



Silicon Triangle

The United States, Taiwan, China,
and Global Semiconductor Security

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CONCLUSION AND DISCUSSION OF RECOMMENDATIONS

The preceding chapters have painted a rich and challenging portrait of the dynamic and rapidly evolving global competition in semiconductors that has swept up the US-Taiwan-China triangle as well as the rest of the world.

As our report has shown, this new phase of international competition over semiconductors has existential implications for the economic and national security of the United States, its allies and partners—and, especially, Taiwan, the remarkable and dynamic but vulnerable democratic society that leads the world in the production of semiconductors. This concluding chapter distills the principal insights and recommendations of the preceding chapters, emphasizing those that have garnered broad support among the participants in our Working Group on Semiconductors and the Security of the United States and Taiwan, organized by the Hoover Institution at Stanford University and the Center on US-China Relations at the Asia Society. In a few instances, we have noted areas of disagreement among the participants. While this chapter represents the editors' final judgments of what we have learned and concluded as a group, it has benefited from extensive input and feedback from many of our participants.

1. Domestic Resilience

As the chapters in this report explain, we are moving toward a world of intensified trade among like-minded nations and sharply reduced dependence on adversary nations for critical supply chains. Thus, a framing principle of US policy on semiconductors in the next few years should be to make voluntary participation in this emerging trading bloc as reliable and attractive for its participants—including the United States—as possible.

The United States should aim to ensure that, as much as possible, its imports of finished semiconductors and key inputs along the supply chain come from reliable trading partners with whom we share common values, such as the current foreign industry leaders Taiwan, Korea, and Japan, and from other countries where the political divide does not bode ill for continued cooperation.

A balanced US policy to that end should pursue efficiencies and growth through trade and increased market access within this still-incipient coalition of critical-technology trading partners. Our policy must also commit to investing in a major new effort to revive US domestic production of semiconductors, from design to fabrication. Toward this goal, US policy should work to level the playing field by reducing domestic tax and regulatory barriers to the competitiveness of the US semiconductor industry.

Even if this approach succeeds, the United States will still be heavily dependent on international partners for critical inputs, materials, components, and steps in its semiconductor supply chain. However, this approach will also leave us less vulnerable to pressure from unreliable suppliers. Moreover, increased US production—as well as other domestic resilience measures—will nurture talent and know-how and stimulate economic growth in the United States. The goal is to create an insurance policy against the kind of catastrophic foreign supply chain disruption that might occur after a People's Republic of China (PRC) blockade or attack on Taiwan, a conflict in the South China Sea, a military accident around the Korean peninsula, or a severe natural disaster.

We recommend the following steps to mitigate supply chain risk and strengthen the US industrial base in semiconductors.

1a. Onshoring Supply Chains

The US government (USG) should subsidize a modest amount of new semiconductor supply chain capacity in sectors where US industry now lacks capacity or global cost competitiveness, such as in advanced-semiconductor manufacturing or packaging. The implementation of the manufacturing-oriented elements of the CHIPS and Science Act of 2022 should be evaluated primarily by their ability to reduce the potential short-term costs of a sudden and severe semiconductor supply chain disruption. While the United States can and should never be entirely self-sufficient, added increments of production will be extremely important if a major crisis strikes.

Funding awards should be made to firms, whether headquartered domestically or in friendly jurisdictions abroad, that have the best chances of executing on this promise from a technology-risk and operational-efficiency perspective.

The National Environmental Policy Act's categorical exemptions (or expedited approvals) should be considered for these initial facilities, which are intended to rapidly produce a minimum viable domestic semiconductor supply chain. Furthermore, Congress and the executive branch should avoid imposing unnecessary new regulations or policies associated with manufacturing subsidies that would impede or delay new semiconductor projects in the United States or make investment less attractive for like-minded foreign partners.

1b. Information Sharing

The US government should fund—or itself establish—improved intelligence gathering, data analysis, economic modeling, and information sharing on the global semiconductor market that is analogous to the US Department of Energy's Energy Information Administration (EIA). Such a data fusion center could be either operated directly through a government agency such as the Department of Commerce, or supported

by specialized contractors such as federally funded research and development centers (FFRDCs).

Drawing from existing industry data services as a starting point, the USG should work with industry to balance the value of this information with commercial sensitivities. Such data could be variously managed for both internal and public consumption as well as being made available to partners globally in return for their own participation.

Even without imposing these additional disclosure requirements on private firms, the US Department of Commerce could do more with the information on trade and intellectual property (IP) flows in the global semiconductor supply chain that it already has. For example, Commerce could share this information within the interagency process more widely as well as with Congress in a summarized and thus less commercially sensitive form.

1c. Stockpiling Chips

In total, US industries use a staggering number and variety of specific chips—far too many to stockpile the way we stockpile primary commodities such as oil. We do believe that the feasibility of a more limited “smart” strategic semiconductor stockpile—which could also improve market liquidity and be operated as a public-private partnership model—deserves further study. Meanwhile, the USG should also explore other effective options to buffer near-term domestic chip supplies in case global supply chains are suddenly disrupted.

First, the Department of Defense (DoD) should, as appropriate, target advance buys of those key semiconductors needed for critical weapons platforms over multiple years, even for the expected lifetimes of the systems (as has recently been done for one key platform). Second, the USG should encourage a private sector strategy of extended inventory management by creating a new 25 percent tax credit on semiconductor inventories exceeding forty-five days for chip-consuming and -integrating firms (e.g., automotive, aerospace, defense, machinery, electronics).

Resilience Q&A

Q: Should the USG be concerned about commercial market and investment cycles of the semiconductor industry, and the effects of those changes on supply and demand?

A: No. But we do believe that increased USG attention on the semiconductor industry is now warranted by new national security concerns that were less prominent a decade ago. The USG now has longer-term public interests in fostering technological competitiveness among critical technologies generally, including semiconductors. At the same time, we underscore that an open, competitive market is the basis of technological innovation, and USG policy interventions should be designed to avoid or minimize intrusions that might cause market distortions as much as possible.

Q: Should domestic chip industry subsidies intended to improve resiliency favor US-domiciled semiconductor firms?

A: No. They should be made available as equally as possible to any company in any partner country, but on a competitive basis to multiple awardees in order to maximize the chances for successful implementation.

Q: Should domestic chip industry subsidies be focused on manufacturing leading-edge logic chips?

A: No. They should seek to enable domestic production of leading- or near-leading-edge logic chips, but the security motivation extends to minimum viable production for mature logic nodes, memory, storage, and analog chips as well, including the support of upstream inputs as well as downstream packaging.

