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US-China Cooperative Interdependence

Opportunities and Obstacles

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Introduction and Overview

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The United States and China are the largest and most consequential players in the global economy. Their actions have enormous consequences, for good or ill. In a perfect world, the two countries would lead the global community and cooperate in the provision of global public goods, including the maintenance of a well-functioning international economy and the resolution of such cross-border issues as climate change and public health.

Today, however, the enormous distrust between the United States and China colors their actions across a range of issues—and in the case of the United States, has led it to abandon the rules-based international order it championed for nearly a century.

The papers in this collection address the origins of this disorder, propose ways of attenuating it, and document how much is being left on the table by the inability of the world's two largest players to cooperate.

HOW DID WE GET HERE?

In 1979, China began a process of economic reform that included opening its centrally planned economy to international exchange. Initially, China's exports were concentrated in labor-intensive manufactures, such as apparel, footwear, and toys, appropriate to its low-wage economy. In the United States, the bulk of these Chinese imports substituted for imports from other suppliers and for the most part did not displace domestic production (Noland 1996).

As Mary E. Lovely observes in "US-China Trade Relations: From Gainful Interdependence to Security Threats," this pattern began to change in the 1990s, as China negotiated its accession to the World Trade Organization (WTO), which it joined in 2001. The policy anchor of WTO membership lent stability to the Chinese policy regime, and the reduced uncertainty about the trajectory of Chinese policy reduced risk on investment in China by both domestic entities and foreign multinational firms (Pierce and Schott 2016, Handley and Limao 2017). The improved environment for foreign investment coincided with technological advances that enabled increased fragmentation of the manufacturing production process and the rise of highly variegated cross-border value chains.

In the United States, this process manifested at the firm level as a relocation of many previously local assembly tasks to China, with marketing, design, and other back-office functions retained domestically. This phenomenon gave rise to the so-called China Shock, the precise contours of which are still debated.

That process undeniably resulted in labor market dislocation in the United States, with some communities sharply affected. The disruption contributed to a US populist backlash against globalization policies broadly and China in particular (Noland 2020).

Political changes were under way in China, as well. The 2008 Global Financial Crisis resulted in a sharp contraction of demand for Chinese exports and underlined to the Chinese leadership that heavy reliance on international exchange was a potential source of vulnerability. These concerns were reinforced by the 2013 revelations of Edward Snowden of the extent of US cyberespionage activities directed toward China. The response by China under President Xi Jinping was the adoption of a "civil-military fusion" development strategy and a multipronged effort to promote indigenous innovation and reduce reliance on foreign providers across a range of high technology fields, including a government guidance fund for semiconductors (2014) and the "Made in China 2025" industrial policy targeting key technologies (2015).

It was in this context that the avowedly nationalist and protectionist Donald J. Trump took office as US president in 2017. The Obama administration had responded to invigorated Chinese industrial policies essentially through conventional means, launching numerous cases against the Chinese policies at the WTO and, when that route proved insufficient, deploying US trade laws such as antidumping. Yet as tensions rose, US firms, including in high technology, continued to invest in China—while complaining about lack of intellectual property protection and forced technology transfer.

The first Trump administration initiated a broad Section 301 investigation focused on forced technology transfer and Chinese innovation policies, including intellectual property theft. The findings were issued in March 2018. When an acceptable resolution with China could not be reached, the United States imposed 25 percent tariffs on a broad range of Chinese products. China retaliated. When the cycle of tariff raising ended, in February 2020, the United States had imposed duties of approximately 20 percent on two-thirds of imports from China and China had placed an average tariff of 21 percent on 58 percent of imports from the United States (Bown 2021).

The phase one agreement, signed in January 2020, ended that escalatory cycle. Its centerpiece was a Chinese commitment to purchase an additional $200 billion of US exports in 2020 and 2021. Ironically, achieving this goal would require an increase in Chinese government influence over its economy after the United States had spent the previous 30 years trying to reduce Chinese government control.

In the event, the target was not met. Chad P. Bown argues that China would not have achieved the goal even without the pandemic, but any increases in imports were knocked off trajectory by COVID-19.[1]

The pandemic, which originated in the Chinese city of Wuhan, further worsened relations. Because Wuhan was the epicenter of the pandemic, suspicions arose that the outbreak might have been connected to the Wuhan Institute of Virology, a government lab.

1 Chad P. Bown, Anatomy of a Flop: Why Trump's US-China 'Phase One' Trade Deal Fell Short, PIIE Trade and Investment Policy Watch blog, February 8, 2021, Peterson Institute for International Economics.

Apart from the "lab leak" hypothesis, some observers posited a possible connection to biological weapons research, speculation that China vehemently denies. Whatever the source, China was less than fully cooperative in releasing data to the World Health Organization (WHO) on the virus and investigating its origins. When Australia called for a rigorous international investigation, China responded with a combination of prohibitive tariffs and nontariff barriers on Australian exports.

The Biden administration largely continued the Trump policy, retaining most of the Trump tariffs and expanding export controls and restrictions on inward foreign investment. Much of the new administration's focus was on restricting China's access to highly advanced semiconductor chips while encouraging the relocation of production to the United States.

When Trump took office for the second time, in 2025, he launched a global trade war, with China as one of the principal targets. China once again retaliated, using both tariffs and export controls. This time the escalatory cycle did not end until the two countries were applying tariffs on each other of well above 100 percent.

China has a dominant position in the mining and processing of critical minerals, such as rare earths. It first used its position for coercive purposes in 2010, in a dispute with Japan. In the context of the second trade war, Beijing rolled out a comprehensive set of export controls, some of which it held in abeyance. The Chinese action precipitated a climbdown by the United States, which reduced its tariffs on Chinese imports to 47.5 percent. China applied a 31.9 percent average tariff on imports from the United States.[2]

The trade barriers have had predictably adverse consequences for economic growth and inflation in both countries (McKibbin, Noland, and Shuetrim 2025). Disengagement is evident in the trade data, which show each country's share of trade with the other falling.

The trade relationship between the United States and China has evolved from benign to unsettling to highly conflictual. The contested terrain has spread from border measures to industrial policies and export controls. The locus of engagement has shifted from the WTO to direct bilateral negotiations. The United States has abandoned its previous commitment to most favored nation principles and multilateralism. Traditional gains from trade have been lost to mutual distrust and national security concerns.

HOW DO WE GET OUT?

The United States and China have exhibited a revealed preference for reducing their level of economic integration**.** The process for doing so has unfolded in a haphazard way, posing ongoing risks of miscalculation, misunderstanding, and unforeseen damage.

In "Negotiating a Win-Win End to the Lose-Lose US-China Trade War over Technology and Critical Minerals," Chad P. Bown takes the political preference for reduced engagement as a given and asks whether there is a way to implement that disengagement in a structured, consensual way. One approach would be

2 Chad P. Bown, US-China Trade War Tariffs: An Up-to-Date Chart, PIIE Charts, November 14, 2025, Peterson Institute for International Economics.

to simply accept that each side is dominant in some sectors and accept this vulnerability, in a sort of economic version of mutually assured destruction. The problem is that there is no way to constrain either country from trying to disrupt the balance of vulnerability.

Bown proposes an alternative approach that takes the old General Agreement on Tariffs and Trade (GATT) model of tariff concessions and turns it on its head: Instead of negotiating the reciprocal removal of tariffs, the United States and China would negotiate mutually acceptable end-states (such as a degree of diversification in sourcing).

Bown argues that the complexity of the Chinese state-party economic system frustrates negotiating over instruments such as tariffs or quotas as in the case of the GATT, justifying a focus on outcome metrics. Under his proposal, each side would identify sectors of concern, propose market outcome targets, and articulate a set of policy actions to attain the outcome goal. Critically, each side would commit not to undertake policies to frustrate the attainment of its counterpart's market diversification goal. A side benefit to this approach would be that it might prevent the imposition of additional layers of distortionary policies.

This proposal abstracts from third parties; the United States would have to coordinate with others to achieve its market diversification goals, as it has done in semiconductor manufacturing equipment and is beginning to do in critical minerals. Launching trade wars against one's erstwhile allies would frustrate this coordination.

WHAT COULD BE ACHIEVED IF THE TWO COOPERATED?

Suppose the United States and China were able to establish some stability in their economic relations and, through the implementation of a proposal such as Bown's, begin to rebuild some trust and confidence. What could they do?

The next three papers address outstanding critical global issues over which cooperative US-China leadership is essential: climate change, public health, and demographic and fiscal issues. In "Pathways to Climate Cooperation: How the United States and China Can Collaborate on Mitigation and Adaptation," Warwick J. McKibbin argues that uncertainty about the future costs of emissions reductions and the impact of technological progress are central challenges to addressing climate change. A desirable system would both anchor expectations about future outcomes and provide for flexibility in attaining those goals. McKibbin proposes a hybrid approach to reducing carbon emissions involving two types of permits: tradable long-term permits to facilitate investment with long-time horizons consistent with long-term emissions goals and short-term annual permits to effectively set an emissions price, essentially acting as a shock absorber for unforeseen positive or negative economic shocks. McKibbin argues that such an approach is preferable to a simple cap-and-trade system, which continues to impose high costs even in economic downturns, exacerbating short-term pain, or a pure carbon tax, which does not provide long-term price signals necessary for investment.

McKibbin proposes a specific institutional mechanism, the Climate Asset and Liability Mechanism (CALM), to implement the approach. A national "carbon bank" would be established that would function as the institutional equivalent of the central bank. It would set the national emissions trajectory, issue the annual emissions certificates, and then package the certificates into tradable carbon bonds representing emissions rights for future years. The existence of these tradable bonds would support a futures market generating a yield curve of carbon prices over the zero-emissions time horizon. The allocation of the tradable emissions certificates to households and firms could play a distributional role, sustaining domestic political support and serving as a compensatory mechanism for those adversely affected by decarbonization.

International coordination would be required to determine the long-run emissions trajectory and the short-term safety valve price, but once there was agreement on these key parameters, implementation would be largely domestic, which could be seen as an advantage given the current context of mistrust. Cooperation would be necessary to develop systems for monitoring emissions, verifying compliance, and tracking permit holdings. Once the system was in place, it would both clarify and reduce the need for carbon border adjustments. Once the United States and China adopted this approach, it would create incentives for other players in the international system to follow suit. Given that the United States withdrew from the Paris Accord for the second time in 2026, progress on these ideas is unlikely in the near future.

Public health is a second area in which the United States and China could cooperate. The epidemiological track record has been uneven. It includes relatively successful cooperation in addressing the SARS and Ebola pandemics and the less salutary experience with COVID-19.

Antimicrobial resistance (AMR) is an emerging challenge that would seem ripe for cooperation. The economic stakes could be enormous. In "Possible Gains from Collaboration between the United States and China on Global Public Health," McKibbin and I report potential cumulative global GDP losses associated with AMR on the order of $32 trillion–$286 trillion in 2021–50, with the United States ($3 trillion–$34 trillion) and China ($3 trillion–$29 trillion) accounting for a significant share of the losses. Agriculture would be disproportionately affected.

The United States and China could cooperate on surveillance systems, provide fiscal support to cushion losses, and leverage US strength in vaccine innovation with Chinese manufacturing capabilities. Regrettably, the United States withdrew from the WHO, which emerged as a locus of surveillance of AMR in 2026.

Another area of public health where the United States and China could productively cooperate is illicit trade in drugs, particularly fentanyl, a leading cause of mortality in the United States (although death rates from it appear to have been falling since late 2023). The drug and its precursor chemicals are sourced in China. The second Trump administration imposed a 20 percent tariff (subsequently reduced to 10 percent) on China, reportedly for its role in fentanyl trade. Cooperation between the two countries has been episodic. More complete resolution of the crisis would require greater action by the United States to address the demand side and enhanced cooperation by the United States, China, India, and Mexico to suppress supply.

A third area in which the United States and China could cooperate is demographic change and fiscal sustainability, which McKibbin discusses in "Demographic Challenges and Fiscal Sustainability in China and the United States: Opportunities for Bilateral Cooperation." During its period of high growth, China benefitted from a favorable demographic structure, characterized by a growing labor force and a low dependency ratio. Now, in part as a legacy of its One Child policy (officially 1980–2015 but well under way on the ground earlier), China is experiencing a rapid demographic transition characterized by a shrinking potential labor force and a rising old-age burden. GDP growth is expected to continue to slow, and it is likely that China's saving and investment rates will slow as well, with implications for its external balances.

With the baby boom generation retiring and birth rates falling, the United States is going through a similar, if less dramatic, transition. Historically, immigration supplemented the labor force. That process effectively ended under the second Trump administration, and it is an open question whether the country's historical status as a significant net inward migration destination will be restored. Unlike China, the United States enters this period running current account deficits and importing capital.

Improvements in the functioning of international capital markets could facilitate cross-border capital flows and the smooth adjustment of these external balances. Bilateral cooperation on aging-related issues—such as combining American innovation in biotechnology and medical devices with Chinese expertise in robotics and manufacturing capacity—could help lead to solutions.

The one major labor surplus region in the world is Sub-Saharan Africa, where much of the increase in world population is expected over the coming decades. Cooperation by the United States and China to strengthen institutions, support the development of human capital, and open up to migration and the importation of labor-intensive goods could help realize the latent complementarity between the aging and growing regions.

Such collaboration would require adjustment of political attitudes in both the United States and China. One would hope that the common challenges both countries face in dealing with aging populations would encourage a spirit of pragmatic cooperation.

CONCLUSION

As the noted philosopher Will Rogers reportedly once observed, "If you find yourself in a hole, stop digging." The papers in this Briefing document how the United States and China got into this hole, how they might start to climb out, and the benefits to the two countries and the world of addressing global public challenges cooperatively.

It is difficult to envision the second Trump administration having the discipline to engage in the sort of negotiated process that Bown proposes, although it might appeal to the president's fondness for "deals." It is also difficult to see China viewing US commitments under Trump as credible (China has its own credibility problems). Realistically, Bown's proposal might be thought of as a policy approach for a future US administration (and perhaps a different Chinese leadership).

The Trump administration's climate change denialism and trashing of public health, both domestically and internationally, make structured international cooperation in those fields doubtful as well.

The papers in this Briefing document the implicit gains through international exchange that are being forgone and "the money left on the table" in the form of public goods not provided because of the inability of the two largest countries in the world economy to cooperate. They can be regarded as pointing the way toward an alternative, more beneficial future that could be achieved under more enlightened leadership in the United States and China.

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US-China Trade Relations: From Gainful Interdependence to Security Threats

Mary E. Lovely

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The massive scale of US-China trade reflects the countries' growing economic integration over the past quarter century, which generated large gains and reshaped both economies. Since its accession to the World Trade Organization (WTO), in 2001, China has moved gradually from serving as a processing-and-assembly platform in multinational supply chains to becoming an indigenous innovator that now competes directly with American firms in key sectors. The United States retains control of advanced technology that China's upgraded manufacturing sector needs, but it depends on Chinese exports of industrial goods and refined mineral products. Rather than identifying opportunities for gainful trade and investment, each side is now locked in a cycle of tariff wars, dueling export controls, and rising national security concerns.

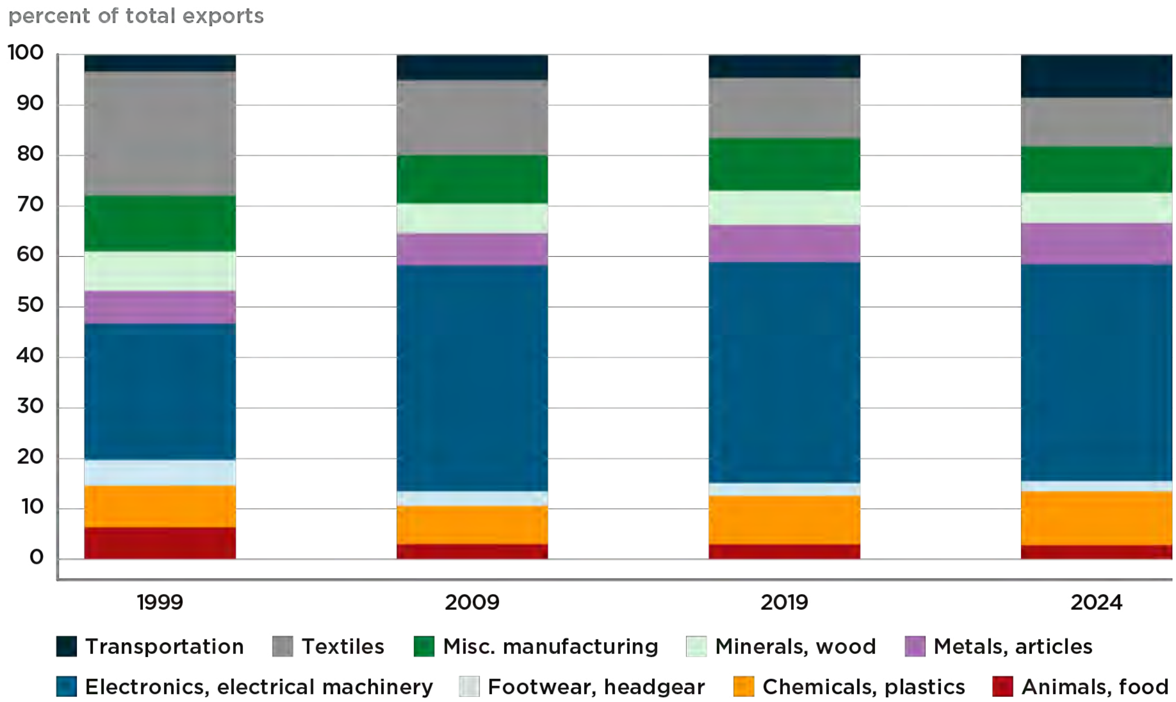
This paper surveys US-China trade relations between 2001 and November 2025. It highlights how shifts in China's position within global value chains, together with policy responses on both sides, contributed to the transition from complementary integration to trade and technology competition to mutual mistrust. The narrative emphasizes the ways in which security vulnerabilities arose from the particular ways in which trade wove the United States and Chinese economies together.

FOREIGN-INVESTED ENTERPRISES AS A DRIVING FORCE BEHIND US-CHINA SUPPLY CHAIN INTEGRATION

China's unique path to manufactured export dominance began with unprecedented foreign direct investment (FDI) inflows and heavy reliance on export-platform processing as the fuel for rapid trade growth (Dean, Lovely, and Mora 2009). Because of its labor abundance and relatively low wages, China quickly became a dominant source of labor-intensive manufactured exports.

Chinese exports of labor-intensive products—many of them produced in factories operating in special economic or free trade zones—quickly filled Western shelves. In 1999, China's exports consisted largely of textiles and apparel; footwear; and miscellaneous manufactures (including brooms, brushes, pens, and other simple products), which together made up more than 40 percent of Chinese exports (figure 1).

Figure 1
Composition of exports by China, selected years



Source: Author's calculations based on China Customs (www.customs.gov.cn) and UN Comtrade data.

China attracted large FDI inflows in the 1990s (Wang and Wei 2010). Huang (2003) finds that foreign-invested enterprises (FIEs) contributed outsized shares of exports in many manufacturing sectors by 1995.[1] FDI inflows exceeded 5 percent of GDP in 1995, settling near 3–4 percent by the end of the decade (Naughton 2018, 425). China's WTO accession, in 2001, and preferential treatment for foreign investors encouraged multinational firms serving the US market to invest in, subcontract to, and source from China-based producers.[2] Naughton (2007) concludes that the United States was the third-most important investor in China (after Hong Kong and Taiwan) through 2002. Investment from South Korea and Japan also contributed to the growth of Chinese exports. Abundant in what Heckman and Yi (2012) term "middle-skilled labor," China became a favored location for labor-intensive manufacturing orchestrated by multinational enterprises, which combined local labor with foreign technology, supply linkages, and access to Western markets.

1 Measures of FIE exports typically include those of enterprises registered in Hong Kong, Macau, and Taiwan. According to Huang (2003), the dominance of FIEs in Chinese exports is evidence of structural weaknesses in China's economy. Whatever the cause of FIE dominance, foreign investment and production fragmentation drove a new sort of economic interdependence between China and advanced economies.

