Hard Then, Harder Now: CoCom's Lessons and the Challenge of Crafting Effective Export Controls Against China

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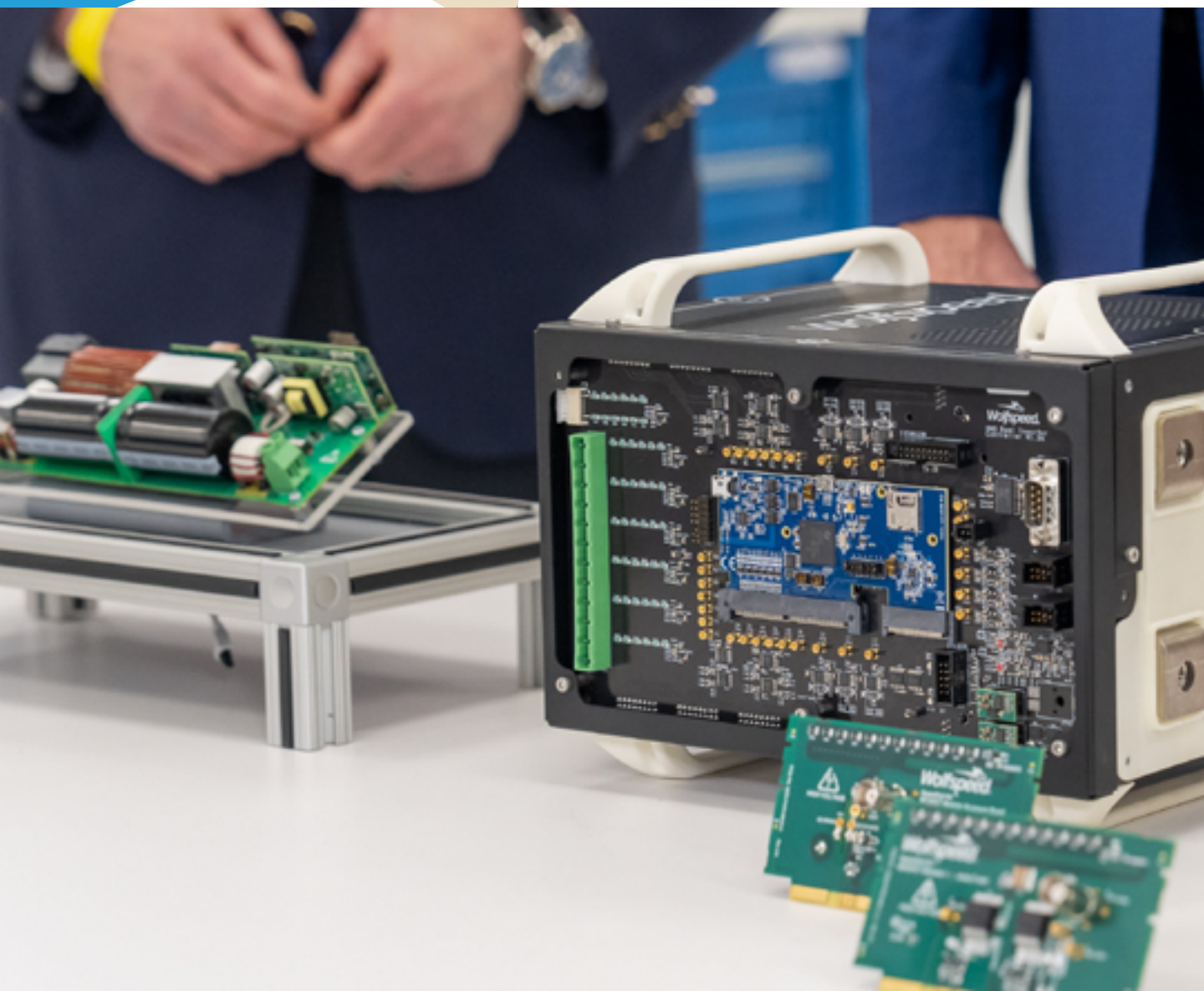

Will the US-led technology control regime against China have a meaningful impact on the emerging great power competition? Supporters praise the effort's targeted approach and optimistically see the case as a prime example of weaponized interdependence. But we identify three lessons from the Cold War "CoCom" technology control regime that show the problems and costs associated with the current US effort, particularly over the long haul: (1) The size of the export control regime expands over time, weakening enforcement and encouraging defection. (2) CoCom did not prevent the USSR from accessing key technologies. The current regime is similarly porous, and China is a more adept target. (3) CoCom had more favorable conditions for partner cooperation, yet was rife with tensions and jealousies that disrupted US alliances. Partner conflicts are likely to recur as controls expand and enforcement weakens. These findings have important implications for US economic security policy, US alliances, and arguments about weaponized interdependence.

In 1987, US intelligence analysts discovered highly advanced propeller designs on Soviet submarines—technology more sophisticated than anything that the Soviet Union had previously produced. The quiet propellers rendered Soviet submarines much more stealthy and harder for NATO to track. A subsequent US investigation found that Toshiba, a Japanese manufacturer, and Kongsberg Gruppen, a Norwegian firm, had sold the Soviets advanced milling machinery. This violated the rules of the Coordinating Committee for Multilateral Export Controls (CoCom) between the United States and its partners, a regime that sought to deny cutting-edge military technology to the Warsaw Pact countries. The episode evoked Vladimir Lenin's famous prediction: "The capitalists will sell us the rope with which we will hang them."

Since the first Trump administration, Washington has again tried to deny advanced technologies to a rival superpower. As China posed a growing military threat in Asia, the first Trump administration imposed export restrictions on specific firms, notably Huawei. The Biden administration dramatically expanded export controls. President Biden's National Security Advisor Jake Sullivan described the administration's approach as constructing a "high fence around a small yard"—that is, cutting off only advanced technology with military relevance, while permitting broader trade with China to continue.[1] Early indications suggest that the second Trump administration is not only maintaining but further expanding the US export control effort.[2]

Many observers and government officials expressed optimism about the US effort. The Biden administration negotiated technology controls with a set of countries that are both key players in the semiconductor sector and among America's closest allies and partners. Sullivan described export controls as "a new strategic asset in the US and allied toolkit to impose costs on adversaries, and even over time degrade their battlefield capabilities."[3]

1 See, for example, "Remarks by National Security Advisor Jake Sullivan on Renewing American Economic Leadership at the Brookings Institution," The White House, April 27, 2023, https://bidenwhitehouse.archives.gov/briefing-room/speeches-remarks/2023/04/27/remarks-by-national-security-advisor-jake-sullivan-on-renewing-american-economic-leadership-at-the-brookings-institution/.

2 Meaghan Tobin, "How Washington Has Tried to Control China's Tech," *The New York Times*, June 12, 2025, https://www.nytimes.com/2025/01/13/us/politics/biden-administration-rules-artificial-intelligence.html; Demetri Sevastopulo, Zijing Wu, and Michael Acton, "Donald Trump Orders US Chip Software Suppliers to Stop Selling to China," *Financial Times*, May 28, 2025, https://www.ft.com/content/2c0db765-03ac-4820-8a02-806469848bee?utm_source=chatgpt.com; Ian Cohen, "Trump Leans Closer to Decoupling from China than to 'Small Yard, High Fence,' Former Officials Say," *Export Compliance Daily*, March 4, 2025, https://exportcompliancedaily.com [subscription database]; Mackenzie Hawkins, Cagan Koc, and Jenny Leonard, "Trump Team Seeking to Toughen Biden's Chip Controls over China," Bloomberg Law, February 25, 2025, https://news.bloomberglaw.com/international-trade/trump-team-seeks-to-toughen-bidens-chip-controls-over-china?utm_source=chatgpt.com.

3 "Remarks by National Security Advisor Jake Sullivan at the Special Competitive Studies Project Global Emerging Technologies Summit," September 16, 2022, https://bidenwhitehouse.archives.gov/briefing-room/speeches-remarks/2022/09/16/remarks-by-national-security-advisor-jake-sullivan-at-the-special-competitive-studies-project-global-emerging-technologies-summit/.

Media coverage and commentary often amplified this optimism. Biden's restrictions were deemed "a painful blow" that "hobbled" or "dropped the hammer on China's semiconductor industry,"[4] while Trump administration sanctions on Huawei were called a "lethal blow to the Chinese tech champion" that left the company "crippled," "kneecapped," or "decimated."[5] Observers report that export controls created equipment shortages for Chinese chipmakers, resulting in severe bottlenecks and limited yields of usable chips.[6]

Recent scholarship in international political economy validates both the problem and Washington's solution to it. Scholars argue that countries have rediscovered "geoeconomics," which sees "the economy as a battleground for geopolitical competition—and industrial policy as a weapon for states to wield against one another."[7] Robert Blackwill and Jennifer Harris warn that US adversaries rely on economic tools as "a major, often primary instrument of their foreign policies" and urge leaders in the United States to exploit its economic centrality and do the same.[8] Scholars have long doubted the efficacy of economic sanctions.[9] But recent work about "weaponized interdependence"[10] highlights US control of information flows and key chokepoints in technology and finance, which gives Washington the power to coerce and deny key capabilities to its adversaries. The United States, according to Henry Farrell and Abraham Newman, enjoys an "underground empire" in which Washington has become "a spider at the heart of a global web" with the ability to "tightly wrap an adversary's economy in smothering strands."[11] In this view, Chinese dependence on imported semiconductor technology and US and allied influence over that supply chain create a potent weapon against China.

Are US export controls against China likely to be as potent a weapon as advocates claim? Do controls bring other costs and risks that aren't being considered in debates of the policy? To answer these questions, we explore lessons from the CoCom regime during the Cold War. Although that effort differs from the current case in several ways, foundational similarities yield important lessons for both US policy and scholarly debates. We explore three lessons in particular.

First, in contrast to reassurances from the Biden administration about the highly targeted nature of export controls, CoCom's experience shows that even an initially "small yard" will grow over time, as indeed the current controls have already done. This growth creates problems of enforcement that encourage defection among supplier countries.

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Second, in a globalized economy, products find their way around "fences." The Soviet Union evaded CoCom restrictions through smuggling, espionage, and third-country transshipment. Importantly, the USSR fell behind not because it couldn't obtain key technologies, but because its dysfunctional economic system couldn't absorb, diffuse, or commercialize the technologies it did obtain. Today's situation is quite different. China is not only succeeding in accessing banned technologies, but also its firms are successfully absorbing and innovating with them.

Third, CoCom reminds us that sanctions have strong potential to create rancor among partners in the control regime. CoCom enjoyed conditions

4 Michael Schuman, "Why Biden's Block on Chips to China Is a Big Deal," *The Atlantic*, October 25, 2022, https://www.theatlantic.com/international/archive/2022/10/biden-export-control-microchips-china/671848/; Stephen G. Brooks, "The Trade Truce," *Foreign Affairs* (July/August 2024), https://www.foreignaffairs.com/world/trade-truce-stephen-brooks.

5 Sherisse Pham, "New Sanctions Deal 'Lethal Blow' to Huawei," CNN, August 18, 2020, https://www.cnn.com/2020/08/17/tech/huawei-us-sanctions-hnk-intl/index.html; "Secretive Chip Startup May Help Huawei Circumvent US Sanctions," Bloomberg, October 5, 2022, https://www.bloomberg.com/news/articles/2022-10-05/secretive-chip-startup-may-help-huawei-circumvent-us-sanctions; Brooks, "The Trade Truce."

6 "Reflecting on the Commerce Department's Role in Protecting Critical Technology with Under Secretary of Commerce Alan Estevez," Center for Strategic and & International Studies, Washington, DC, January 14, 2025, https://www.csis.org/analysis/reflecting-commerce-departments-role-protecting-critical-technology-under-secretary.

7 Matthias Matthijs and Sophie Meunier, "Europe's Geoeconomic Revolution," *Foreign Affairs*, August 22, 2023, https://www.foreignaffairs.com/europe/european-union-geoeconomic-revolution; Ling S. Chen and Miles M. Evers, "'Wars Without Gun Smoke': Global Supply Chains, Power Transitions, and Economic Statecraft," *International Security* 48, no. 2 (October 2023): 164–204, https://direct.mit.edu/isec/article/48/2/164/118107/Wars-without-Gun-Smoke-Global-Supply-Chains-Power; Stephen F. Szabo, *Germany, Russia, and the Rise of Geo-Economics* (Bloomsbury Publishing, 2014).

8 Robert D. Blackwill and Jennifer M. Harris, *War by Other Means: Geoeconomics and Statecraft* (Harvard University Press, 2016).

9 See, for example, Daniel W. Drezner, "The Hidden Hand of Economic Coercion," *International Organization* 57, no. 3 (2003): 643–59; Robert A. Pape, "Why Economic Sanctions Do Not Work," *International Security* 22, no. 2 (1997): 90–136; Gary Clyde Hufbauer et al., *Economic Sanctions Reconsidered* (Peterson Institute for International Economics, 2007).

10 Henry Farrell and Abraham L. Newman, "Weaponized Interdependence: How Global Economic Networks Shape State Coercion," *International Security* 44, no. 1 (July 2019): 42–79, dx.doi.org/10.1162/isec_a_00351; Daniel W. Drezner, Henry Farrell, and Abraham L. Newman, eds., *The Uses and Abuses of Weaponized Interdependence* (Brookings Institution Press, 2021).

11 Henry Farrell and Abraham Newman, *Underground Empire: How America Weaponized the World Economy* (Henry Holt and Company, 2023).

highly favorable for multilateral coordination, yet still faced mistrust, jealousies, and violations, such as the Toshiba-Kongsberg episode. Washington's frustrations with enforcement led it to impose secondary, extraterritorial controls on its allies that created political crises in US alliances.

These lessons have important implications both for US foreign policy and for theoretical debates. First, observers often describe the US-China technology competition as a zero-sum contest in which one side will "win" or strike a "lethal blow" (as the Trump administration's controls against Huawei were described).[12] But tellingly, the firm adapted and roared back, arguably stronger, through reliance on indigenous innovation and product diversification, as well as positioning itself—out of necessity—to challenge Google and Apple in the software sector by developing its own operating system.[13] The US-China superpower technology contest will be long, is only beginning, and—as we show from CoCom—technology controls will likely weaken over time.

Second, the fact that "China may never match, let alone surpass, the United States in chips" is not reassuring.[14] Since the 1970s, Soviet technological capabilities trailed those of the United States, but the USSR nonetheless posed a dangerous, decades-long global national security challenge. Moreover, unlike the Soviet Union, China is becoming a global technology leader.[15] Through stockpiling, exploiting loopholes, theft, and creative adaptation, a country can develop dual-use capabilities that are good enough to compete with the United States even if not at the very highest technological (or lowest nanometer) frontier. As scholar Chris Miller notes, even the most effective export controls can only "throw sand in the gears" of China's technological effort.[16] The gears still turn, even if more slowly.

Third, US export controls against China risk sowing discord in the United States' most important alliances. Many observers characterize America's network of allies and partners as a prized US asset in its competition with China. But divergent interests and threat perception are already harming US relations with its key political-military partners.[17] The security stakes in geopolitical competition with China are higher for the United States than for its partners, and the economic stakes in trade with China are higher in Europe and East Asia than in the United States. The consensus where interests overlap is narrow and fragile; it depends on Washington keeping controls selective and resisting the temptation to apply secondary sanctions extraterritorially against recalcitrant firms or well-intentioned partner governments whose enforcement efforts prove inadequate. The CoCom experience suggests that the United States will find it difficult to maintain that discipline over time, particularly given the high stakes of a superpower competition and the domestic political incentives for politicians to outtough one another on China. US leaders have already unleashed the extraterritorial weapon, in modified form, to force partner compliance with expanding US controls on China.