2. Business Environment

The United States must seek new capabilities in the semiconductor supply chain, especially in segments where it is not now seen as cost-competitive

with other global trading partners. But efforts should not seek to compromise competitiveness of existing US areas of innovation and strength in the global semiconductor supply chain. Creating a welcome environment for investment and operations by US allies and partners that command significant semiconductor supply chain strengths and expertise—a business environment that extends beyond the five-year time frame of the CHIPS and Science Act subsidies—should be a high priority during this period. Ensuring fair business opportunities and market access for foreign technology firms operating within the United States will also sustain the ability of foreign allied and partner governments to align with otherwise costly controls on commerce with China. To that end, US federal and state governments should take steps to reduce the costs of doing business in the United States within this and other critical-technology sectors.

2a. Federal Tax Efficiency

Given the capital-intensity of the industry, private investment will be the primary route to scaling the US domestic semiconductor supply chain. Hence, private capital efficiency ultimately matters more in terms of driving siting decisions than comparatively small or uncertain government subsidies:

- For example, well over half of the cost of a new semiconductor fabrication plant (“fab”) comes from the equipment purchased by the manufacturer to build production lines. Congress should consider extending 100 percent tax depreciation for short-lived capital assets beyond 2022 to improve the competitiveness of US semiconductor and semiconductor equipment manufacturers.
- Similarly, Congress should consider a preemptive extension of the 25 percent chip manufacturing tax credit passed in the CHIPS and Science Act beyond its 2027 sunset. Further, it should consider moderately expanding coverage domestically of upstream semiconductor material inputs and manufacture of semiconductor equipment including etching, deposition, lithography, and metrology tools.

- Modern semiconductor fabs and semiconductor equipment manufacturers reinvest significant portions of their revenue into research and development each year to sustain leading-edge capabilities. Yet since 2022, US firm research and development (R&D) spending deductions have been required to be taken over five years rather than immediately in the year in which they are incurred (as per the Tax Cuts and Jobs Act of 2017). We recommend reverting to full tax deductions of R&D expenses in the year incurred, which would stimulate a broad swath of knowledge investments in this and other critical research-intensive industries.
- Taking advantage of these deductions could require eliminating the alternative minimum tax and additional corporate taxes passed in the Inflation Reduction Act of 2022 (IRA), which have historically been seen as disincentivizing domestic manufacturing and other investments of multinational corporations. Even so, we believe eliminating those taxes is particularly important for the semiconductor industry and other strategic technologies where the restoration of some degree of domestic manufacturing is critical to US economic and national security.

2b. Federal Environmental Regulation

New chip manufacturing facilities receiving federal subsidies are expected to be subject to National Environmental Policy Act (NEPA) regulations and reviews. Given the industry's short two-year technology cycles, however, the roughly eighteen-month time frame required for a NEPA Environmental Review—let alone the four- to five-year timeline for a full Environmental Impact Statement—could in itself prevent the United States from ever producing the world's most advanced chips. Federal financing intended to speed the development of this sector should not have the inadvertent and perverse effect of slowing down the process. To mitigate this problem, the USG should consider additional fast-tracking and definitional authorities for the semiconductor and other critical industries.

Separately, a policy of timely Environmental Protection Agency (EPA) reviews for critical industries such as chip fabs (perhaps with a special three-month cap) could improve private investor confidence in project delivery schedules. This confidence is particularly important given large up-front capital outlays and the need to coordinate orders with long lead times from dozens of vendors. Flexible air permits—as with, for example, Oregon’s Plant Site Emissions Limit (PSEL) program—could allow for flexibility in operations and investment across a company’s facilities (as long as overall emissions limits are met) without triggering additional federal or state reviews.

Industry should also be consulted more closely to avoid inadvertently introducing new regulatory barriers for chip manufacturing alongside other existing state and federal government climate change or water quality regulations. Investments in this sector already face high total compliance costs in the United States compared to other globally attractive sites. Excessive environmental reviews or mitigation requirements could push a manufacturer abroad—emissions will simply occur elsewhere (and in any case become embedded in our own imports). Particular attention should be given to gases and other manufacturing inputs that lack viable domestic alternatives. Here, priority should be given to funding and incentives for the discovery and development of alternative, environmentally friendly replacement materials and processes.

2c. State-Level Business Environment

Semiconductor firms have a wide range of investment opportunities globally. The ease of doing business across the United States, therefore, remains a key consideration in decisions about where to invest. Taiwan Semiconductor Manufacturing Company’s (TSMC) leadership, for example, estimates that of the approximately 50 percent cost premium to operate a leading-edge fab in the United States, perhaps half of that premium is due to the lack of geographic clustering of spare equipment, service firms, and workers who can help improve factory uptime and yields. Thus, it is in the broader national interest for individual states with advanced-manufacturing endowments to remain attractive

places to do business—in terms of cost of living, cost and reliability of electricity, water rights, local taxes, and local building regulations.

The federal government should coordinate with state and local governments to create technology hubs by implementing opt-in policies that engender such favorable business environments. These state-sponsored hubs could also adopt beneficial tax and regulatory reforms of their own that may not be possible to pass at the national level. Fine-tuning the legislation that establishes such hubs should be encouraged through the experimentation and success of pilot projects.

Business Environment Q&A

Q: Should water availability limit semiconductor manufacturing activities in the American West?

A: No. Given water recycling and purification technology advancements, we do not believe that in most places endowed water resources should be a major barrier to modern semiconductor manufacturing. Reliable, affordable electricity and local infrastructure that permits clustering of associated suppliers and service firms are far more important.

Q: Should the semiconductor industry receive special tax and regulatory treatment, or should cost-of-doing-business reforms be pursued more broadly?

A: This is a matter of judgment. We recognize that there are many competing US industrial and commercial policy priorities. At the same time, the historical record is clear that the United States' semiconductor manufacturing and packaging business environment has not been cost-competitive, even compared to that of some allies and partners.

A middle path between targeted and broad reforms would be to prioritize the competitiveness of the US business environment for critical emerging technologies with security implications, such as chips, and where flows of investment and IP are likely to be increasingly limited among like-minded trade clubs.

3. Technological Competitiveness

In the shift to a world more defined by trade, investment, IP, and human capital flows among voluntary blocs of like-minded nations, long-term US leadership in a portfolio of critical technologies should significantly influence the prosperity and security of all participant countries of that bloc.