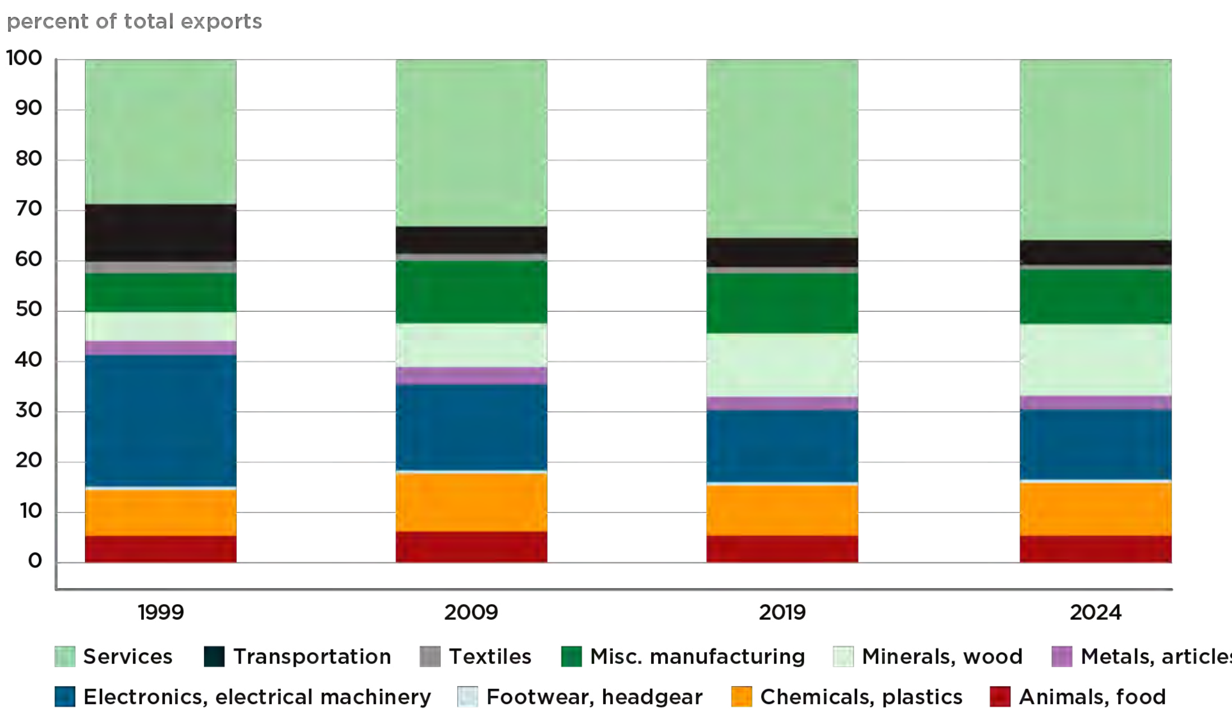
2 In current dollars, the value of China's exports to the United States between 1997 and 2007 grew at an average annual rate of 21.7 percent (Dean, Lovely, and Mora 2009).

Dean and Lovely (2010) link this investment wave to Western advances in information technology that enabled production fragmentation across borders, allowing the factor intensity of production components to be matched with the factor abundance of different locations (Arndt and Kierzkowski 2001, Baldwin 2016). FIEs formed a dynamic synergy with Chinese entrepreneurs and labor to provide labor-intensive fragments within global value chains, encouraged by subsidies implicit in free-trade zones and processing trade customs rules.

Dean, Lovely, and Mora (2009) use detailed Chinese customs data for 1995–2007 to better understand the pattern of trade between China and its two largest trading partners, Japan and the United States. They find that only a small share of these flows can be characterized as arm's length, one-way trade in final goods. Instead, they document extensive two-way intra-industry trade, deep vertical specialization, and large trade shares for FIEs.

Intensely linked to foreign-controlled value chains, China's export bundle shifted toward electronics and electrical machinery, whose share soared from 27 percent of Chinese exports in 1999 to 45 percent in 2009 (see figure 1). The fragmentation of production in technology-intensive sectors was driven by knowledge, not just goods, crossing borders, as Baldwin (2016) emphasizes. Some of this knowledge transfer is reflected in the large share of services in total US exports (figure 2).

Figure 2
Composition of exports by the United States, selected years



Source: Author's calculations based on US Bureau of Economic Analysis and UN Comtrade data.

The rising share of electronics and machinery in China's exports raised questions about the extent to which China was competing directly with advanced-economy producers. Schott (2008) finds unusually wide overlap in 2001 between exports to the United States from China and from the Organization for Economic Cooperation and Development (OECD), given China's (much lower) wage rate. However, he shows that Chinese products sell for lower prices than similar goods from OECD countries.[3] Examining Chinese exports up to 2006, Edwards and Lawrence (2010) show that Chinese unit values remained far below those of developed-country exporters, with little narrowing over time.

In addition to differences between Chinese and OECD exports of the same good, the heavy use of imported intermediates in China's processing trade (trade that occurs when duty-free imported inputs are assembled into exports) contributed to the appearance of Chinese export sophistication before 2010. Amiti and Freund (2010) find that the share of Chinese exports produced under processing trade arrangements grew rapidly as China entered the world economy, rising from 47 percent in 1992 to 55 percent in 2005.[4] They also find that the domestic content and technical sophistication of exports from domestic Chinese firms evolved less rapidly than trade shares alone indicated.

On the cusp of the 2008 global financial crisis, the Chinese and US economies were already deeply intertwined in key sectors. China provided 16.4 percent of US imports, exceeding the share provided by its second-largest source country, and North American Free Trade Agreement (NAFTA) partner, Canada. Direct imports from the United States accounted for only 7.2 percent of China's imports, exceeded by purchases from its advanced economy neighbors in Asia.

GROWING US CONCERNS ABOUT ECONOMIC SECURITY AS CHINESE FIRMS UPGRADED THEIR CAPABILITIES

Pearson, Rithmire, and Tsai (2022) argue that the global financial crisis and its aftermath sparked an acute sense of insecurity among China's leadership, as the sudden drop in external demand highlighted China's dependence on exports and the firms that controlled them. Edward Snowden's 2013 revelations about American cyber capabilities and intrusions focused the Chinese Communist Party (CCP) leadership on the dangers of foreign-made equipment and the need for technological self-reliance. Foreign firms dominated Chinese supply chains for key industrial components, such as semiconductors, and retained control over the design, sourcing, and marketing of its most valuable exports. Foreign-invested firms accounted for 82 percent of China's 2010 exports in sectors labeled "high-tech" (Sun and Grimes 2018). These exports contained relatively little domestic

3 Schott (2008) defines goods at a finely disaggregated nomenclature (10-digit Harmonized Tariff Schedule [HTS] code). Chinese and OECD goods may differ in ways not captured by a comparison of similar products, however (in terms of quality or other characteristics, for example). To assess the sophistication of Chinese exports, Schott compares the range of product categories China exports to the United States with the export bundles of other US trading partners, as well as Chinese export unit values within these product categories with the prices received by other US trading partners.

4 Amiti and Freund (2010) provide a comprehensive overview of the evolution of China's trade patterns from 1992 to 2005.

value added (Koopman, Wang, and Wei 2012), and Chinese suppliers were subject to contractual arrangements that shifted risk and cost pressure onto them and hindered domestic upgrading (Sun and Grimes 2018).[5]

Subsequently, the CCP embraced a development strategy of "military-civil fusion," which emphasized economic "securitization." Huang and Tan argue that the establishment of China's Central National Security Commission in late 2013 and the introduction of the "comprehensive national security concept" in 2014 signaled a paradigm shift in Beijing's approach to the relationship between the economy and security.[6] China's leadership turned its focus from integration into the world economy toward reducing its own external vulnerabilities, especially its dependence on foreign technology.

Following the ascension of Xi Jinping to CCP Party Secretary, in 2012, China paired its security concerns with an industrial policy strategy. In 2015, it launched the "Made in China 2025" (MiC2025) industrial policy to promote indigenous innovation in advanced manufacturing and emerging technologies.[7] The 13th Five-Year Plan (2016-2020), which overlaps MiC2025, reinforced the policy shift toward high-end manufacturing. MiC2025's nationalist focus on obtaining technological leadership and global market shares set off alarm bells in the capitals of China's advanced economy trading partners. China's determination to reach the frontier of emerging sectors not only portended loss of other countries' technology leadership and export markets, but it also posed new challenges to Western military dominance.

The United States awakened gradually to the dangers of overreliance on China for critical inputs. China's 2010 curbs on rare earth exports to Japan during a dispute over the Senkaku/Diaoyu Islands underscored how it could leverage dominance of a critical input. With exports to Japan halted, prices of some materials rose by a factor of 10. When a 2010 US Department of Energy report warned that Chinese monopolization of rare earth metals threatened American production of many key technologies, the US government responded with initiatives to increase stockpiling, create alternative materials, and reopen domestic mines. The United States, the European Union, and Japan filed a joint case with the WTO challenging the curbs on Japanese access to rare earths. The 2014 ruling against China led Beijing to drop formal quotas in 2015.

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5 Koopman, Wang, and Wei (2012) estimate the domestic value added (DVA) in Chinese exports. They find that the share of DVA in its manufactured exports was approximately 50 percent before China's WTO membership, rising to only about 60 percent by 2007. Ma, Wang, and Zhu (2015) estimate DVA in 2007 exports of telecommunications equipment and computer manufacturing at only 39.6 and 42.5 percent, respectively, well below the 60 percent estimated for total merchandise exports.

6 See Tianlei Huang and Yeling Tan, "China's Upcoming Party Session Is Unlikely to Reverse Its Economic Troubles," RealTime Economics blog, June 27, 2024, Peterson Institute for International Economics. Some observers saw this stance as a distinct change in Chinese strategy. Feigenbaum argues that "China's relentless quest to be a technology leader has deep roots, stretching as far back as the 1950s, when Beijing first began to benchmark its capabilities and ambitions against overseas technology pacesetters" ("The Deep Roots and Long Branches of Chinese Technonationalism," August 12, 2017, originally published in *Macro Polo*).

7 State Council of the People's Republic of China, "Notice of the State Council on the Publication of 'Made in China 2025,'" (Guofa [2015] No. 28), May 8, 2015 (English language translation).

After 2010, the Obama administration increased bilateral pressure over market access, intellectual property protection, and cyber-enabled theft. It also deployed trade remedy tools available under various statutes to address domestic adjustments attributed to Chinese unfair practices. Bown (2019) reports that between 2001 and 2017, the United States launched 130 antidumping and 69 countervailing duty investigations of imports from China, resulting in 103 and 55 restrictions imposed, respectively. By his count, 8.1 percent of US imports from China were subject to antidumping or countervailing duties by 2017.

Despite active engagement with the WTO and domestic trade remedies, the United States' dissatisfaction with its relationship with China continued to grow. Perceived costs to America's social fabric gained new resonance, and the benefits to American companies appeared to recede. The perceived negative effect of China's trade expansion on US economic and social health became known as the "China Shock," a narrative that demanded a more aggressive response to Chinese trade practices.[8]

As US concerns about overdependence on China rose, foreign companies, including those serving the US market, continued to invest in and profit from integration with China in high-technology sectors. Lovely and Huang (2018) find that between 2011 and 2016, the FIE shares of both profits and assets in China's high-technology sectors declined.[9] The share of FIE assets in high-technology manufacturing fell from 31 percent in 2011 to 21 percent by 2016, and their share of profits dropped from 31 percent to 21 percent. The decline in asset share belies the fact that the absolute value of FIE assets in high-tech sectors rose by approximately 40 percent between 2011 and 2016. Foreign firms continued to expand high-tech-related manufacturing in China even as the indigenous capabilities of domestic firms in high-tech sectors rose quickly. Although domestic enterprises played an increasing role in China's high-tech manufactured exports—with their share almost doubling over the period—FIEs remained dominant, providing 77 percent of China's high-tech exports in 2016, according to Lovely and Huang.

INTENSIFIED TECHNOLOGY COMPETITION, EXPORT CONTROLS, AND A TRADE WAR

As China's domestic private sector grew, the composition of its exports changed dramatically. The share of exports from domestic private firms increased from 23.5 percent in 2007 to 55.3 percent in 2020 (Cai, Wang, and Wei 2025). Chinese companies' efforts to upgrade capabilities within broad product categories bore fruit as firms shifted toward higher-value-added activities, via industrial upgrading, research and development, technology adoption, and workforce skill

8 The term *China Shock* was coined by economists David Autor, David Dorn, and Gordon Hanson, who estimated the effect of import competition on labor markets and communities in the United States. A cottage industry of empirical studies followed the 2013 publication of their paper, linking trade with China to a wide variety of economic and social ills in the United States. Empirical studies have cast doubt on the conclusion drawn by many from this literature—that trade with China had few benefits. Wang et al. (2018) and Liang (2021), for example, show that China created jobs in service and manufacturing sectors in the United States.

9 Lovely and Huang (2018) use data from the China National Bureau of Statistics, Department of Social Technology and Cultural Industry Statistic.

enhancements (Song and Zhou 2023). They were especially successful in new energy products, quickly dominating global export shares of solar and wind equipment as well as batteries.

In their detailed analysis of Chinese exports, Cai, Wang, and Wei (2025) find that the domestic value added (DVA) of Chinese merchandise exports continued the upward trend reported by Koopman, Wang, and Wei (2012) for 1997–2007. Their examination of recent national input-output tables and customs data indicates that the DVA of China's merchandise exports rose from 62.6 percent in 2007 to 71.7 percent in 2020. They also find that although exports from FIEs had the smallest share of DVA, their domestic content rose between 2017 and 2020.

The upgrading of indigenous capacity changed China's participation in global value chains, as its reliance on imported intermediates (and the duty drawbacks implicit in processing trade customs regimes) fell over time. The share of Chinese exports classified as processing exports fell steadily after 2015 (figure 3). The processing trade share of the two product categories that dominate China's export bundle to the United States (electronics and machinery and computers) fell from 70 percent to less than 45 percent.[10] Although still high compared with other sectors, this decline reflects the growing capabilities of Chinese domestic producers to control parts of high-tech supply chains that were once imported. The share of exports originating in FIEs fell even more dramatically, from a high of 58 percent in 2006 to 27 percent in 2025 (figure 4).

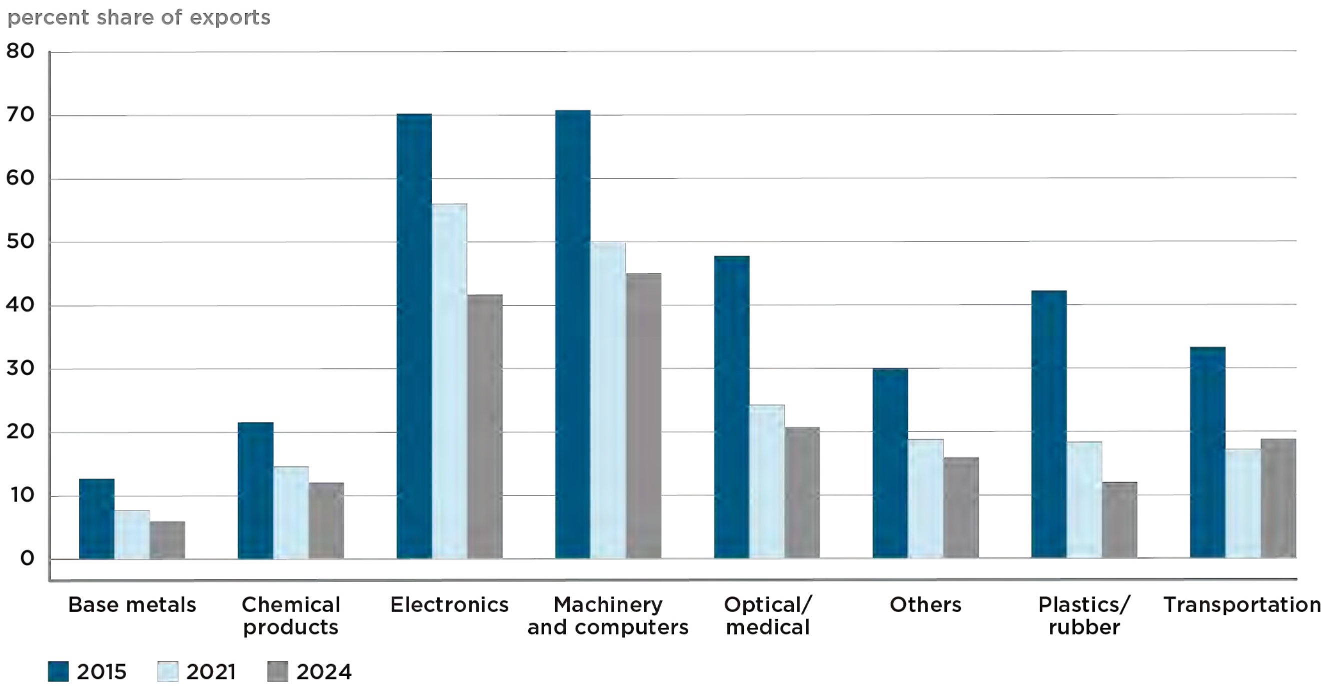
Of particular concern to Western observers is the extent to which growing domestic capabilities were less the result of market evolution than of state intervention and intellectual property violations. Although identifying a clear link between industrial policy and firm growth is challenging, Cai, Wang, and Wei (2025) confirm that the increase in the DVA share in exports and the decline in the share of processing trade are consistent with national industrial strategies.

Tension between state-sponsored industrial upgrading and firm performance permeates the relationship between the United States and Huawei, China's leading electronics hardware and infrastructure company. American companies sued Huawei in US courts for intellectual property theft in 2003 and 2014.[11] Once the Trump administration took office, in 2017, the US Congress passed legislation to broadly restrict Huawei's market access. In May 2019, Huawei and 68 affiliates were added to the US government's Entity List, which requires licenses for US firms to sell covered items. Other Huawei affiliates were added in subsequent updates. In May 2020, the Trump administration invoked the Foreign Direct Product Rule (FDPR) to restrict Huawei's access to certain foreign-made advanced chips produced using US technology, software, or manufacturing equipment. Applying the FDPR to Huawei significantly expanded US leverage over the company's global semiconductor supply chain. Even off-the-shelf chips fabricated with US tools could not be shipped to Huawei without a license.

10 Cai, Wang, and Wei (2025) estimate that the DVA of information and communications technology products as well as machinery and equipment increased for both processing and nonprocessing exports between 2007 and 2020, with the large increase in average domestic content in these sectors attributed to the large decline in processing exports.

11 In 2003, Cisco Systems sued Huawei for allegedly illegally copying its source codes and manuals; in 2014, T-Mobile sued Huawei for allegedly stealing its robot testing technology. The US government viewed Huawei as a security risk with ties to the Chinese party-state.

Figure 3
Share of processing trade in China's exports to the United States, by sector, selected years



Source: China Customs Statistics.

With its application of the FDPR to Huawei, the Trump administration deployed a tool that had previously been confined to national security and anti-proliferation controls. Analysis of US economic sanctions on China by Chorzempa, Lovely, and Wan (2024) finds that Huawei is the most targeted company on the Entity List.[12] It is hardly the only one, however: The first Trump administration added three times as many Chinese entities to export control and other sanctions lists than the previous four administrations had over the prior 16 years.

Beyond firm-specific sanctions, the Trump administration used Section 301 of the Trade Act of 1974 to broadly challenge China's technology transfer, licensing, and innovation policies. Its investigation concluded that Chinese practices—including equity restrictions, licensing constraints, outbound acquisition, and cyber-enabled theft—burdened US commerce.[13] The Section 301 findings were followed by escalating tariffs beginning in July 2018, with multiple rounds and Chinese retaliation applied through 2019.[14] In January 2020, President Donald J. Trump struck the so-called phase one agreement with Beijing, which paused

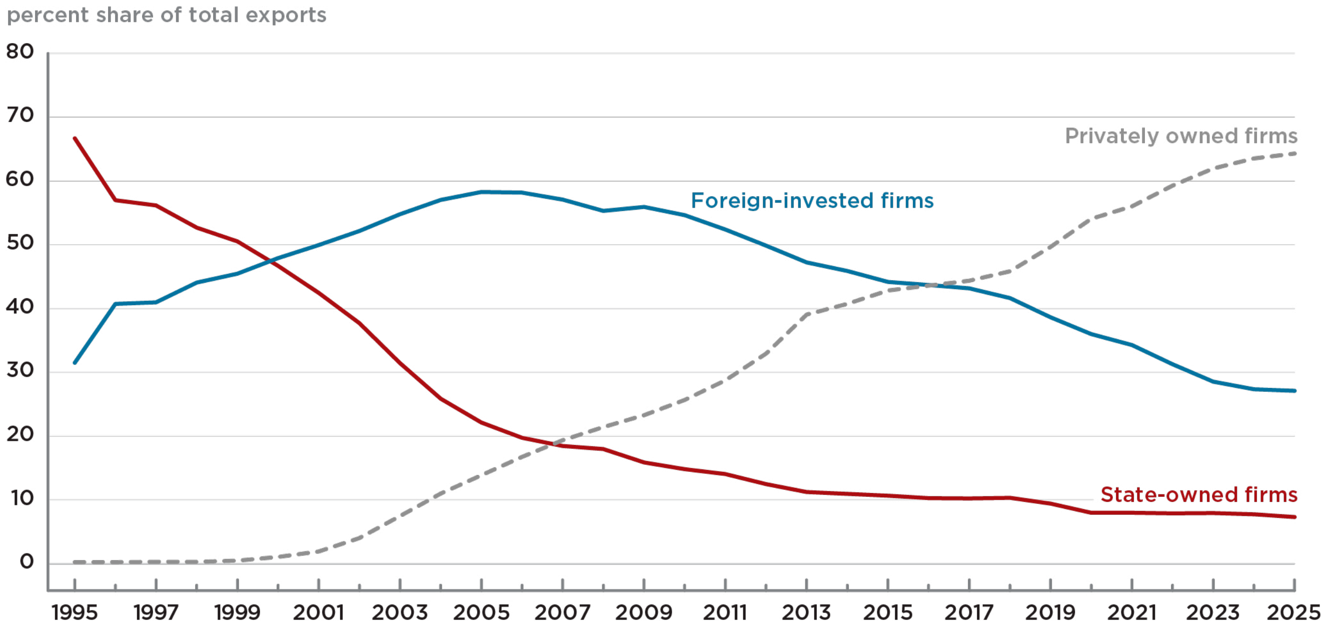
12 US actions against Huawei escalated with a warrant to arrest Meng Wanzhou (the company's chief financial officer and the daughter of its founder) over alleged sanctions violations.

