to sustain.

Looking ahead, the U.S.-China tech rivalry is likely to intensify, with mounting competition in areas like R&D, market expansion, and policy development. This rivalry will shape technological progress in both countries and have significant implications for the global tech landscape and geopolitical economies. As global tech faces increasing fragmentation. The real challenge lies in balancing fierce competition with the need for cooperation to shape the future of innovation.

Chinese Firms Confront Dual Regulations in Pursuit of Advanced Computing Power

Chinese companies relying on U.S.-based cloud services face significant data security and privacy risks, threatening both China's national security and economic interests. U.S. laws like the Foreign Intelligence Surveillance Act (FISA), the Patriot Act, and the Clarifying Lawful Overseas Use of Data Act (CLOUD Act) grant sweeping authority to access data stored

on American cloud platforms. These statutes allow the government to compel providers to disclose client data stored on global servers, regardless of the data's physical location.

Concurrently, China enforces strict controls on cross-border data transfers. Under the Data Security Law, Cybersecurity Law, and Personal Information Protection Law, any critical data relevant to national security or public interest must undergo a security assessment process before being transmitted across borders. As a result, Chinese companies using U.S. cloud services must contend with both U.S. data access laws and Chinese regulations on cross-border data flows. This dual regulatory burden may prompt Chinese enterprises to consider domestic or regional cloud providers to reduce data sovereignty risks and navigate complex compliance requirements.

Chinese Cloud Firms Rely on Software Workarounds, but High-Performance Hardware Remains Irreplaceable

In response to U.S. chip restrictions, Chinese cloud companies are maximizing their limited resources through innovative optimization techniques to boost computational performance. DeepSeek, known as the "Pinduoduo of China's AI scene,"¹ uses methods like Mixture of Experts and Data Compression to enhance its models for coding and multilingual tasks. Similarly, Tsinghua University and startup ModelBest have collaborated on the MiniCPM model, achieving AI capabilities with fewer parameters. Other techniques, such as Meta's and Nvidia's FlashAttention-3 algorithm and DeepMind's JEST algorithm, apply hierarchical data usage and optimized training processes to improve model efficiency and speed, reducing

dependency on high-performance chips.

Chinese companies have turned to data compression, distributed computing, and algorithmic optimization to reduce their reliance on advanced AI chips, but these solutions come with significant trade-offs. Unlike Western cloud firms with robust hardware, Chinese companies face performance limitations, narrower application scenarios, and increased operational risks. High-performance chips remain indispensable for large-scale data processing and complex computations, particularly in tasks demanding precision and real-time responsiveness. While optimization techniques help bridge the gap, Chinese firms still grapple with technical hurdles and resource constraints, making it challenging to develop sustainable and cost-effective AI solutions at scale.

Tightening U.S. Chip Restrictions Accelerates China's Quest to Build a Self-Sustaining Semiconductor Supply Chain

Historically, Chinese companies have been key players in the global supply chain, specializing in end-product manufacturing while leaning heavily on foreign partners for advanced technologies like semiconductors. However, U.S. export controls, aimed at safeguarding its tech dominance, have forced China to pivot. Now, Beijing is doubling down on domestic innovation in semiconductors, a move that has not only intensified trade tensions but also escalated barriers between the two nations.

Stricter U.S. policies are a double-edged sword. While they disrupt the global semiconductor supply chain, they also fuel China's determination to achieve self-sufficiency in critical technology.

¹ Pinduoduo, launched in 2015, has rapidly grown to become one of China's largest e-commerce companies "Pinduoduo Overview," Pinduoduo Official Website, accessed December 3, 2024, <https://www.pinduoduo.com/>.

If successful, China's semiconductor independence could upend the global chip market, sparking widespread geopolitical and economic concerns. China's breakthrough in the semiconductor industry could disrupt the current global supply chain and redefine semiconductor industries across countries and regions. The race for semiconductor independence represents a seismic shift, not just for China and the U.S., but for the entire global technology landscape. As China builds its semiconductor ecosystem, it's also forming strategic alliances to counterbalance U.S. influence, pushing the global tech system toward fragmentation.

China's Countermeasures to U.S. Restrictions Create Tension for U.S. Allies

Amid economic challenges, China's response to U.S. restrictions focuses on adaptive solutions rather than direct retaliation. Since the U.S. and the EU remain crucial markets for many Chinese industries, Beijing must carefully balance industry interests with potential retaliatory trade policies. Meanwhile, the U.S. and its allies see the loss of access to the Chinese market as a more immediate threat than the slower impact of Chinese trade countermeasures, such as rare earth export restrictions, agricultural import limits, and selective tariffs.

While the U.S. aims to curb China's development through technological restrictions, this strategy has, ironically, accelerated China's drive toward technological independence, potentially resulting in revenue losses and financial risks for the U.S. and its allies. An April report by the New York Federal Reserve highlighted these effects, noting significant impacts on U.S. companies, including reduced profitability, job cuts, and an estimated \$130 billion in lost market value. Recognizing the limits of unilateral actions, the U.S. is aware that multilateral approaches are complex for its allies. Washington must frame

these joint containment efforts as critical to "mutual security" rather than solely serving "U.S. interests" to maintain allied support.

Taiwan Should Preemptively Classify Critical Tech Risk Levels to Address Escalating U.S. - China Rivalry

The U.S.-China technology rivalry now extends beyond chips and cloud services to emerging areas such as artificial intelligence, quantum computing, and biotechnology, signaling an intensification of competition. In this context, China may seek closer partnership with other nations to secure stable supply chains and access to critical technologies. Policymakers worldwide are increasingly challenged to balance economic interests with national security concerns to promote long-term stability and industry growth.

For Taiwan, where semiconductors hold strategic economic importance, any impact on the industry could threaten its exports, investments, and competitive standing. Although Taiwanese firms currently benefit economically from the U.S.-China rivalry, escalating U.S. technology restrictions may eventually pressure them to take a clear stance. Last year, Taiwan's National Science and Technology Council identified 22 National Critical Technologies and expanded its list to 32 as of November 1st, encompassing fields such as defense, quantum, energy, semiconductors, space, agriculture, and cybersecurity. To protect national security, Taiwan must act swiftly, working with academia and industry to guard its critical technologies against talent poaching and espionage by China. Moreover, robust regulatory controls signal Taiwan's commitment to the U.S. Taiwanese companies must also stay updated on regulatory developments to maintain compliance and avoid overstepping boundaries.



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Specialized in China's industrial economy, robotics, and electric vehicles, this analyst possesses extensive cross-disciplinary industry research experience. Previously, she served as a project manager at a globally renowned touch panel manufacturer, leading the development and project management of branded smartphone products. Also, she worked at a technology advisory unit under the Ministry of Transportation and Communications (MOTC), focusing on government transportation technology and policy research. She holds a Master's degree in Transportation and Logistics Management from National Chiao Tung University.