The United States should therefore pursue comprehensive, market-oriented industrial policy measures that are also mindful of the interests of US partners. To achieve strategic autonomy by means of technology and economic leadership, these policies should accomplish the following:

- Enhance value capture and commercialization of research through scaling innovation, alongside the incubation of complementary domestic manufacturing activity.
- Strengthen national and economic security by decreasing dependence on unreliable competitor nations and by diversifying geographic risk.
- Amplify value creation through investment in US research capacity for breakthrough technologies, a process that for semiconductors is strongly coupled to advanced manufacturing activities.
- Strengthen the global intellectual property regime through both domestic reforms and, in consultation with allies and partners, countering China's systematic theft of open-society technologies.

3a. Immigration and Workforce

Additional legislative skilled immigration and workforce measures can greatly enhance the impact of the CHIPS and Science Act and other recent private investments in domestic semiconductor manufacturing, and help smooth an otherwise rapid labor market transition.

The USG should provide worker-oriented tax incentives for the semiconductor industry and other strategic manufacturing sectors. The goal should be to boost their take-home income and help semiconductor companies to compete for high-skilled (master's and PhD) workers

within the domestic labor force. Examples could include waiving student loans for US citizens who work in the industry for a period of time after graduation.

Meanwhile, community colleges and related industry apprenticeships located within the region of a semiconductor manufacturing cluster should be supported in providing the skilled trade and tool operators that compose the bulk of fabrication facility jobs. The training of technicians needs to be targeted to the regions in which the jobs are.

Finally, we recommend that H-1B visas be made available to all international students who complete a graduate program in science or engineering at an accredited US university, without numerical visa caps. Until the United States can dramatically increase its own domestic supply of relevant science and engineering talent—a task that will, at a minimum, take a decade or more—the only alternative for the United States to restore its international competitiveness in high-tech manufacturing is by finding new ways to retain the international talent that it has already educated and trained.

3b. Market-Oriented Public Infrastructure

Subsidies to encourage the onshoring of semiconductor manufacturing capabilities should be designed to minimize market distortions and be as complementary as possible with already-existing private enterprise capabilities.

For example, funding access by start-ups to otherwise cost-prohibitive prototyping facilities can help overcome the increasingly steep barriers to entry into chip design. That kind of access will encourage competition over time. Rather than building a single public facility to this end, however, the Department of Commerce's public-private National Semiconductor Technology Center (NSTC) should instead aim to facilitate a digital and physical network of new pathfinder fabs and facilities across the country. These could be focused on simulation, AI-enabled chip design, and the development of digital test environments that can mimic more-expensive physical chip manufacturing processes.

Similarly, Commerce should in particular use funding for the National Advanced Packaging Manufacturing Program of the CHIPS

and Science Act to sponsor the development of technologies that boost automation. The goal here should be to increase the output efficiency per packaging employee by one to two orders of magnitude, as a way of ensuring economically sustainable operations over the long term. More broadly, given US labor-cost concerns, US semiconductor manufacturing should pursue employee productivity through automation.

Other subsidies for research and development should be awarded on a cost-competitive basis. For example, the USG might act as a customer of the capabilities being developed under the subsidy program and then require firms competing for the subsidies to raise additional private capital to supplement taxpayer dollars.

3c. Antitrust

The USG has in the past expressed concern over the potential consumer impacts of large internet technology firms becoming even larger and more monopolistic. We nonetheless believe that US antitrust policy must take into account a firm's broader impact on US economic competitiveness, innovation capacity, and effects on national security. It can do so by recognizing the importance of a firm's market size on its ability to undertake valuable research, invent, and then scale up new technologies—particularly capital-intensive ones—as well as on its ability to compete with the protected industries of other nations.

In particular, Congress could consider antitrust protections for semiconductor industry collaborations that may be undertaken in response to the CHIPS Act, but extend beyond the limiting scope of precompetitive R&D. US regulatory agencies need to appreciate that these firms compete globally with enormous firms from other countries, often aided by government subsidies, as opposed to their traditional antitrust concern of US companies competing only with one another.

3d. Business and National Security

The USG should consider incentives to provide better feedback between US corporate activity and US national security interests. For

example, regulatory bodies such as the Federal Trade Commission (FTC), Federal Communications Commission (FCC), Securities and Exchange Commission (SEC), Environmental Protection Agency (EPA), and Federal Energy Regulatory Commission (FERC) could be instructed to weigh the national security implications of their regulatory decisions. This instruction might be modeled on the Biden administration's 2021 executive order requiring regulatory bodies to weigh the estimated social cost of carbon emissions in their decisions.

3e. Investment and National Security

New geopolitical circumstances are now creating the need to consider both inbound and outbound investment screening in critical-technology areas.

As we continue to closely monitor inbound investment by China, we should make a special effort to enhance greenfield foreign direct investment into the United States from allied and partner countries, including partner-country firms making mergers and acquisitions (M&A) as a normal part of doing business. The inbound investment review of the Committee on Foreign Investment in the United States (CFIUS) should be more transparent, and more actively engage and negotiate with prospective foreign investors from friendly nations. To do that, CFIUS should hire more staffers with technical backgrounds. The United States should encourage foreign direct investment in critical technological fields from allied countries to make these attractive sectors for entrepreneurs to do business in. At the same time, it should limit foreign investment in such fields from autocratic countries that pose a documented national security risk.

Some in our working group believe CFIUS or a new agency should be given additional authority to review and restrict outbound investment in critical technologies, such as building research and manufacturing centers, establishing joint ventures, and making financial investment in China and other autocracies, especially when such outbound investments are required by those countries for access to their own domestic markets. Should things become more hostile and fraught, the United States should be open to such a prospect.

3f. Research and Development

The United States should increase federal R&D funding in basic and applied research that spans established fields such as conventional semiconductors as well as frontier fields such as beyond-CMOS (complementary metal-oxide semiconductor) devices that could someday complement today's predominant logic chips. And once increased, such funding should be sustained indefinitely. We also recommend allocating a portion of federal R&D budgets to building and operating new research infrastructure, rather than research programs alone. This would lower barriers for innovation and technology development by start-ups in the private sector.

In particular, we recommend significant increases in applied research funding to develop technologies, as opposed to pure science—an approach our competitors (friendly or otherwise) have been embracing more fulsomely than has the United States. We must better organize our economy and society to value and nurture applied engineering research. Increasing support for the new Engineering Directorate of the National Science Foundation would help.

We also endorse the role of international semiconductor research organizations, such as Taiwan's Industrial Technology Research Institute (ITRI), the Berlin-based Fraunhofer Group, and Belgium's industry and academic semiconductor research consortium imec; we believe that the CHIPS Act's NSTC should reinforce, not displace, those institutions. Even so, we maintain that imec's future role hinges on it offering a trusted environment for researchers and firms operating in democratic and open societies.