13 See Office of the US Trade Representative, "Findings of the Investigation into China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation under Section 301 of the Trade Act of 1974," March 22, 2018.

14 Bown (2021) provides a detailed timeline of the sequential trade war tariff hikes.

additional tariff increases.[15] By early 2020, however, duties averaged roughly 20 percent on two-thirds of US imports from China, and China levied duties of about 21 percent on 58 percent of imports from the United States (Bown 2021).

Figure 4
Sources of Chinese exports, by ownership status, 1995–2025



Notes: Prior to 2013, exports by privately owned firms are estimated as the difference between total exports and the sum of exports by state, foreign, and collective firms. Collective enterprise exports are not shown. In 2013, collective enterprise exports were only 3 percent of total exports.
Source: Author's calculations based on data from China Customs (www.customs.gov.cn), ISI Emerging Markets, and the CEIC database.

The Biden administration inherited the trade war tariffs. Citing China's unfair trade practices and forced technology transfers, on May 14, 2024, President Joseph R. Biden Jr. announced that the Trump trade war tariffs would remain in place.[16] In addition, to promote domestic production in sectors in which overreliance on China was viewed as a vulnerability, his administration levied new tariffs on Chinese steel and aluminum, semiconductors, electric vehicles, batteries, critical minerals, solar cells, ship-to-shore cranes, and medical products. Almost immediately, China signaled retaliation against the new trade barriers, as its Ministry of Commerce announced an anti-dumping probe into imports of polyoxymethylene copolymer, a thermoplastic widely used in the consumer

15 China's promises of increased purchases of US exports did not materialize. See Chad P. Bown, "Anatomy of a Flop: Why Trump's US-China 'Phase One' Trade Deal Fell Short," PIIE Trade and Investment Policy Watch blog, February 8, 2021, Peterson Institute for International Economics.

16 See White House, "Remarks by President Biden on His Actions to Protect American Workers and Businesses from China's Unfair Trade Practices," May 14, 2024.

electronics and automotive industries, from the European Union, the United States, Japan, and Taiwan.[17]

The Biden administration kept and expanded Trump-era technology controls. It used Entity List additions and export controls to target sensitive technologies (Chorzempa, Lovely, and Wan 2024), including a broad package in October 2022 aimed at constraining China's advanced chip and semiconductor manufacturing ecosystem and extending the FDPR as a core instrument.[18] The Biden administration framed continuing tariffs and new controls in economic security terms, citing concentration risk from China's large global market shares, concerns about state-directed behavior that could weaken partner resilience, and the risk of politically motivated supply shocks as China continued to selectively weaponize trade as a tool of economic coercion.

With his return to the presidency, in January 2025, Trump unleashed a host of tariff increases on China and other trading partners.[19] The tariff escalation unfolded rapidly, with multiple tariff rounds evolving into brinkmanship on export control of critical industrial inputs.[20] The salvos began in February 2025, when the United States imposed a 10 percent punitive duty on all goods imported from China in response to its sales of precursor chemicals used to produce fentanyl.[21] In early March, Trump doubled these fentanyl-related tariffs to 20 percent. On April 2, which he dubbed "Liberation Day," he imposed an additional 34 percent tariff on China and unveiled tariffs on all US trade partners. China responded on April 4 by implementing significant controls on exports to the United States of seven rare earth elements and imposing retaliatory tariffs.[22] In mid-April, the stand-off escalated when both sides imposed an effective tariff rate of 125 percent, with some carve-outs, and in addition to tariffs levied under other mechanisms.

During May 2025 meetings in Geneva, the United States and China agreed to a 90-day tariff "pause," during which each side reduced its new tariffs to 10 percent and created a mechanism for further negotiations. Despite the truce, Chinese exports to the United States were subject to higher tariffs from sector-specific actions, including on steel, aluminum, and their derivative products;

17 Eleanor Olcott and Paola Tamma, "China Retaliates against the US and EU with Anti-Dumping Probe," *Financial Times*, May 19, 2024.

18 See also Martin Chorzempa, "A New Export Rule Escalates US-China Tensions," PIIE RealTime Economics blog, October 27, 2025, Peterson Institute for International Economics.

19 Bown provides a detailed timeline of US tariff changes by country, with details on the purported reasons for each duty hike (see Chad P. Bown, Trump's Trade War Timeline 2.0: An Up-to-Date Guide, PIIE RealTime Economics blog, February 12, 2026, Peterson Institute for International Economics).

20 Bown provides a useful timeline of US-China technology and trade policy escalation in 2025 (see Chad P. Bown, Trump's Trade War Timeline 2.0: An Up-to-Date Guide, PIIE RealTime Economics blog, February 12, 2026, Peterson Institute for International Economics).

21 Fentanyl can be made using compounds known as "precursors," ready-made building blocks created from common industrial chemicals. A large share of these chemicals is believed to be imported from China to Mexico, where they are assembled into fentanyl intended for the United States.

22 Lewis Jackson, Amy Lv, Eric Onstad, and Ernest Scheyder, "China Hits Back at US Tariffs with Export Controls on Key Rare Earths," Reuters, April 24, 2025.

copper; lumber; and large trucks.[23] The temporary tariff détente achieved in May lasted until October 2025, when China announced expanded controls on its rare earth exports.[24] President Trump responded quickly, announcing an additional 100 percent tariff on Chinese imports, on top of the 30 percent reached in May, with the new rate to take effect November 1, with limited exemptions. China immediately threatened retaliation for these new tariffs.

Finding themselves again on the edge of destroying their trade relationship, US and Chinese negotiators met in Busan, South Korea on November 10, 2025. Agreeing to a year-long truce in their trade war, the United States reduced to 10 percent its emergency-power tariff on Chinese exports, and China removed tariffs on US exports it had imposed in retaliation. China also agreed to restart imports of US soybeans, delay the introduction of export restrictions on some of its rare earth metals, and intensify efforts to curb illegal trafficking in fentanyl. Plans were launched for President Trump to visit Beijing in 2026.

SECURITY CONCERNS VERSUS THE NEED FOR TRADE AND COOPERATION

The future of US-China trade relations is uncertain, as the extraordinary tariff escalation of the past year clearly demonstrates. Gross bilateral trade flows have decreased dramatically since 2017. In 2025, China was the fourth-largest US export market ($106.3 billion) and the third-largest source of US imports ($308.4 billion), but both flows were more than 25 percent lower than they had been the previous year.[25] Despite this decoupling, mutual dependencies and supply-chain chokepoints persist, with current trade negotiations reflecting a stalemate borne of threats that portend significant economic costs.

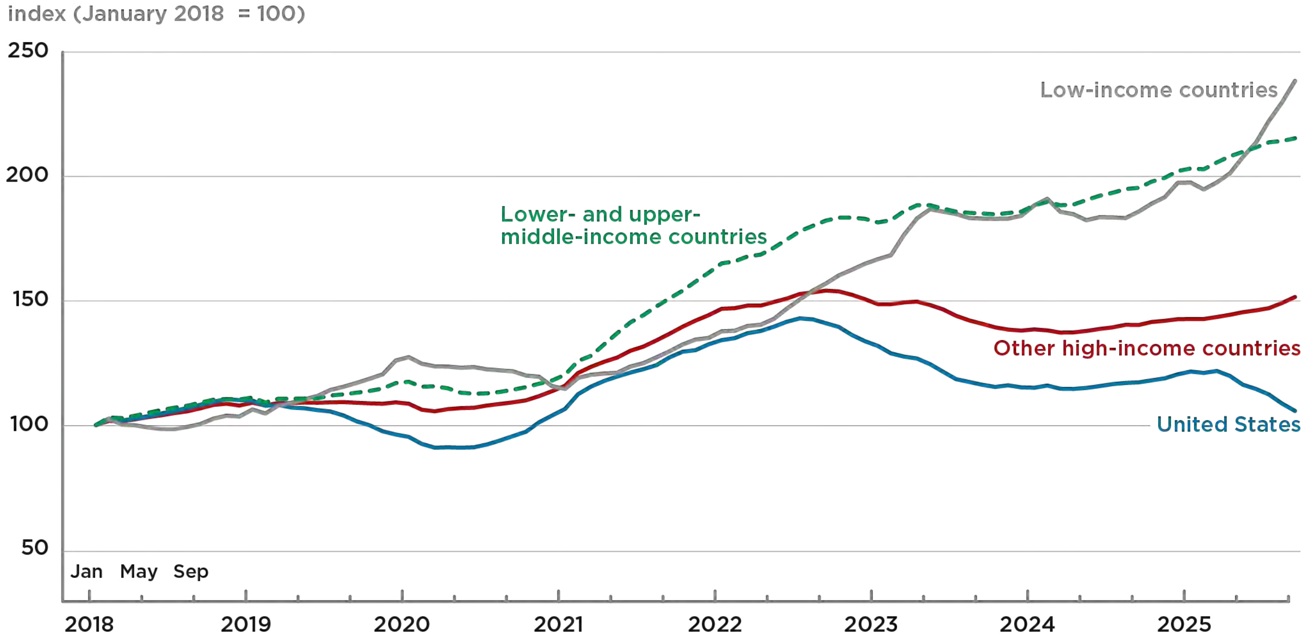
Fundamentally, since the onset of the 2018–19 trade war, US trade policy has shifted away from attempts to change Chinese behavior through dialogue, defensive trade remedies, and dispute settlement to one aimed at reducing the level of bilateral economic integration. Officially, China's leadership maintains its commitment to open trade while reaffirming its support for indigenous innovation, enhanced self-reliance, and expanded use of export controls, most recently on rare earth metals. Direct Chinese exports to the United States continue to decline (figure 5), and exports to low- and middle-income countries more than doubled in value between January 2018 and September 2025.

23 The US rate includes a 10 percent emergency-power tariff plus a 20 percent fentanyl-related tariff. These tariffs were stacked on top of other existing tariffs levied on Chinese imports. For a timeline, see Chad P. Bown, "US-China Trade War Tariffs: An Up-to-Date Chart," PIIE Charts, November 14, 2025, Peterson Institute for International Economics.

24 The expanded controls on rare earth exports restricted sales of rare earth magnets and certain semiconductor materials. The new regulations require foreign firms to obtain Chinese government approval to export rare earth magnets and select semiconductor materials that contain at least 0.1 percent heavy rare earth elements sourced from China (Baskaran 2025).

25 US exports to China fell 25.8 percent in 2024, and US imports from China fell 29.7 percent. Indirect trade through third countries expanded, however (see Freund et al. 2024 for early evidence). See also Karen M. Sutter, *US-China Trade Relations*, Congressional Research Service, March 4, 2026.

Figure 5
Chinese exports by destination income group, January 2018–September 2025



Note: Country income groups are as defined by the World Bank.
Source: Author's calculations based on China Customs data (www.customs.gov.cn).

US-China commercial integration generated enormous wealth. For US firms, China-based manufacturing enabled rapid scaling of new products; Apple's long reliance on China for assembly is a prominent example.[26] China benefited from foreign investment, imported know-how, and access to external markets, which complemented domestic reforms.

Despite these gains, political support for deep integration has eroded, at least partly because aggregate gains from trade did not preclude geographically concentrated losses. In the United States, concerns about concentrated supply chains and technology leakage have strengthened support for tariffs, export controls, and sanctions. In China, policy has emphasized economic security and indigenous innovation, alongside tighter governance of cross-border flows of technology, data, and investment (Chimits 2023). Whether the relationship can move beyond the current stalemate to one based again on complementary differences and gainful cooperation remains to be seen.

26 Jack Nicas, "Apple Reaches $2 Trillion, Punctuating Big Tech's Grip," *New York Times*, August 19, 2020.

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2

Negotiating a Win-Win End to the Lose-Lose US-China Trade War Over Technology and Critical Minerals

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The United States and China put parts of the global economy at risk with a spiral of trade policy escalation in 2025. The new Trump administration suddenly increased tariffs on goods from China by 145 percentage points—leaving them in place for a month—causing importers and exporters on both sides of the Pacific to scramble. China retaliated not only with matching tariffs but also by restricting exports of rare earth elements and permanent magnets, nearly shutting down automobile supply chains worldwide.

Washington responded by expanding its export control regime, first to cover the software needed to design the chips powering artificial intelligence (AI) and then to include the global subsidiaries of Chinese firms. Beijing countered by cutting off exports of certain semiconductors that were also essential to carmakers, nearly slamming the brakes on global auto production for a second time in less than six months.

Toward the end of the year, Presidents Donald Trump and Xi Jinping met in South Korea and called a truce, dialing back some of these policies. But many remained, and the truce seemed fragile.

Both the United States and China seek to reduce their mutual economic dependence. Each wants greater autonomy to pursue its own domestic and foreign policy priorities and less vulnerability to external interference. Even before 2025, the two countries had intervened to address those underlying worries. Their motivations are partly economic, driven by the desire to end the market dominance of the other. But they are also partly noneconomic. National security concerns, combined with the considerable policy resources available to each country, make significantly less interdependence in these key sectors seem like an unavoidable ultimate outcome.

The path to achieving that outcome is not yet settled. The lack of US-China cooperation and open channels for communication in 2025 revealed the risks of unnecessary escalation and the implementation of excessively inefficient policies. Some use of trade policy was more restrictive than necessary to achieve the desired effect of responsible de-risking. Governments also suddenly adopted new subsidies, bought into companies, implemented price floors, and applied other far-reaching policies. Each has suffered economic costs—from its own and the other country's chaotic policies—that could have been avoided. Unless the United States and China come together, policies may continue to spiral, and costs will increase.

This paper explores a novel path for US-China "cooperation" over technology and critical minerals that is explicitly designed to limit the costs of reducing dependencies and the risks of that escalatory spiral. It exploits a version of the reciprocal trade policy negotiations undertaken during the General Agreement on Tariffs and Trade (GATT) period. The novelty is the application of the fundamentals of creating a mutually beneficial negotiating process to a new setting.

The United States and other large industrial economies used reciprocal negotiations over tariffs repeatedly between 1947 and 1994 to ensure a balanced exchange of market access concessions. This approach allowed them to move collectively and in an orderly fashion from one outcome (less trade) at the end of World War II to another outcome (more trade) by the 1990s.

The proposal in this paper would modify that reciprocal negotiating approach along two dimensions. The first is recognition that the two primary protagonists now seek to move in the opposite direction: from more trade to less trade. The second is a focus on outcome metrics (such as diversification of sourcing) rather than the policy instruments (such as tariffs) designed to achieve those outcomes. China's economic model—and the excessive complexity involved in translating its nonmarket policies and practices into economic effects—necessitates targeting the outcome metrics of policymaker concern.

The rest of this paper is organized as follows. The next section summarizes efforts by the United States and China to decouple since 2013, the policy escalation and narrowly avoided crises of 2025, and the underlying problem the two countries are attempting to solve. The following section proposes a framework for "cooperation," defined as achieving a more efficient and less risky path to unwind key dependencies. The last section outlines some of the additional economic costs of failing to act.

US-CHINA TRADE RELATIONS AND THE PROBLEM POLICYMAKERS ARE NOW TRYING TO SOLVE

Both the United States and China had unrealistic expectations about what would happen after China joined the World Trade Organization (WTO) in 2001. A dominant Washington view at the time was that the combination of WTO disciplines and the reformers in Beijing would push China to become even more market oriented. That American hope did not pan out. China never fully shifted its economic model to one that the GATT/WTO system was set up to accommodate.[1] Many of its market-oriented reforms in the period since have even gone into reverse.[2]

US-China decoupling policies of 2013–24 and areas of concern

For the technology and trade conflict at issue today, key events coincide with Xi Jinping's rise to power in 2013. Table 1 provides a nonexhaustive list of important policies and milestones through 2024 (a handful of earlier events are noted for reference purposes).[3]

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1 Wu (2016) analyzes how the Chinese economic system and policies evolved following its accession to the WTO in 2001.

2 Lardy (2019) points to Xi Jinping's leadership as reversing reforms and shifting more economic activity away from private firms and toward the state.

3 For details on US–China trade actions between 2017 and 2024, see Bown and Kolb (2025). For details on US–China trade actions beginning in 2025, see Bown (2026).

Table 1
Key events in the US-China technology and trade war, 2009–24

Date	Event	Why important
2009	China retaliates against US safeguard on imported tires imposed in 2009	China signals that it will not follow the World Trade Organization (WTO) rulebook to challenge other countries' WTO-permissible trade actions
2010	China restricts exports of rare earth elements to Japan after Senkaku Islands dispute	China exploits Japan's supply chain vulnerability with export restrictions
2014	China announces National Integrated Circuit Industry Investment Fund Co. (Big Fund) for semiconductors	Government applies guidance fund model of subsidies for the chip industry
2015	China adopts Made in China 2025 policy	China sets market share targets, aiming for market dominance in new (and critical) sectors
2018	US sanctions ZTE, then backs off	US signals that its use of export controls for national security are now negotiable; China experiences the threat to a national champion because of its interdependence
2018–19	US imposes tariffs on imports from China, and China retaliates	US begins process of reducing dependence on China for certain imports
2019–20	US controls exports of high-end chips to Huawei for 5G equipment	US restricts exports of inputs for national security reasons
2019	China implements Phase II of its Big Fund	China engages in new chips subsidies; priorities include national suppliers of semiconductor manufacturing equipment
2020	US controls exports of equipment sales to SMIC	US export restrictions limit access to the equipment one major Chinese firm needs to manufacture chips
2022	West establishes the Minerals Security Partnership and tasks the International Energy Agency to include critical minerals in its work program	US and partner countries signal new cooperative efforts to end China's market dominance in critical minerals
2022	US CHIPS Act, Inflation Reduction Act signed into law	US industrial policy is designed to diversify away from China's market dominance for critical minerals and potential market dominance in segments of the semiconductor supply chain
2022	US imposes "small yard, high fence" export controls; coordinates policy with the Netherland and Japan	US signals concern with Chinese access to equipment used to manufacture high-end chips that could empower its military
2023	China controls exports of gallium and germanium	China signals displeasure with efforts by the US, the Netherlands, and Japan to control exports of chip manufacturing equipment

table continues

Date	Event	Why important
2023	China controls exports of graphite	China signals displeasure with EU potential tariffs on subsidized Chinese electric vehicles
2023–24	China announces new export control procedures and coverage of more critical minerals and rare earths	China significantly expands product coverage and demands additional information from firms to grant licenses
2023–24	US restricts outbound foreign investment	US develops and implements policies restricting US investments in the artificial intelligence, semiconductor, and quantum computing industry in China
2024	China implements Phase III of Big Fund	China extends chip subsidies to focus on new segments of supply chain, including high-bandwidth memory and other needs for artificial intelligence

In 2014, Beijing announced the establishment of new subsidies via a government guidance fund for semiconductors ("The Big Fund"). The following year, it announced the "Made in China 2025" policy.[4] These actions signaled that higher-technology sectors would be an emphasis of its industrial policy. The plans also articulated explicit market (dominance) share targets for these high-tech Chinese industries, to reduce interdependence with the West.[5]

Market share targets for Chinese industrial policy were not new.[6] The novelty was the size of the goal, the sectors targeted, and the emerging evidence that Chinese industries were beginning to dominate certain global markets. Also important was China's signal that it was using an explicit policy process to reduce its dependence on Western firms for technology and other inputs in which they had market dominance.

In the period since, the United States and China have used a range of tools to unwind what each views as its excessive dependence on the other in key sectors. These tools include new tariffs, subsidies, export controls, investment restrictions, sanctions, and anti-trust actions.[7]

Tariffs are one important and easy-to-measure example. As late as February 2018, the average US tariff on imports from China was only 3 percent.[8] The first Trump administration imposed numerous rounds of tariffs, raising the average rate to 21 percent by the end of 2019. China retaliated, raising its average tariff on imports from the United States from 8 percent to 21 percent.

4 On the Big Fund and China's government guidance funds more generally, see Huang (2019) and Lee (2024).

5 China's target was to produce 70 percent of its domestic semiconductor consumption by 2025 (Semiconductor Industry Association 2021).

6 See, for example, China's announced aspirations to dominate commercial shipbuilding in the early 2000s and its success at reaching 50 percent of global production in 2009, six years earlier than its initial target date to become the world's largest supplier (Barwick, Kalouptsidi, and Zahur forthcoming).