Fourth, our findings inform debates about weaponized interdependence. Although the prospect that states can exploit their control over economic chokepoints to coerce or weaken an adversary is an attractive one, our analysis suggests that even in the most ideal circumstances—such as the semiconductor industry today—weaponized interdependence runs into the messy realities of politics. The dominant "weaponizer" might be tempted to extend sanctions beyond what is needed to control the chokepoint; other states may thus become reluctant to enforce the overall effort. The extended time horizon of export controls represents the greatest challenge, as over time targeted states adapt and

12 For example, Michael Schuman, "China Is Losing the Chip War," *The Atlantic*, June 6, 2024, https://www.theatlantic.com/international/archive/2024/06/china-microchip-technology-competition/678612/; Pham, "New Sanctions Deal 'Lethal Blow' to Huawei"; "Secretive Chip Startup May Help Huawei Circumvent US Sanctions"; Brooks, "The Trade Truce."

13 On Huawei's resurgence, see Liza Lin, Stu Woo, and Raffaele Huang, "The US Wanted to Knock Down Huawei. It's Only Getting Stronger," *The Wall Street Journal*, July 29, 2024, https://www.wsj.com/business/telecom/huawei-china-technology-us-sanctions-76462031; "America's Assassination Attempt on Huawei Is Backfiring: The Company Is Growing Stronger and Less Vulnerable," *The Economist*, June 13, 2024, https://www.economist.com/briefing/2024/06/13/americas-assassination-attempt-on-huawei-is-backfiring; Rob Davies, "Huawei Shrugs Off US Sanctions with Fastest Growth in Four Years," *The Guardian*, March 29, 2024, https://www.theguardian.com/technology/2024/mar/29/huawei-shrugs-off-us-sanctions-with-fastest-growth-in-four-years.

14 Schuman, "China Is Losing the Chip War."

15 Jennifer Lind, *Autocracy 2.0: How China's Rise Transformed Tyranny* (Cornell University Press, 2025); "China Has Become a Scientific Superpower," *The Economist*, https://www.economist.com/science-and-technology/2024/06/12/china-has-become-a-scientific-superpower; Robert D. Atkinson, "China Is Rapidly Becoming a Leading Innovator in Advanced Industries," Information Technology & Innovation Foundation, September 2024, https://itif.org/publications/2024/09/16/china-is-rapidly-becoming-a-leading-innovator-in-advanced-industries/; Kaoru Takatsuki, "China Leads High-Tech Research in 80% of Critical Fields: Report," *Nikkei Asia*, https://asia.nikkei.com/Business/China-tech/China-leads-high-tech-research-in-80-of-critical-fields-report.

16 Gideon Rose, presider, "Arthur Ross Book Award: 'Chip War: The Fight for the World's Most Critical Technology,'" January 29, 2024, Council on Foreign Relations, https://www.youtube.com/watch?v=kuxR5tHc5dk.

17 On extended deterrence problems within the US-ROK alliance, see Foster Klug, "South Korea Wants Its Own Nukes," Associated Press, November 29, 2023, https://apnews.com/article/north-korea-south-korea-nuclear-arms-race-543e85e5e6832c50ba9dc26a91ef071b. On NATO, see Andrew Dorman, "Here Are Five Difficult Issues for the NATO Summit," Chatham House, November 22, 2023, https://www.chathamhouse.org/publications/the-world-today/2023-06/here-are-five-difficult-issues-nato-summit.

evade the chokepoint through various methods, and then the coalition weakens in the face of the kinds of pressures described.

Below, we compare the CoCom regime and the contemporary effort against China, then turn to an examination of three different lessons from CoCom and how they apply today. We conclude with a review of our findings and a discussion of their implications.

Technology Export Controls: Then and Now

The US effort to deny the Soviet Union and its allies sensitive military and dual-use technologies began in 1949 with the passage of the Export Control Act at home, and the creation of CoCom abroad. The regime's members included the United States, most of its NATO allies, and Japan.[18] The regime, which never attained treaty status, remained an informal "gentlemen's agreement" in deference to governments that wanted to downplay trade discrimination against the Soviet bloc. CoCom convened regularly in Paris to negotiate lists of banned technologies. Over the years, it denied "dual-use" technologies (technologies with both civilian and military applications) to the USSR and other Warsaw Pact countries, and to China through a CoCom-related entity called ChinCom. These technologies included computers and software, telecommunications systems, metalworking machinery, and power-generating equipment. The CoCom regime was formally disbanded in 1994.[19]

Did CoCom work? The question is difficult to answer and depends on one's definition of success. If CoCom's goal was to prevent the Soviet Union from becoming and sustaining itself as a peer military competitor, the regime clearly failed; the Soviets posed a dangerous military threat to NATO for four decades. But even assuming a more modest goal—maintaining the US and Western lead in advanced military technologies—the answer is less clear-cut. The United States did maintain a lead; export controls, when coordinated most effectively, plausibly contributed by frustrating and complicating Soviet efforts to catch up. In his authoritative study of Soviet acquisition of Western technology, Philip Hanson concludes that the CoCom embargo was "probably" an important constraint on the development of Soviet military capabilities by helping to delay Soviet progress.[20] Maurice Mountain, who directed the US Defense Department's export control effort, estimated in 1978 that controls targeting the Soviet electronics sector contributed to a US lead of about two to five years.[21] Shortly thereafter, the CIA revealed that weak enforcement of CoCom controls had enabled the Soviets to catch up faster than expected in the application of integrated circuits to military applications.[22]

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While export controls likely mattered, however, it's difficult to untangle their impact relative to other factors that helped maintain a technology gap between the Soviets and the West. The speed and efficiency with which each side was able to innovate with militarily relevant commercial technologies and diffuse them to the military sector was a key factor in driving the West's advantage.[23] As we argue below, perhaps the most important factor was Soviet economic inefficiency: its inability to develop civilian technology and to absorb and diffuse foreign technology.[24]

A successor to CoCom, the Wassenaar Arrangement (named for the town in the Netherlands that hosted the founding meeting), was formed in 1996. Just as CoCom was the product of the bipolar Cold War world, Wassenaar emerged in the post–Cold

18 Iceland, a NATO ally, was not a member. Spain joined CoCom in 1985 and Australia in 1989, bringing total membership to seventeen countries.

19 Michael Mastanduno, "What Is CoCom and How Does It Work?," in *The Post-Containment Handbook*, ed. Robert Cullen (Westview Press, 1990), 75–78.

20 Philip Hanson, *Trade and Technology in Soviet-Western Relations* (Columbia University Press, 1981), 225–26.

21 Maurice Mountain, "Technology Exports and National Security," *Foreign Policy* 32 (Fall 1978): 95–103.

22 US Central Intelligence Agency, *Soviet Acquisition of Western Technology*, April 1982, https://www.cia.gov/readingroom/docs/CIA-RDP83M00914R001200050005-3.pdf.

23 For an application of this argument to the current US-China context, see Hannah Dohmen, Jacob Feldgoise, and Charles Kupchan, "The Limits of the China Chip Ban: Washington's Export Controls Could End Up Helping Beijing," *Foreign Affairs*, July 24, 2024, https://www.foreignaffairs.com/china/limits-china-chip-ban. To maintain US technological lead time, the authors argue that, rather than export controls, the United States' best bet in the long run is to promote its own technological advances and innovative capacities.

24 Hanson, *Trade and Technology in Soviet-Western Relations;* Chris Miller, *Chip War: The Fight for the World's Most Critical Technology* (Scribner, 2002), chapter 8. Miller argues that the Soviets pursued a strategy of acquiring then copying US-built semiconductors—a strategy that, because of the rapid pace of innovation in the sector, "condemned them to backwardness" (43).

War context, the defining feature of which was the absence of great power competition. Most members implicitly shared a desire to focus on disruptive states such as North Korea and Iran—but importantly, the agreement designates no target states. Wassenaar has forty-two participating countries, including former CoCom members, members of the former Soviet bloc including Russia, and various other members including India and South Africa. Like CoCom, Wassenaar focuses on the export of sensitive dual-use technologies, along with conventional weapons. As an export control mechanism, however, Wassenaar is far looser than was CoCom. It does not obligate its members to restrict controlled items but instead functions essentially as a forum to exchange information about exports, with the goal of establishing transparency and accountability. Wassenaar maintains a common control list, but the decision to approve or deny controlled items is not multilateral but left to the discretion of members.

The return of great power competition has proved a challenge for Wassenaar. As Russian-Western hostility has intensified, Russia has obstructed the upgrading of control lists, continued to sell sensitive items to unstable destinations, and used information sharing for intelligence gathering.[25] China, for its part, is neither a Wassenaar member nor a mutually agreed-upon target for its controls.[26] Amid calls for Wassenaar to be elevated to treaty status with China and Russia as explicit targets, the United States has instead chosen to pursue new export controls against China using an array of unilateral, bilateral, and minilateral initiatives.[27]

US Export Controls

Since the first Trump administration, the United States has imposed and over time strengthened export controls against China and other states. In 2018, Congress restored the legislative foundation for export restrictions by passing the Export Control Reform Act (ECRA), which gives the president broad authority to impose export controls with no expiration date.[28] The first Trump administration used executive authority to target the Chinese telecom firm ZTE—preventing it from buying American products—for violating US sanctions against Iran and North Korea.[29] The administration also targeted China's national telecom champion, Huawei, by cutting off Huawei's access to US semiconductor and other technology, in a more sustained effort to prevent Huawei's infrastructure from being adopted in global 5G networks.[30]

Expanding export controls beyond specific firms, the Biden administration targeted China's semiconductor industry as a whole. Along with incentivizing semiconductor manufacturing at home, the 2022 Chips and Science Act imposed investment restrictions on China. This law stipulated that any firm receiving assistance from the US government under the act was prohibited from engaging in any significant transaction "involving the material expansion of semiconductor manufacturing capacity" in China.[31] The Biden administration subsequently tightened restrictions on the export of semiconductor and artificial intelligence (AI) technology to China—including chip designs, design automation software, and an array of related equipment—with the goal of targeting production chokepoints and preventing China from obtaining or producing advanced chips.[32] America's dominance at the front end of the supply chain (design software and semiconductor manufacturing equipment) affected not just US exports but exports to China from Japan, South Korea, Taiwan, and others. The Biden administration also added more Chinese firms, research institutes, and individuals to the "Entity List," which required licenses for purchases of US-origin products and technologies.

In its first few months, the second Trump administration expanded export controls still further. It

25 "Wassenaar Arrangement," Center for Arms Control and Non-Proliferation, https://armscontrolcenter.org/wp-content/uploads/2023/03/Wassenaar-Arrangement-Fact-Sheet.pdf.

26 Libiao Pan, "Looking In and Looking Out: Understanding China's Non-Membership of the Wassenaar Arrangement," Institute of Nuclear Materials Management, 2018, https://resources.inmm.org/annual-meeting-proceedings/looking-and-looking-out-understanding-chinas-non-membership-wassenaar.

27 Andrei Brunel, "Adopt a Treaty for Semiconductor Export Controls," *Defense News*, February 7, 2024, https://www.defensenews.com/opinion/2024/02/07/adopt-a-treaty-for-semiconductor-export-control/. Some of the items that target China today, such as extreme ultraviolet lithography machines, are on the Wassenaar list, but, as noted, member states are under no obligation to restrict them to any particular destination.

28 The prior legislative foundation, the Export Administration Act of 1979, expired in 2001; from that time until the passage of ECRA, US presidents exercised export control authority under the auspices of the International Emergency Economic Powers Act (IEEPA). See Paul Kerr and Christopher Casey, "The US Export Control System and the Export Control Reform Act of 2018," *Congressional Research Service (R46814)*, June 7, 2021.

29 President Trump subsequently rescinded the order after a personal request from Chinese President Xi Jinping. See Ana Swanson, "Trump Administration Plans to Revive ZTE, Prompting Backlash," *The New York Times*, May 25, 2018, https://www.nytimes.com/2018/05/25/us/politics/trump-trade-zte.html.

30 David McCabe and Raymong Zhong, "Trump Administration Widens Huawei Dragnet," *The New York Times*, August 17, 2020, https://www.nytimes.com/2020/08/17/technology/trump-huawei-commerce-chips.html.

31 CHIPS and Science Act of 2022, section 103C, https://www.congress.gov/bill/117th-congress/house-bill/4346.

32 William Reinsch and Margot Putnam, "Addressing Gaps in US Export Controls," Center for Strategic and International Studies, May 15, 2023, https://www.csis.org/analysis/addressing-gaps-us-export-controls.

added eighty more Chinese firms to the Entity List and tightened restrictions on the types and quantities of advanced chips that can be exported to China without a license.[33] Administration officials negotiated with Japan and the Netherlands to restrict Tokyo Electron and ASML personnel from performing maintenance of their companies' products at Chinese facilities.[34]

Although separated by decades, America's Soviet and Chinese export control efforts are strikingly similar. Once again, the United States faces an emerging peer competitor with revisionist aspirations.[35] Once again, the United States enjoys a military-technological advantage relative to its rival. And once again, an effective export control regime requires multilateral coordination. America's allies again appear willing to cooperate in adopting targeted controls on militarily sensitive trade with China—yet worry that an increasingly broad regime, and retaliation from China, will harm their firms' profits and competitiveness.[36]

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The following discussion outlines three problems that undermined CoCom and explores similar problems in today's export controls against China. Importantly, CoCom faced these problems despite highly favorable conditions for cooperation—conditions that for the most part do not exist today. China today poses a more diffuse security threat to America's allies and partners than did the Soviet Union, and, unlike the Soviet Union, China is embedded within and a central player in the liberal world economy. Coordinating export controls and denying sensitive technology to a superpower rival was hard then; it will be harder now.

Small Yard? The Problem of Ever-Expanding Controls

National Security Advisor Jake Sullivan repeatedly characterized the Biden administration's export controls against China as "a high fence" of restrictions around a "small yard" of truly critical technologies.[37] Assistant Commerce Department Secretary Thea Rozman Kendler called the controls "calibrated and targeted," relying on a "scalpel approach" that reduces Chinese military capabilities "without unduly interfering with commercial trade that doesn't undermine our national security and foreign policy."[38] Rep. Raja Krishnamoorthi, ranking member of the House Select Committee on the Chinese Communist Party (hereafter House Select Committee), echoed the need "to take a scalpel to this as opposed to a sledgehammer."[39] Indeed, a more selective approach to export controls has many advantages; it facilitates administration and enforcement and increases the likelihood of compliance among US and foreign firms. If foreign firms and their governments believe their trade will be only minimally disrupted, both are more likely to support the effort.

The CoCom experience, however, suggests that export controls conceived as selective and focused are unlikely to remain so in practice. Cold War–era leaders also advocated the scalpel approach, but CoCom's "yard" nonetheless expanded for three reasons: Soviet civil-military integration; the US use of export controls as a broader foreign policy weapon; and domestic politicization in the United States.

Civil-Military Integration

The CoCom regime implicitly treated the Soviet economy and military as separate domains, but reality was more complex. CoCom members wanted controls

33 Tobin, "How Washington Has Attempted to Control China's Tech"; Karen Freifeld and David Shepardson, "US Adds Dozens of Chinese Entities to Export Restrictions List, Including Inspur Units," Reuters, March 26, 2025, https://www.reuters.com/world/us/us-adds-dozens-entities-export-restriction-list-2025-03-25/?utm_source=chatgpt.com.

34 Hawkins, Koc, and Leonard, "Trump Team Seeking to Toughen Biden's Chip Controls over China."

35 On China's rise and geopolitical aspirations, see Oriana Skylar Mastro, *Upstart: How China Became a Great Power* (Oxford University Press, 2024); Jennifer Lind, "Back to Bipolarity: How China's Rise Transformed the Balance of Power," *International Security* 49, no. 2 (2024): 7–55; Rush Doshi, *The Long Game: China's Grand Strategy to Displace American Order* (Oxford University Press, 2021).