3g. Education and Human Capital

The long-term solution to the critical shortage of home-grown science and engineering talent in the United States must include substantial enhancements of K–12 education. Students should be exposed to high-tech industries, including semiconductors, at an early age. We must find ways to convey both the excitement of innovation in this sector and its vital importance to the national and economic security of the United States, as was done for the defense and space industries

in earlier eras. K–12 education should be strengthened to ensure that students have sufficient training in math and science to compete with global peers upon entry into universities or trade schools. Funding as well as teacher incentives are important here.

For those pursuing college degrees in semiconductor technology and related fields, we recommend increasing the number of funded scholarships with direct pathways to jobs—for example, a semiconductor-focused version of the DoD SMART Scholarship program in partnership with industry. Universities should also consider making it possible for their students to transfer into engineering majors from other fields as they discover the opportunities and excitement of developing and producing transformative technologies.

Broadly speaking, more thought should be given to how government policies and regulations could directly or indirectly affect profitability across the entire semiconductor value chain—from chip designers and software system developers to materials and equipment producers, and ultimately to chip manufacturers. After all, such concerns affect domestic investment and employee compensation that determine the career choices of US graduates. A healthy US semiconductor ecosystem will need to attract and retain the best talent in the field among even the least glamorous links in that chain.

3b. Tacit Knowledge

An essential pillar of improved US competitiveness in the semiconductor ecosystem—or in most other critical technologies—must be the attraction and retention of advanced talent.

Toward this end, we urge corporations, government agencies, universities, and society at large to make the pursuit of engineering and careers in critical technologies as rewarding, well compensated, and esteemed as pathways as possible. Put simply, we must retain our own talent once they are trained, while attracting as much international talent as we can.

The United States should also provide an expedited path to legal residency in the United States for skilled and critical-technology workers fleeing autocracies.

Given the great contributions that scholars and professionals from China continue to make to the US economy, our society, and our nation's technological advancement, the United States should continue to grant visas to scientists and engineers from China, even to work in critical technologies. These visas, however, must be subject to an evidence-based process for screening out those applicants with demonstrable ties to China's military-industrial base, security agencies, United Front organs, surveillance apparatus, and other PRC entities that steal or misappropriate technological know-how. The USG should also consider mechanisms to embrace individuals who seek to vacate China's authoritarianism system and remain in or permanently relocate to the United States.

Noncompete agreements among skilled technology workers are critical, if imperfect, legal instruments for deterring leakage of tacit knowledge and trade secrets through employee mobility. Some in the United States have proposed broadly limiting the use of noncompete clauses, justifying new limitations on the proliferation of noncompetes among trade workers. But limiting noncompetes for advanced-technology workers risks encouraging trade secret theft in semiconductors. Limiting noncompete agreements may also make it less attractive for foreign technology firms of partner countries to invest in the United States, as many of them rely on noncompetes to protect tacit knowledge. For example, Korean and Taiwanese firms should not be made to worry that, if they send their semiconductor manufacturing experts to the United States, they may be poached by competing firms (just as we worry about US technical workers being lured to competitors in China).

3i. IP and Incentives for US Innovation

The United States' intellectual property regimes should be made more efficient, competitive, and stable through consideration of the following measures:

- Clarify and stabilize patent eligibility criteria to promote a range of high-tech industries and to ensure that the United States is not placed at a competitive disadvantage.

- Make injunctive relief readily available in IP infringement cases of all types.
- Create a team within the US Patent and Trademark Office (USPTO) to address the relationship between intellectual property and strategic competitiveness.
- Appoint US IP officials in a timely manner.
- Ensure that countries with which the United States forms relationships (such as via trade and friend-shoring) have robust IP regimes to avoid repeating the problems that US companies have faced in protecting IP in China.

3j. Trade

In partnership with allies and friends who share common values and seek to counter China's market-distorting actions, the United States should pursue a comprehensive agenda to reform global trade rules that are focused on strong protections of IP, the rule of law, fairness, and reciprocity. The United States should start by focusing on signing market-access trade deals with as many partners as possible to establish a wider circumference of stronger trade relationships.

The United States should also rigorously evaluate what, if any, criteria should be imposed on foreign companies seeking to gain access to the US economy. But such policies should be evaluated from a strong baseline expectation of encouraging open commerce and foreign investment in the United States.

Our working group members are united in favoring some use of technology export controls to protect intellectual property developed in the United States. Some members of our group favor robust export controls on critical emerging technologies (see below), while others endorse the use of such controls only sparingly, such as for technologies that are difficult to copy (so that the controlled technology cannot simply be reproduced abroad, resulting only in lost market share for US firms) or for technologies that directly pertain to security matters.

Technology Competitiveness Q&A

Q: Should the USG sponsor large-scale professional training programs to ensure that new semiconductor manufacturing or packaging facilities have sufficient employees?

A: No. The track record for such state-sponsored programs is poor. While we believe that the currently envisioned domestic supply chain investments may create some labor market disruption, the spike can most sustainably be met by more flexible visa and employee tax treatment in the near term. Over the mid term, broader skilled-immigration reforms, coupled with natural labor market wage adjustments, should be used to encourage an adequate and sustainable stream of students and workers to enter this industry. For trade workers and operators, strengthening existing local community colleges is preferable to other government training schemes.

Q: Should the USG directly engage in semiconductor manufacturing or use its Defense Production Act Title I authority to compel activity in this area by the private sector?

A: No. That is neither a sustainable nor a scalable approach to improving US technology competitiveness over the long term.

Q: Are you advocating increased government intervention in US markets?

A: Yes, in some measure, but only for technologies critical to national security interests. The challenge will be to find the right balance in a constantly changing geopolitical climate. We recognize that commercial incentives and free-market forces are the prime sources of US technology competitiveness and innovation. But we also see increasing security and strategic interests that relate to these sectors and warrant new initiatives and guardrails.

Q: Could such an “industrial policy” do more harm than good?

A: Yes. The historical record of the USG in encouraging the development of certain technologies or industries is mixed. We advocate for an honest reckoning with that track record and consideration of the downside risk. Given the geopolitical shifts that appear to be moving us away from a flat, fully globalized world, some members of the working group favor a more ambitious industrial policy. The predominant view, however, emphasizes lowering barriers for technology innovation and for translating that innovation into applications for manufacturing—so as to maximize the benefits of a competitive market—and opposes using industrial policies as a vehicle for other political or social priorities.