7 For sanctions, see Chorzempa, Lovely, and Wan (2024); for outbound investment restrictions, see Chorzempa (2023) and Daya et al. (2024).

8 See Bown (2021) for a comprehensive analysis of US and China tariffs between 2017 and 2020.

The 2018–19 tariff escalation hurt both the US and Chinese economies, but it did not result in a crisis, for several reasons. The tariff increases were modest and spread over 15 months.[9] US policy focused primarily on imported intermediate inputs, the full cost-increasing effects of which took time to wind through supply chains.[10] The US farm sector was severely affected by China's retaliation, but the US government compensated it through subsidies. The fact that the main policy instruments used were taxes—rather than quantitative limits or outright bans—meant that the result was typically a cost increase instead of something more dramatic, such as a shortage, which could have more abruptly shut down production.

Some of the tariffs, as well as the use of industrial policy and other actions summarized in table 1, were deliberate attempts to move supply chains to create alternative sources of production. For a set of essential industries, each side became worried about the other having market dominance that could be exploited at its expense.

Washington became concerned that China was dominating critical minerals and rare earths mining and processing needed for essential downstream sectors, ranging from military applications to consumer electronics to automobiles. For some minerals and elements, China has more than 90 percent of global production (figure 1). Even for critical minerals in which China has less geographic market dominance, state ownership stakes in facilities located abroad allows China to continue to affect markets.[11] The lack of clarity of the relationship between even private Chinese companies and the Chinese Communist Party raises the question of whether any Chinese firms working in other countries are independent operators that respond to market signals as opposed to being an arm of the state.

China has analogous concerns in the technology sector. The United States and its partners dominate the provision of the inputs needed to develop and manufacture the advanced-node semiconductors that are the building blocks for AI.[12] The United States, Japan, and Europe supply 89 percent of the essential equipment installed in semiconductor fabs (figure 2), including the highest-end extreme ultraviolet lithography machines, made by ASML in the Netherlands. US companies supply 73 percent of the design of logic chips, such as the highest-end semiconductors for AI by Nvidia and AMD. Together, the United States and Europe supply over 95 percent of the electronic design automation (EDA) software and intellectual property used in the architecture of chips, through companies such as Cadence, Synopsys, and Arm. (These countries do not dominate all segments, as China's market share for mature-node production increased from 19 percent in 2015 to 33 percent in 2023.[13])

9 Flaaen and Pierce (forthcoming) document the negative effect on US employment and the increase in prices in the manufacturing sector arising from the 2018–19 tariffs. See Chor and Li (2024) for the negative impacts of the US tariffs on the Chinese economy.

10 See Cavallo et al. (2021).

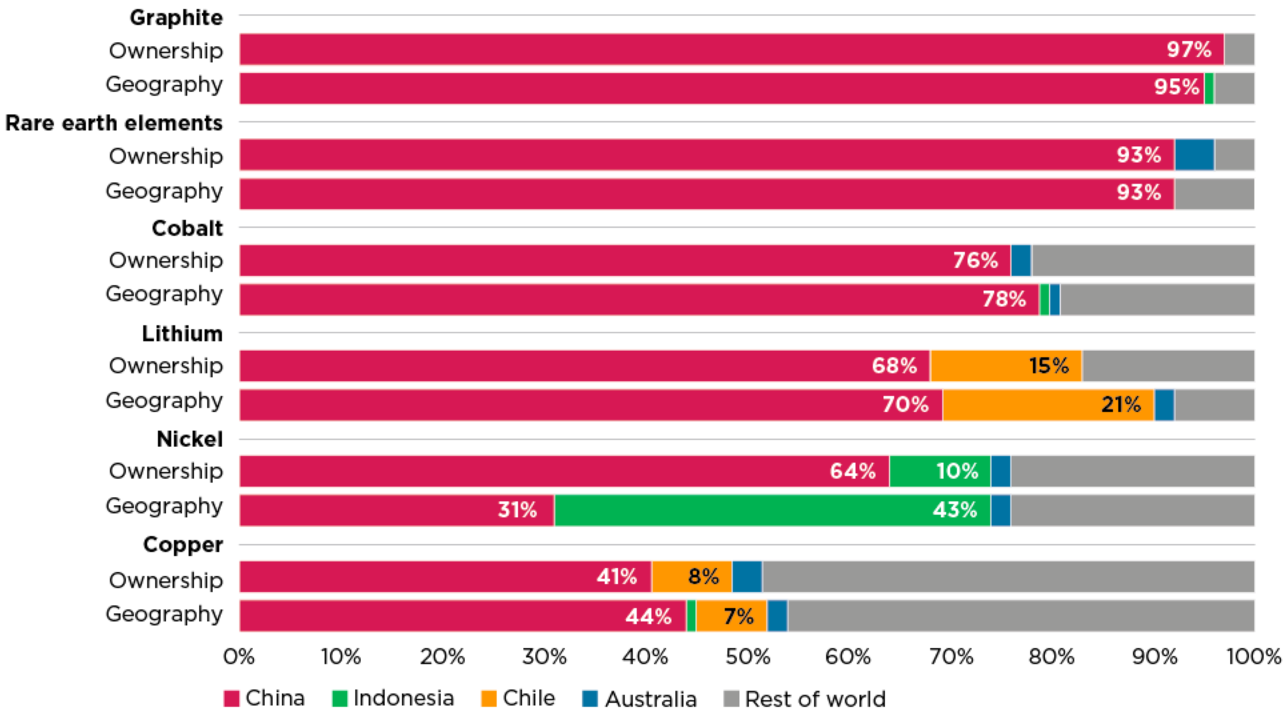
11 See Leruth et al. (2022).

12 For a discussion of the semiconductor industry's reluctant role in the US-China trade war of 2018–19, see Bown (2020). See Chorzempa (2025b) for an update and Chorzempa (2025a) for an assessment of the shifting nature of US diffusion policy for AI.

13 Semiconductor Industry Association, "Re: Request for Public Comments: China's Acts, Policies, and Practices Related to Targeting of the Semiconductor Industry for Dominance," Letter to the Office of the United States Trade Representative, February 5, 2025.

Figure 1
China dominates refining of rare earth elements and other critical minerals

Percent of global refining production, 2024



Note: Ownership is based on the location of company headquarters. Geography is based on the physical location of production.
Source: IEA (International Energy Agency), *Global Critical Minerals Outlook 2025*, Paris, page 28.

US and Chinese policymakers could respond to these facts about extreme dependencies in one of two ways.[14] One would be to acknowledge their existence in sectoral isolation but to also recognize that the other side is equally vulnerable in other industries. When viewed collectively, the countries could agree to live with their own vulnerabilities and not attempt to weaponize the other's. Such a deal would allow them to avoid the costly policies needed to reduce the dependencies. It would require an enforceable agreement to prevent weaponization, however. Currently, both sides seem unwilling to consider this approach.

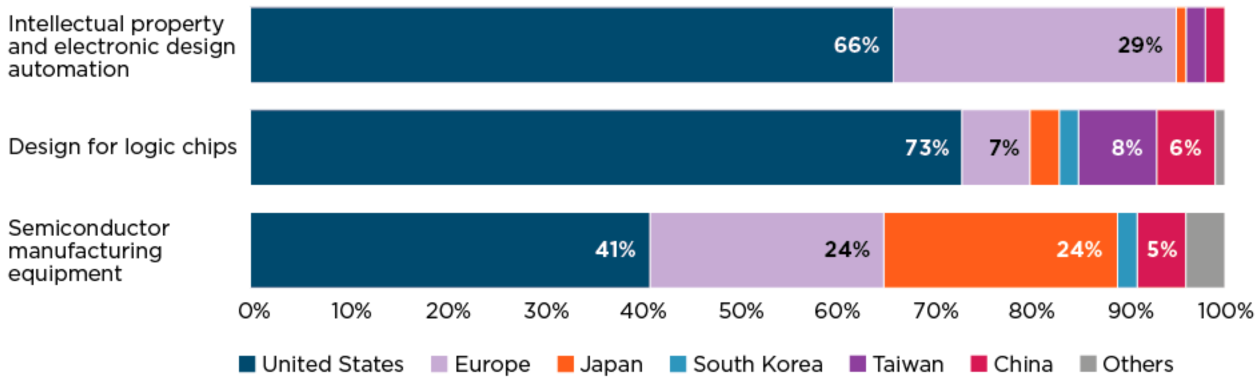
Instead, Washington and Beijing are now implementing policies to reduce the other's market dominance where it feels vulnerable. China has been undertaking policy efforts since at least 2014 to reduce its vulnerability in semiconductors and more recently AI. It expanded the Big Fund with billions of additional dollars of subsidies, targeting new segments of the Chinese semiconductor and AI ecosystem in 2019 and again in 2024.[15] It has also set goals to establish market dominance to make other economies dependent on it, achieving success in critical minerals and rare earths.

14 For a theory-based illustration of the tradeoffs, see Mayer, Mejean, and Thoenig (2025).

15 For an early examination of Chinese subsidies in the semiconductor industry, see OECD (2019).

Figure 2
The United States and its partners dominate the markets for inputs for leading-edge semiconductors and artificial intelligence

Percent of global value added, 2024



Source: Semiconductor Industry Association, *State of the US Semiconductor Industry 2025*, page 20.

The United States and its partners only later took action to reduce Chinese dominance.[16] Efforts began in 2022, when the United States passed two pieces of legislation—the Inflation Reduction Act and the CHIPS and Science Act—that used industrial policy to try to end Chinese market control in sectors it already dominated, such as critical minerals, and sectors in which its dominance was emerging, such as mature-node semiconductors.[17] Partners responded with their own legislation, including the European Union's Critical Raw Materials Act and the European Chips Act, Japan's Economic Security Promotion Act, Korea's K-Chips Act, and Taiwan's expansion of tax credits to its semiconductor firms.[18]

The West also began loose attempts to coordinate some of these emerging policies among themselves. Collectively, they launched the Minerals Security Partnership, in an effort to aggregate buyers and encourage new sellers to emerge outside of China.[19] They tasked the International Energy Agency to expand its energy security mandate beyond traditional carbon-intensive fuels to include critical minerals.[20] For semiconductors, the Organization for Economic Cooperation and Development (OECD) developed a work program, and the United States, the European Union, Japan, Korea, and Taiwan formed various

16 Japan is an outlier. Through its relationship with the Australian firm Lynas, the Japanese government began a program to help diversify its sourcing of rare earth elements in the early 2010s.

17 Of course, the CHIPS Act also began an effort by US as well as Japanese policymakers to diversify production capacity for advanced-node semiconductor manufacturing away from Taiwan if China were to retake the island by force. Both have subsidized TSMC's construction of new facilities in their countries as well as advanced-node capacity by other firms, including Intel and Samsung (United States) and Rapidus (Japan).

18 Lisa Wang, "Taiwan 'Chips Act' Sets R&D Spending at NT$6 Billion," *Taipei Times*, May 2, 2023; Alex Kim, "CHIP on the Shoulder," Wilson Center blog, October 10, 2023.

19 US Department of State, "Minerals Security Partnership," Media Note, June 14, 2022.

20 International Energy Agency, "2022 IEA Ministerial Communiqué," March 24, 2022.

groupings (the Chips-4 alliance, the US-EU Trade and Technology Council) to improve communications about their new policies.[21]

Progress at establishing new sources of supply was slow, in part because semiconductors and critical minerals are industries with massive upfront costs. Domestic politics also made international coordination between the United States and its partners messy at best.[22] Nevertheless, policy alignment was headed in the right direction. Then Donald Trump was reelected.

Policy escalation and the near crises of 2025

The United States provoked a potential economic crisis with its escalatory policies in 2025 (table 2). Shortly after the second presidential inauguration of Donald Trump, the United States once again raised its tariffs on imports from China (figure 3). China retaliated. By April, each country had announced tariff increases of more than 125 percentage points. (The average applied tariffs were lower than the announcements, as some products were excluded.) For some products, prohibitive tariffs remained in place for a month. Many firms just stopped shipping. In May alone, total US imports from China and US exports to China each fell by 40 percent.[23]

As disruptive as those tariffs were, China's April 4 export restrictions on rare earth elements and permanent magnets turned out to be much more worrisome for global supply chains.[24] Permanent magnets are essential for the functioning of various components of automobiles, including seats, windshield wipers, motors, cameras, and audio systems.[25] In 2024, China manufactured over 90 percent of one major class of the world's rare earth permanent magnets.[26]

When Chinese exports of permanent magnets fell to nearly zero beginning in April 2025 (figure 4), the US auto industry panicked. "It's day to day," Ford CEO Jim Farley said in a June interview with Bloomberg, when asked about the loss of supplies.[27] "We have had to shut down factories. It's hand-to-mouth right now."

21 OECD, "Semiconductor Informal Exchange Network," accessed March 1, 2026; Yuka Hayashi, "US, EU Agree to Coordinate Semiconductor Subsidy Programs," *Wall Street Journal*, December 5, 2022; Rihao Nagao, "Japan and EU to Share Chip Subsidy Info to Disperse Production. Three-Way Exchange with US Aims for Better Supply Chain Distribution," *Nikkei Asia*, June 29, 2023; Jake Sullivan, "Remarks by National Security Advisor Jake Sullivan on Renewing American Economic Leadership at the Brookings Institution," Speech at Brookings Institution, Washington, DC, April 27, 2023.

22 See, for example, the case of electric vehicles in the Inflation Reduction Act (Bown 2024). For semiconductors, see Bown and Wang (2024).

23 US Census Bureau, "Trade in Goods with China," accessed March 13, 2026.

24 Ministry of Commerce of the People's Republic of China, "Announcement No. 18 of 2025 on Export Controls for Certain Medium and Heavy Rare Earth-Related Items," April 4, 2025.

25 Keith Naughton, "Ford Forced to Idle Multiple US Plants on China Magnet Shortage," Bloomberg, June 27, 2025.

26 International Energy Agency, "China's Share in Rare Earth Magnet Production, 2024," October 6, 2025; International Energy Agency, "Global Critical Minerals Outlook 2024," May 17, 2024.

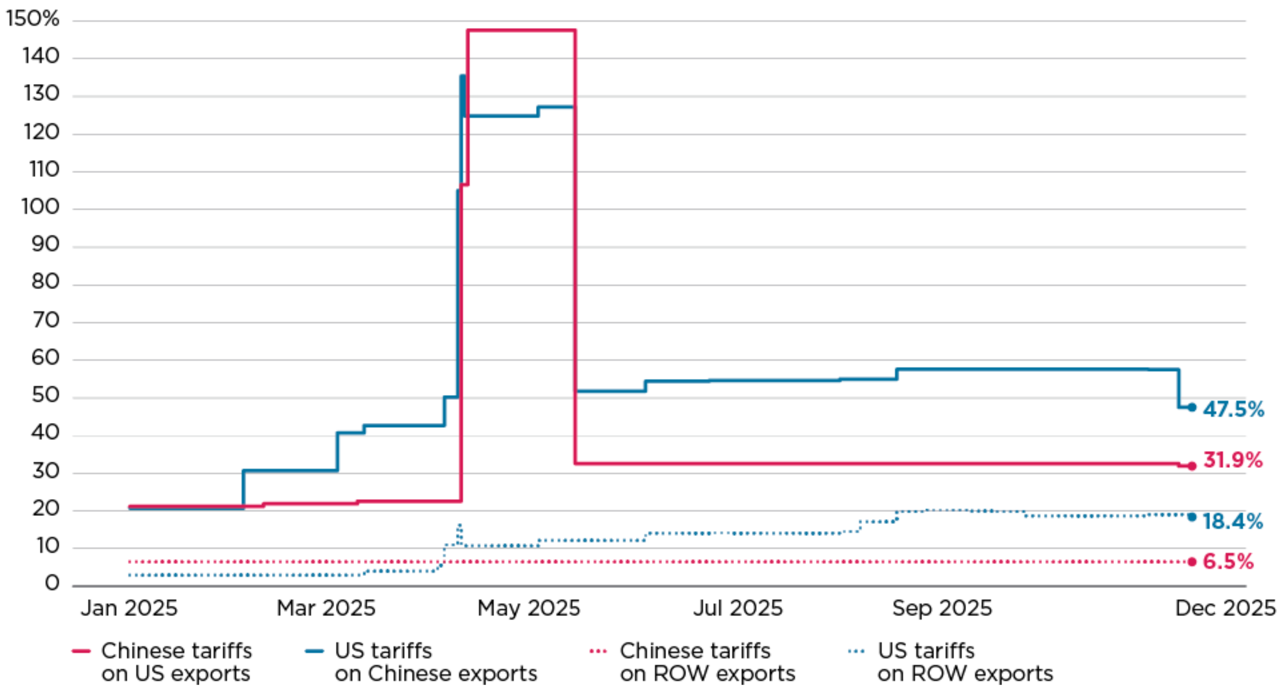
27 Keith Naughton and Matthew Miller, "Ford CEO Says Rare Earth Supply Is 'Day to Day' After Plant Halt," Bloomberg, June 13, 2025.

Table 2
US-China technology and trade policy escalation, February 2025–February 2026

Year	Event	Why important
2025	US resumes tariff escalation against China; China retaliates with tariffs and other policies	US and Chinese tariffs reach more than 120 percent; US rare earths mining company MP Materials loses sales to its main customer (Shenghe Resources) for refining in China
2025	China tightens export controls on rare earths and permanent magnets	Auto plants and suppliers in the US, Japan, Europe and elsewhere temporarily shut down because of lost access to rare earth permanent magnets
2025	US reduces tariffs on imports from China; China reciprocates and agrees to relax rare earth export controls	US and China reduce hostilities, but tariffs remain considerably higher than in 2024
2025	US loosens export controls on chips used in artificial intelligence	US again signals its export controls ostensibly imposed for national security purposes may be negotiable
2025	US announces export controls on electronic design automation tools then reverses them just weeks later	US signals it is adding export controls to new products to increase leverage, given that US-China negotiations have shifted to mainly export controls
2025	US takes ownership stake in MP Materials for rare earths, provides price guarantee for offtake	US government makes financial commitment to a domestic rare earths mining company, with aspirations for domestic refining and manufacturing of permanent magnets
2025	US expands export controls to cover subsidiaries of foreign companies already subject to its controls	Nexperia, a subsidiary of the Chinese firm Wingtech, is caught up in new US controls
2025	China restricts chip exports from Nexperia	Automakers worldwide again face shutdowns, this time because of lack of chips for their supply chains
2025	China quietly tells firms to stop buying US-produced chips used in AI	China signals further intent to develop its own domestic AI ecosystem in attempt to end US market dominance
2025	US and China agree to October truce, relaxing some 2025 trade restrictions	China postpones export controls on rare earths and Nexperia's chips; US postpones expanding its export controls to cover subsidiaries of companies already facing controls
2026	US implements export tax on chips used in artificial intelligence produced by Nvidia and AMD	US administration signals it does not find China's access to such American chips a national security threat
2026	US convenes two ministerial-level meetings on critical minerals	US signals potential willingness to cooperate with partners on critical minerals and rare earths

Figure 3
The United States and China raised tariffs to prohibitive levels in 2025 before calling a truce

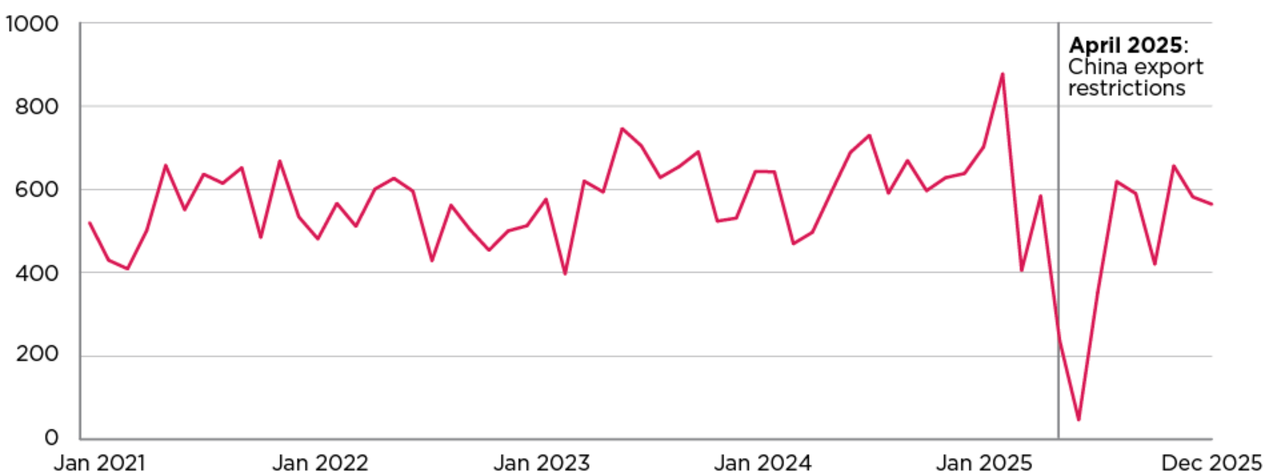
US-China tariff rates toward each other and rest of world (ROW), January–December 2025



Source: Chad P. Bown, US-China Trade War Tariffs: An Up-to-Date Chart, PIIE Chart, 2026.