36 See, for example, Corey Lee Bell and Elena Collinson, "US Tech Controls on China: Lessons from COCOM," *Australian Outlook*, February 24, 2023, https://www.internationalaffairs.org.au/australianoutlook/us-tech-export-controls-on-china-lessons-from-cocom/; and James Andrew Lewis, "The End of Export Controls," CSIS Commentary, September 28, 2023, https://www.csis.org/analysis/end-export-controls.

37 See "Remarks by National Security Advisor Jake Sullivan on Renewing American Economic Leadership at the Brookings Institution," April 27, 2023, https://bidenwhitehouse.archives.gov/briefing-room/speeches-remarks/2023/04/27/remarks-by-national-security-advisor-jake-sullivan-on-renewing-american-economic-leadership-at-the-brookings-institution/.

38 "Statement of Thea D. Rozman Kendler, Assistant Secretary of Commerce for Export Administration," May 31, 2023, https://www.banking.senate.gov/imo/media/doc/Kendler%20Testimony%205-31-23.pdf.

39 Gopal Ratnam, "Screening US Funds for Chinese Tech Raises Question: Which Tech?," April 18, 2023, https://rollcall.com/2023/04/18/screening-us-funds-for-chinese-tech-raises-question-which-tech/.

to minimally disrupt trade.[40] The regime thus sought to target technologies related to Soviet military capabilities, while allowing trade in "non-strategic" products to continue. But practically speaking, a country's economic and military sectors are integrated; a country's economic strength and commercial technology base undergirds its military power, and advanced technologies are often dual use.

CoCom officials found it difficult to maintain both the selective embargo and the operational understanding of compartmentalization on which it was based. At times of rising threat perception (for example, the outbreak of the Korean war and the Soviet invasion of Afghanistan), US officials advocated undermining the Soviet "war economy"; they wanted to expand controlled technologies beyond the narrow military sphere, and pressured other CoCom members to follow suit.[41] Furthermore, as the Cold War progressed and US officials evaluated the efficacy of CoCom controls, officials recognized that the locus of competition had become increasingly technological. US officials thus shifted the emphasis of controls from end products—say, computers or heavy-duty trucks—to "design and manufacturing know-how," or the capability to produce those end products. During the late 1970s, the US Defense Department constructed a Military Critical Technologies List (MCTL), organized around fifteen broad areas of technology critical to US strategic advantage, including computer networking, software, sensors, advanced optics, underwater systems, and directed energy, among others. "Technology is not science and it is not products," argued the 1976 Bucy Report, on which the MCTL effort was based. The report continued: "Technology is the application of science to the manufacture of products and services. It is the specific know-how required to define a product that fulfills a need, to design the product, and to manufacture it."[42] The focus on products made it easier to distinguish civilian from military end users and to target controls against the latter. But because technologies are foundational to both civilian and military applications, the line between the two became blurred. The Bucy Report argued, for example, that the widespread use of computers, even in commercial applications, merited control because they enhanced the "cultural preparedness" of the Soviets to develop and exploit advanced technology.[43] The emphasis on design and manufacturing know-how thus expanded US controls and prompted efforts to have those broader controls replicated in CoCom. Following the Soviet invasion of Afghanistan, the United States urged its CoCom partners to increase restrictions on personal computers, even those with common commercial applications.

In the contemporary export control regime, China's military civilian fusion (MCF) approach similarly creates pressures to broaden export controls. Prioritized by President Xi Jinping, MCF aims to strengthen Chinese military power by integrating China's "strategic and complementary civilian and military economic and technological domains," writes scholar Tai Ming Cheung.[44] MCF involves "the civil-military sharing of information, resources, and capabilities and is anchored around the opening of the defense science, technology, and industrial system to civilian, and especially market sector, participation." MCF encourages "'spin-on' to the military and a 'spin-off' to the civilian sector," notes analyst Emily Weinstein, "demonstrating Beijing's desire to bolster the competitiveness of civilian-side science and technology in addition to the Chinese military's high-tech capabilities."[45] China's large state sector and government influence over its private sector create pressures to expand export controls, given that many Chinese firms work closely with the government, and all firms must cooperate with Chinese Communist Party (CCP) demands for information.[46] As such, many US officials want to add more and more Chinese firms to the Entity List and have been urging the Bureau of Industry and Security (BIS) "to adopt a blanket 'presumption of denial' posture for export license applications that would send critical technology to *any* entity based in the PRC [People's Republic of China]."[47] Calling for such a policy, then–US Senator Marco Rubio blasted the Biden

40 Michael Mastanduno, *Economic Containment: CoCom and the Politics of East-West Trade* (Cornell University Press, 1992); Ellen L. Frost and Angela E. Stent, "NATO's Troubles with East-West Trade," *International Security* 8, no. 1 (1983): 179–200, https://doi.org/10.2307/2538491.

41 Mastanduno, *Economic Containment*, chapters 3 and 7.

42 Defense Science Board Task Force, *An Analysis of Export Control of Advanced Technology: A DoD Perspective* (Office of Defense Research and Engineering, 1976). The Task Force was chaired by J. Fred Bucy of Texas Instruments.

43 Mastanduno, *Economic Containment,* 194.

44 Tai Ming Cheung, *Innovate to Dominate: The Rise of the Chinese Techno-Security State* (Cornell University Press, 2022).

45 Emily Weinstein, "China's Military-Civil Fusion Efforts," *Foreign Policy,* February 5, 2021, https://foreignpolicy.com/2021/02/05/dont-underestimate-chinas-military-civil-fusion-efforts/.

46 Murray Scot Tanner, "Beijing's New National Intelligence Law: From Defense to Offense," Lawfare, July 20, 2017, https://www.lawfaremedia.org/article/beijings-new-national-intelligence-law-defense-offense.

47 "Rubio: Blanket Denial for Tech to China," Washington Tariff & Trade Letter, September 6, 2024, https://www.wttlonline.com/stories/rubio-blanket-denial-for-tech-to-china,12734.

administration for a "porous and ineffective" export control regime, arguing that "America's government cannot afford to stand idly by as the CCP steals sensitive technologies and, through its military-civil fusion strategy, propels the growth of the PLA [People's Liberation Army]."[48]

Some US officials have argued that China's MCF necessitates a broad economic decoupling rather than a selective embargo. In this view, anything that enhances Chinese economic power enhances its military and coercive power and thus harms US security. On the House Select Committee, Rep. Blaine Luetkemeyer (R-MO) recently argued that the US trade deficit "helps their economy, which helps them to be able to build detention camps against their own people, subsidize industries against ours, and build up their military."[49] Luetkemeyer continued, "We've got to stop everything going to China."[50] A committee report argues that "the CCP now uses its economic power to suppress its own people, purpose-build a modern military to threaten the United States and its neighbors, and dominate global supply chains, critical industries, and emerging technologies." The report further noted that China "weaponizes that interdependence . . . to coerce the United States and our allies and partners."[51] Furthermore, concerns about potential Chinese dominance of trailing-edge semiconductors—an economic, not military issue—led Congress to debate a bill that would cut China off from *all* US semiconductor technology—not just the leading-edge technology focused on in the "small yard" approach.[52] The second Trump administration appears sympathetic to broader economic (rather than narrow military) rationales. Early in its tenure the administration imposed punitive tariffs on Chinese exports and, under Secretary of State Rubio, threatened to revoke the visas of hundreds of thousands of Chinese students at US universities.[53]

The close ties between China's government and its economy have not only led to calls to expand export controls, but also to impose other kinds of economically discriminatory measures, such as the targeted investment restrictions found in the CHIPS Act of 2022. Many US lawmakers recently have called for even broader bans on US investment in Chinese companies that are associated with the CCP or the PLA. For example, in 2023 the House Select Committee flagged two firms that manage US pension funds (BlackRock and MSCI) for investing in blacklisted Chinese companies and argued for imposing new investment restrictions: "It is unconscionable for any US company to profit from investments that fuel the military advancement of America's foremost foreign adversary and facilitate human rights abuses."[54] Commentators voiced concerns about Americans using Chinese products that—like Lenovo, a Chinese computer maker with a 15 percent market share in the United States—give the CCP access to "the sensitive personal and enterprise data of millions of Americans and businesses."[55] China's dominance in electric vehicles has led some observers to warn that the CCP could weaponize data from such vehicles; advocates of a US TikTok ban made similar arguments.[56] American policymakers worry about Chinese influence over products related to the Internet of Things (IoT): for example, cars, appliances, farm equipment, and medical devices, along with "connectivity modules" that connect such products

48 Letter from Sen. Marco Rubio to Secretary of Commerce Gina Raimondo, September 3, 2024.

49 Rep. Blaine Luetkemeyer, "Hearing: The Biden Administration's PRC Strategy," House Select Committee on the CCP, July 20, 2023, https://selectcommitteeontheccp.house.gov/committee-activity/hearings/hearing-notice-biden-administrations-prc-strategy.

50 Robert Delaney and Bochen Han, "Divide Grows in Washington over US-China Trade, as Hawkish Bipartisanship Starts to Crack," *South China Morning Post*, July 21, 2023, https://www.scmp.com/news/china/diplomacy/article/3228408/divide-grows-washington-over-us-china-trade-hawkish-bipartisanship-starts-crack.

51 The Select Committee on the Strategic Competition Between the United States and the Chinese Communist Party, "Reset, Prevent, Build: A Strategy to Win America's Economic Competition with the Chinese Communist Party," US Congress, December 2023, https://selectcommitteeontheccp.house.gov/sites/evo-subsites/selectcommitteeontheccp.house.gov/files/evo-media-document/reset-prevent-build-scc-report.pdf.

52 Ben Noon, "Biden Needs to Broaden Semiconductor Sanctions on China," *Foreign Policy*, April 3, 2023, https://foreignpolicy.com/2023/04/03/chips-biden-xi-china-sanctions-semiconductors/.

53 Edward Wong, "Trump Makes a New Push to 'Decouple' US from China," *The New York Times*, May 30, 2025, https://www.nytimes.com/2025/05/29/us/politics/trump-china-visas-tariffs.html.

54 "'Unconscionable to Profit from Fueling China's Military'—Select Committee Launches Investigation Into BlackRock & MSCI," press release, Select Committee on the CCP, August 1, 2023, https://selectcommitteeontheccp.house.gov/media/press-releases/unconscionable-profit-fueling-chinas-military-select-committee-launches; see also Lingling Wei, "Wall Street Steered Billions to Blacklished Chinese Companies, House Probe Finds," *The Wall Street Journal*, April 18, 2024, https://www.wsj.com/politics/national-security/wall-street-steered-billions-to-blacklisted-chinese-companies-house-probe-finds-1b5a1d3c.

55 Robert C. O'Brien and Arthur Herman, "The President Can't Counter China on His Own," *Foreign Affairs*, May 5, 2023, https://www.foreignaffairs.com/china/president-biden-counter-china-congress-american-bipartisan.

56 Diana Furchtgott-Roth, "America Should Ban Chinese EVs," Heritage Foundation, February 16, 2024, https://www.heritage.org/trade/commentary/america-should-ban-chinese-evs; Sapna Maheshwari and Amanda Holpuch, "Why TikTok Is Facing a US Ban, and What Could Happen Next," *The New York Times*, January 17, 2025, https://www.nytimes.com/article/tiktok-ban.html.

to the internet.[57] China's civil-military fusion thus encourages the small yard to grow larger. And, as recent studies have demonstrated, by the end of its term the Biden team had indeed expanded the control yard both to close prior loopholes and to impede China's 'self-reliance' on national champions such as Huawei and SMIC.[58]

Layering on Foreign Policy Considerations

The purpose of Cold War technology controls—to which most US partners (reluctantly) agreed—was to deny the USSR key military-technological capabilities. To the consternation of US firms and partners, however, Washington also reached for technology controls as carrots or sticks to respond to Soviet behavior. The 1979 Export Administration Act empowered the president to restrict exports in order to advance foreign policy goals, Ellen Frost and Angela Stent note. They write, "These provisions were invoked by Presidents Carter and Reagan in response to various Soviet actions, both domestic and foreign, such as the trial of dissident Anatoly Shcharansky, the invasion of Afghanistan, and the Polish crisis."[59] During the Carter years, NSC officials called for "conditioned flexibility" in export controls to influence Soviet behavior, which meant imposing export controls on items—for example, oil and gas exploration equipment and common computer products—that under CoCom were permitted for export.[60] At other times, State Department officials favored easing technology controls to incentivize Soviet agreement to arms control measures.[61] This approach frustrated US and foreign firms, who said that America's unpredictable "light switch" diplomacy undermined their ability to sign contracts and manage trade relationships.[62] The approach also frustrated CoCom partners, who "refuse[d] to allow COCOM to be transformed into a political instrument" and "balk[ed] at US attempts to hide foreign policy objectives behind national security rhetoric."[63]

Today, broader US foreign policy goals toward China, alongside narrow national security rationales, drive both the content of controls and the composition of the Entity List. The first Trump administration listed Huawei and ZTE for violations of US sanctions policy toward Iran. In 2021, the Biden administration added thirty-four Chinese research institutes and firms for activities "contrary to US national security and foreign policy interests," such as supporting Iranian military modernization, supplying weapons to Russia for use in the war against Ukraine, and facilitating China's activities in the South China Sea.[64] Human rights issues—notably the CCP's treatment of the Uyghur people—are increasingly prominent, and many Chinese firms were added to the Entity List for supporting the CCP's domestic surveillance and repression.[65] In 2025, Trump also put export controls on the table in trade negotiations with China. In April, Trump expanded export controls to include American electronic design automation (EDA) tools as well as Nvidia's H20 chip (designed as export

Today, broader US foreign policy goals toward China, alongside narrow national security rationales, drive both the content of controls and the composition of the Entity List.

57 Letter from Rep. Mike Gallagher and Rep. Raja Krishnamoorthi to Hon. Jessica Rosenworcel, August 7, 2023, https://selectcommitteeontheccp.house.gov/sites/evo-subsites/selectcommitteeontheccp.house.gov/files/evo-media-document/2023-08-07-cellular-iot-modules.pdf.

58 See, for example, Reva Goujon and Ben Reynolds, "Slaying Self-Reliance: US Chip Controls in Biden's Final Stretch," Rhodium Group, Dec. 9, 2024, https://rhg.com/research/slaying-self-reliance-us-chip-controls-in-bidens-final-stretch/; Geoffrey Gertz, "Goodbye to Small Yard, High Fence," *The New York Times,* December 31, 2024, https://www.nytimes.com/2024/12/31/opinion/china-semiconductor-biden-xi.html.

59 Frost and Stent, "NATO's Troubles with East-West Trade," 185.

60 Samuel Huntington, "Trade, Technology, and Leverage: Economic Diplomacy," *Foreign Policy* 32 (Fall 1978): 63–80.

61 Personal interview, Carter administration official, June 2023.

62 George Shultz, "Light Switch Diplomacy," *Business Week*, May 28, 1979.

63 Antony J. Blinken, *Ally Versus Ally: America, Europe, and the Siberian Pipeline Crisis* (Praeger, 1987), 135.

64 Department of Commerce, Bureau of Industry and Security, 15 CFR Part 744, Final rule, "Addition of Certain Entities to the Entity List and Revision of an Entry on the Entity List," *Federal Register* 88, no. 240 (December 17, 2021): 71557, https://www.federalregister.gov/documents/2021/12/17/2021-27406/addition-of-certain-entities-to-the-entity-list-and-revision-of-an-entry-on-the-entity-list.