4. Taiwan's Stability

Taiwan is one of Asia's most prosperous, successful liberal democracies and a trusted partner in critical supply chains. While it stands at the center of the global semiconductor economy, its broader political isolation from the international community contributes to its existential vulnerability.

Consequently, we believe it is in the interest not only of the twenty-four million people of Taiwan but also of the United States and the entire Indo-Pacific region to both militarily deter aggression against the island and fortify its autonomy and democracy through strengthened security and economic interactions.

While the necessary security engagements are beyond the scope of this report, we strongly endorse US arms sales to strengthen Taiwan's defenses—including through a “porcupine” strategy of deterrence through a large number of small weapons systems—and improving joint training and coordination among Taiwan, the United States, and those countries in the region that view the future of Taiwan as critical to their own security and prosperity.

Semiconductors, meanwhile, which have drawn enormous levels of American attention to Taiwan's current situation, now offer a unique

platform for deeper and sustained US-Taiwan economic and civil engagements. To that end, we endorse the following steps to create an environment that fosters deeper business-to-business, research, academic, individual, and civil ties between the United States and Taiwan.

4a. R&D Collaboration

There is a unique opportunity for US research centers and universities to partner with Taiwan on talent development. One goal should be to incentivize leading Taiwan semiconductor firms and research organizations to grow their R&D efforts in the United States. In addition, the United States can learn from the semiconductor manufacturing expertise that Taiwan's semiconductor industry has pioneered over the past three decades, while Taiwan can learn from US strengths in chip design and other areas, such as these:

- Taiwan's semiconductor technology leaders—such as TSMC, United Microelectronics Corporation (UMC), and MediaTek—and Korea's industry leader, Samsung, should be invited to join the public-private National Semiconductor Technology Center to accelerate a wide range of collaborations on US soil, from R&D to manufacturing.
- Taiwan's Industrial Technology Research Institute (ITRI, established in 1973) and the Taiwan Semiconductor Research Institute (TSRI, established in 2019 to engage in cooperation with international partners) are logical partners for collaboration with the United States on technology research and supply chain resilience. There is considerable overlap between the missions of the TSRI and the NSTC. Indeed, the NSTC is intended to conduct research in semiconductor technologies, manufacturing, design, packaging, and prototyping; strengthen the competitiveness and security of supply chains; and promote workforce training.
- In 2021, Taiwan established a collection of “semiconductor colleges” within the top universities on the island. A potential US partner could be the American Semiconductor Academy (ASA)

initiative, a proposed nationwide semiconductor education and training network of faculty at US universities and colleges engaged in semiconductor research and education.

- Cooperative US-Taiwan work on advanced-technology IP protection regimes and experiences is essential to support such deeper joint R&D on semiconductors.

4b. Workforce and Educational Exchange

Both Taiwan and the United States are concerned with the development of the kinds of student-worker pipelines necessary to strengthen today's semiconductor supply chains in both places:

- The 2022 initiative announced between Taiwan-based chip designer MediaTek and Purdue University to create a new chip design center should become a model for pairing up Taiwan's semiconductor firms and expertise with US engineering programs. Such agreements can provide industry with know-how, firms with access to engineering talent, and students with career opportunities in a win-win-win development initiative.
- Meanwhile, initiatives such as the US-Taiwan Education Initiative—which encourages American students to study Mandarin at Taiwan universities—and bidirectional summer internship programs for engineering, economics, and social science students should be expanded, particularly as China becomes a less attractive destination for US students.
- In turn, the Taiwan and US governments should take steps to reverse the decline in the number of Taiwanese students studying in US universities—a cohort that formed the original bedrock of Taiwan's chip industry, as well as its democratization experiment. One future opportunity is to increase the presence of Taiwanese undergraduates in US master's degree programs, which would in turn improve the pipeline to funded research PhDs. Another is to encourage English coursework options within Taiwanese universities.

4c. Joint Evaluations of Vulnerabilities

There is a need for regular evaluations of US semiconductor industry vulnerabilities to a range of threats, including natural and geopolitical disaster scenarios involving Taiwan. Such evaluations, including tabletop scenario exercises with US and Taiwan industry participation, could reveal supply chain weaknesses that need to be addressed, and they could develop plans for recovery after such potential incidents. A partnership between Taiwan's TSRI and the US's NSTC would be a potential institutional structure to conduct such evaluations.

4d. Energy Cooperation

A stable electricity supply is essential for semiconductor production. With the growth of the industry in Taiwan, power demand from the information and communications technology (ICT) subsector in Taiwan has quadrupled since 2000, with TSMC alone consuming 5 percent of the island's electricity supply. And yet, Taiwan maintains only a forty-day supply of coal and roughly a ten-day supply of natural gas and may close its nuclear plants altogether. Meanwhile, US chip buyers and other original equipment manufacturers (OEMs) are increasingly concerned with the emissions profiles of their suppliers. So, climate, resource adequacy, and electric grid security issues are fertile areas for US-Taiwan technical collaboration to improve the island's supply chain resiliency. The US Department of Energy and national labs should be directed to increase energy statistical and technical collaborations with Taiwan. Climate and energy are also good areas for subnational collaboration—for example, with California, which already pursues such policy and technical memoranda of understanding with China.

4e. Smoothing US-Taiwan Economic Frictions

Taiwan's government has made significant overtures to opening its domestic market to US exports, even at some political risk, and its semiconductor firms are now in the process of carrying out one of the largest foreign direct investments (FDI) in US history. Meanwhile, Taiwan is also undertaking a long and potentially costly but ultimately sound effort to realign its own trade and investments to be less dependent on

China. Lacking access to multilateral trade fora, bilateral agreements are particularly important for Taiwan—not just for lowering tariffs, but as a symbol of strategic partnership.

- The US Trade Representative should accelerate its ongoing efforts to complete a real US-Taiwan free-trade agreement for the benefit of US businesses and consumers and as a demonstration of US commitment to Taiwan’s prosperity and stability.
- In the near term, US-Taiwan worker and trainee exchanges are needed to enable the timely opening of new manufacturing facilities such as TSMC’s Arizona plant, which will involve the transfer of thousands of workers in both directions. And Taiwanese nationals already have a significant presence in US semiconductor technology clusters, including in Silicon Valley and Texas. Accordingly, the US Department of the Treasury should rapidly finalize an avoidance-of-dual-taxation agreement with Taiwan, mirroring the income tax treaties and totalization agreements already in place with thirty-seven other jurisdictions globally.