Figure 4
China cut off exports of rare earth permanent magnets in April 2025

China's monthly exports to US of rare earth permanent magnets, 2021–25 (metric tons)



Source: China Customs.

The shortage of permanent magnets disrupted supply chains well beyond the American Midwest. A Suzuki factory in Japan and an auto plant in India also closed down production.[28] As European parts suppliers had to take production offline, worried automakers pushed European political leaders to beg China for magnets as well.[29]

The automotive industry warned the Trump administration on May 9 that China's export restrictions could force vehicle assembly lines to shut down "before the end of this month, most likely."[30] The memory of the COVID-19 pandemic had put the sector on heightened alert for input shortages. The sudden shortfall of semiconductors in early 2021 caused US automakers to temporarily halt production, furloughing tens of thousands of manufacturing workers.[31] (Companies in Germany, the United Kingdom, Japan, and Korea faced similar problems at the time.[32])

Despite the warnings, the Trump administration escalated matters by expanding export controls that would hit the Chinese semiconductor industry.[33] In late May, for example, it threatened to broaden the scope of products covered by US export controls to include EDA software essential to the design of leading edge chips (see figure 2).[34] After a month, the administration backtracked.[35]

Then, in late September, the Trump administration again expanded the US export control regime, this time to cover the subsidiaries of foreign companies already restricted from receiving US exports.[36] This move was also expected to affect Chinese companies developing and manufacturing chips for AI, including Huawei's HiSilicon and Semiconductor Manufacturing International Corporation

28 Keith Bradsher, "Export Controls Are Endangering the Fragile US–China Truce," *New York Times*, May 29, 2025; ItsukiMiyake and Mitsutoshi Masuno, "China's Rare-Earth Export Curbs Halt Output of Suzuki Swifts in Japan," *Nikkei Asia*, June 5, 2025; Mei Mei Chu, "EU Firms Brace for More Shutdowns Due to China Rare Earth Controls Despite Summit Promise," Reuters, September 16, 2025; Nandan Mandayam, "India's Royal Enfield Maker Briefly Hit by Rare Earth Magnet Shortage, Secures Alternative, Executive Says," Reuters, July 31, 2025.

29 Victoria Waldersee and Christoph Steitz, "China's Rare Earth Export Curbs Hit the Auto Industry Worldwide," Reuters, June 4, 2025.

30 Alliance for Automotive Innovation, "Letter to the US Departments of State, Commerce, Treasury, and the Office of the US Trade Representative Regarding China Rare Earth Export Controls," May 9, 2025.

31 Reuters, "US Commerce Chief Cites Auto Chips Shortage in Jobs Report," May 7, 2021; David Coffin, Dixie Downing, Jeff Horowitz, and Greg LaRocca, "The Roadblocks of the COVID-19 Pandemic in the Automotive Industry," US International Trade Commission Working Paper, June 2022.

32 Ilona Wissenbach and Nick Carey, "Daimler to Put up to 18,500 Workers on Short-Time Work over Chip Shortage," Reuters, April 21, 2021; Reuters, "Nissan to Furlough 800 Workers at Its UK Plant as Chip Shortage Cuts Production," April 16, 2021; Maki Shiraki, "Nissan to Slash Japanese Production in May Due to Chip Shortage, Sources Say," Reuters, April 15, 2021; "Hyundai Motor to Suspend South Korea Production Due to Chip Shortage," Reuters, March 30, 2021.

33 For one early warning, see Posen (2025).

34 Karen Freifeld, "US Curbs Chip Design Software, Chemicals, Other Shipments to China," Reuters, May 29, 2025; Liam Mo and Brenda Goh, "Exclusive: Synopsys Halts China Sales Due to US Export Restrictions, Internal Memo Shows," Reuters, May 30, 2025.

35 Thomas Hale and Christian Davies, "Chip Software Makers Say US Restrictions on Sales to China Lifted," *Financial Times*, July 3, 2025.

36 Demetri Sevastopulo, "US Tightens Export Controls on Chinese Companies," *Financial Times*, September 29, 2025.

(SMIC).[37] The controls would also hit Nexperia, a subsidiary of Wingtech Technology, a Chinese company that had been subject to US export restrictions since 2024. Nexperia's plants in Europe manufactured silicon wafers that were then sent back to its Chinese facilities for assembly, testing, and packaging into finished semiconductors. One of Nexperia's most important customers for those mature-node semiconductors was the global automotive industry.

The Dutch government ousted the CEO of Nexperia shortly after the US policy announcement, reportedly because of concern that he had been involved in the "improper transfer of production assets, funds, technology and knowledge (including intellectual property)" to another foreign company that the CEO owned that was not part of Nexperia.[38]

Beijing responded by stopping Nexperia's exports on October 4.[39] The company's finished semiconductors were not permitted to leave China without a license; Nexperia's foreign customers would face lengthy delays. Two weeks later, and for the second time in less than six months, automakers warned that they once again risked having to shut down production because of lost access to an essential input coming out of China.[40] By late October, the chip shortage forced Honda to halt assembly at a plant in Mexico and adjust its production at its US and Canadian facilities.[41] Stellantis set up a "war room" to address the emergency.[42] The lack of chips caused Bosch, the auto parts supplier, to announce preparations to furlough workers in Germany.[43]

Presidents Trump and Xi met in South Korea on October 30 and declared a truce. The White House readout of the deal noted that Beijing would allow shipments of rare earths and Nexperia's chips to the world.[44] (A spokesperson for China's Ministry of Commerce confirmed the rare earths agreement.[45]) Each side also reduced its tariffs, albeit to levels that were considerably higher than before the 2025 escalation. Economic damage had been done, and supply chains remained on edge.[46]

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37 Martin Chorzempa, "A New Export Rule Escalates US–China Tensions," PIIE Realtime Economics, October 27, 2025.

38 Vincent Karremans, "Developments Concerning Nexperia," Dutch Minister of Economic Affairs Letter to the President of the House of Representatives, November 19, 2025.

39 Nexperia, "Update on Company Developments," October 14, 2025.

40 Reuters, "Automaker Group Warns Nexperia Chip Supply Issue Could Quickly Disrupt US Production," October 16, 2025.

41 Maki Shiraki, "Honda to Resume Regular Output at N. America Plants after Chip Supply Disruptions," Reuters, November 18, 2025; Honda Motor Co., Ltd., "Fiscal First Half Year Ended September 30, 2025 Financial Results," November 7, 2025.

42 Reuters, "Stellantis Has Set Up 'War Room' to Manage Nexperia Chip Crisis, CEO Says," October 30, 2025.

43 Rachel More, "Bosch Warns Production at Risk as Nexperia Dispute Hits Auto Suppliers," Reuters, October 24, 2025.

44 The White House, "Fact Sheet: President Donald J. Trump Strikes Deal on Economic and Trade Relations with China," November 1, 2025.

45 Ministry of Commerce of the People's Republic of China, "A Spokesperson for the Ministry of Commerce Answered Reporters' Questions Regarding the Joint Arrangements for the China–US Kuala Lumpur Trade Consultations," October 30, 2025.

46 Eduardo Baptista, "China Warns of Global Chip Shortages as Nexperia Dispute Escalates Again," Reuters, March 7, 2026.

Concerns over the noncooperative approach to reducing trade dependency

The noncooperative approach of the United States and China to decoupling their trade dependencies is a source of worry for three reasons. One is that escalation threatens unnecessary disruption to their economies. Had they not been resolved in time, the shocks to the US auto sector, for example, could have been profound. Just-in-time automotive supply chains employ nearly 6.5 percent of all US manufacturing workers.[47] The 2008–09 Global Financial Crisis cost the US auto industry 400,000 jobs in a year, with estimates suggesting that over 1 million would have been lost had the federal government not bailed out General Motors and Chrysler in time.[48]

More generally, the early data from 2025 suggest that the tariff escalation had a potentially sizable impact. US exports to China were 26 percent lower, with the US farm sector particularly hard hit.[49] Soybean sales to China fell by almost $10 billion, to depths not seen since Trump's first trade war. Just as in 2018–19, the Trump administration announced that a farm bailout (of $11 billion) would be available starting in 2026.

China's steps to decrease transparency make it difficult to assess the impact of tariff escalation on its economy. (China has stopped publishing certain data series and has even censored economists for criticizing Xi Jinping's economic policies.[50]) Nevertheless, there are clues that policy escalation is of concern. US real imports from China in 2025 fell by more than 25 percent, a much larger decline than the 3 percent drop in the 12 months following Trump's first-term tariff actions of 2018.[51] A study of the 2018–19 trade war that used data on night lights in China (a good proxy for economic activity) found a significant negative impact—a 2.6 percent decline in per capita income and a 1.6 percent drop in manufacturing employment—in Chinese regions more exposed to the US tariffs relative to unexposed areas.[52]

Another anecdote suggesting that Chinese policymakers are wary of the disruptive employment effects of escalation comes from the Trump-Xi negotiations during the first trade war. At the time, President Trump decided to spare the Chinese telecommunications company ZTE, which employed 75,000 people, from devastating US sanctions, stating "President Xi of China, and I, are working together to give massive Chinese phone company, ZTE, a way to get back into business, fast. Too many jobs in China lost."[53]

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47 US Bureau of Labor Statistics, "Automotive Industry: Employment, Earnings, and Hours," accessed February 26, 2026.

48 The White House, "The Resurgence of the American Automotive Industry," June 2011.

49 Chad P. Bown, "China No Longer Buys US Exports: Drawing The Right Lessons for the Next Trump-Xi Deal," PIIE Realtime Economics, March 3, 2026.

50 Rebecca Feng and Jason Douglas, "How Bad Is China's Economy? The Data Needed to Answer Is Vanishing," *Wall Street Journal*, May 4, 2025; Chun Han Wong and Lingling Wei, "Top Economist in China Vanishes after Private WeChat Comments," *Wall Street Journal*, September 24, 2024.

51 Chad P. Bown, "The Trump-China trade wars: Five takeaways from US imports in 2025," PIIE Realtime Economics, March 16, 2026.

52 See Chor and Li (2024).

53 Donald J. Trump (@realDonaldTrump), "President Xi of China, and I, are working together to give massive Chinese phone company, ZTE, a way to get back into business, fast. Too many jobs in China lost. Commerce Department has been instructed to get it done!" X, May 13, 2018, 11:01 AM; Paul Mozur and Raymond Zhong, 2018, "In About-Face on Trade, Trump Vows to Protect ZTE Jobs in China," *New York Times*, May 13.

A second concern is that each government is applying tariffs, subsidies, and export controls in ways that are excessively costly. Their bilateral tariffs are likely too restrictive, even relative to their own objectives. (Higher US tariffs are clearly not strategic when applied to imports of clothing and footwear, industries in which China does not have market dominance.) But at least the US policy is transparent. Nearly continuous reporting out of China is that the government is also informally directing businesses to shift their purchases away from imports and toward domestically produced alternatives without formal policy announcements.[54]

Subsidies are also now likely to be excessive relative to the targeted interventions strictly necessary to end market dominance. Such compensation is often a second round of policy designed to offset the other country's original intervention, such as US subsidies to farmers for their losses from Chinese tariff retaliation.

Another example of such subsidies involves the US response to the underpricing of critical mineral and rare earth exports by Chinese state-owned enterprises (SOEs) to deter Western firms from launching new mining and processing projects. To address that concern, in July 2025 the US government took an equity stake in MP Materials, a small rare earth mining company, and agreed to buy its output for 10 years at nearly double the current market price.[55] By the end of 2025, the United States had bought ownership stakes in at least seven other companies in various critical minerals supply chains.[56] These actions pose governance challenges and increase the scope for waste, as the US government has little experience owning companies or implementing price floors effectively.

For its part, China has long been accused of subsidizing too much. The OECD estimates that direct subsidies made up 10 percent of the Chinese semiconductor industry's revenue in 2023, without accounting for the below-market equity holdings arising through the Big Fund.[57] Staff at the International Monetary Fund (IMF) estimated China's total subsidies in 2023 at 4.4 percent of its GDP[58]—and that figure is an underestimate, as it does not include the implicit subsidies involved in Chinese SOEs periodically underpricing their sales of critical minerals and rare earths outside of China in order to deter new entrants emerging.

The expansion of export controls is also worrisome. If one country imposes such restrictions simply to create future leverage, the other is likely to do the same. In 2025, the US government reportedly told firms to prepare for its export

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54 Zijing Wu, Cheng Leng, and Tim Bradshaw, "China Bans Tech Companies from Buying Nvidia's AI Chips," *Financial Times*, September 17, 2025; Zijing Wu and Cheng Leng, "China Launches Customs Crackdown on Nvidia AI Chips," *Financial Times*, October 10, 2025; Reuters, "Exclusive: China Bans Foreign AI Chips from State-Funded Data Centres, Sources Say," November 5, 2025; Reuters, "Exclusive: China Mandates 50% Domestic Equipment Rule for Chipmakers, Sources Say," December 30, 2025.

55 Camilla Hodgson, Leslie Hook, and Steff Chávez, "Pentagon's China-Style Rare Earths Deal Triggers Industry Backlash," *Financial Times*, July 18, 2025.

56 The companies are Lithium Americas, Trilogy Metals, Vulcan Elements, USA Rare Earth, ReElement Technologies, Korea Zinc, and Atlantic Alumina (Reuters, "Trump Administration Pivots to Buying Stakes in Critical Sectors," January 26, 2026; Reuters, "US, Vulcan Elements Ink Deal to Boost Rare Earth Magnet Supplies," November 3, 2025; Reuters, "ATALCO Secures Investment from US, Pinnacle Affiliate to Boost Alumina, Gallium Output," January 12, 2026).

57 See OECD (2025b).

58 See Garcia-Macia, Kothari, and Tao (2025).

control regime to cover not only the EDA software described earlier but also butane, ethane, machine tools, equipment used for aviation, and chemicals used for semiconductors.[59] Beyond rare earths, permanent magnets, and those chips from Nexperia, China added new rounds of controls to exports of other critical minerals as well as battery equipment technology.[60] Without any offsetting national security benefits, the imposition of more controls by both countries also increases the uncertainty and compliance costs firms face.

A third worry is that the adverse economic effects of the US-China approach to decoupling are spilling over to third countries. China's export restrictions on permanent magnets and Nexperia chips also affected production and jobs in Japan, Germany, India, Canada, and Mexico, as described earlier.

US and Chinese tariffs are also affecting trade flows to the rest of the world. Sometimes the tariffs create opportunities. For example, US imports from third countries have continued to increase, despite new tariffs on those countries, often because the tariffs on China were higher.[61] China is buying more soybeans from Brazil and Argentina, as it weans itself from US farmers. But the tariffs can also create costs. The fact that China is shifting its export focus away from the United States, for example, may also be putting unwanted and unfair pressure on unprepared industries and workers in third countries.

A RULES-GUIDED PROPOSAL FOR COOPERATION ON UNWINDING

This section establishes a path for US-China cooperation to facilitate a reduction in their excessive economic dependencies. The negotiating proposal shows how to efficiently manage the process of moving from one equilibrium to the other with the fewest additional spillovers possible, including those on trading partners.

The drafters of the rules-based trading system in 1947 foresaw that countries might someday seek an orderly way to unwind some of their economic interdependencies. They set up a process in GATT Article XXVIII, under which negotiations are based on reciprocity.[62] A country is allowed to raise its tariffs, thereby reducing the market access it had previously granted to trading partners, but the countries that are adversely affected can reciprocally raise their tariffs to reduce an equivalent amount of market access. (The European Commission recently proposed increasing its import protection for steel and engaging in Article XXVIII negotiations with affected trading partners.[63])

US-China negotiations could apply this basic model. They would also include four elements.

59 Karen Freifeld, "US Curbs Chip Design Software, Chemicals, Other Shipments to China," Reuters, May 29, 2025.

60 See Bown (2025, 286) and Hussain et al. (2025).

61 Chad P. Bown, "The Trump-China trade wars: Five takeaways from US imports in 2025," PIIE Realtime Economics, March 16, 2026.

62 For a legal discussion of GATT Article XXVIII, see Hoda (2004). For an early modeling interpretation of renegotiations to reduce market access after a different kind of shock (political economy, not national security or market dominance) see Bown (2002). The application is imperfect, as the GATT envisioned application on an MFN basis and involved tariff changes. As described below, the approach here is only bilateral (therefore violating MFN) and involves changes to non-tariff policies.

63 See European Commission (2025). For other historical examples, see WTO (2025a) for negotiations during the WTO period (1995–present) and WTO (2025b) for negotiations during the GATT period (1947–94).

Articulation of concerns, objectives, and actions

First, the negotiations would provide a forum of communication for the two sides to articulate their concerns, objectives, and actions. The US worry is that it is too dependent on China as a source of critical minerals, rare earth elements, and permanent magnets. The Chinese concern is that it is too dependent on the United States and other Western economies for semiconductors and related technology. To reduce these dependencies, each country is now throwing tens if not hundreds of billions of dollars at firms attempting to create sources of supply in other geographic locations outside the other's control.

By now, enough public analysis has been done about each side (examples include figures 1 and 2) to make clear what the private analysis of each government also likely already reveals.[64] Each recognizes its own basic vulnerabilities and strengths. China knows where it is vulnerable, the United States knows that China knows where it is vulnerable, and China knows that the United States knows that China knows where it is vulnerable. And the same holds for US vulnerabilities.

Given this public knowledge, cooperation would take the form of the two sides negotiating reciprocally to reduce their primary vulnerabilities of concern. The process would involve each drawing from a common set of publicly available metrics about the other side's market dominance in its sectors of interest.

Each side could put on the table its top five sectoral concerns. There needs to be a balance of sectors across the two countries to ensure that the negotiations can be reciprocal under an approach similar to Article XXVIII. Efforts to silo AI or rare earths, for example, into separate negotiating tracks are unlikely to be successful. They need to be linked in the negotiations for reciprocity to work.

Note, however, that this linkage is likely to meet political-economic resistance. In the United States, for example, different government agencies oversee policy on AI and rare earths, and at least one will not like having its fate linked to the other. Furthermore, the domestic industry seen as having to give something up (e.g., the AI sector in the United States) would complain if policymakers trade what it views as a strength to offset a weakness (excessive dependency) of another sector. Nevertheless, such political-economy tradeoffs form the very nature of country-level trade negotiations.

Agreement on the definition of success

The second element involves agreeing to a definition of success, which requires thinking through to the end of the negotiations. When negotiating reductions in market access under Article XXVIII, the end point was the higher tariff rate. Identification of final tariff rates was sufficient for GATT negotiations between market economies, because the new tariff, combined with the old (original) tariff, could be used to provide a good proxy for the change in economic activity that the negotiators really cared about. Put differently, a tariff change in market economies provided enough information about changes in imports (market access), which policymakers could use to understand the implications for fundamental domestic economic activities of interest such as industry

64 For a recent review, see OECD (2025b).

growth and job growth in key sectors, given their knowledge that firms would be maximizing their profits.

Reciprocity was used throughout the GATT era to balance the market access changes resulting from the negotiations.[65] As one example, take Europe's decision to restrict imports of poultry in 1963 which reduced market access for American chicken exporters.[66] The US increased its tariff on trucks reciprocally, which meant an offsetting decrease in market access for European truck exports. The episode became known as the "Chicken War," but such GATT-prescribed reciprocity served to limit the fallout from the initial policy change and prevented a more damaging escalation.

In the current US-China setting, the two sides need to agree to a metric of success. Defining the new outcome would also allow for a mutual understanding of when new policies designed to shift supply chains and reduce market dominance would stop. Given their apparent agreement that the underlying problem is their vulnerability because of market concentration of production, the agreed metric could be a reduction in that concentration.

As a crude example of reciprocity, the United States and its partners could reduce to 40 percent their share of the inputs used in China to produce the advanced-node semiconductors needed for AI in exchange for a reduction to 40 percent in the Chinese share of the US and partner markets for rare earths and critical minerals.[67] Such reciprocal exchanges are possible only if negotiations are linked across sectors.

The focus on outcomes (market shares) as opposed to policies (tariffs) is another accommodation of the realities imposed by China's nonmarket economic model relative to historical negotiations under GATT Article XXVIII. Peculiarities of the Chinese system mean that a simple focus on policy commitments is not enough. Government guidance funds as well as nonpublic requests for companies to source locally are but two examples of China's nontransparent system. The nature of Chinese SOEs, and even the role of the Chinese Communist Party committees within private firms, implies that Chinese companies may have objectives that differ from the pure profit maximization of Western companies.