65 "Cotton, Colleagues Introduce Bill to End China's Permanent Normal Trade Status," January 26, 2023, https://www.cotton.senate.gov/news/press-releases/cotton-colleagues-introduce-bill-to-end-chinas-permanent-normal-trade-status; Rob Garver, "DeSantis Joins Republican Rivals Seeking to Revoke China's Trade Status," voanews.com, August 2, 2024, https://www.voanews.com/a/desantis-joins-gop-rivals-seeking-to-revoke-china-s-trade-status-/7207547.html; Clark Packard, "Josh Hawley's China-Trade Bill Misses the Mark," CATO Institute, March 24, 2023, https://www.cato.org/commentary/josh-hawleys-china-trade-bill-misses-mark; "China—Country/Commercial Guide," International Trade Administration, Department of Commerce, https://www.trade.gov/country-commercial-guides/china-us-export-controls; Mara Hvistendahl, "How a Chinese AI Giant Made Chatting—and Surveillance—Easy," *Wired*, May 18, 2020, https://www.wired.com/story/iflytek-china-ai-giant-voice-chatting-surveillance/.

control–compliant for the Chinese market).[66] By August, Trump reversed the policy: permitting the H20, EDA, and other sales, reportedly in exchange for Chinese relaxation of its controls on critical minerals. The episode demonstrates that the broader US goal of reducing the adversary's military capabilities is compromised when export controls begin to be traded as negotiating chits.

The Cold War shows that foreign policy crises will likely expand export controls. During the Soviet invasion of Afghanistan, politicians expressed outrage that trucks produced with Western equipment at the Kama River Plant near Moscow found their way into Soviet units that invaded Afghanistan in 1979. Previously deemed nonstrategic, US industrial equipment became politically salient in the context of Soviet aggression. Similarly, in 2023, many in the United States decried the use of US technology in the construction of a Chinese spy balloon that flew over US territory. Washington added six Chinese aerospace firms to the Entity List after this incident.[67] As a foreign policy crisis, the spy balloon incident was relatively minor. A more serious incident would likely trigger calls to punish China with additional export controls, further expanding the yard.

The Politicization of Export Controls

In addition to military-civil fusion and the temptation to respond to foreign-policy crises of the moment, the "small yard" expands because of domestic politicization of national security policy. The construction and management of export control lists attract intense scrutiny. During the Cold War, members of Congress skeptical of US-Soviet détente kept a watchful eye over the process and publicized instances where Western trade seemed to help the Soviet military (as in the case of the trucks in the Soviet invasion of Afghanistan). Such politicization encouraged a "better safe than sorry" mentality among control officials. As noted above, in the 1980s the Defense Department insisted on maintaining controls on personal computers even though, noted the *Economist*, "they could be bought by anybody at a thousand different places."[68]

Politicization, or the tendency of elected officials to highlight export control deficiencies for partisan or electoral gain, today exerts similar pressures to expand export controls and broader trade discrimination against China. During the Biden years, for example, Republican lawmakers needled administration officials (accurately or not) by asserting that the Trump administration had a longer list of export controls and thus that the Democrats were soft on China.[69] Then-Senator Marco Rubio characterized the Biden administration's investment controls on China as too narrow and "almost laughable,"[70] while House Select Committee chair Rep. Mike Gallagher complained that the "loopholes are wide enough to sail the [People's Liberation Army] Navy fleet through."[71]

Today's Expanding Yard

Relative to the Cold War, current US efforts to control Chinese technology access are at an early stage. Yet, for the reasons described above, the US government has expanded the yard on multiple occasions in multiple ways.

Major expansions came in 2023. Building on the CHIPS Act restrictions, in August 2023 the Biden administration banned US investment in China's AI activities with military applications and high computing thresholds for training, as well as in China's quantum technology efforts.[72] The administration then expanded semiconductor export controls in October 2023. Responding to industry circumvention of the previous regulations, this update adjusted the performance thresholds for advanced chips. To prevent Chinese subsidiaries in foreign countries from accessing controlled technologies, the October 2023

66 See Liza Lin and Amrith Ramkumar, "US Tries to Crush China's AI Ambitions with Chips Crackdown," *The Wall Street Journal,* April 17, 2025, https://www.wsj.com/economy/trade/trump-chip-exports-nvidia-h20-china-amd-d2c4c866?gaa_at=eafs&gaa_n=ASWzDAgW4h5bJDHUKEavsnrBY_9y-efjAdxETWFtMhCrY-wmqaUqgOX8yn4IKuByUvc%3D&gaa_ts=6896635c&gaa_sig=8I6CL419lgGZxIWa6peNkCINZzsuoCoQrhBlwhtC7qq9GHO_0RJV4tUladkA2xh9EiPkWb_LsYaqqzqFFfZdIg%3D%3D; Demetri Sevastopulo, "Donald Trump Freezes Export Controls to Secure Trade Deal with China," *Financial Times,* July 28, 2025, https://www.ft.com/content/a13ba438-3b43-46dd-b332-4b81b3644da0; Jarrett Renshaw and Karen Freifeld, "Nvidia's Resumption of AI Chips to China Is Part of Rare Earths Talks, Says US," Reuters, July 15, 2025, https://www.reuters.com/technology/nvidia-resume-h20-gpu-sales-china-2025-07-15/.

67 Ana Swanson, "US Blacklists 6 Chinese Entities Involved in Spy Balloon Programs," *The New York Times,* February 10, 2023, https://www.nytimes.com/2023/02/10/business/economy/china-spy-balloon-sanctions.html.

68 *The Economist,* April 21, 1984, 13.

69 See discussion in "Hearing: The Biden Administration's PRC Strategy," Select Committee on the CCP, July 20, 2023, https://selectcommitteeontheccp.house.gov/committee-activity/hearings/hearing-notice-biden-administrations-prc-strategy.

70 Sevastopulo, "White House Unveils Ban on US Investment in Chinese Tech Sectors."

71 WisPolitics, "The Select Committee on the Chinese Communist Party: Gallagher Issues Statement on President Biden's Executive Order to Curb US Investment in China," August 10, 2023, https://www.wispolitics.com/2023/the-select-committee-on-the-chinese-communist-party-gallagher-issues-statement-on-president-bidens-executive-order-to-curb-u-s-investment-in-china/.

72 Sevastopulo, "White House Unveils Ban on US Investment in Chinese Tech Sectors"; Reva Goujon, Charlie Vest, and Thilo Hanemann, "Big Strides in a Small Yard: The New US Outbound Investment Screening Regime," Rhodium Group, August 11, 2023, https://rhg.com/research/big-strides-in-a-small-yard-the-new-us-outbound-investment-screening-regime/.

update imposed licensing requirements on an additional forty-three countries, in what analyst Emily Benson calls a "significant geographic expansion." Such countries, she notes, over the past year had "shown an anomalous uptick in chips trade, despite having a relatively limited import and export of chips in past years."[73] Furthermore, the update added several dozen technologies and materials used to fabricate advanced logic chips to the list of controlled semiconductor manufacturing equipment (SME), and added thirteen Chinese firms to the Entity List. Additionally, the Biden administration imposed a "0% de minimis rule" on advanced lithography, a rule that effectively blocks China from acquiring advanced lithography equipment or components that rely on US technology from anywhere in the world—even if only a tiny fraction of the product is US-origin.

As Chinese firms continued their efforts to evade export controls—working through third-party countries and using unregulated software and equipment to produce advanced chips—the Biden administration further broadened the regulations in December 2024.[74] The update added software tools and twenty-four types of SME to the control list. The new regulations vastly expanded the scope of the Foreign Direct Product Rule (FDPR)—the US law, initially enacted in 1959, that extends US controls to foreign-made products incorporating US-origin technology, regarding both chips and SME (discussed further below). Additionally, the Biden administration imposed new controls on high-bandwidth memory (HBM). HBM, which offers significantly higher data-transfer speeds and energy efficiency compared to conventional memory technologies, is vital for building advanced AI systems and supercomputers. Prior to the December update, writes industry analyst Gregory Allen, "the focus on restricting logic rather than memory chip exports meant that Chinese firms were still able to acquire massive volumes of HBM."[75] This update sought to deal a serious blow to China's AI sector by crippling its HBM access.

It is likely, under the second Trump administration, that the "yard" will grow further. "Every day I fought a battle to restrict the size of the yard," a former Biden administration official told us, "because of a range of pressures: from the Department of Defense, from the military forces, from other agencies, all pushing the yard outward."[76] Such pressures remain powerful, perhaps even more so, in the new administration and Congress. Former Biden administration NSC official Geoffrey Gertz correctly anticipated that a second Trump administration would "take the technology control tools that the Biden team developed but was reluctant to employ broadly and . . . unleash them at full force. . . . So much for that manicured small yard."[77] In May 2025, the Trump team threatened a fragile tariff truce with China by calling for global restrictions on the use of Huawei chips.[78] Some members of Congress have recently called for restricting US investments in Chinese pharmaceutical, critical mineral, and even fashion industries (because China's textile industry uses Uyghur forced labor), and the Rhodium Group notes that the EV and biotechnology sectors face "growing regulatory scrutiny."[79]

As the yard grows, the export control effort is likely to weaken. Keeping allies on board will grow more difficult, given that, as the *Economist* notes, "Japanese and Dutch businesses—and their governments—rankle even at the porous controls that are in place today."[80] A larger regime also increases the number of licensing applications that US officials must adjudicate.[81] This situation creates growing problems of enforcement—an issue to which we now turn.

High Fence? The Twin Challenges of Enforcement and Adaptation

Export controls (then and now) seek to maintain the US lead, relative to its rivals, in the application of civilian technologies to military capabilities. A successful effort depends on enforcement—that is, whether the regime can prevent businesses from selling, illicit middlemen from reselling or smuggling, and the target government from stealing restricted items.

73 Emily Benson, "Updated October 7 Semiconductor Export Controls," CSIS, October 18, 2023, https://www.csis.org/analysis/updated-october-7-semiconductor-export-controls.

74 Hanna Dohmen and Jacob Feldgoise, "A Bigger Yard, a Higher Fence: Understanding BIS's Expanded Controls on Advanced Computing Exports," Center for Security and Emerging Technology, Georgetown University, December 4, 2023, https://cset.georgetown.edu/article/bis-2023-update-explainer/.

75 Gregory C. Allen, "Understanding the Biden Administration's Updated Export Controls," CSIS, December 11, 2024, https://www.csis.org/analysis/understanding-biden-administrations-updated-export-controls.

76 Personal communication, August 2024.

77 Gertz, "Goodbye to Small Yard, High Fence." See also Cohen, "Trump Leans Closer to Decoupling from China than to 'Small Yard, High Fence.'"

78 Lingling Wei, "China Trade Detente Teeters," *The Wall Street Journal*, May 31, 2025.

79 Goujon, Vest, and Hanemann, "Big Strides in a Small Yard."

80 "Why America's Controls on Sales of AI Tech to China Are So Leaky," *The Economist*, January 21, 2024, https://www.economist.com/business/2024/01/21/why-americas-controls-on-sales-of-ai-tech-to-china-are-so-leaky.

81 Emily Kilcrease, "US Economic Security Strategy, Authorities, and Bureaucratic Capacity," testimony to US Congress, January 18, 2024, https://www.cnas.org/publications/congressional-testimony/u-s-economic-security-strategy-authorities-and-bureaucratic-capacity.

Success also depends on the target's adaptability of its domestic economy and military to disruptions and scarcities in the technologies it needs.

CoCom's Enforcement Challenges

CoCom worked reasonably well during the 1960s, as the United States and its partners settled on a narrow strategic embargo aimed at restricting the export of militarily significant goods to the Soviet bloc.[82] Subsequently, however, CoCom experienced problems of enforcement, especially during the 1970s and 1980s as the superpower arms race became more technology intensive. The target proved to be highly creative at obtaining banned technology; furthermore, CoCom's discipline waned over time as members increasingly petitioned for exceptions during the era of East-West détente.

By the early 1980s, approximately one thousand KGB agents operating worldwide were tasked with stealing foreign technology.

The Soviet Union devoted tremendous energy to obtaining the technology it needed to catch up militarily. The CIA lamented that the USSR acquired technology "through open literature, legal trade channels, and scientific and technological exchanges and conferences."[83] Beyond legal means, the Soviet government supported a vast effort to obtain technology illegally. Early in the Cold War, Soviet leaders recognized that the West was more adept at creating and diffusing advanced technologies.[84] In 1963, the KGB established Directorate T with the mission "to acquire Western equipment and technology" and "improve [the Soviet Union's] ability to produce integrated circuits."[85] By the early 1980s, approximately one thousand KGB agents operating worldwide were tasked with stealing foreign technology. Near Silicon Valley, the Soviet Consulate hosted some sixty agents assigned to obtain both chips and chip designs.[86] One hundred KGB agents operated out of the Soviet embassy in Tokyo, "one of the most fertile areas for acquisitions."[87] The KGB positioned agents in Western firms, bribed customs and trade officials, and created dummy companies to circumvent CoCom restrictions. Through these methods, the Soviets and their partners in the Eastern bloc were able to acquire a "startling" volume of advanced technologies.[88]

Soviet successes and CoCom's limitations vexed US officials. As John McMahon, deputy director of the CIA, revealed in 1982:

> *We found that some 75 percent of the militarily significant items of US and Western technology that the Soviets had were derived from operations through their intelligence services, where they acquired information either overtly or through typical James Bond operations where they could operate against the US industry and businessmen both here and abroad and against US subsidiaries abroad to acquire not only plans and/or designs but even hardware. This effort spanned the entire spectrum of technology.*[89]

Admonishing US firms, CIA official Jan Herring added that the Soviets "acquired hundreds of millions of dollars of microelectronics production and design equipment illegally, and that doesn't go out of this country in a diplomatic pouch."[90] The US Defense Department, relying on the code-named Farewell documents (provided by a Soviet defector who was a former engineer within Directorate T), calculated that the Soviet acquisition effort had reduced the US lead time over the Soviets in microelectronics from 10–12 years down to 4–6 years between the mid-

82 Mastanduno, *Economic Containment*, chapter 4.

83 Quoted in Wende A. Wrubel, "Toshiba-Kongsberg Incident: Shortcomings of CoCom, and Recommendations for Increased Effectiveness of Export Controls to the East Bloc," *American University International Law Review* 4, no. 1 (1989): 242.

84 Hanson, *Trade and Technology in Soviet-Western Relations*.

85 Miller, *Chip War*, 141.

86 Miller, *Chip War*, 144.

87 John Vinocur, "A Trail of Western Technology Is Followed to the KGB's Door," *The New York Times*, July 25, 1983, https://www.nytimes.com/1983/07/25/world/a-trail-of-western-technology-is-followed-to-the-kgb-s-door.html.

88 Vinocur, "A Trail of Western Technology Is Followed to the KGB's Door."

89 Quoted in "Managing the Flow of Technical Information: An Industry/Government Dialogue," Institute of Electrical and Electronics Engineers, June 2, 1982.