4f. Defense Industry Cooperation

The war in Ukraine has exposed the fragility and limited capacity of the US defense industrial base. The invasion has also contributed to multiyear backlogs in the delivery of US weapons systems to Taiwan that would materially improve its deterrence posture. At the same time, Taiwan’s capabilities in precision manufacturing, electronics, and defense-grade semiconductors make it—if given a green light—a promising contributor to the manufacture of key weapons systems and ammunitions for its own defense and even for export.

The USG can and should materially improve regional deterrence by partnering with Taiwan’s manufacturing firms to rapidly scale up local production of a large number of mobile, distributed, resilient weapons. These efforts could include the authorization of IP transfer and other use provisions of the US International Traffic in Arms

Regulations (ITAR). Supported by defense firms in both the United States and Taiwan, the USG should sponsor a joint industry working group to identify opportunities and then work through the thicket of interagency barriers to allow greatly scaled weapons coproduction and codevelopment within Taiwan, and possible later indigenization. This is the most sustainable way to align Taiwan's deep will to defend itself with its capabilities to do so.

Taiwan Q&A

Q: Are there other areas ripe for semiconductor collaboration with Taiwan beyond manufacturing chips?

A: Yes, we believe that US collaboration with Taiwan on semiconductors should also extend to technology research and development, and to parts of the supply chain where the US has considerable strengths as well, including chip design.

Q: Do US efforts to attract domestic investment by Taiwan semiconductor firms compromise Taiwan's "silicon shield"?

A: No, we believe that potential semiconductor-related costs or benefits do not weigh heavily in Beijing's calculus regarding military force against Taiwan. US-Taiwan business and civil collaborations on semiconductors would therefore strengthen, not undermine, deterrence.

Q: Should the threat of semiconductor supply chain disruption be the motivation for US military involvement in a Taiwan contingency scenario?

A: No. A US decision to intervene militarily should be motivated by the defense of common values and broader regional security considerations, not by a failure to maintain the semiconductor supply chain. A test of proposed US domestic resilience efforts should be whether or not access to Taiwan's semiconductor exports is a significant factor motivating US decision makers in the event of a Taiwan contingency.

5. Dealing with China

There are two dimensions to any form of engagement with China on semiconductors. First is the need to mitigate emerging economic and supply chain vulnerabilities that could make us more dependent on China. While starting from a relatively weak position, China is now aggressively pursuing its own domestic semiconductor aims—first to reduce its dependence on imports, and then to seize an ever-larger share of the global market through steadily growing exports of chips and other elements in the global chip supply chain. But the variety of PRC government targets and subsidies to China's semiconductor firms make it likely that these firms, lavishly aided by nonmarket mechanisms, will undercut the pricing of established semiconductor firms in the US and its trading allies. However, anticompetitive behavior by firms in China could, with state assistance, severely and unfairly harm US or ally and partner producers through, for example, the production of legacy or specialized chips and then flooding the global market at discount prices. Over time, this could create new dangerous US or partner dependencies on China-based supply chains, with ominous consequences for US strategic autonomy.

Second is the option for the United States and allies to use their strengths in the semiconductor supply chain, and China's current reliance on them, as a form of economic deterrence against dangerous military or geopolitical pressure and actions by China. Aggression toward Taiwan is a key threat in this regard, but not the only one. As our relations with China morph, a deeper role for a more deliberate economic deterrence strategy may arise, especially given China's reliance on the United States and allies as trading partners. The critical question to keep asking is: What could help diminish the impulse of China's leadership to use force, economic coercion, or other punitive actions to achieve its geopolitical goals in both Taiwan and the world?

US and allied policy stances to deny China technological supremacy should remain flexible and preserve options for both escalation and deescalation, based upon principles of reciprocity and adherence to a rules-based order. The following recommendations should therefore be

considered as points along a sliding scale that could offer such flexibility depending on China's own choices and behaviors.

5a. Supply Chain Diversification

As part of a long-term process of engagement and partnership, the US government and private industry should, with their counterparts in Taiwan, more clearly articulate the case for semiconductor manufacturers to diversify their operations beyond any single region. Doing so would effectively hedge against the risk of economic or military coercion by China. This messaging should be paired with a strong operational commitment to assist in the defense of a fellow liberal democracy. We believe this kind of engagement improves deterrence by making global decisions to oppose China's use of force over Taiwan less transactional. South Korea, likewise, should be incentivized to shift more of its production of memory chips to places other than China, where a large share of the world's memory chips is presently made by South Korean firms.

Beyond logic and memory chip production aims, China is already on course to attain significant market share in chip supply chain and related segments, including printed circuit boards, ingots, and the assembly, packaging, and testing that accompany them. US policy makers should dig deeper into their tool kits to mobilize more private capital, such as through investment partnerships with the US International Development Finance Corporation, to actively push more of these generally lower-skill and lower-margin production lines to Southeast Asia, India, Mexico, and other countries without the same political complexities as China.

5b. Multilateral Export Control Regime

Our working group members broadly endorse developing or reforming new institutional mechanisms to better coordinate multilateral export controls for semiconductors and other critical technologies. Members have proposed a host of different strategies to that end.

One view takes inspiration from the voluntary, informal Cold War-era Coordinating Committee for Multilateral Export Controls (COCOM) as a model to revive now as a way to confront China,

Russia, Iran, and North Korea. Proponents of this strategy observe that the Biden administration's October 2022 export controls, which involved preconsultation but were essentially unilateral, were undertaken before reaching agreement with other substitute suppliers—especially the Netherlands and Japan. They also placed few controls on these countries' firms exporting subsystems directly to China's equipment manufacturers. Accordingly, firms in China reacted by buying the equipment piecemeal and seeking to do assembly themselves. Our recommendation is therefore that future talks on semiconductor controls should be elevated to the level of the national security advisors and select cabinet officials of the United States, the Netherlands, and Japan to make it easier for new export controls to be multilateral and comprehensive from the start.

In parallel, the USG could also build a grouping of partners that additionally includes South Korea, Germany, Israel, Taiwan, the United Kingdom, and India to discuss semiconductor supply chain resiliency. That slightly broader but still nimble consortium could commission studies of existing and planned fab capacity at advanced and mature nodes, as well as of related segments of the semiconductor industry, such as chip packaging and testing.

Just as COCOM's coordination was done discreetly, such an approach would leave room for partners to agree on a shared goal—for example, limiting China's domestic chip manufacturing capabilities below 16nm—but leave the form of implementation up to each participating country, thus minimizing disagreement and domestic political or commercial costs.