China's system has resulted in misunderstanding and distrust by foreign policymakers especially. Cooperation that focuses on "managed trade"–type outcomes directly, instead of attempting to induce outcomes indirectly through negotiations over China's policies, may yield better results.[68]

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65 In their seminal contribution, Bagwell and Staiger (1999) show how reciprocity neutralizes the terms-of-trade impact of otherwise unilateral policy changes. Reciprocity thus provides an approach for two countries to coordinate policy changes and move from a prisoner's dilemma to an outcome with a more cooperative policy mix. For more recent summaries of the empirical evidence behind the effectiveness of reciprocal market access negotiations, see Bagwell, Bown, and Staiger (2016) and Staiger (2022).

66 Alan Wolff, "Trump's Tariff Threats Amount to a Game of Chicken with Trading Partners," PIIE Realtime Economics, September 16, 2024. See also Walker (1964).

67 For more sophisticated metrics, see the Herfindahl-Hirschman measures of industry concentration (OECD 2025b).

68 See, for example, Staiger (2022) and Grossman and Sykes (2025).

Articulation and updating of the path of policies in use to end the other country's market dominance

The third element involves each country articulating and updating the path of policies in use to end the other's market dominance, including tariffs, subsidies, export controls, and other tools. Although information on Chinese policies will be translated into the outcome metrics of interest to policymakers only imperfectly (see above), the additional clarity will reduce misunderstandings. It may prevent a breakdown in the agreement as well as unnecessary escalation.

The request is not novel, as transparency is a requirement at the WTO. What would be novel is for China to treat the transparency requirements seriously and to convert more of its informal communications to firms into actual policy announcements.[69] The United States would also have to do more reporting than it has in the past, given its new policy instruments, including industrial subsidies, ownership stakes in private companies, and price floors. (Unlike in the WTO era, when countries were fearful that what they reported publicly could be used against them as evidence in formal dispute settlement proceedings, there will be no litigation except in the court of public opinion.)

Commitment not to deploy policies to thwart the effects of the other country's efforts to diversify

The last element is that each country would commit not to deploy policies to simply thwart the economic effects of the other's market diversification efforts. For example, China would not drive down world prices for miners and refiners of rare earths and critical minerals; high enough world prices would accommodate profitable entry by Western investors in the global market. The United States would not implement policies to encourage its semiconductor industry to offer cut-rate prices in China to thwart market entry by Chinese companies.

Such an agreement would prevent the adoption of additional layers of distortionary policies.

IMPLEMENTATION DIFFICULTIES AND CONCERNS ABOUT LACK OF COOPERATION

The proposal put forth in this paper is motivated by the US-China policy escalation in 2025, which put elements of the global economy at unnecessary risk. It accepts as legitimate each country's desire to reduce its vulnerabilities but requires a sincere commitment by both to change how they approach that objective. If both sides are not committed and see the outcome as zero sum, there may be no scope for cooperation. The proposal requires belief that a win-win outcome is possible.

The approach would follow incentives similar to those articulated by the historical GATT model of reciprocal negotiations in market access. The benefits include providing clarity over what the other side is doing, why it is doing it, and when it would expect to stop doing it. At the point at which each side reaches its pre-agreed market diversification goal, the actions of each country

69 For other historical problems in defining and monitoring China's subsidies in the WTO, see Bown and Hillman (2019).

would pivot from establishing new sources of production to policies needed to sustain those newly diversified supply chains to prevent conflict in this domain from reemerging.

Numerous additional difficulties in implementing such an approach have been glossed over here. For example, the proposal strips down the negotiations to the United States and China, assuming that the United States can coordinate separately with like-minded partners.[70] That may no longer be feasible. The 2025 US approach of applying (and threatening) ever-higher tariffs to imports of even partner countries and then making demands that they invest in the US market to achieve other US objectives is not a formula for cooperation between like-minded countries on how to collectively address China's market dominance.

The US government would need to reprioritize its policies toward those countries if it seeks to enlist their help in achieving any common goals for finding new sources of non-Chinese supply of critical inputs.[71]

The Supreme Court's rejection of its 2025 tariff approach presented the US administration with an opportunity to develop a new strategy. In the early months of 2026, for the first time, the administration convened dozens of countries and hosted two separate ministerial-level meetings over critical minerals.[72] Although these signs are positive, real change would require a massive reorientation of the president's tariff policy. (Those details may only emerge following completion of the Trump administration's dozens of investigations announced in March 2026 under Section 301 of the Trade Act of 1974.[73])

China, too, faces tremendous technological and innovation challenges to develop its own advanced semiconductor ecosystem. Even if the United States and its partners interfered less in China's process, the Chinese industry would need to create its own versions of companies like ASML, TSMC, and other parts of the supply chain that Western companies currently dominate technologically.

There are other important costs of failure to cooperate. Unmanaged competition over technology could lead to the excessive build out of energy-demanding AI models, in a world already struggling with the global collective action problem of climate change and the green transition. Mining and refining rare earths and critical minerals are also environmentally damaging. Excessive supply-side diversification caused by noncooperative policy would result in more facilities operating on a smaller scale, potentially increasing negative environmental spillovers.

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70 On the supply side for semiconductor inputs, partners would include Japan, Europe, South Korea, and Taiwan (the other major economies in figure 3), most of which share the same basic concerns about China as the United States.

71 For example, Bown (2025b) describes why the United States and partner countries need to expressly limit their use of export controls toward each other to help achieve any joint objectives at combating Chinese market dominance of critical minerals and rare earths.

72 US Department of Treasury, "Secretary Bessent Convenes Finance Ministerial on Securing Critical Minerals Supply Chains," Press Release, January 12, 2026; US Department of State, "2026 Critical Minerals Ministerial: Fact Sheet," Press Release, February 4, 2026.

73 Office of the US Trade Representative, "USTR Initiates Section 301 Investigations Relating to Structural Excess Capacity and Production in Manufacturing Sectors," March 11, 2026; Office of the US Trade Representative, "USTR Initiates 60 Section 301 Investigations Relating to Failures to Take Action on Forced Labor," March 12, 2026.

By design, this proposal abstracts from questions about the optimal level of interdependence between the United States and China. It accepts the premise that, in a handful of critical sectors, each is excessively dependent on the other and that each is committed to diversifying its sourcing, even if doing so leads to less economically efficient outcomes. Pursuing less dependence may address concerns over market dominance, but it will involve giving up some other economic benefits, such as the full exploitation of scale economies and trade based on comparative advantage. Too little interdependence between the two countries also risks creating an environment that is more susceptible to military conflict.[74]

The goal of this proposal is extremely modest. In the current geopolitical climate, the main intent is to prevent something worse by introducing some rationality and efficiency considerations into the uncoordinated and worrisome process on display in 2025. It presents US and Chinese policymakers with an approach that allows each country to achieve its core objective while minimizing collateral damage, reducing the risk that their actions inadvertently spill over to other policies, as well as to their and other countries' economies.

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74 See, for example, Mayer, Mejean, and Thoenig (2025).

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3

Pathways to Climate Cooperation: How the United States and China Can Collaborate on Mitigation and Adaptation

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Addressing the urgent challenge of climate change requires unprecedented international cooperation. Together, the United States and China produce over 40 percent of the world's carbon dioxide emissions. Their cooperation is essential for limiting global temperature increases (mitigation) and for adapting to the changing climate.

The need for cooperation has never been greater. But the relationship between Washington and Beijing has grown increasingly acrimonious, with trade disputes, technology rivalry, and geopolitical tensions threatening to impede their efforts even in areas of common interest.

This paper examines opportunities for US-China climate policy cooperation, exploring how innovative policy mechanisms could facilitate joint action on reducing greenhouse gas emissions while building resilience to climate impacts.

THE LIMITED SUCCESS OF PAST APPROACHES

The United States and China have cooperated on climate issues in the past. Both countries—as well as 195 others and the European Union—signed the United Nations Framework Convention on Climate Change (UNFCCC), which entered into force in March 1994. The most recent major UNFCCC meeting—the 30th Conference of the Parties (COP30), held in Brazil in November 2025—marked the 10th anniversary of the Paris Agreement, which both China and the United States ratified. US President Donald J. Trump withdrew the United States from the agreement during his first term and again in January 2026 (under President Joseph R. Biden, Jr., the United States had rejoined the agreement).[1]

US and Chinese scientists have cooperated significantly, particularly in climate modeling and through Annual Track II[2] Climate Mitigation Dialogues. Both countries participate in the Coupled Model Intercomparison Project (CMIP6), the international framework underpinning Intergovernmental Panel on Climate Change (IPCC) assessments, with Chinese institutions such as the Chinese

1 Trump administration opposition also sank an agreement through the International Maritime Organization to impose a carbon emissions fee on shipping and helped block a UN agreement to limit plastics production.

2 Track II refers to purely unofficial dialogue, bringing together unofficial representatives on both sides, with no government participation. It offers a private, open environment for individuals to build trust, hold conversations that their official counterparts sometimes cannot or will not, and discuss solutions.

Academy of Sciences contributing models alongside US institutions such as the National Oceanic and Atmospheric Administration (NOAA), the National Center for Atmospheric Research (NCAR), and others.

In recent years, US-China coauthorship in climate research has declined sharply. In 2017, around 25 percent of Chinese climate publications involved US authors; by 2023, that figure had fallen to just 13 percent. This decline was likely driven by US policies casting doubt on the wisdom of scientific cooperation with China. The China Initiative, for example, launched in November 2018, treated scientists of Chinese ethnicity as security risks if they collaborated with Chinese partners (Baark and Budian 2025).

Cooperation through Track II Dialogues between US and Chinese stakeholders has continued. Key participants include the National Committee on US-China Relations (NCUSCR), the World Resources Institute (WRI), Columbia University, Tsinghua University, and the Beijing Green Finance Association.

The institutional infrastructure of Track II climate dialogue has survived into Trump's second term as president, as it survived his first term, because it is civil society–anchored and has demonstrated resilience to political disruption. But the conversations taking place within it have shifted, from problem-solving around shared goals to something closer to damage assessment, relationship maintenance, and an exploration of whether any residual basis for cooperation exists outside the framework of US federal climate policy (Sandalow 2025).

One of the early obstacles in international negotiations, starting with the 1997 Kyoto Protocol, was the focus on specific targets and deadlines for countries' greenhouse gas emissions, without sufficient consideration of the costs of meeting those goals by a given date. The Kyoto Protocol's failure to alter the global emissions path led to a breakthrough at COP15, in Copenhagen, in December 2009. Under the Copenhagen Agreement, countries agreed to focus on Nationally Determined Contributions (NDCs) to voluntarily shift toward a low-emissions profile over time. This emphasis on policy commitments rather than fixed targets shifted the focus of international negotiations.

The 2015 Paris Agreement marked the beginning of a return to a "targets and timetables" approach. The IPCC's 2018 *Special Report on Global Warming of 1.5°C* concluded that to limit the world's temperature rise to 1.5°C, global net-zero emissions would need to be achieved by around 2050. After the release of the IPCC report, countries started adopting 2050 targets more broadly. By 2021, at the Glasgow Climate Summit (COP26), commitments to reach net-zero emissions had greatly increased, with governments pledging to meet the Paris Agreement goal of keeping warming below 1.5°C.

The decision to focus on a target year of 2050 for net-zero emissions without considering the costs of achieving it weakened political support in key countries. The IPCC (2018) provides clear guidance on reducing emissions to prevent temperatures from rising significantly above pre-industrial levels, but the exact timing and levels needed to avoid dangerous climate change remain highly uncertain. Despite this acknowledged uncertainty, the goal of net-zero by 2050 and its timetable have been incorporated into political discourse.

Despite the challenges of achieving a meaningful reduction in global greenhouse gas emissions, climate change remains an issue on which cooperation provides significant benefits to the United States, China, and the broader international community. A breakthrough in climate policy between the two largest emitters would spur greater global action.

THE POTENTIAL OF NEW APPROACHES

Research using the G-cubed model (McKibbin and Wilcoxen 1999, 2013) examines the costs of climate change and the costs of reducing greenhouse gas emissions (Liu et al. 2020; McKibbin, Morris, and Wilcoxen 2011).[3] Given the lack of progress in lowering global emissions and the potential scale of benefits, these authors also used the modeling to develop and test practical, economically feasible frameworks for international climate policy that account for uncertainty, manage costs, recognize differences in institutional capacity across countries, and create incentives for sustained action. Policy frameworks such as the McKibbin-Wilcoxen hybrid approach (McKibbin and Wilcoxen 1997a, 1997b, 2002a, 2002b, 2002c) and the recent Climate Asset and Liability Mechanism (Academy of Social Sciences in Australia 2020) provide insights into how the United States and China might structure cooperation on climate mitigation and adaptation.

By understanding the economic logic behind these frameworks and their applicability to the unique circumstances of both countries, this paper identifies concrete pathways forward even amid broader geopolitical tensions.

The McKibbin-Wilcoxen hybrid policy: A framework for flexible climate action

At the heart of a new approach is the hybrid model developed by McKibbin and Wilcoxen (1997, 2002a, 2002b, 2002c). This framework, most thoroughly explained in McKibbin and Wilcoxen (2002c, 2002d), provides a fundamental rethinking of how international climate agreements should be designed. Instead of depending on strict emissions targets and timetables, the McKibbin-Wilcoxen hybrid combines elements of emissions trading and carbon taxes to create a more adaptable and resilient global system. It balances the speed of reaching future greenhouse concentration goals with the economic costs incurred during the transition.

The hybrid policy tackles the most crucial aspect of climate change as a policy issue: uncertainty. From climate sensitivity science to future costs of emissions reductions and the pace of technological progress, nearly every part of climate policy involves significant uncertainty. Traditional policy methods, such as the Kyoto Protocol's fixed targets and timetables, ignore this uncertainty and involve excessive economic risks when actual results differ from projections. This uncertainty has led to international agreements that are either too costly or do too little to protect the environment.

The hybrid approach recognizes that the scientific focus is on atmospheric levels of greenhouse gases rather than the precise annual emissions path. To reach a future concentration goal, policymakers need to focus on finding the most cost-effective route to that target, even if that route cannot be predicted

3 The G-Cubed model is a global intemporal general equilibrium model widely used by policymakers and researchers for studying global economic issues such as climate change, trade policy, macroeconomic policy, and pandemics. Full documentation is available at https://documentation.gcubed.com/.

with certainty. The purpose of the hybrid is to identify that route over time, through economic incentives and markets. The hybrid's second idea is that in the short term, carbon prices are a cost to economic activity but also present an opportunity for innovators over time.

The hybrid approach establishes two types of emissions permits. Long-term permits provide price signals for long-run investment decisions, reducing uncertainty for businesses planning infrastructure and technology investments over decades. These permits would be issued in quantities consistent with long-term emissions goals and could be traded in domestic markets, allowing firms to find the most cost-effective ways to reduce emissions.

Short-term annual permits, to be issued by governments at a fixed price, effectively set a carbon price ceiling (or floor if governments buy rather than sell the permits [McKibbin, Morris, and Wilcoxen 2009a, 2009b]). This safety valve prevents carbon prices from spiking unexpectedly as a result of economic shocks or policy miscalculations, thereby addressing the legitimate concerns businesses have about uncontrolled compliance costs.

Using the G-cubed global economic model, McKibbin, Morris, and Wilcoxen (2009c) and McKibbin and Wilcoxen (2004) show that this hybrid approach performs better than pure cap-and-trade or pure carbon tax systems when faced with macroeconomic volatility. During economic downturns, a rigid cap-and-trade system continues to impose high carbon prices even as emissions naturally fall with reduced economic activity, causing unnecessary economic pain. A pure carbon tax lacks the long-term price signals needed for major investment decisions. The hybrid policy combines the best features of both approaches.

For US-China cooperation, the hybrid framework offers several benefits. First, it allows each country to implement its policies domestically, based on its own circumstances, while coordinating on key parameters such as the long-term emissions trajectory and the safety valve price. This approach respects national sovereignty while creating aligned incentives. Second, the safety valve addresses Chinese concerns about economic stability during rapid growth, while the long-term permits provide the price certainty US businesses need. Third, the system's flexibility enables both countries to adjust their approaches as technology advances and scientific understanding of climate impacts improves.

Coordinated action between major economies yields far better outcomes than unilateral policies. When countries act together to price carbon, economic costs decline substantially compared with isolated action, and carbon leakage—the phenomenon in which emissions-intensive industries relocate to countries without carbon pricing—is minimized (see McKibbin, Morris, and Wilcoxen 2015). A hybrid policy implemented jointly by the United States and China would send powerful signals to other countries and create momentum for broader international participation.

The climate asset and liability mechanism

Building on the intellectual foundation of the hybrid policy, the Academy of Social Sciences in Australia (2020) proposes a more refined framework, called the Climate Asset and Liability Mechanism (CALM). This approach incorporates lessons from decades of climate policy experimentation and draws on recent innovations in economic policy management. CALM is a mechanism for pricing carbon that maintains flexibility while ensuring progress toward net-zero emissions (the goal is to reach net-zero by 2050, but the target could be reached sooner if costs are lower than expected and later if costs are higher than expected).

The core innovation of CALM is its use of a government-created “Carbon Bank” that would function much like a central bank managing monetary policy. The Carbon Bank would play several key roles. First, it would set an emissions trajectory to reach net-zero emissions by a specific target date, such as 2050. Second, it would generate and issue annual emissions certificates aligned with annual emissions targets, which all major emitters in a country would be required to hold to match their annual emissions within the country. Third, it would package these annual certificates into tradable carbon bonds representing emission rights for future years. The presence of certificates with fixed dates and their trading in a market would establish a future market and create a yield curve of carbon prices extending into the middle of the century.

The advantages of CALM lie in its ability to handle both short-term volatility and long-term price signals. At the start of the policy, the Carbon Bank would initially allocate long-term carbon bonds freely to households and firms. This allocation would act as a wealth transfer intended to offset the short-term economic costs of carbon pricing. These carbon bonds could be traded, establishing market-driven long-term carbon prices that influence investment decisions. The Carbon Bank would be prepared to sell additional short-term certificates in the current year at a fixed price—effectively creating a carbon tax on additional emissions above target in a given year.

This approach offers several advantages, particularly relevant to global cooperation (see McKibbin and Wilcoxen 2007). The free allocation of carbon bonds (to households and fossil fuel-intensive firms) addresses distributional concerns in both countries. In China, where state-owned enterprises dominate key sectors, the allocation could support firms during the transition while maintaining emissions discipline. In the United States, allocation to households and businesses could build political support and compensate those most affected by the transition. The mechanism’s flexibility would allow both countries to adjust to technological breakthroughs or unexpected costs without abandoning the long-term trajectory.

The market-based nature of CALM encourages innovation, rewards efficiency, and minimizes administrative burdens. Unlike prescriptive regulations that mandate specific technologies, CALM allows firms to find the most cost-effective ways to reduce emissions. This feature is particularly important given the differences in industrial structures and technological capabilities between the United States and China. US firms may excel in certain technologies while Chinese firms lead in others; CALM allows these comparative advantages to emerge naturally.

Applying new policy approaches to US-China cooperation on mitigation

Implementing the hybrid approach as a framework for US-China mitigation cooperation would require careful coordination but offer substantial benefits. The two countries could begin by agreeing on compatible long-term emissions trajectories that limit global temperature rise to well below 2°C, ideally 1.5°C.

These trajectories need not be identical—China, as a developing economy, might have a somewhat different path from the United States—but they should be mutually reinforcing and credible.

The two countries could coordinate on the safety valve price or the fixed price at which additional short-term certificates would be issued. Such coordination is essential to prevent carbon leakage between the two economies (if one country sets its safety valve price significantly lower than the other, emissions-intensive industries would have strong incentives to relocate, undermining the policy's environmental effectiveness). By establishing a minimum carbon price floor that increases over time, both countries could ensure that competitive conditions remain aligned.

A key aspect of cooperation involves mutual recognition of carbon pricing systems and coordination on border carbon adjustments. McKibbin et al. (2018) show that when major economies align their carbon pricing, the need for strict border adjustments decreases. Countries adopting compatible hybrid policies or CALM mechanisms could agree to exempt each other's products from border carbon adjustments and encourage other countries to join the framework.

The coordination of measurement and reporting standards represents another essential area for cooperation (see McKibbin, Morris, and Wilcoxen 2014a, 2014b, 2015). Both the hybrid policy and CALM require robust systems for monitoring emissions, verifying compliance, and tracking permit holdings. The United States and China could jointly develop technical standards for measuring emissions, leveraging US expertise in data systems and satellite monitoring alongside Chinese experience in managing large-scale industrial emissions tracking. Harmonized standards would facilitate trade, reduce compliance costs, and make it easier for other countries to join compatible systems.

These frameworks would greatly enhance technology cooperation. The long-term price signals created by tradable long-term permits or carbon bonds would drive investment in clean technology research and development in both countries. Joint research initiatives, technology demonstration projects, and intellectual property arrangements could accelerate innovation. For example, American advances in carbon capture and storage technology could be deployed in Chinese industrial facilities, and Chinese expertise in manufacturing renewable energy equipment at scale could help drive down deployment costs in the United States.