90 Quoted in "Managing the Flow of Technical Information."

1970s and mid-1980s.[91] "Our export control system is a shambles," lamented Sen. Henry Jackson. He went on: "What we haven't sold (the Soviets), we have given away in educational, governmental, and commercial technical exchange programs. What we haven't sold or given away, they have stolen."[92]

Some Western firms were innocent targets of Soviet acquisition, but others complied willingly. US and West German–based firms helped the Soviets build their most advanced semiconductor fabrication plant. Furthermore, as noted earlier, Japan's Toshiba Machine and the Norwegian state-owned firm Kongsberg Våpenfabrik sold state-of-the-art, computer-controlled milling machines to Soviet buyers. The technology found its way to the Leningrad shipyard, where quieter propellers were built for Soviet submarines that were then untrackable by NATO sensors. Toshiba had previously refused Soviet entreaties, but reconsidered after learning that French firms—in violation of CoCom rules—were selling the Soviets similar equipment.[93]

CoCom's enforcement problems grew over time as governments and firms petitioned for exceptions. The regime allowed members to request exceptions to sell controlled items if the petitioner could demonstrate that the item had become militarily insignificant or had a low probability of military use. Exceptions proliferated into the thousands annually during the US-Soviet détente of the 1970s.[94] In one such case, the Nixon administration allowed a US company, Bryant Grinder, to sell precision ball-bearing machines that likely allowed the Soviets to improve their ballistic missile–guidance systems.[95] As Washington requested more exceptions, other CoCom members did too; in some cases, members ignored CoCom altogether. In the French sale that encouraged Toshiba's subsequent violation, Paris justified the sale by claiming that the milling machines were only "slightly above" CoCom control limits, that the sales took place when détente was "in vogue," and that CoCom "did not work very well."[96]

Adaptation: The Soviet Achilles' Heel

The Soviets had a world-class human capital base and—despite CoCom's efforts—reasonable access to advanced Western technology. Yet the Soviets struggled to absorb, diffuse, and commercialize that technology.[97] Across industries, "no process of remarkable assimilation of foreign know-how or actions of reverse engineering took place."[98] As Chris Miller has argued, the Soviet strategy of acquiring Western technology and then trying to reverse engineer and copy it condemned the USSR to ongoing backwardness; by the time Soviet engineers fully replicated and equipped a Western-style production plant, technology had vaulted forward.[99] Philip Hanson's analysis of the Soviet chemical sector confirms this finding. Rather than leading to diffusion and self-sufficiency, an initial influx of Western technology and equipment condemned the Soviets to ongoing dependence. Soviet managers proved remarkably reluctant to walk on their own; in one instance, plant managers forced British exporters of chemical equipment to revise operating instructions from "open valve A" to "open valve A using both hands, three times counterclockwise."[100]

The market economies of the United States and its partners incentivized innovation and facilitated technological absorption. Western consumer markets—not just military end users—drove demand for new technologies and products. Integrated supply chains across the United States, Western Europe, and East Asia diffused innovations and provided a deep reserve of equipment, know-how, and materials to fill production gaps and provide spare parts.

The Soviet Union lacked this ecosystem. As Hanson noted in 1982, "the high-risk-high reward incentives of Western firms deciding to introduce new technology into production processes have no counterpart in Soviet enterprise decision-making."[101] Enjoying privileged access to finance, equipment, and the society's most talented scientists and engineers, the Soviet military was reasonably capable at innovation. But

91 *Soviet Acquisition of Militarily Sensitive Western Technology: An Update* (Central Intelligence Agency, 1985), https://www.cia.gov/readingroom/docs/DOC_0000500561.pdf. The Farewell documents did at least reveal Soviet acquisition priorities, allowing the United States in some instances to transfer sabotaged equipment and faulty designs.

92 Quoted in Rodney P. G. Bricker, "US Technology Transfer to the Soviet Union: A Dilemma," Research Report no. MS-094-81, Air War College, April 1981, https://apps.dtic.mil/sti/tr/pdf/ADA107313.pdf.

93 Mastanduno, *Economic Containment,* 302–3.

94 For data, see Mastanduno, *Economic Containment*, 175.

95 Thane Gustafson, "Selling the Russians the Rope? Soviet Technology Policy and US Export Controls," RAND Corporation, R-2649-ARPA, 1981, https://apps.dtic.mil/sti/tr/pdf/ADA104204.pdf, 10.

96 Mastanduno, *Economic Containment,* 184.

97 Jeffrey Ding, *Technology and the Rise of Great Powers: How Diffusion Shapes Economic Competition* (Princeton University Press, 2024).

98 Sari Autio-Sarasmo, "Soviet Economic Modernisation and Transferring Technologies from the West," in *Modernisation in Russia Since 1900,* ed. Markku Kangaspuro and Jeremy Smith (Finnish Literature Society, 2006), 111.

99 Miller, *Chip War*, chapters 7 and 8.

100 Hanson, *Trade and Technology in Soviet-Western Relations*, 194, 216–20.

101 Hanson, *Trade and Technology in Soviet-Western Relations*, 61.

unlike in the West, there was little "spin-off" from the military to the civilian sector and little "spin-on" from the civilian to the military realm.[102] Absorbing new technologies requires resources and suppliers, "which in the Soviet Union was a considerable problem because of the lack of horizontal connections between industries."[103]

Like the Soviet Union, China today is actively trying to evade the export control regime.

Soviet central planning stymied innovation and technological diffusion. Managers of Soviet enterprises were incentivized to meet quotas; innovating or absorbing new technologies diverted resources and threatened a firm's ability to meet its quota.[104] Instead of responding to competitors or consumers, managers ignored both in favor of central planners, who instructed them about technologies to develop or absorb.[105] Furthermore, Soviet producers mostly traded with enterprises in the Warsaw Pact states; these firms also lagged the technological frontier and were similarly embedded in economies driven by quotas and state directives. In sum, the Soviets succeeded in stealing, smuggling, and otherwise obtaining much of the technology they needed. CoCom controls may have complicated Soviet acquisition efforts, but in the end the USSR was thwarted less by CoCom than by itself: "The main problems for the Soviet Union in the imitation process lay in its own economic system."[106]

Can China Be Fenced In?

Like the Soviet Union, China today is actively trying to evade the export control regime.[107] Western firms report the theft of valuable proprietary technology; for example, the Netherlands' ASML announced that a former employee violated export controls by stealing information about lithography technology and returning to China.[108] Chinese firms recruit engineers and managers from cutting-edge global firms, as Huawei is doing in its massive push to build lithography equipment.[109] Investigative journalists reported $1 billion in smuggled Nvidia chips to China during the second Trump administration, and under Biden described a "barely concealed network of buyers, sellers and couriers bypassing the Biden administration's restrictions."[110] These journalists report intense demand for chips in China, finding sellers who "can easily procure small numbers of [Nvidia] A100s."[111] Chips "can also usually fit in a shoebox, making smuggling possible even at the scale required to build modern supercomputers (thousands of chips)."[112] Strategies for obtaining key technologies include "inducements from Beijing, theft by well-placed workers, and in at least some cases, a reluctance to complain by corporate victims seeking to preserve or enhance access to the Chinese market."[113]

Top Chinese institutions are also obtaining the technology they need. China's National University of Defense Technology circumvented the technology ban to source Intel's Xeon chips for use in cutting-edge supercomputers. Another blacklisted

102 For more on the US superiority in technological diffusion vis-à-vis the USSR, see Jeffrey Ding, "The Diffusion Deficit in Scientific and Technological Power: Re-Assessing China's Rise," *Review of International Political Economy* 31, no. 1 (2023): 173–98, dx.doi.org/10.1080/09692290.2023.2173633.

103 Autio-Sarasmo, "Soviet Economic Modernisation and Transferring Technologies from the West," 123.

104 Autio-Sarasmo, "Soviet Economic Modernisation and Transferring Technologies from the West," 123.

105 Hanson, *Trade and Technology in Soviet-Western Relations*, 62.

106 Autio-Sarasmo, "Soviet Economic Modernisation and Transferring Technologies from the West," 123.

107 "Why America's Controls on Sales of AI Tech to China Are So Leaky"; Cheng Ting-Fang, "How China's Tech Ambitions Slip Through the US Export Control Net," *Nikkei Asia*, October 20, 2023, https://asia.nikkei.com/business/business-spotlight/how-china-s-tech-ambitions-slip-through-the-u.s.-export-control-net.

108 Cagan Koc, "Ex-ASML Staff Accused of Theft Went to Work for Huawei, NRC Says," Bloomberg, October 23, 2023, https://www.bloomberg.com/news/articles/2023-10-23/ex-asml-staff-accused-of-theft-went-to-work-for-huawei-nrc-says.

109 Cheng Ting-Fang, "Huawei Building Vast Chip Equipment R&D Center in Shanghai," *Nikkei Asia*, April 11, 2024, https://asia.nikkei.com/Business/Tech/Semiconductors/Huawei-building-vast-chip-equipment-R-D-center-in-Shanghai.

110 Zijing Wu and Eleanor Olcott, "Nvidia AI Chips Worth $1bn Smuggled to China After Trump Export Controls," *Financial Times*, July 24, 2025, https://www.ft.com/content/6f806f6e-61c1-4b8d-9694-90d7328a7b54; Raffaelle Huang, "The Underground Network Sneaking Nvidia Chips into China," *The Wall Street Journal*, July 2, 2024, https://www.wsj.com/tech/the-underground-network-sneaking-nvidia-chips-into-china-f733aaa6; Lin et al., "The US Wanted to Knock Down Huawei"; Ana Swanson, "Takeaways from Our Investigation into Banned A.I. Chips in China," *The New York Times*, August 4, 2024, https://www.nytimes.com/2024/08/04/technology/china-ai-microchips-takeaways.html.

111 Josh Ye, David Kirton, and Chen Lin, "Focus: Inside China's Underground Market for High-End Nvidia AI Chips," Reuters, June 20, 2023, https://www.reuters.com/technology/inside-chinas-underground-market-high-end-nvidia-ai-chips-2023-06-19.

112 Tim Fist, Lennart Heim, and Jordan Schneider, "Chinese Firms Are Evading Chip Controls," *Foreign Policy*, June 21, 2023, https://foreignpolicy.com/2023/06/21/china-united-states-semiconductor-chips-sanctions-evasion/.

113 Jordan Robertson and Michael Riley, "Engineer Who Fled Charges of Stealing Chip Technology in US Now Thrives in China," Bloomberg, June 6, 2022, https://www.bloomberg.com/news/articles/2022-06-06/engineer-who-fled-us-charges-of-stealing-chip-technology-now-thrives-in-china#xj4y7vzkg.

institution, China's state-run Academy of Engineering Physics, acquired advanced Intel and Nvidia chips (that is, in the 7–14 nm range). According to a review of Chinese research papers conducted by *The Wall Street Journal*, "[these chips] are widely available on the open market: Versions of Intel's Xeon Gold and Nvidia's GeForce RTX chips purchased by CAEP can be bought off Taobao, one of China's largest e-commerce marketplaces."[114] Interviews with students at Tsinghua University's "chip college" (School of Integrated Circuits) report that students can "easily circumvent" restrictions on US-made EDA software used for chip design. Researcher Christina Knight writes: "Despite sanctions, students use Cadence and Synopsys—two of the most popular EDA providers from the United States—through back channels or special licenses. They then send advanced chips they design with EDA software to the Taiwan Semiconductor Manufacturing Company to manufacture—achieving the entire process Washington aims to restrict."[115] Furthermore, a *New York Times* investigation concluded that "more than a dozen state-affiliated entities purchased restricted chips, including organizations under sanctions for modernizing the Chinese military."[116] China's military has then relied on these chips in modeling related to nuclear weapons and stealth technology.[117]

Chinese firms rely on dummy companies and transshipment to obtain banned products. Chinese firms put on the US Entity List sometimes dissolve that company and create a new one; in one case discussed by the *Times*, "Nvidia, Intel and Microsoft quickly formed ties with the new firm."[118] Chinese firms also buy chips from dummy companies incorporated abroad (particularly in India, Taiwan, and Singapore).[119] Gregory Allen observes that the Xeon ban was "completely ineffective at stopping indirect sales to the shell companies that helped the Chinese military evade export

114 Liza Lin and Dan Strumpf, "China's Top Nuclear-Weapons Lab Used American Computer Chips Decades After Ban," *The Wall Street Journal*, January 29, 2023, https://www.wsj.com/articles/chinas-top-nuclear-weapons-lab-used-american-computer-chips-decades-after-ban-11674990320.

115 Christina Knight, "US Chip Sanctions May Not Be Enough to Deter China's Military Ambitions," East Asia Forum, August 30, 2023, https://www.eastasiaforum.org/2023/08/30/2099944/.

116 Swanson, "Takeaways from Our Investigation into Banned A.I. Chips in China."

117 Swanson, "Takeaways from Our Investigation into Banned A.I. Chips in China."

118 Swanson, "Takeaways from Our Investigation into Banned A.I. Chips in China."

119 Ye et al., "Focus: Inside China's Underground Market for High-End Nvidia AI Chips."

controls."[120] Huawei is reportedly building facilities under the names of dummy companies, seeking "to circumvent US government restrictions to indirectly purchase American chip-making equipment."[121] A CSIS study notes that US government officials say that it can take Chinese and Russian actors "mere days to successfully set up a shell company for purchasing US technology." Furthermore, the authors note, "the current process for uncovering a shell company's illegal activity may take years, if it is uncovered at all."[122] Restrictions enacted in October 2023 expanded the geographical reach of US semiconductor sanctions to another forty-three countries—where companies must also now obtain export licenses for US technology—in an effort to thwart transshipment.[123] So far, however, the methods of adaptation pursued by Chinese entities are confounding the effectiveness of the export controls against China.

During China's economic rise, CCP policies mandated technology transfer from foreign firms investing in China, and Chinese firms proved adept at technological absorption.

Chinese firms also bypass export controls through methods the Soviets lacked. Cyberattacks enable countries to steal technological specs and monitor online communications.[124] Chinese firms seeking to train AI models can also rent chips or hire cloud service providers (including Amazon and Microsoft). "If any Chinese company wanted access to Nvidia A100, they could do that from any cloud service provider," Emily Weinstein noted in 2023. She concluded, "That's totally legal."[125] In 2024, the Biden administration took the first step toward closing this loophole by issuing "Know Your Customer" guidelines in which cloud computing firms are expected to monitor and report foreign customers' names and IP addresses. Ultimately, however, "the appetite and the capacity of Chinese customers and the companies that want to sell to them to find legal loopholes is . . . infinite, and they don't take days off in that journey," observes Allen, "whereas what our government has demonstrated is the ability to do one update per year."[126]

Similar to CoCom, waivers are reducing the enforcement of today's export controls against China. The Biden administration granted waivers to Taiwan's TSMC and to the Korean firms SK Hynix and Samsung, permitting them to export embargoed technology, below the most advanced level, to their factories in China.[127] By granting waivers, the Biden administration prioritized the coalition's solidarity over the embargo's effectiveness. Not surprisingly, observers argue that export controls are not succeeding in denying China sensitive technologies. The regime, argue Chris Miller and Jordan Schneider, features "tough rules—but leaky enforcement" that enables US technology to reach "Huawei's supply chain."[128]

120 Quoted in Afiq Fitri, "Can the US Stop China's Rise in Quantum Computing?," *Tech Monitor*, October 26, 2022, https://techmonitor.ai/technology/can-us-stop-china-rise-in-quantum-computing.

121 Ian King and Debby Wu, "Huawei Building Secret Network for Chips, Trade Group Warns," Bloomberg, August 22, 2023, https://www.bloomberg.com/news/articles/2023-08-23/huawei-building-secret-chip-plants-in-china-to-bypass-us-sanctions-group-warns?embedded-checkout=true. See also "America's Assassination Attempt on Huawei Is Backfiring," *The Economist*, https://www.economist.com/briefing/2024/06/13/americas-assassination-attempt-on-huawei-is-backfiring.

122 Gregory C. Allen, Emily Benson, and William Alan Reinsch, "Improved Export Controls Enforcement Technology Needed for US National Security," Center for Strategic and International Studies, November 2022, 4, https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/221130_Allen_Export_Controls.pdf.

123 Benson, "Updated October 7 Semiconductor Export Controls."

124 See, for example, "China-Backed Hackers Stepping Up Attacks on Taiwan, Cybersecurity Firm Says," Al Jazeera, June 24, 2024, https://www.aljazeera.com/economy/2024/6/24/china-backed-hackers-stepping-up-attacks-on-taiwan-cybersecurity-firm-says; "Dutch Intelligence Says Chinese Cyber Espionage Goes Wider Than It Suspected," Reuters, June 11, 2024, https://www.reuters.com/technology/cybersecurity/dutch-intelligence-says-chinese-cyber-espionage-goes-wider-than-it-suspected-2024-06-11/.