A second view from our working members recommends a more expansive multilateral regime. These members note that at the end of the Cold War, the informal COCOM mechanism was replaced with the consensus-based Wassenaar Arrangement on arms and dual-use technologies, and was expanded to include the Russian Federation and the former members of the Eastern Bloc. Wassenaar, however, no longer serves its purpose, given each member's veto ability. Indeed, nearly all of the export control actions taken against Russia since its 2022 invasion of Ukraine have been outside this multilateral regime.

Accordingly, these working group members recommend that for the ongoing export controls imposed on Russia as well as concerns about coordinating export controls on China, the United States and its partners should retire the Wassenaar Arrangement, replacing it with a new multilateral regime that takes elements of COCOM, incorporates lessons from Wassenaar, and includes new members that were not a part of either regime. Such a mechanism could be used not just for semiconductors but for a variety of other critical technologies, too. High-technology powers such as Israel and Taiwan (members of neither COCOM nor the Wassenaar Arrangement) should be members of this new multilateral regime.

5c. USG Dependence on China's Chips

A provision of the 2023 National Defense Authorization Act strengthened the security of defense systems by prohibiting USG procurement of products that contain semiconductors from chipmakers with ties to the Chinese Communist Party, including Semiconductor Manufacturing International Corp. (SMIC), Yangtze Memory Technologies Co. (YMTC), and ChangXin Memory Technologies (CXMT). The legislation also requires the USG and its suppliers to understand their supply chains better—for example, external audits could help US defense contractors and end users identify their products' potential reliance on chips from China. But Congress should close several loopholes in this important bill by expanding its scope beyond “national security systems”—an outdated construct limited to weapons and certain equipment required for defense and intelligence activities—to include “critical infrastructure.” Provisions should also be expanded to cover the procurement of not just critical goods but also critical software, inputs such as critical minerals or chemicals, and services.

5d. BIS

Congress should allocate the Department of Commerce's Bureau of Industry and Security (BIS), which has responsibilities in technology export controls, more funding for more staff to handle its growing plate of responsibilities in this more challenging era.

The Bureau reportedly has at times had only two officers to conduct end-use export checks in China. BIS also urgently needs to upgrade its technical systems to private sector standards; its current databases are too outdated and fragile for its new responsibilities. And BIS should make better use of private providers of market intelligence and abandon the flawed “end use” paradigm when it comes to China. US officials cannot be expected to reasonably determine the ultimate end user of chips under such a system, and the presumption should be that, if a sensitive technology can be diverted to or co-opted for an undesired end use, it will be.

BIS will increasingly also be tasked with addressing the phenomenon of US persons working or consulting for China’s chip firms. For example, beyond the most advanced manufacturers covered by the October 2022 export control rules, US persons with expertise and know-how for mature chips may also indirectly, but substantially, impact China’s chipmaking capabilities on leading-edge nodes. BIS should seek to creatively but firmly encourage US talent to leave China’s semiconductor industry and work in allied and partner countries or in the United States, where numerous fabs are now under construction.

5e. Expand the Blacklist

The Foreign Direct Product Rule (FDPR) blacklist currently includes twenty-one firms in China to which both US and foreign firms are prohibited from selling goods that contain US technology and equipment. Given the ease with which targeted companies in China can evade export controls via affiliates, the blacklist should be expanded to include the subsidiaries and affiliates of listed PRC companies. The blacklist should also incorporate China’s semiconductor manufacturing equipment firms.

As of the end of 2022, the FDPR blacklist (which limits the exports of products containing US technologies from all countries) includes Huawei and forty-nine other firms involved in advanced computing and supercomputing or military computing applications in China. Some in our working group urge that this strictest blacklist be expanded to include all BIS Entity Listed companies and their affiliates. The BIS

Entity List, a broader list that numbers hundreds of firms in China, is less strict and requires licenses only for exports from the United States (firms in third countries are generally not restricted from sales to China). Accordingly, this sort of expansion of the FDPB blacklist would more directly affect businesses operating in allied and partner countries; with the costs that entails, this should be viewed as a potential further step for consideration along a sliding scale as the changing geopolitical situation may demand.

5f. Import Restrictions/Antidumping

As a defensive step, the US could mitigate the potential harm of Beijing's semiconductor industrial policy by taking note of its track record in other sectors—in particular, creating a market reliance on China via overcapacity and global trade distortions through under-priced goods. Such defensive actions would be intended first to signal to US or partner manufacturers that their future investments to expand chip manufacturing capacity within the United States will be shielded from imports from China that are priced lower due to state subsidies. Additional actions could later protect existing domestic manufacturers from dumping (once it occurs and is formally demonstrated).

The USG could begin imposing incremental import restrictions contemporaneously with CHIPS Act investments. For example, despite potential punitive retaliation by China, some in our working group nevertheless support import restrictions that could, in the near term, be self-initiated by the USG under Section 301 of the Trade Act of 1974, as amended, and Section 232 of the Trade Expansion Act of 1962, as amended. In this scenario, restrictions would be low in the first year to allow imports to continue to fill domestic demand while US or partner firms invest in US domestic capacity. These measures, when initiated, should make available to industry and the public a tariff/quota schedule that shows how restrictions would be ratcheted up over time. The goal would be to give domestic manufacturers market certainty, that is, knowing their immense investments will be protected in the long term.

As domestic production capacity grows and ongoing harm can be shown, the USG should be ready to initiate more conventional

antidumping/countervailing duties (AD/CVDs) against China to address any unfair trading practices. Traditionally, the United States has imposed AD/CVDs only after the harm of dumping has occurred. Moreover, even if they are self-initiated by the USG, AD/CVDs require individual US firms to prosecute at the International Trade Commission, which would open the door to retaliation. Such actions, while useful, can be seen as one tool within a larger portfolio of defenses.

Importantly, while it is possible that the effects of China's mature logic, memory, or power electronic chip dumping could be isolated to a small number of US or partner semiconductor companies, it is also possible that there would be a contagion effect, weakening even the most advanced manufacturers. A majority of members in our working group believe that, given these uncertainties, the United States and its allies should err on the side of more strenuous and well-coordinated actions in response to PRC plans both to become self-sufficient in microchips and to expand the global market reach of its microchip sector. Their view is that, in this critical and fast-moving sector, it is better to be more exclusionary rather than less.

5g. Target Mature Nodes

A more strenuous, and controversial, approach to mitigating the global risks of China's chip ambitions would be not just to defend against dumping through duties, but also to seek to hobble—or at least not further actively enable—China's ability to mass-produce commercially competitive mature chips.