Inclusion of all major greenhouse gases, not just carbon dioxide, is critical. Methane—which has more than 25 times the warming potential of carbon dioxide over a 100-year period—represents a particularly promising area for cooperation. Recent bilateral agreements between the United States and China on methane emissions demonstrate that cooperation is possible even amid broader tensions.[4] Incorporating methane and other potent greenhouse gases into a coordinated hybrid policy or CALM framework would amplify the environmental benefits

4 During the Glasgow climate conference (COP26) in 2021, the US and China jointly committed to reduce methane emissions as a prioritized area of their bilateral cooperation in addressing climate change in the 2020s. In 2023, the United States and China produced the Sunnylands Statement ahead of COP28, covering topics related to the energy transition, forest conservation, and non-CO_2 greenhouse gases, including methane.

while creating opportunities for technology collaboration in agriculture, waste management, and fossil fuel production.

The sequencing of policy implementation is critical. Both countries could begin with pilot programs in specific sectors or regions. China has already expanded its national emissions trading system, and several US states operate cap-and-trade programs. These systems could serve as laboratories for testing hybrid features or CALM-like mechanisms. As both countries gain confidence in the approaches, they could expand coverage and deepen coordination.

Integrating adaptation into US-China climate cooperation

Mitigation dominates much of the climate policy discussion in developed countries; adaptation to unavoidable climate impacts deserves equal attention. The focus on mitigation policy provides insights relevant to adaptation as well, particularly regarding how to manage uncertainty and finance costly investments (McKibbin and Wilcoxen 2003).

Both countries are experiencing severe consequences of climate change. The United States confronts rising sea levels that threaten coastal cities, intensifying hurricanes, increasing wildfire risks, and more severe and frequent droughts and floods. China faces similar coastal flooding risks, water scarcity in the north, flooding in major river basins, and the disruption of agriculture. These shared vulnerabilities create opportunities for cooperation on adaptation strategies, technologies, and financing.

The magnitude and timing of climate impacts remain uncertain, as do the costs and effectiveness of adaptation measures. This uncertainty argues for adaptive management approaches that allow for course correction as impacts materialize and knowledge improves. Joint US-China research on climate modeling, particularly regional climate projections, could reduce uncertainty and inform adaptation planning in both countries and globally.

Infrastructure resilience is a clear area for cooperation. Both countries need to upgrade their infrastructure to handle more severe weather and a changing climate. Chinese experience in large-scale infrastructure projects and American expertise in advanced engineering and materials science could be combined to develop and showcase climate-resilient infrastructure solutions, including flood-resistant building methods, drought-tolerant water systems, resilient power grids, and transportation networks built for more extreme conditions.

Agricultural adaptation is vital for both countries and global food security. Climate change is already reducing growing seasons, crop yields, and the viability of various crops. The United States and China together represent a significant portion of global food production; disruptions to their agricultural systems therefore have worldwide effects. Collaboration on climate-smart agriculture, drought-resistant crop varieties, water-efficient irrigation, and agricultural insurance mechanisms could benefit both countries while strengthening global food security.

The financing mechanisms created for mitigation under frameworks such as CALM could be adapted for adaptation funding. Revenue from carbon pricing could be partly allocated to adaptation projects, establishing a direct link between those who emit greenhouse gases and those who bear the costs of climate impacts. The carbon bonds issued under CALM could specify funding for adaptation initiatives, ensuring sustained support for resilience-building efforts.

Coastal resilience is a particularly urgent adaptation challenge, and cooperation can be especially beneficial. Both countries have large population centers and economic assets in coastal regions that are threatened by sea level rise and storm surges. Nature-based solutions such as mangrove restoration, engineered fixes such as seawalls and storm surge barriers, and policy measures such as managed retreat and resilient development standards all require joint research and demonstration. Lessons learned in one country could help shape strategies in the other.

Climate-related health impacts are another area for adaptation cooperation. Rising temperatures lead to more heat-related illnesses and deaths; shifting disease vectors expand the range of tropical diseases. Air quality declines under certain climate conditions, affecting respiratory health. Waterborne diseases may increase due to flooding and changing rainfall patterns. To help adapt to these conditions, public health surveillance systems, early warning systems, and medical countermeasures could be developed and shared.

OVERCOMING OBSTACLES TO COOPERATION

Implementing new policy frameworks for US-China climate cooperation faces significant obstacles beyond the technical design challenges. Geopolitical tensions between the two countries create skepticism about cooperation. Technology competition, particularly in clean energy technologies, generates concerns about intellectual property protection and strategic advantages. Domestic political constraints in both countries limit the space for international agreements.

These challenges notwithstanding, several factors support continuing cooperation efforts. First, climate change is an existential threat that goes beyond bilateral competition. The physical impacts of unchecked climate change would severely damage both economies, outweighing any competitive advantages from noncooperation. Second, climate cooperation can help stabilize the bilateral relationship, offering a channel for constructive engagement even when other issues are difficult to resolve. Third, the economic benefits of coordinated action—including lower costs, reduced carbon leakage, and faster technology development—provide strong incentives for both countries to cooperate.

The flexibility built into the proposed new approach addresses many obstacles to cooperation. The hybrid policy and CALM do not require a single unified system but rather compatible national systems that achieve similar objectives, thereby respecting sovereignty while enabling coordination. The mechanisms can be implemented gradually, allowing trust to be built and adjustments to be made based on experience. The focus on agreed actions rather than fixed outcomes reduces the risks of failure and blame when circumstances change.

Track II dialogues (dialogues involving experts, businesses, and subnational governments) can promote cooperation even when national governments face political constraints. US states such as California and Chinese provinces (including Beijing, Shanghai, Tianjin, Chongqing, Hubei, Guangdong, and Shenzhen) could lead the way in establishing compatible carbon-pricing systems. Business groups in both countries could push for policies that create a level playing field through coordinated carbon pricing. Scientific exchanges on climate impacts, modeling, and technologies could continue strengthening the technical foundation for cooperation.

Creative diplomacy could find ways to frame cooperation that are politically acceptable in both countries. Emphasizing economic competitiveness, energy security, air quality co-benefits, and technological leadership could help build domestic support beyond environmental constituencies. Structuring agreements as reciprocal actions rather than one-sided concessions would address fairness concerns. Allowing both countries to claim credit for achievements could overcome obstacles related to national pride and political positioning.

BEYOND BILATERAL COOPERATION: GLOBAL IMPLICATIONS

The importance of US-China climate cooperation goes well beyond their bilateral relationship, as together these countries could spark global action through various mechanisms. First, by showing that effective carbon pricing is both economically feasible and politically sustainable, they could motivate other countries to follow suit. The hybrid policy or CALM frameworks could serve as models for international climate policy, replacing the ineffective targets-and-timetables approach of the Kyoto Protocol.

Second, coordinated US-China action would significantly reduce uncertainty about the global carbon price path. Uncertainty about future policies is a major barrier to climate-related investments (McKibbin and Wilcoxen 2003, 2009a). When the world's two largest economies commit to an increasing path for carbon prices through credible mechanisms, businesses worldwide can plan long-term investments with greater confidence, thereby accelerating the global transition to clean energy.

Third, compatible carbon pricing systems in the United States and China would encourage other countries to adopt similar systems to avoid losing their competitive edge. Leading by example is likely to be more effective than forcing participation through border carbon adjustments, which could lead to trade conflicts. Countries that do not price carbon could face border adjustments when exporting to the United States or China, creating incentives for establishing domestic carbon pricing.

Fourth, revenue from coordinated carbon pricing could finance global public goods such as clean energy research, technology transfer to developing countries, and adaptation support for vulnerable countries. McKibbin and Wilcoxen (2007) and McKibbin, Morris, and Wilcoxen (2009a) highlight the importance of helping developing countries with climate action, both for fairness reasons and because global emissions reductions require participation by all countries. Some of the revenues generated by hybrid policies or CALM in the United States and China could be allocated to international climate finance.

The G-cubed model shows that the impacts of climate policy propagate through international trade and capital flows. Coordinated action by major economies yields better outcomes than isolated policies, and these benefits multiply as policy coordination extends beyond the initial participants. The United States and China could invite other countries to join their coordinated framework, expanding the benefits of compatible carbon pricing systems globally.

CONCLUSION: A PRAGMATIC PATH FORWARD

Reducing global greenhouse emissions requires urgent action, including meaningful cooperation by the world's two largest emitters. The practical, economically sound frameworks presented in this paper could facilitate effective US-China cooperation on climate mitigation and adaptation. The McKibbin-Wilcoxen hybrid policy and the Climate Asset and Liability Mechanism (CALM) provide flexible, cost-effective strategies for lowering greenhouse gas emissions while managing economic uncertainty and gaining political support.

These frameworks address the main obstacles that have hindered international climate cooperation: They manage uncertainty with safety valves and adaptive mechanisms, they respect national sovereignty while enabling coordination, they establish long-term price signals while preventing excessive short-term costs, and they build political support through wealth transfers within (rather than between) countries that cushion the transition. Applied to US-China relations, these mechanisms could facilitate cooperation even amid broader geopolitical tensions.

The path forward requires political will in both countries, creative diplomacy, patience to build trust through incremental progress, and sustained engagement despite setbacks. Climate cooperation cannot and should not be held hostage to every disagreement in the bilateral relationship. The stakes are too high, and the benefits of cooperation too substantial, to allow climate action to become another casualty of great power competition.

Effective climate policy does not have to be economically harmful or politically unfeasible. With smart policy development that recognizes uncertainty, controls costs, and creates proper incentives, both mitigation and adaptation can be accomplished while supporting economic growth and development. The question is whether leaders in both countries will seize the chance to cooperate in their shared interest and for the benefit of future generations worldwide.

A new overarching framework built around coordinated national efforts is achievable. What remains is the political will to act—to set aside short-term competitive concerns in favor of long-term survival, recognize shared interests even amid genuine disagreements, and demonstrate that great powers can cooperate when the future of the planet is at stake.

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4

Possible Gains from Collaboration between the United States and China on Global Public Health

Warwick J. McKibbin and Marcus Noland

Many important global public health threats transcend borders. They include antimicrobial resistance (AMR), the illicit trade in drugs, and pandemics.

As the world's two largest economies, the United States and China possess the capacity, expertise, and reach to play a key cooperative role in addressing these issues. The track record has been uneven. Historical collaborations in health—such as joint responses to SARS and Ebola—demonstrate the potential for substantial cooperation; China's possible role in, and lack of international cooperation on, the COVID-19 pandemic lie on the other side of the ledger. Successful cooperation in this domain could generate massive positive public health and economic benefits; conflict in this domain could contribute to heightened geopolitical tensions. This paper explores the potential gains from cooperation and suggests ways in which the United States and China could partner on three important public health challenges.

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COOPERATION ON ANTIMICROBIAL RESISTANCE

Several studies estimate the economic costs of AMR. Most find substantial economic losses from unchecked resistance.

The first systematic review of the economic implications of priority pathogens and infections that have acquired resistance to existing antimicrobials was commissioned in 2014 by the UK prime minister. The review, chaired by Jim O'Neill (2016), included two economic studies, conducted by KPMG and RAND Europe.

Using the G-cubed model,[1] Fernando and McKibbin (2025) estimate potential global economic losses from AMR between 2021 and 2050 at $32 trillion–$286 trillion. They suggest that bilateral partnerships could mitigate these risks through shared investments and policy alignment.[2] They examine six scenarios, based on the rate of growth of AMR through 2100 together with assumptions about labor, financial, and climate risks. Two (Scenarios 1 and 2) assume AMR growth of 20 percent; four (Scenarios 3–6) assume AMR growth of 40 percent (table 1).

1 For details on the G-Cubed model, see McKibbin and Wilcoxen (1999, 2013). See https://documentation.gcubed.com/.

2 In the absence of AMR, cumulative GDP between 2021 and 2050 is projected at $4,004 trillion (Fernando and McKibbin 2025). The losses thus represent 0.8–7.1 percent of potential GDP.

Table 1
Design assumptions for AMR scenarios

Scenario 1	**Labor Productivity**: Diseases evolve as a function of MVPP, and resistance rates remain constant at 2019 rates.* **Agriculture Productivity**: Initial change in 2020** increases by 20 percent by 2100.
Scenario 2	**Labor Productivity**: Diseases evolve as a function of MVPP, and resistance rates evolve as a function of MVPP from 2020. **Agriculture Productivity**: Initial change in 2020** increases by 20 percent by 2100.
Scenario 3	**Labor Productivity**: Diseases evolve as a function of MVPP, and resistance rates evolve as a function of MVPP from 2020. **Agriculture Productivity**: Initial change in 2020** increases by 40 percent by 2100.
Scenario 4	**Same as Scenario 3 with Climate Risks**: Diseases evolve as a function of MVPP, and resistance rates evolve as a function of MVPP and SSP 2-4.5 from 2020.
Scenario 5	**Same as Scenario 4 with Financial Risks**: The initial changes in country risk premia in 2020 (approximated using 10 percent of those due to COVID-19 for 2020 from Fernando and McKibbin 2021) rise by 20 percent annually until 2100.
Scenario 6	**Same as Scenario 5 with Government Expenditure Response**: The initial changes in government expenditure in 2020 (approximated using 10 percent of COVID-19-related government expenditure rate for 2020 from Fernando and McKibbin 2021) rise by 20 percent by 2100.

MVPP = UN Medium Variant Population Projections; SSP = Shared Socioeconomic Pathways (SSP) 2-4.5; * = Resistance rate for 2019 from Murray (2022); ** = Agriculture productivity impact for 2000 from Laxminarayan et al. (2015).
Source: Constructed by the authors.

Agriculture is projected to be disproportionately affected, because of its labor intensity and the extent of antimicrobial reliance, with output losses exceeding 1 percent by 2030 and 2 percent by 2050 in countries such as Argentina, Australia, and Russia under scenario 4. In China, cumulative GDP losses range from $3.5 trillion–$29.2 trillion by 2050 across all six scenarios. In the United States, cumulative GDP losses are $2.8 trillion–$46.5 trillion by 2050 under scenarios 1–4 and $33.1 trillion and $33.7 trillion under scenarios 5–6.[3] These shocks cascade through supply chains, reducing investment in linked sectors like manufacturing.

To mitigate these losses, Fernando and McKibbin advocate coordinated investments, such as early detection to reduce AMR occurrence and fiscal support to address the resulting economic damage. For US-China collaboration, such investments could include joint genomic surveillance and a wide variety of modeling approaches to forecast outbreaks, leveraging US vaccine innovation and Chinese manufacturing for equitable distribution. Bilateral liquidity swaps could stabilize markets. G20 advocacy could ensure aid to vulnerable countries, reducing economic spillovers.

3 The losses to the United States fall under scenarios 5 and 6 relative to scenarios 1–4 because the increase in global financial risk causes capital to flow to the US economy as a safe haven, which dampens the economic effects of AMR on the United States.

Fernando and McKibbin's estimates of the economic costs of AMR exceed those of earlier studies, which did not integrate demographic and climate factors. Those estimates include the following:

- The World Bank (2017) projects annual global GDP losses of $ trillion–$6 trillion by 2050. This estimate includes livestock but lacks full general equilibrium effects.
- Ahmed et al. (2017) estimate the cumulative cost of AMR between 2015 and 2050 at $85 trillion. Their estimate includes livestock reductions and trade bans. Fernando and McKibbin's estimate of $90.4 trillion in Scenario 3 includes larger spillovers.
- A World Organization for Animal Health (WOAH)/World Bank report (Adamie et al. 2024), which focuses on food-producing animals, projects annual global GDP impacts of –0.025 percent to –0.046 percent by 2050 (a cost of $39.7 billion–$74.0 billion), equivalent to a decline in food consumption for 746 million to 2 billion people. It also suggests that interventions could reduce AMR by 30–50 percent. This estimate is narrower than the one under Fernando and McKibbin's multisectoral approach; it may underestimate the full impact by excluding full climate interactions and broader spillovers. It aligns with the Fernando and McKibbin estimate on low- and middle-income vulnerabilities.

China, the world's leading producer of antibiotics, and the United States, with its advanced research infrastructure, could collaborate to curb AMR by sharing data, conducting joint clinical studies, and harmonizing stewardship policies. Collaborative efforts could focus on surveillance systems to track resistance patterns across human, animal, and environmental sectors, building on China's national AMR policies and on US initiatives such as the Centers for Disease Control and Prevention's *2019 Antibiotic Resistance Threats Report.*

Launched in 2015 by the World Health Organization (WHO), the Global Antimicrobial Resistance and Use Surveillance System (GLASS) exemplifies a standardized approach to AMR monitoring, integrating data on resistance, consumption, and system implementation across human, animal, and environmental sectors under a One Health framework. The 2025 report finds that resistance to life-saving medicines is high and rising.

Other practical steps include establishing joint research and development programs for new antimicrobials and alternatives, such as phage therapy,[4] an area in which China's surge in AMR research publications complements US innovation. Bilateral workshops and educational programs could address the misuse of over-the-counter antibiotics in China and prescription practices in the United States, promoting responsible use through education and regulation. Extending cooperation to multilateral forums, such as the United Nations' High-Level Meeting on AMR,[5] would amplify impact. Such partnerships would not only reduce AMR rates, they would also foster trust in broader health diplomacy.

4 Phage therapy is a medical treatment that uses bacteriophages—viruses that naturally infect and kill bacteria—to treat bacterial infections.

5 The UN High-Level Meeting on Antimicrobial Resistance (AMR) is a summit convened by the United Nations General Assembly where world leaders gather to make political commitments to combat the global threat of drug-resistant infections.

COMBATING ILLICIT DRUG TRADE

Drug overdose is the leading cause of death among Americans 15–44, exceeding heart disease, cancer, suicide, vehicular accidents, and COVID-19 in 2023 (Contreras, Noland, and Rengifo-Keller 2025). Since 2016, fentanyl—a synthetic opioid that is up to 50 times stronger than heroin and 100 times stronger than morphine—has been the drug most frequently associated with these deaths. Although fentanyl-related deaths have declined significantly since peaking in mid-2023, the annual toll still exceeded 49,000 in 2024, the most recent year for which complete data are available (Ahmad et al. 2026).

Most illicit fentanyl consumed in the United States originates abroad. It has been subject to bilateral diplomacy since 2015. In May 2019, China agreed to embargo direct fentanyl exports to the United States. This action led to a significant increase in the street price of fentanyl in the United States and resulted in fewer fentanyl overdose deaths than would have occurred otherwise for a period of three to five months in late 2019 (Contreras, Noland, and Rengifo-Keller 2025).

Illicit production and trade in fentanyl was subsequently rerouted through third countries, primarily Mexico. As a result, prices fell and the number of overdoses rose. Since then, the United States and China have been engaged in periodic diplomacy to control the export of precursor chemicals from China. (Precursor chemicals are the chemicals used to produce fentanyl.) After China tightened restrictions on these chemicals, criminal cartels began sourcing them from India, another major producer of pharmaceutical chemicals (Wang et al. 2022).

In October 2025, Presidents Donald J. Trump and Xi Jinping agreed that the United States would reduce its punitive fentanyl-related tariff from 20 percent to 10 percent (bringing the overall US tariff rate on China down from about 57 to 47 percent) in exchange for intensified Chinese enforcement efforts. The public health impact of this agreement depends on the rigor of Chinese action. Fuller resolution of this crisis would require more effective action by the United States on the demand side of this market and enhanced coordination with China, India, Mexico, and Canada to suppress supply.

ENHANCING PREPAREDNESS FOR FUTURE PANDEMICS

McKibbin and Fernando (2020) estimated global GDP losses from the COVID-19 pandemic at up to $9.17 trillion, with the United States and China facing losses of $1.77 trillion and $1.62 trillion, respectively, from supply shocks, reductions in labor, and spikes in risk premia. The actual outcomes of the COVID-19 pandemic vary by source, but the World Bank estimates that $4.7 trillion was wiped from the world economy in 2020.[6] This is within the authors' range of scenarios between $283 billion and $9.17 trillion in 2020.

The COVID-19 pandemic exposed vulnerabilities in global health security, underscoring the need for US-China collaboration in surveillance, vaccine development, and response mechanisms. Building on past successes, such as

6 Brian Stacy, Rebuilding economies after COVID-19: Will countries recover? World Bank Data Blog, September 6, 2023.

joint work on infectious diseases since SARS, the two countries could renew commitments to share genomic data, conduct joint exercises, and codevelop diagnostics. China's revised Law on the Prevention and Control of Infectious Diseases[7] and US biodefense strategies[8] offer complementary strengths for early warning systems.

Opportunities include multilateral engagement in the WHO's pandemic treaty, where China's influence in developing countries aligns with the United States' leadership in innovation. Bilateral programs could focus on Southeast Asia, combining US and Chinese public health efforts to build regional resilience. Addressing dependencies, such as US reliance on Chinese biodefense components, requires cooperation on transparent supply chains, to ensure equitable access to vaccines and personal protective equipment. Such a partnership would enhance global preparedness, preventing future outbreaks from ballooning.