125 Quoted in Yuka Hayashi and John D. McKinnon, "US Looks to Restrict China's Access to Cloud Computing to Protect Advanced Technology," *The Wall Street Journal*, July 4, 2023, https://www.wsj.com/articles/u-s-looks-to-restrict-chinas-access-to-cloud-computing-to-protect-advanced-technology-f771613. See also John Leyden, "US Chip Export Control Rules Circumvented by AI Cloud Services, Says Report," *ComputerWorld*, June 7, 2024, https://www.computerworld.com/article/2139697/us-chip-export-control-rules-circumvented-by-ai-cloud-services-says-report.html; Fist, Heim, and Schneider, "Chinese Firms Are Evading Chip Controls"; Hanna Dohmen et al., "Controlling Access to Advanced Compute via the Cloud: Options for US Policymakers, Part 1," Center for Security and Emerging Technology, May 15, 2023, https://cset.georgetown.edu/article/controlling-access-to-advanced-compute-via-the-cloud/.

126 Jordan Schneider, host, Gregory C. Allen interview, ChinaTalk, "Emergency Pod: Biden's Final Export Controls Misfire," Apple, December 3, 2024, https://podcasts.apple.com/us/podcast/emergency-pod-bidens-final-export-controls-misfire/id1289062927?i=1000679067280.

127 Rintaro Tobita, "US to Extend China Chip Export Waivers for Taiwan, Korea Chipmakers," *Nikkei Asia*, August 24, 2023, https://asia.nikkei.com/business/tech/semiconductors/u.s.-to-extend-china-chip-export-waivers-for-taiwan-korea-chipmakers.

128 Chris Miller and Jordan Schneider, "How to Stop Our High-Tech Equipment from Arming Russia and China," *The New York Times*, December 29, 2023, https://www.nytimes.com/2023/12/29/opinion/chips-semiconductor-china-russia-military.html.

Chinese Adaptation

The contemporary export control effort faces the problem that not only are they circumventing the regime, Chinese firms—exposed to international competition, globally integrated, and performing at the technological frontier—have also shown themselves far more capable than Soviet firms at absorbing and innovating with the technologies they obtain.

During China's economic rise, CCP policies mandated technology transfer from foreign firms investing in China, and Chinese firms proved adept at technological absorption.[129] For example, the CCP provided leadership and resources to develop China's solar power industry. In a manner very unlike the Soviets, the Chinese government "created incentives to spur domestic demand, and drew on Australian academic expertise and Californian venture capital to expand the industry. By the 2010s, China had a huge domestic market for solar panels and dominated the world market."[130] Today China accounts for 80 percent of the world's solar cell exports (used in solar panels). Innovation by Chinese firms has also transformed the EV battery industry, leading China to supply 80 percent of the world's lithium-ion batteries.[131] China is a dominant player globally in telecommunications, financial technology (such as mobile payments), high-speed rail, commercial drones, and consumer appliances. Overall, metrics of national innovation performance rank China among the world's most innovative countries.[132]

Chinese adaptation has already softened the impact of export controls. Cut off from accessing ASML's state-of-the-art extreme ultraviolet (EUV) lithography machines, China's leading semiconductor manufacturer, the Semiconductor Manufacturing International Corporation (SMIC), boosted imports of the less sophisticated deep ultraviolet (DUV) lithography machines. The firm used DUVs on its production lines to manufacture 5 nm chips as well as Huawei's 7 nm Ascend 910b chip.[133] The 5 nm chips lag TSMC's 3 nm chips, which at this time represent the frontier; SMIC's yield of usable chips is also much smaller.[134] Both, however, are likely to improve with time. Huawei is also adapting to US export controls—and to tightening restrictions imposed by the Dutch government (under pressure from Washington)—by investing in a massive chipmaking equipment R&D center that will build lithography machines.[135] Among the center's 30,000 employees, Huawei has recruited many former employees of ASML, Applied Materials, LAM Research, and other leading semiconductor equipment firms. The latest phase of the $50 billion "Big Fund"—Chinese government investment to indigenize the semiconductor industry—has now been targeted toward the goal of elevating Chinese lithography machines and electronic design automation (software for chip design) to the global cutting edge, in order to wean China off imports from the United States and its allies.[136] Other examples of Chinese firms adapting to export controls abound. After the first Trump administration placed Huawei on the Entity List (banning it from importing US chips or chips manufactured using American technology), "Huawei simply built the 5G base stations with mature chips (with a 28-nanometer gate width rather than the 7-nanometer chips banned by Washington)."[137] After the Biden administration banned exports of Nvidia's then-most advanced chips

129 See James Mulvenon and Chenny Zhang, "Targeting Defense Technologies," in *China's Quest for Foreign Technology*, ed. William Hannas and Didi Kirsten Tatlow (Routledge, 2020), chapter 6.

130 Scott Malcomson, "How China Became the World's Leader in Green Energy," *Foreign Affairs*, February 28, 2020, https://www.foreignaffairs.com/articles/china/2020-02-28/how-china-became-worlds-leader-green-energy; Matthew Hopkins and Yin Li, "The Rise of the Chinese Solar Photovoltaic Industry: Firms, Governments, and Global Competition," in *China as an Innovation Nation*, ed. Yu Zhou, William Lazonick, and Yifei Sun (Oxford University Press, 2016), 306–32.

131 Ellen Wald, "The US Wants to End Its Reliance on Chinese Lithium. Its Policies Are Doing the Opposite," *New Atlanticist*, January 23, 2024, https://www.atlanticcouncil.org/blogs/new-atlanticist/the-us-wants-to-end-its-reliance-on-chinese-lithium-its-policies-are-doing-the-opposite/; Stephen Ezell, "How Innovative Is China in the Electric Vehicle and Battery Industries?," Information Technology & Innovation Foundation, July 29, 2024, https://itif.org/publications/2024/07/29/how-innovative-is-china-in-the-electric-vehicle-and-battery-industries/.

132 Lind, *Autocracy 2.0*; "China Has Become a Scientific Superpower"; Atkinson, "China Is Rapidly Becoming a Leading Innovator in Advanced Industries"; Dan Wang, "China's Hidden Tech Revolution," *Foreign Affairs* 102, no. 2 (April 2023), https://www.foreignaffairs.com/china/chinas-hidden-tech-revolution-how-beijing-threatens-us-dominance-dan-wang.

133 Qianer Liu, "China on Cusp of Next-Generation Chip Production Despite US Curbs," *Financial Times*, February 5, 2024; Qianer Liu, "How Huawei Surprised the US with a Cutting-Edge Chip Made in China," *Financial Times*, November 30, 2023, https://www.ft.com/content/327414d2-fe13-438e-9767-333cdb94c7e1. Huawei is also working on the Ascend 910c chip in order to replace the Nvidia chips it can no longer obtain due to export controls. See Liza Lin and Raffaele Huang, "Huawei Readies New Chip to Challenge Nvidia, Surmounting US Sanctions," *The Wall Street Journal*, August 13, 2024, https://www.wsj.com/tech/ai/huawei-readies-new-chip-to-challenge-nvidia-surmounting-u-s-sanctions-e108187a.

134 Jacob Feldgoise and Hanna Dohmen, "Pushing the Limits: Huawei's AI Chip Tests US Export Controls," Center for Security and Emerging Technology, June 17, 2024, https://cset.georgetown.edu/publication/pushing-the-limits-huaweis-ai-chip-tests-u-s-export-controls/.

135 Cheng, "Huawei Building Vast Chip Equipment R&D Center in Shanghai." On the expansion of Dutch export controls, see Toby Sterling, "Dutch Government Retakes Export Control over Two ASML Tools from US," Reuters, September 6, 2024, https://www.reuters.com/technology/dutch-government-retakes-export-control-over-two-asml-tools-us-2024-09-06/.

136 Yuan Gao and Dong Cao, "China's $50 Billion Chip Fund Switches Tack to Fight US Curbs," Bloomberg, June 27, 2025, https://www.bloomberg.com/news/articles/2025-06-27/china-s-50-billion-chip-fund-switches-tack-to-fight-us-curbs?embedded-checkout=true.

137 David P. Goldman, "Why America Is Losing the Tech War with China," *National Interest*, July 23, 2023, https://nationalinterest.org/blog/techland/why-america-losing-tech-war-china-206664.

(the A100 and H100s), Chinese firms stockpiled Nvidia's less advanced versions(the A800 and H800) in order to train AI algorithms. Chinese firms placed orders for over $5 billion of Nvidia chips for 2023–24.[138] To be sure, relying on older chips is more costly and energy intensive, suggesting that the US-led controls are having some impact. Notes one AI expert, "If a US firm needs 1,000 H100s to train a large language model, a Chinese firm could need 3,000 or more H800s to achieve the same results."[139] Ultimately, however, as technology expert Robert Atkinson comments: "it just makes it more expensive. And it uses more energy. But the Chinese are happy to do that."[140] And as China's own chips improve in quality, Huawei and other firms are increasingly training AI algorithms using only Chinese-made chips.

As they adapted to export controls, Chinese firms have relied on a process called bundling, stacking, or cluster computing to train AI models.[141] The approach involves linking together hundreds or even thousands of less powerful, export-compliant chips—for example, Nvidia's A800, H800, or H20—to generate the computational capabilities of the restricted, more advanced GPUs. Using parallel processing and high-speed interconnectivity, the bundled chips divide and share the workload required for training large-scale models. This method does bring drawbacks (for example, efficiency loss and higher energy and hardware costs). At the same time, this sort of improvisation may encourage significant innovation. Indeed, leading Chinese tech firms such as Alibaba, Tencent, and Baidu have invested heavily in bundled configurations, and are developing optimized software and networking infrastructure toward maximizing performance. In the past few years, multiple shocks led US observers to proclaim that export controls were failing. In 2023 Huawei released its Mate 60 smartphone, which reportedly tested comparably to US-made 5G models. Containing no US technology, the phone featured a 7 nm chip manufactured by SMIC.[142] In the United States, the Mate 60 triggered shock (with policymakers lambasting the failure of Biden's export controls); China reacted with a surge in national pride at successfully cutting America out of its supply chains (an effort known as "Delete + A").[143] Commented one observer, Huawei's "breakthrough means that China was able to circumvent the heavy US sanctions aimed at preventing China from advancing beyond 14-nanometer chips to establish its own chip supply chains."[144]

Next came the shock of DeepSeek. In January 2025 the Chinese firm—staffed entirely by young graduates of Chinese universities—introduced its AI model DeepSeek-R1. Experts said the model's sophistication rivaled US models such as OpenAI in performance, yet was trained on dramatically fewer, less advanced chips. DeepSeek shocked the global tech community as well as US stock markets; the fall in Nvidia's stock price wiped out $600 billion of the company's total worth—the biggest one-day loss ever for an American company. DeepSeek's achievement, concluded the *Economist*, "laid waste to several years of American policy meant to hold back Chinese innovation."[145] DeepSeek is not alone; *Nature* reported that China's "tech behemoth Alibaba released its most advanced LLM so far," and "Moonshot AI and ByteDance released new reasoning models . . . which the companies claim can outperform [Open AI] on some benchmark tests."[146]

Such achievements by Chinese firms suggest that not only are export controls failing to hold China back, they might actually be *accelerating* Chinese innovation through the scarcity they impose. Companies are figuring out how "to write more efficient code for large

138 Qianer Liu and Hannah Murphy, "Chinese Internet Giants Order $5bn of Nvidia Chips to Power AI Ambitions," *Financial Times*, August 9, 2023, https://www.ft.com/content/9dfee156-4870-4ca4-b67d-bb5a285d855c. When new restrictions in 2023 banned sales of the H800 and A800, Nvidia then created the export-compliant H20 for the Chinese market. Liam Mo and Fanny Potkin, "Nvidia to Launch Cheaper Blackwell AI Chip for China After US Export Curbs, Sources Say," Reuters, May 26, 2025, https://www.reuters.com/world/china/nvidia-launch-cheaper-blackwell-ai-chip-china-after-us-export-curbs-sources-say-2025-05-24/?utm_source=chatgpt.com.

139 Yang You, quoted in Karen Hao and Raffaele Huang, "US Sanctions Drive Chinese Firms to Advance AI Without Latest Chips," *The Wall Street Journal*, May 7, 2023, https://www.wsj.com/articles/u-s-sanctions-drive-chinese-firms-to-advance-ai-without-latest-chips-f6aed67f.

140 John Xie, "US Tech Leaders Aim for Fewer Export Curbs on Chips for China," VOA, July 20, 2023, https://www.voanews.com/a/us-tech-leaders-aim-for-fewer-export-curbs-on-ai-chips-for-china-/7189543.html.

141 Lionel Lim, "China Can Shrug Off US Tech Controls, Thanks to Open-Source Design and Chip Packaging Techniques, Says Huawei's Founder," *Fortune*, June 10, 2025, https://fortune.com/asia/2025/06/10/china-us-tech-controls-open-source-huawei-founder-ren-zhengfei/.

142 Eva Dou, "New Phone Sparks Worry China Has Found a Way Around US Tech Limits," *The Washington Post*, September 2, 2023, https://www.washingtonpost.com/technology/2023/09/02/huawei-raimondo-phone-chip-sanctions/.

143 Mackenzie Hawkins, "House Republicans Demand Full Huawei Sanctions After Chip Breakthrough," Bloomberg, September 14, 2023, https://www.bloomberg.com/news/articles/2023-09-14/republicans-demand-full-huawei-sanctions-after-chip-breakthrough?embedded-checkout=true; Liza Lin, "China Intensifies Push to 'Delete America' from Its Technology," *The Wall Street Journal*, March 7, 2024, https://www.wsj.com/world/china/china-technology-software-delete-america-2b8ea89f.

144 Kim Dongho, "China's Safe Landing in the Chip Territory," *Korea JoongAng Daily*, September 24, 2023, https://koreajoongangdaily.joins.com/news/2023-09-24/opinion/columns/Chinas-safe-landing-in-the-chip-territory/1877200.

145 "DeepSeek Poses a Challenge to Beijing as Much as to Silicon Valley," *The Economist*, January 29, 2025, https://www.economist.com/business/2025/01/29/deepseek-poses-a-challenge-to-beijing-as-much-as-to-silicon-valley.

146 Gemma Conroy and Smriti Mallapaty, "How China Created AI Model DeepSeek and Shocked the World," *Nature*, January 30, 2025, https://www.nature.com/articles/d41586-025-00259-0.

language models to cope with the limited number of training cycles that come with using less sophisticated semiconductors,"[147] and are experimenting with "how to combine different types of chips to avoid relying on any one type of hardware."[148] One executive in Taiwan's semiconductor industry told us that export controls "are only going to force China to become even more creative and focused on using the resources that they have."[149] As tech analyst JS Tan writes, some might see "American technology bans, sanctions, tariffs, and other barriers as accelerants, rather than obstacles, to Chinese growth."[150] This perspective may be particularly true at this formative time in which AI is transforming the semiconductor sector; as one recent article notes, "AI chip design is still in its early days."[151] Rather than setting China back, in other words, export controls may encourage Chinese innovation at a time of profound change in the industry.

Effective export controls almost always require multilateral coordination, and the current effort against China is no exception.

In sum, the USSR's technological development was stymied not by a failure to access banned technologies, but by its own dysfunctional economic system. By contrast, the contemporary situation is the worst of both worlds: The PRC is not only managing to access banned technologies, but it also has an economic ecosystem able to absorb and diffuse them—and to adapt to the scarcity that export controls create. China's success suggests that export controls may actually be improving—not weakening—the adversary's technological capability, with long-term economic and military effects.