Current Biden administration rules restrict US exports of technologies and tools that would help China make advanced-logic chips with transistor architectures of 16nm or smaller. But lagging node and specialized logic chips (e.g., in the 28nm range), as well as radio frequency (RF) chips, wide-bandgap chips, and analog sensors, are used to power consumer electronics, vehicles and transportation equipment, high-capacity energy-storage systems, and many of our most advanced weapons systems. Some in our working group recommend that the United States and its allies expand the scope of regulations to prohibit the export of equipment that China could use to make 28nm or smaller logic

chips—specifically, the sale of deep ultraviolet (DUV) lithography tools and the skilled labor (from Dutch, Japanese, and US firms) that is essential to keep these machines running and with upgraded software. The trade-off of doing so could be revenue losses to Western firms likely exceeding the levels already expected from today’s 16nm export restrictions.

China Q&A

Q: How do existing allied and partner technology coordination mechanisms, such as the US-EU Trade and Technology Council (TTC), fit into a modernized multilateral export control regime?

A: Our working group members expressed some skepticism about the US-EU TTC. Some believe that the effort has been worthwhile, even given the significant time and resources the Biden administration has put into it, but they argue that the true test of its value would be whether it becomes a venue for Europe to work more closely with the United States on coordinating semiconductor and other critical-technology export controls toward China. Others argue that placing too much emphasis on the TTC mechanism risks being ineffective, since the EU does not exercise authority over relevant member-state decisions.

Q: Should the US and partners continue to sell semiconductors to China?

A: Yes. A “constraining” strategy, as advocated by some in our group, would not entail stopping the sale of all chips to China, but rather would focus on preventing the sale of manufacturing equipment, subsystems, and other essential materials to China. The goal would be to prevent China from indigenizing advanced-semiconductor production capabilities domestically, or then possibly dominating certain trailing-edge chip markets instead. That said, sale of advanced chips should be prohibited.

Q: Would pursuing this approach further encourage Beijing to pursue its objectives, and should we instead moderate our response

to reassure Beijing and persuade them not to pursue their semiconductor goals?

A: No. The United States and its allies have a poor track record when using reassurance to persuade the PRC to abandon goals that it believes support its interests or undermine our own. The PRC leadership will undoubtedly try to respond to any steps the United States and allies may take, and it may produce some surprising outcomes, including potential parallel technology advances (such as in advanced packaging). But at a high level, we believe that China's perception of the United States as a "hostile foreign force" has already predisposed it to take every measure it can to pursue not just semiconductor autonomy but also greater global influence and dominance of the global chips market. This pattern is evident today, for example, through the PRC's twinning of production lines using both foreign and domestic semiconductor manufacturing equipment. Rather than trying to reassure China, it is now time for us to start focusing on a new strategy of denial.

Q: Regarding mature nodes, doesn't China already have DUV and the other manufacturing equipment it would need to produce chips at 28nm? Would further export controls have any meaningful effect?

A: Yes. True, China already has much of this equipment, and has even been a major buyer from Western equipment firms in recent years. But further controls could still have an effect. Scale matters. The concern among those in our working group about 28nm logic chips (or more mature memory or power management chips) is not to foreclose all of China's capability to produce them—it already does—but that it not be able to build the scale of its production to produce these chips at sustained, commercially competitive yields that would lead to massive exports and potential dumping.

Q: Would 28nm equipment export limits be commercially ruinous to Western semiconductor manufacturers or otherwise constrain their own R&D budgets and innovative potential?

A: There are different views on this question within our working group. These firms were competitive and profitable before the surge in recent demand from China, and there are many fabs in Taiwan and elsewhere outside China that are now on multiyear waiting lists to receive ASML's or other firms' DUV machines. The chip manufacturers that buy such equipment make investment decisions based on expectations of competing investment within China. As a result, they may choose to increase their own equipment orders if they expect that they will not be competing for global chip customers with an expected glut of new entrants from China. The Netherlands could effectuate a "soft ban" on China by simply delivering current orders, by delaying new orders from China's firms, by reprioritizing sales of DUV machines to non-China companies, or by not undertaking new firmware update or maintenance contracts for machines it has already sold to China.

Q: The October 2022 BIS export controls and subsequent allied and partner outreach emphasized the national security implications of China's chip manufacturing at advanced nodes (e.g., 16nm or smaller). With 28nm, are you arguing that there should in fact be a higher threshold for national security concerns, or is this predicated on more of an economic/protectionist justification?

A: We recognize that this is a matter of sensitivity and judgment, and our working group does not have a unanimous view on this matter. As discussed in our scenario-planning exercise and in subsequent analysis within this report, we feel that the separation between commercial and security considerations is less distinct in a world shifting toward the intensification in trade, investment, human capital, and IP flows among like-minded coalitions of nations—as opposed to the flatter, globalized vision of recent decades. In such a world, we believe that leadership of

respective trade networks in critical technologies has major implications for the attractiveness of participation in them by otherwise nonaligned nations. And the vitality of those networks, in turn, affects both economic and military strength. What is economic today could become security tomorrow, and US policy must constantly make course corrections to keep up with changing trends.

This shift has profound implications for relations among US partners that have not yet been fully appreciated in semiconductors—or in other critical sectors where principles of economic freedom and national security intersect.



If the United States is to retain and strengthen its global leadership in semiconductors, or even to preserve its most vital economic and national security interests in this sector, it will need to revive the competitiveness of its workforce and business environment. It is not enough to simply constrain China's malign behavior and intentions. It is not even enough to innovate in design. The United States must run faster, harder, and with longer-term vision.

And in this increasingly globalized world, the United States cannot run alone. Restoring US leadership requires close cooperation with reliable partner countries as we work to strengthen and reconfigure global semiconductor supply chains. It also requires an international talent pool of scientists and engineers from around the world, and immigration rules that welcome and retain this talent.

To win this race, we will need both vigilance and agility. We will need the focus and enhanced information systems to detect important new trend lines, and the agility to respond to these changing forces as quickly as possible. We will also need the flexibility and humility to understand that our partners and friends will sometimes hold different views, and that their policies will sometimes evolve at a different pace than our own.

The key for the United States will be to deepen and nurture these cooperative relationships. Such cooperation will ensure that innovation can thrive through multilateral collaboration, so that our supply chains for semiconductors and other critical commodities can be secure, and so we cannot be held to ransom by our adversaries.

Above all, we must remain steadfast both in our commitment to the common values that undergird these partnerships and in our resolve that open societies can and must win the technological competition with authoritarian states.



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