To realize these collaborations, the United States and China could revitalize existing platforms, such as the US-China Health Cooperation Program and dialogues (National Committee of US-China Relations 2021), for regular high-level meetings on public health. Joint funding for research, technology transfer with intellectual property protections, and data-sharing protocols under bilateral agreements would build capacity. Mistrust could be mitigated through depoliticized channels, including academic ties and private sector involvement and integrating these efforts into global frameworks.

CONCLUSION

There are potentially enormous economic, public health, and societal gains from US–China cooperation on AMR, illicit drugs like fentanyl, and pandemic preparedness. By prioritizing joint innovation, enforcement, and preparedness, the two powers can transform rivalry into a high-value public good with global benefits.

7 China first enacted the Law on the Prevention and Control of Infectious Diseases (IDL) in early 1989, following several deadly disease outbreaks in the late 1980s. China adopted the revised law on April 30, 2025, passed at a session of the Standing Committee of the National People's Congress. It took effect on September 1, 2025.

8 First unveiled in September 2018 and updated in October 2022, the National Biodefense Strategy and Implementation Plan for Countering Biological Threats, Enhancing Pandemic Preparedness, and Achieving Global Health Security outlines a national vision for addressing challenges arising from naturally occurring, deliberate, or accidental biological threats.

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5

Demographic Challenges and Fiscal Sustainability in China and the United States: Opportunities for Bilateral Cooperation

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The unprecedented demographic shift the world is currently experiencing will fundamentally reshape the global economy in the coming decades. Both China and the United States face the challenge of aging populations, but the timing, pace, and specific demographic changes differ significantly. Based on research using the G-Cubed model,[1] this paper examines the demographic issues facing each country, analyzes their macroeconomic effects, and considers potential areas for bilateral cooperation that could be mutually advantageous.

This research explores how demographic shifts affect saving, investment, capital flows, and economic growth in interconnected economies. It reveals that demographic changes present both challenges and opportunities, especially when countries go through different stages of aging at different times. This asymmetry creates chances for cooperation that can benefit all parties involved.

THE DEMOGRAPHIC CHALLENGE IN CHINA

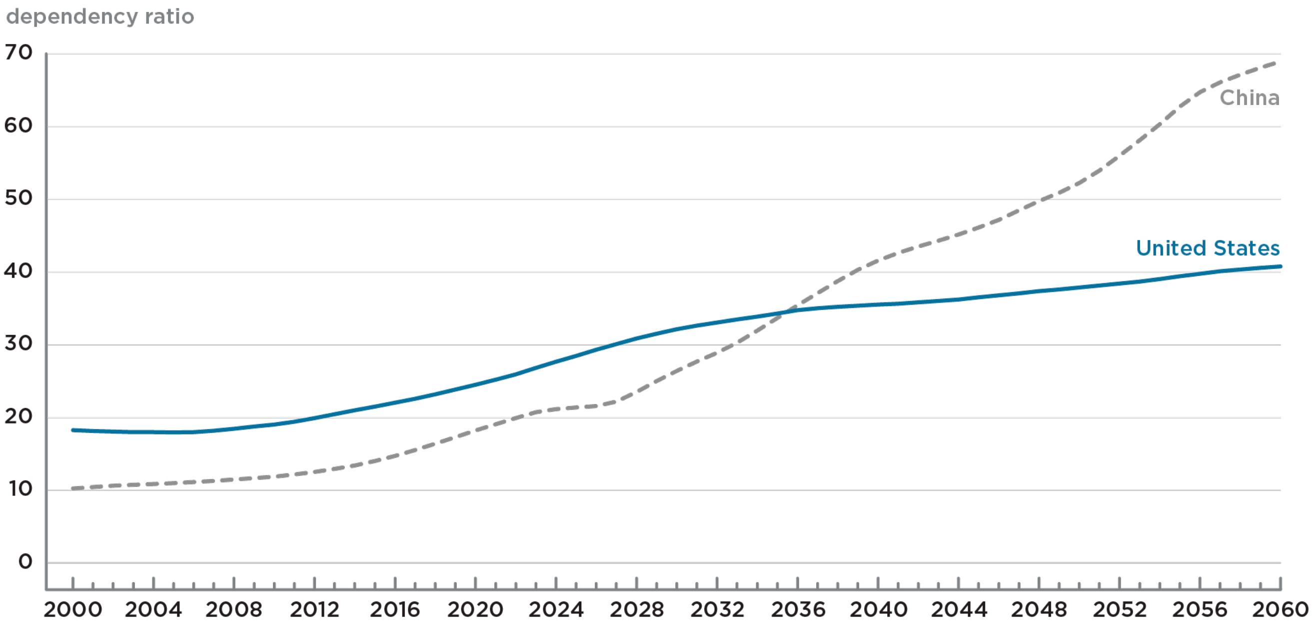
China is going through one of the most rapid and large-scale demographic changes in world history. The One Child policy, which was in effect between 1980 and 2015, created a demographic structure that will lead to rapid aging in the next few decades.

China's dependency ratio will soar between 2000 and 2060 (figure 1). Over the same period, declining birth rates and population aging will reduce the growth rate of the potential labor supply, a process that began in 2012 (Liu and McKibbin 2021).

The macroeconomic impacts of China's demographic shift are significant and complex, creating several key challenges. First, as the share of the working-age population decreases, China's potential GDP growth rate (i.e., the economic growth rate at which the economy can grow if all inputs of capital and labor are fully utilized) will fall. The demographic dividend that supported much of China's remarkable economic growth over the past 40 years is turning into a demographic burden. Simulations by Liu and McKibbin (2021) show China's effective labor supply decreasing by 7 percent by 2030 and by 22 percent by 2050, leading to a slowdown in GDP growth.

1 The G-Cubed model is a global intemporal general equilibrium model widely used by policymaker and researchers for studying global economic issues such as climate change, trade policy, macroeconomic policy and pandemics. Full documentation is available at https://documentation.gcubed.com/.

Figure 1
Actual and projected old-age dependency ratio in China and the United States, 2000–60



Note: A ratio of 50 percent means that there are 50 people 65 years and over for every 100 working-age people (15–64 years).
Source: UN World Population Prospects, 2024.

Second, the aging population will significantly reduce national saving and investment patterns. As populations age, overall saving rates tend to decline as retirees deplete their savings (Liu and McKibbin 2021). In China, which has traditionally maintained very high saving rates, this shift could be particularly important, as high saving rates were a key factor driving domestic investment and a source of capital exports to other countries. As this saving rate decreases, China may move from being a major capital exporter to a significant capital importer, potentially exerting substantial effects on global financial markets.

Third, fiscal pressures will intensify. Health care costs, pension obligations, and social welfare expenses will rise significantly, and tax revenue from the working-age population will decline. China's social security system, still in its early stages of development, will face the challenge of providing sufficient support for the elderly while maintaining fiscal sustainability. The rapid pace of China's aging process leaves little time for gradual policy adjustments, making policy challenges especially difficult.

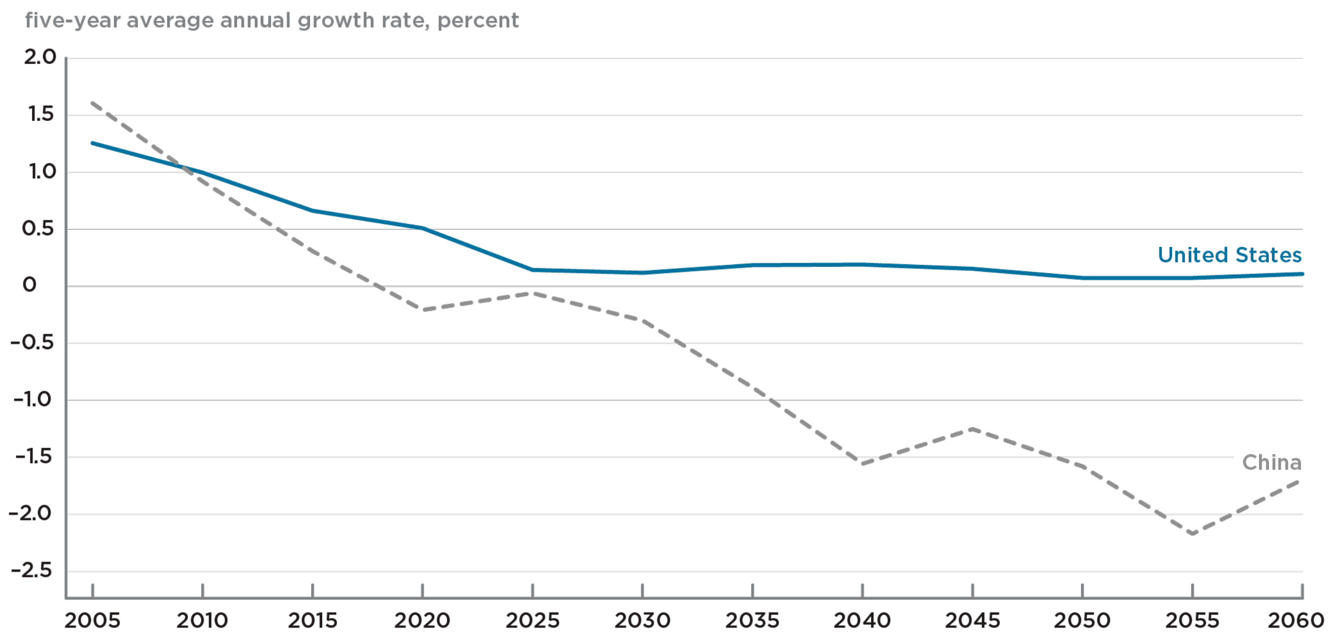
THE DEMOGRAPHIC CHALLENGE IN THE UNITED STATES

By 2030, all baby boomers in the United States (people born between 1946 and 1964) will be over 65, greatly increasing the old-age dependency ratio (see figure 1). This demographic shift will have several economic consequences.

Like China, the United States will face slower labor force growth and downward pressure on potential GDP growth (see figure 2). Traditionally, immigrants provided a source of younger workers. Congressional Budget Office projections from

September 2025 suggest that potential labor force growth might now be negative, driven by a drop in net migration, increased deportations of undocumented workers, and their withdrawal from the workforce. This change notwithstanding, the demographic transition in the United States is happening more gradually than in China, allowing more time for economic and policy adjustments. McKibbin and Liu (2021) estimate a 5–10 percent increase in the effective labor supply by 2050, which supports modest GDP per capita gains but also creates fiscal pressures that could lead to debt accumulation if left unaddressed.

Figure 2
Actual and projected annual growth rate of working-age population in China and the United States, 2000–60



Source: UN World Population Prospects, 2024.

The saving and investment implications for the United States are complex. Batini, Callen, and McKibbin (2005); McKibbin (2006); and Liu and McKibbin (2021) suggest that aging populations in advanced economies usually see declining real interest rates as the ratio of savers to borrowers shifts. The United States has traditionally been a net capital importer, running persistent current account deficits. The interaction between domestic demographic trends and international capital flows adds uncertainty to future interest rate paths and asset prices.

Fiscal challenges in the United States revolve mainly around health care and retirement security programs. Medicare and Social Security face long-term funding shortages as the worker-to-beneficiary ratio declines. Unlike China, the United States has mature, albeit financially strained, social insurance systems. Political polarization hampers reform efforts, even as demographic pressures intensify. Health care costs add to the burden, with the United States spending a significantly larger share of GDP on health care than other advanced economies while achieving mixed outcomes.

ASYMMETRIC DEMOGRAPHIC TRANSITIONS AND AREAS FOR BILATERAL COOPERATION

When countries age at varying rates, the resulting differences in savings, investment returns, and real interest rates create opportunities for beneficial capital flows between economies (Liu and McKibbin 2019). This understanding is particularly important for exploring potential cooperation between China and the United States.

Capital tends to move from aging economies with high savings rates and declining domestic investment opportunities to younger economies or those aging more slowly, where returns on capital stay higher (Liu and McKibbin 2019). In the early stages of China's demographic shift, when its working-age population was growing quickly, China ran large current account surpluses and exported capital, including through significant purchases of US Treasury securities. These capital flows helped finance US current account deficits while providing safe assets for Chinese savers.

As China's population ages, this pattern may shift. China's saving rate will likely decline over the next few decades, potentially transforming China from a net capital exporter into a net importer. At the same time, demographic aging in both countries, though occurring at different speeds, will influence the global balance of saving and investment. The resulting capital flow patterns will significantly affect exchange rates, trade balances, and financial market conditions in both countries. Barriers to the movement of capital and goods would increase the cost of adapting to the demographic transition in both countries.

The unique but interconnected demographic challenges facing China and the United States present promising opportunities for bilateral cooperation. These prospects arise directly from the asymmetries and complementarities in the demographic trends and institutional frameworks of the two economies.

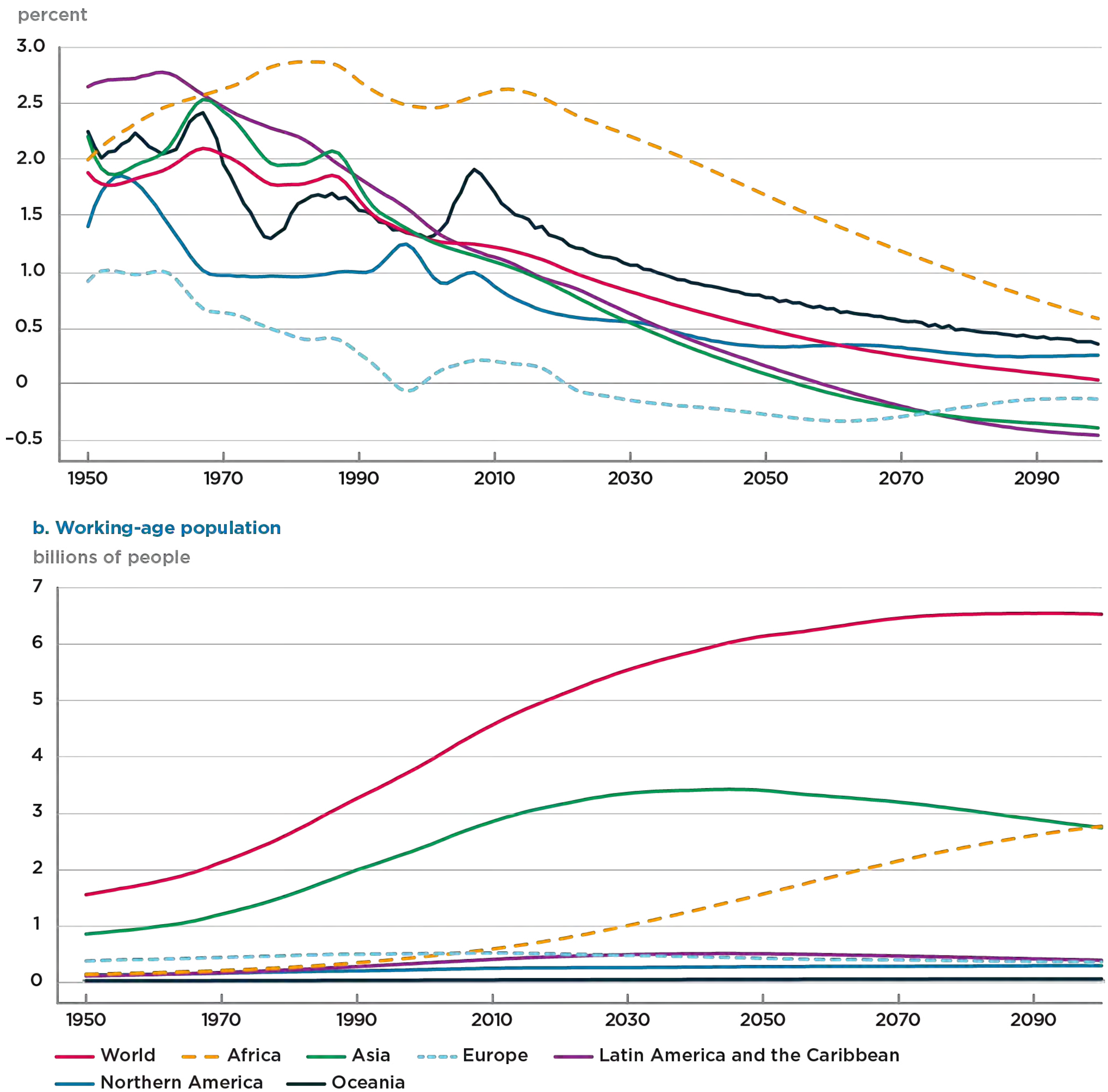
There are also notable opportunities for cooperation between China and the United States on demographic trends beyond their own economies. Figure 3 illustrates the population growth rates and working-age population forecasts for major world regions. A key aspect of these projections is the potentially significant role Africa could play in the coming decades, thanks to its very young and growing population. By working together to develop institutions and human capital in Africa, China and the United States could generate substantial global benefits in tackling future labor shortages. Greater migration flows or increased trade in labor-intensive goods could mitigate the projected decline in the labor force in both China and the United States.

Financial market integration and capital allocation

International capital flows can be substantial and beneficial for all economies when demographic transitions are asymmetric. Increased financial market integration between China and the United States could promote more efficient capital allocation as both countries' saving and investment patterns change. Currently, Chinese investment in the United States focuses mainly on Treasury securities and other safe assets. Deeper financial cooperation could enable a wider range of investment flows, including Chinese investments in US infrastructure, green energy projects, and private sector ventures, while also giving American investors greater access to Chinese markets. Such integration requires careful management of regulatory frameworks, financial stability, and national security issues, but the potential benefits for efficient capital allocation are considerable. Currently the opposite is occurring, preventing the large gains that cooperation could deliver.

Figure 3
Actual and projected global and regional total population growth rates and size of working-age population, 1960–2100

a. Annual population growth rates



Source: Liu and McKibbin (2019).

Technology and innovation sharing for aging populations

Both countries face the challenge of caring for rapidly growing populations aged 65 and above. Collaboration in developing and sharing technologies for their care—including robotics, telemedicine, remote monitoring systems, and artificial intelligence (AI) applications for health care—could benefit both countries (IMF 2025a, 2025b). Combining Chinese expertise in manufacturing and scaling technologies with US innovation in biotechnology and medical devices could accelerate the development of solutions to shared problems. Joint research efforts on age-related diseases, assistive devices, and health care delivery systems could improve outcomes while managing costs in both countries.

Labor-market policies and knowledge exchange

Both countries are exploring policies to extend working lives, retrain older workers, and increase labor force participation among women and other underutilized groups (Ai, Feng, and Zhang [2024] for China, Becker and Fiske [2022] for the United States). Sharing policy experiences, research findings, and best practices could help both countries better utilize their human capital as demographic pressures grow. Programs that facilitate temporary skilled worker exchanges, especially in sectors facing critical shortages, could also offer mutual benefits.

Pension system design and social insurance reform

China is still developing and refining its pension system, while the United States is grappling with reforming its mature but fiscally strained Social Security and Medicare programs (Cao, Freudenberg, and Bonthuis 2026). Each country could learn from the other's experiences and challenges. American expertise in actuarial science, risk management, and long-term fiscal planning could inform the development of China's pension system. China's experience in rapidly building social insurance infrastructure and managing large-scale transitions could provide insights for US policymakers. Academic exchanges, joint research projects, and policy dialogues on pension design, health care financing, and long-term care could benefit both countries.

CHALLENGES TO COOPERATION

Geopolitical tensions between the United States and China have escalated in recent years, with disputes over trade, technology, human rights, and regional security creating a difficult environment for collaboration. Concerns about national security limit technology sharing and financial integration in sensitive sectors. Political pressures in both countries can make cooperation politically costly for leaders.

The asymmetry that creates opportunities for beneficial cooperation also generates concerns. As China's economy has grown, American policymakers have worried about technological competition, trade imbalances, and strategic dependencies. Chinese policymakers are concerned about financial stability risks from greater market openness and the need to maintain policy autonomy. Building trust and finding mutually acceptable frameworks for cooperation require sustained diplomatic effort and political will.

CONCLUSION

The asymmetric demographic transitions in China and the United States present both challenges and opportunities. Our G-cubed modeling shows that international capital flows responding to different demographic pressures can benefit both countries, enhancing capital allocation and supporting growth in aging and younger economies. Cooperation in technology development, policy learning, financial market integration, and intersecting issues such as climate change could help both countries better manage their demographic shifts.

Realizing these benefits requires overcoming significant political and strategic obstacles. The magnitude and long-term nature of demographic challenges argue for sustained engagement, despite the difficulty of action given the current geopolitical environment. Both countries have much to gain from cooperation and much to lose from failure to address demographic challenges effectively. As populations age and fiscal pressures mount, the case for pragmatic cooperation on specific issues grows stronger, even amid broader strategic competition.

Our research provides a quantitative framework for understanding how demographic shifts will reshape the global economy and why international cooperation, especially by major economies like China and the United States, can lead to positive-sum outcomes. The demographic transition is inevitable; how countries respond to it, both individually and collectively, will affect global economic prosperity and stability for decades. Seizing cooperation opportunities while addressing legitimate concerns about competition and security is one of the key policy challenges of the 21st century.

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