The Necessity and Difficulty of Supplier Coordination

Effective export controls almost always require multilateral coordination, and the current effort against China is no exception.[152] The CoCom experience shows that serious coordination problems undermined allied political relations. A key example was the US imposition of extraterritorial sanctions, which outraged NATO allies. Today, with China as the target, underlying conditions for effective coordination are even less accommodating, creating significant potential for a downward spiral of partner mistrust, resentment, and coercion.

Conditions for Supplier Coordination: Better Then than Now

In both the past and present eras, conditions were highly favorable for multilateral cooperation on one dimension: namely, the advanced technology in question was and is highly concentrated in the hands of the United States and its closest allies and partners.[153] In three other respects, however, today's conditions are much less promising relative to the Cold War.

The first factor relates to threat perception within countries that are other potential suppliers of semiconductor technology. During the Cold War, the USSR both challenged the United States as a global peer competitor and posed a proximate and ever-present security threat to other potential suppliers. Even then, threat perception varied by country and over time, and Washington constantly clashed with its allies because they tended to prioritize trade over security.[154] Nonetheless, CoCom members were members of military alliances (NATO and the US-Japan alliance) organized explicitly against the USSR, and

147 Kimberly Kao and Raffaele Huang, "Chips or Not, Chinese AI Pushes Ahead," *The Wall Street Journal,* August 23, 2024, https://www.wsj.com/tech/ai/chips-or-not-chinese-ai-pushes-ahead-31034e3d.

148 Karen Hao and Raffaele Huang, "US Sanctions Drive Chinese Firms to Advance AI Without Latest Chips," *The Wall Street Journal,* May 7, 2023, https://www.wsj.com/articles/u-s-sanctions-drive-chinese-firms-to-advance-ai-without-latest-chips-f6aed67f.

149 Personal communication, Taipei, Taiwan, August 16, 2023. Bolstering this view, scholars have found that firms subject to export control restrictions subsequently grow more innovative in terms of patenting; see Kenneth G. Huang, Nan Jia, and Yeyanran Ge, "Forced to Innovate? Consequences of United States' Anti-Dumping Sanctions on Innovations of Chinese Exporters," *Research Policy* 53, no. 1 (2024), https://doi.org/10.1016/j.respol.2023.104899.

150 J. S. Tan, "DeepSeek's Secret to Success: How It Broke the China Mold," China Talk, January 30, 2025, https://www.chinatalk.media/p/deepseeks-secret-to-success; also John Villasenor, "DeepSeek Shows the Limits of US Export Controls on AI Chips," Brookings Institution, January 29, 2025, https://www.brookings.edu/articles/deepseek-shows-the-limits-of-us-export-controls-on-ai-chips/?utm_source=chatgpt.com.

151 Will Knight, "China Has Never Had a Chips Industry. Making AI Chips Could Change That," *Technology Review,* December 14, 2018, https://www.technologyreview.com/2018/12/14/138260/china-has-never-had-a-real-chip-industry-making-ai-chips-could-change-that/.

152 Sarah Bauerle Danzman and Emily Kilcrease, "The Illusion of Controls: Unilateral Attempts to Contain China's Technology Ambitions Will Fail," *Foreign Affairs,* December 30, 2022, https://www.foreignaffairs.com/united-states/illusion-controls.

153 During the Cold War, Washington brokered side deals with neutral countries that were important suppliers, for example, Sweden and Switzerland. See Gunnar Adler-Karlsson, *Western Economic Warfare, 1947–67* (Almquist and Wiksell, 1968). As technology diffused to other countries, Washington did the same with new players that emerged, such as Austria, Finland, and South Korea. See Mastanduno, *Economic Containment*, 185.

154 Mastanduno, *Economic Containment*; Frost and Stent, "NATO's Troubles with East-West Trade."

recurrent crises over Berlin, Cuba, and the Middle East constantly reminded them of the danger of war.

Today, threat perception of China varies considerably among the countries that are key semiconductor technology suppliers. Threat perception is most prominent in the United States, which sees China as its main geopolitical rival and "pacing threat." Japan has a long history of conflict and a territorial dispute with China, leading it to move closer to Washington and to build up its military capabilities.[155] But South Korea and Taiwan each worry about antagonizing China, fear entrapment in a US-China war, and worry about Chinese economic retaliation.[156] The Netherlands and Germany lie outside the region and face no direct threat from China. Although NATO has in recent years expressed greater concern over the threat from China, that view is largely due to China's support for Russia, the more proximate security threat to Europe, most notably in the Ukraine war.[157]

Second, supplier coordination today will be harder because of the target's economic centrality. The Soviet Union was an insignificant trading partner for CoCom countries; trade with the Warsaw Pact was at most 10 percent of their overall trade.[158] Even under those circumstances, the United States and its partners still clashed because of European reliance on imports from the USSR, because the USSR was a major market for certain firms, and because European countries advocated trade with the USSR (that is, a policy of engagement) as a means to improve East-West relations.

Prospects for restricting trade with China face greater hurdles today because of its economic centrality. China is a major trading partner for all of the potential suppliers, and is the number one trading partner—a significant export market and source of revenue—for Germany, Japan, South Korea, and Taiwan. "There's no alternative for the China market," a technology executive told us: "There's no other country out there that can eat up that market share."[159] As the chairman of South Korea's SK Hynix said: "To give up the large market that is China? We won't be able to recover."[160] The waivers that Washington gave SK Hynix, Samsung, and TSMC (as noted earlier) reflect "a recognition by US authorities," notes *The Wall Street Journal*, "that efforts to isolate China from high-tech goods are more difficult than anticipated in a highly integrated global industry."[161] By itself, the integration of global supply chains—and the centrality of US producers within them—would facilitate export control coalition building. But, in many instances, Chinese firms are embedded in global supply chains as well.

China's deep economic integration also gives it powerful tools for retaliation—fears of which dissuade countries from participating in export controls.[162] China supplies most of the world's critical minerals such as graphite, antimony, germanium, and gallium, and has repeatedly restricted its exports of these minerals to retaliate against the United States for export controls.[163] China's coercive toolkit also includes sanctioning specific firms and withholding regulatory approval for mergers.[164] Japan, South Korea, and several European countries fear such retaliation from Beijing that could harm their access to key inputs and their significant investments in

155 Jennifer Lind, "Japan Steps Up: How Asia's Rising Threats Convinced Tokyo to Abandon Its Defense Taboos," *Foreign Affairs,* December 23, 2022, https://www.foreignaffairs.com/japan/japan-steps; Andrew L. Oros, *Japan's Security Renaissance: New Policies and Politics for the Twenty-First Century* (Columbia University Press, 2017).

156 On South Korean hedging, see James Park, "South Korea's Enduring Restraint Toward China," *The Diplomat*, February 18, 2023, https://thediplomat.com/2023/02/south-koreas-enduring-restraint-toward-china/. On Europe, see Anchal Vohra, "Europe Is Stuck in a Toxic China Relationship," *Foreign Policy,* June 22, 2023, https://foreignpolicy.com/2023/06/22/europe-is-stuck-in-a-toxic-china-relationship/. On Chinese retaliation, see Jenny Leonard et al., "China Promises Retaliation If Japan Expands Its Chip Controls, and Toyota Worries It'll Get Caught in the Crossfire," *Fortune,* September 1, 2024, https://fortune.com/asia/2024/09/02/china-promises-retaliation-japan-chip-export-controls-toyota-semiconductors/.

157 Chels Michta, "Europe Wakes Up to the China Threat," CEPA, July 25, 2024, https://cepa.org/article/nato-wakes-up-to-the-chinese-threat/.

158 Frost and Stent, "NATO's Troubles with East-West Trade," 188.

159 Personal communication, March 2024.

160 John Liu and Jin Yu Young, "What the US-China Chip War Means for a Critical American Ally," *The New York Times,* September 27, 2023, https://www.nytimes.com/2023/09/27/business/samsung-hynix-south-korea.html.

161 Quoted in Hayashi, "US to Allow South Korean, Taiwan Chip Makers to Keep Operations in China."

162 Leonard et al., "China Promises Retaliation If Japan Expands Its Chip Controls, and Toyota Worries It'll Get Caught in the Crossfire." China explicitly warned other states not to side with the United States in the 2025 Trump-initiated US-China tariff war. See Tobias Burns, "China Warns Against Trade Deals with US That Harms Its Interests," *The Hill,* April 21, 2025, https://thehill.com/business/5258552-china-trade-deals-us/.

163 Edward White, "China's Tighter Export Controls Squeeze Wider Range of Rare Earths," *Financial Times*, June 30, 2025, https://www.ft.com/content/13d18620-d3d8-417e-b7fb-40d97fc064bf; Amy Lv and Tony Munroe, "China Bans Export of Critical Minerals to US as Trade Tensions Escalate," Reuters, December 3, 2024, https://www.reuters.com/markets/commodities/china-bans-exports-gallium-germanium-antimony-us-2024-12-03/.

164 Zijing Wu and Cheng Leng, "China Delays Approval of $35bn US Chip Merger amid Donald Trump's Trade War," *Financial Times*, June 13, 2025, https://www.ft.com/content/762b1818-795d-4270-b6cc-5d902d8bc0a8; James Mullinax, "China's New Economic Coercion Toolkit," *The Diplomat,* March 22, 2025, https://thediplomat.com/2025/03/chinas-new-economic-coercion-toolkit/; Elizabeth C. Economy, *The World According to China* (Polity Press, 2021).

China. For example, China has told South Korea that it may not export equipment to US military contractors that relies on Chinese rare earth minerals, or it will face a ban of such materials.[165] In Germany, for example, "the primary argument against taking a tougher stance is that there is a high risk of retaliation from Beijing."[166] That the target economy is situated deeply within the integrated world economy is among the most striking differences in the export control context then and now.

A third difference between the present and past export control efforts relates to institutionalization. CoCom convened regularly; it established rules, norms, and behavior expectations for member governments and their firms regarding export restrictions to controlled destinations.[167] Decisions made in CoCom applied to all members simultaneously. By contrast, the current effort is neither multilateral nor institutionalized. US officials negotiate with individual governments, which creates time lags that undermine enforcement. For example, because Washington announced export controls before its partners, Chinese firms stockpiled advanced chips, lithography machines, chemicals, and other technologies after the US announcement but before partner governments announced their own restrictions. Denied access to the massive advanced EUV machines that make the most advanced chips, Chinese firms stockpiled the less sophisticated DUV machines.[168]

Furthermore, instead of a single set of export restrictions, countries' individual policies vary widely. American regulations transparently deny technology to specified Chinese firms on the published Entity List. For their part, European countries resist targeting a specific country, and Japan "has assiduously avoided mentioning China specifically, for fear of sparking the ire of a big trading partner."[169] Japan balked when Washington sought to extend export controls into chemical sales (a major Japanese export) to China.[170] South Korean firms have reduced exports of advanced chips to China to comply with US regulations, but Seoul has enacted no export control laws of its own.[171] When Washington criticized ASML's decision to fulfill Chinese orders for DUV lithography machines, the Dutch government stated that it would not get involved.[172] The US has also asked ASML to stop providing Chinese firms with the maintenance and software updates included with the sale of lithography machines (which would violate ASML's contracts).[173] Among supplier countries, notes the *Economist*, "the goals, resources and reach of anti-Chinese technology sanctions vary widely."[174] Importantly, not one of America's partners employs anything like the FDPR, which would enable them to restrict the transshipment of controlled items across multiple borders.

Bringing Down the Extraterritorial Hammer

During the Cold War, the United States struggled to balance enforcement and allied comity. Relative to its partners, Washington defined military-relevant technologies more expansively and sought tighter enforcement. But when the US imposed more sanctions and enforced them more diligently than its partners, not only did the Soviet military continue to acquire advanced technology, US firms lost profits

165 Ri-Ahn Kim and Dae-Hun Kim, "China Bans Export of Korean Goods Containing Its Rare Earth Metals to the US," *Korea Economic Daily*, April 22, 2025, https://www.kedglobal.com/economy/newsView/ked202504220010.

166 Laura von Daniels, "Will the EU Agree to Use Economic Sanctions Against China?," Brookings Institution, November 1, 2024, https://www.brookings.edu/articles/will-the-eu-agree-to-use-economic-sanctions-against-china/.

167 On the import of multilateral institutions, see Stephen D. Krasner, ed., *International Regimes* (Cornell University Press, 1983); Lisa L. Martin, "An Institutionalist View: International Institutions and State Strategies," in *Exploration and Contestation in the Study of World Politics*, ed. Peter J. Katzenstein, Robert O. Keohane, and Stephen D. Krasner (MIT Press, 1999), 78–98.

168 Andy Lin and Qianer Liu, "China Imports Record Amount of Chipmaking Equipment," *Financial Times*, August 25, 2023, https://www.ft.com/content/6a1a88ff-a122-41a0-8e16-d062f603f81c.

169 "Are America's Allies the Holes in the Export Control Fence?," *The Economist*, October 16, 2023, https://www.economist.com/business/2023/10/16/are-americas-allies-the-holes-in-its-export-control-fence; Ken Sakakibara and Ryoji Nagahashi,「最先端のチップ皆無」かつての半導体大国、今は必死の補助金行政」['There Are No Cutting-Edge Chips': Once a Semiconductor Powerhouse, Now Desperate for Subsidies], *Asahi Shimbun*, April 11, 2024, https://www.asahi.com/articles/ASS4B6RQHS4BUHBI01JM.html.

170 Vishakha Saxena, "Japan 'Not Planning' to Widen China Chip Curbs Despite US Push," Asia Financial, March 10, 2024, https://www.asiafinancial.com/japan-not-planning-to-widen-china-chip-curbs-despite-us-push.

171 Britney Nguyen, "South Korea Sends Chipmaking Equipment to China—and the US Wants It to Stop," Quartz, April 2, 2024, https://qz.com/south-korea-china-chip-exports-us-1851380981; Mackenzie Hawkins, Sam Kim, and Jason Schreier, "US Asks South Korea to Toughen Up Export Controls on China Chips," Bloomberg, April 2, 2024, https://www.bloomberg.com/news/articles/2024-04-02/us-asks-south-korea-to-toughen-up-export-controls-on-china-chips.

172 Ann Nguyen, "The Discomfort of Extraterritoriality," EJIL:Talk!, December 1, 2023, https://www.ejiltalk.org/the-discomfort-of-extraterritoriality-us-semiconductor-export-controls-and-why-their-chokehold-on-dutch-photolithography-machines-matter/; Nando Kasteleijn, "ASML verkocht veel chipmachines aan China, ondanks beperkingen [ASML Sold Many Chip Machines to China, Despite Restrictions]," NOS, January 24, 2024, https://nos.nl/l/2506021.

173 "VS zet techoorlog tegen China voort: exportbeperkingen op AI-chips aangescherpt [US Continues Tech War Against China: Export Restrictions on AI Chips Tightened]," *De Telegraaf*, March 30, 2024, https://www.telegraaf.nl/financieel/872812197/vs-zet-techoorlog-tegen-china-voort-exportbeperkingen-op-ai-chips-aangescherpt.

174 "Are America's Allies the Holes in the Export Control Fence?"

and market share to European and Japanese companies in the process.[175]

Washington had a weapon it could wield against foot-dragging or noncompliant partners: extraterritorial controls. *Extraterritorial export controls* are restrictions imposed by the US government that apply not only to US-made products but also to foreign-made goods that incorporate US technology, software, or components. These controls allow Washington to regulate and penalize foreign firms—regardless of their location—for selling such items to designated countries or entities without US authorization. The 1949 Export Control Act authorized the US president to use extraterritorial export controls to advance US national security.[176] Furthermore, as noted earlier, under FDPR, the United States claimed the authority to control the movement anywhere in the world of US-origin products, components, and technologies.[177]

But the imposition of extraterritorial controls posed a dilemma. These controls upset relations with important military allies, disrupted intra-Western trade, and undermined the post–World War II Western project of building a free trade system. Additionally, extraterritorial controls damaged US businesses by encouraging foreign firms to "design out" US technology in an effort to make supply chains "EAR-free" (referring to US export administration regulations). Such restrictions in the satellite industry, for example, led the world market share of US firms to drop from 63 to 41 percent over the period from 1998 to 2005.[178]

Later in the Cold War, the US use of extraterritorial sanctions created a crisis within NATO. In the later part of the 1950s and the 1960s, Washington prioritized alliance solidarity, generally deferred to its CoCom partners' desires for a small yard, and negotiated with them to strengthen enforcement.[179] But in the 1980s, US frustrations about CoCom and threat perception of the USSR were mounting. US policymakers had lost faith in détente after the Soviet invasion of Afghanistan. Washington was incredulous that its European partners were pursuing a pipeline project with the Soviet Union. At the next spike in US threat perception—Poland's declaration of martial law in 1981—Washington imposed sanctions on both Poland and the USSR, and extended those controls extraterritorially.[180] European governments were outraged. Margaret Thatcher noted that the US policy caused layoffs in Britain's already struggling economy, lamenting, "We have been deeply wounded by a friend."[181] The French foreign minister said that this policy "could well go down as the beginning of the end of the Atlantic Alliance. . . . The United States has just declared what amounts to economic warfare on her allies in Western Europe."[182] Allies decried the US government for violating international law, and demanded that the United States rescind the extraterritorial sanctions or face a range of retaliatory policies, both economic and political.[183] European governments ended up telling their firms to ignore the US embargo and fulfill their contracts with the Soviet Union. In the crisis, "allies had become adversaries." European countries defied the United States and supported the USSR, which remained "virtually unaffected" by the embargo.[184] The CoCom experience thus shows—even under supportive strategic conditions—the rancor that a multilateral sanctions regime can create, given a "persistent tendency of US authorities to attempt to extend the system beyond US borders."[185]

Today, Washington's use of the extraterritorial weapon is once again antagonizing its partners. During his first term, Trump used extraterritorial sanctions against Huawei, Iran, and the Nord Stream 2 pipeline. Biden did so vis-à-vis China, using the FDPR to prohibit any firm from selling China the

175 Conflicts between the US government and the US business community are detailed in Mastanduno, *Economic Containment*, chapter 4.

176 Michael Mastanduno, "The United States Defiant: Export Controls in the Postwar Era," *Daedalus* 120, no. 4 (1991): 91–112, http://www.jstor.org/stable/20025405.

177 Mastanduno, *Economic Containment*, 32–35, 102–4.

178 United States Air Force, "Defense Industrial Base Assessment: US Space Industry," August 2007, 46–49, https://www.bis.doc.gov/index.php/documents/technology-evaluation/38-defense-industrial-base-assessment-of-the-u-s-space-industry-2007/file. See also Tim Hwang and Emily S. Weinstein, "Decoupling in Strategic Technologies: From Satellites to Artificial Intelligence" Center for Security and Emerging Technology, July 2022, https://cset.georgetown.edu/publication/decoupling-in-strategic-technologies/.

179 Mastanduno, *Economic Containment*, chapter 3.

180 Mastanduno, *Economic Containment;* Bruce Jentleson, *Pipeline Politics: The Complex Political Economy of East-West Energy Trade* (Cornell University Press, 1986); Susan Colbourn, "An Interpreter or Two: Defusing NATO's Siberian Pipeline Dispute, 1981–1982," *Journal of Transatlantic Studies* 18 (2020): 131–51; "The Rift in the Alliance," *Boston Globe*, October 10, 1982; "Divided We Stand," *The Economist*, January 30, 1982, 49.

181 The British were also furious because of what they saw as a double standard of US wheat sale to the USSR at the same time; see Peter Osnos, "Thatcher Feels 'Deeply Wounded' by US Curbs on British Fir," *The Washington Post,* September 1, 1982, https://www.washingtonpost.com/archive/politics/1982/09/02/thatcher-feels-deeply-wounded-by-us-curbs-on-british-fir/005f642f-04c2-4ace-ab6b-2ceef412a927/.

182 Quoted in Antony Blinken, *Ally Versus Ally: America, Europe and the Siberian Pipeline Crisis* (Praeger, 1987), 3.

183 David H. Small, "Managing Extraterritorial Jurisdiction Problems: The United States Government Approach," *Law and Contemporary Problems* 50, no. 3 (1987): 286, https://scholarship.law.duke.edu/lcp/vol50/iss3/17/; Jerome J. Zaucha, "The Soviet Pipeline Sanctions: The Extraterritorial Application of US Export Controls," *Law and Policy in International Business* 15, no. 4 (1983): 1176.

184 Blinken, *Ally Versus Ally,* 109.

185 Mastanduno, "The United States Defiant," 97.

most advanced chips, equipment, or other technology whose manufacture relies on US software, hardware, or personnel. Today, this is a potentially powerful weapon, as Emily Kilcrease notes: "Virtually no chip made anywhere in the world can be produced without using some US tooling or EDA software."[186]

As in the past, Washington is increasingly likely to rely on extraterritorial restrictions, which will sow discord among allies and—as industries adapt—harm American firms.

Over time the US government has increasingly tightened FDPR requirements in the semiconductor technology control regime. The October 2023 updates proclaimed a "0% de minimis rule" for advanced lithography equipment.[187] "Remarkable," noted a Rhodium Group report: "This rule effectively asserts that even if no obvious US linkage exists via a person, technology, product, or service, the US nonetheless 'retains jurisdiction over such foreign-made equipment to protect US national security and foreign policy interests.'"[188] The December 2024 update imposed what the Rhodium Group called a "single chip de minimis," requiring that "if a foreign-produced item is made in a plant anywhere in the world, and if that plant or 'a major component' of a plant where that tool was made contains a *single US chip*, then the US can assert extraterritorial jurisdiction to restrict controlled items."[189]

As in the past, Washington is increasingly likely to rely on extraterritorial restrictions, which will sow discord among allies and—as industries adapt—harm American firms. One former Biden administration official told us that only "under significant duress" did the Netherlands agree to limit semiconductor technology exports to China. "There are hammers in the background," he noted, referencing US extraterritorial controls, "hammers that you really don't want to use because it would be so diplomatically problematic."[190] But over time, Washington may decide to wield them. Even the Biden administration—which placed a high value on maintaining good relations with allies—told them that the administration would consider "using the most severe trade restrictions available if companies such as Tokyo Electron Ltd. and ASML Holding NV continue giving [China] access to advanced semiconductor technology."[191] The second Trump administration, as Jordan Schneider and Lily Ottinger observe, has "less concern about allies' reactions" as well as a "stronger desire to confront China."[192]

As in the CoCom experience, American allies would not be happy if Washington increasingly relied on extraterritorial sanctions—and US firms would also feel the sting. Agathe Demarais writes that, after US extraterritorial sanctions regarding the Nord Stream 2 pipeline, some European leaders wanted to ban the travel of certain US officials, freeze American assets in Europe, and sanction US banking institutions.[193] However implausible, notes Demarais, "these far-fetched proposals highlight the fury of allies with US sanctions."[194] Furthermore, as seen in the satellite industry, FDPR and de minimis rules encourage firms to design US technology out of supply chains. As Matthew Goldstein notes: "Switching to alternative suppliers where possible and increasing investments in the development of indigenous technologies is a logical response."[195] Kilcrease argues that this harms

186 Emily Kilcrease, "US Economic Security Strategy, Authorities, and Bureaucratic Capacity," CNAS, January 18, 2023, https://www.cnas.org/publications/congressional-testimony/u-s-economic-security-strategy-authorities-and-bureaucratic-capacity.

187 Reva Goujon and Jan-Peter Kleinhans, "All In: US Places a Big Bet with October 17 Controls," Rhodium Group, November 6, 2023, https://rhg.com/research/all-in/; Ann Nguyen, "The Discomfort of Extraterritoriality."

188 Goujon and Kleinhans, "All In"; see also "A Daunting Arsenal," *The Economist* (April 1, 2023): 17–19.

189 Reva Goujon and Ben Reynolds, "Slaying Self-Reliance: US Chip Controls in Biden's Final Stretch," Rhodium Group, December 9, 2024, https://rhg.com/research/slaying-self-reliance-us-chip-controls-in-bidens-final-stretch/.

190 Personal communication, August 2024.

191 Mackenzie Hawkins, Ian King, and Cagan Koc, "US Floats Tougher Trade Rules to Rein in China Chip Industry," Bloomberg, July 17, 2024, https://www.bloomberg.com/news/articles/2024-07-17/us-considers-tougher-trade-rules-against-companies-in-chip-crackdown-on-china?embedded-checkout=true. Biden officials did increase extraterritorial controls in December 2024, but at least initially exempted Japanese and Dutch suppliers based on pledges that their home governments would impose similar controls.

192 Jordan Schneider and Lily Ottinger, "Trump's Semis Trade Policy," China Talk, April 22, 2025, https://www.chinatalk.media/p/chips-liberated.

193 On the US sanctions, see "Nord Stream 2: Trump Approves Sanctions on Russia Gas Pipeline," BBC, December 21, 2019, https://www.bbc.com/news/world-europe-50875935.

194 Agathe Demarais, *Backfire: How Sanctions Reshape the World Against US Interests* (Columbia University Press, 2022), 133.

195 Matthew A. Goldstein, "Will Recent Expansions of US Export Controls on Foreign Electronics Backfire?," Reuters, November 22, 2023, https://www.reuters.com/legal/legalindustry/will-recent-expansions-us-export-controls-foreign-electronics-backfire-2023-11-22/.

US firms "as they lose access to a broader range of global markets, not just the China market."[196]

Conclusion

America's significant influence over key nodes and chokepoints in the global economy gives it powerful tools to limit China's military-technological advance.[197] Since the first Trump administration, the US government has negotiated with key allies to stem technology flows to China, and has rapidly updated export controls in response to Chinese adaptation.

Yet the CoCom experience suggests pessimism about the efficacy of export controls. In the US geoeconomic war against China, the core problems that plagued CoCom—inability to keep export controls selective, leaky and uneven enforcement, and conflicts among allies—are already recurring, and are likely to intensify. China's deep economic integration and technological adaptability exacerbate the challenges of the current effort.

Five broad implications follow. First, as in the case of US export controls against Huawei, analysts often characterize US-China technology competition as a zero-sum contest in which one side will "win" or knock the other out of the competition.[198] But Huawei's resilience despite the blows it received reminds us that the US-China technology contest is only beginning and may go on for decades; because of the dynamics analyzed here, the US effort to limit Chinese technology may also be much less successful than hoped. Indeed, in the long run, export controls may actually accelerate China's overall technological advance.

Second, even if China never surpasses the United States technologically, it can still pose a dangerous security challenge. During the Cold War, Soviet technological capabilities consistently lagged behind the United States, but the USSR posed a serious military threat nonetheless. Targeted countries can—through stockpiling, exploiting loopholes, theft, and creative adaptation—develop dual-use capabilities that are good enough, even if not the best, for a punishing superpower competition. China—one of the world's most technologically advanced countries, which rivals the United States in many emerging technologies—has already put itself in the game, regardless of who is in the lead.

Third, at a time when the United States is grappling with a range of tensions with its allies, US export controls against China risk weakening key US military alliances.[199] Many observers celebrate US alliances as a key advantage that Washington enjoys and China lacks. But divergent threat perception and interests among the United States and its partners are already creating diplomatic friction as well as undermining the effectiveness of export controls. Alliance comity requires Washington to maintain a small yard and to resist the temptation to apply extraterritorial sanctions—neither of which it succeeded in doing under CoCom.

Fourth, our analysis suggests skepticism about recent calls for reviving CoCom-like multilateral export control arrangements. Kevin Wolf and Emily Weinstein, for example, have advocated for the creation of "CoCom's daughter."[200] They argue that the unprecedented and coordinated response among "techno-democracies" to Russia's invasion of Ukraine opens the door to a new multilateral export control regime targeted at Russia, China, and other authoritarian states. The temptation in the current context to advocate for a new CoCom is understandable; an institutionalized regime with established rules and expectations would potentially harmonize controls across suppliers and enhance enforcement.

Our analysis suggests, however, that Washington should resist this temptation. Unlike during the Cold War, most advanced economies today are both tied to the United States and heavily dependent on trade with China. The creation of a formal regime would force them to make, or appear to make, a choice between the two sides. Even in 1949, with a more serious Soviet threat and far less at stake in trade with the Soviet Union, many US partners hesitated to take sides, leading to CoCom's shadowy and informal character. Today, the pressure to hedge rather than choose is all the stronger. Forcing the choice could lead some states (South Korea, for example) to decline the invitation, thereby forcing the United States to impose secondary sanctions in response.

A more formal regime would also increase the US inclination to politicize controls beyond national security to achieve broader foreign policy objectives. Wolf and Weinstein indeed argue that "Cocom's daughter" should coordinate export controls to punish human rights violators and respond to

196 Kilcrease, "US Economic Security Strategy, Authorities, and Bureaucratic Capacity"; see also Demarais, *Backfire*, 181.

197 Farrell and Newman, "Weaponized Interdependence"; Farrell and Newman, *Underground Empire*.

198 For example, Schuman, "China Is Losing the Chip War."

199 On extended deterrence problems within the US-ROK alliance, see Jennifer Lind and Daryl G. Press, "South Korea's Nuclear Options," *Foreign Affairs*, April 19, 2023, https://www.foreignaffairs.com/united-states/south-koreas-nuclear-options-north-korea-deterrence. On NATO, see Andrew Dorman, "Here Are Five Difficult Issues for the NATO Summit," Chatham House, November 22, 2023, https://www.chathamhouse.org/publications/the-world-today/2023-06/here-are-five-difficult-issues-nato-summit.

200 Kevin Wolf and Emily Weinstein, "CoCom's Daughter?," *WorldECR*, May 13, 2022, https://cset.georgetown.edu/wp-content/uploads/WorldECR-109-pp24-28-Article1-Wolf-Weinstein.pdf.

concerns of "economic security," such as supply chain resilience. As we have shown, however, the more controls stray from the "small yard" of items with direct and significant military application, the harder it becomes to maintain a consensus around the implementation and enforcement of controls.

Finally, this article informs scholarly debates about weaponized interdependence. Daniel Drezner observes that weaponized interdependence "does not guarantee successful statecraft; it merely increases the probability of coercion being attempted."[201] The prospect that states could exploit their control over economic chokepoints to weaken an adversary or change its behavior is indeed attractive. Yet our analysis suggests that even in the most ideal circumstances—such as today's semiconductor industry—weaponized interdependence is messier in practice than theorists anticipate. Chokepoint controls work best in the short term, before targets have the chance to adjust and adapt.[202] But the US-China competition will be enduring, and export controls are no panacea.

Today's optimism about "devastating" export controls can quickly give way to tomorrow's frustration and finger-pointing. In preparing for the long haul, the more US officials resist the inevitable temptation to expand the control yard, the better their chances at keeping the supplier coalition together—maintaining effective enforcement, and maximizing the ability to deny China advanced military capabilities.

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Image: *"P20230328AS-0633" by Biden White House Archived, United States Government Work*[203]

201 Drezner, "Introduction," in Drezner et al., *The Uses and Abuses of Weaponized Interdependence,* 12.

202 On "strategic adaptation" to disruptions, see Eugene Gholz and Daryl G. Press, "The Effects of Wars on Neutral Countries: Why It Doesn't Pay to Preserve the Peace," *Security Studies* 10, no. 4 (June 2001): 1–57, dx.doi.org/10.1080/09636410108429444.

203 For the image, see https://www.flickr.com/photos/whitehouse46/52783861884/.