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Reboot

Framework for a New American Industrial Policy

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About the Report

This report is published as part of the U.S. National Industrial Policy Strategy project at CNAS. The project is developing an intellectual framework for industrial policy in the American context, in an era of strategic competition with technology at its center. The goal of the project is to pave the way for enhanced and sustained American economic competitiveness and technological leadership. This report builds on analysis and insights from prior CNAS publications, including:

"The Tangled Web We Wove: Rebalancing America's Supply Chains," by Megan Lamberth, Martijn Rasser, Ryan Johnson, and Henry Wu (March 2022)

"From Plan to Action: Operationalizing a U.S. National Technology Strategy," by John Costello, Martijn Rasser, and Megan Lamberth (July 2021)

"Trust the Process: National Technology Strategy Development, Implementation, and Monitoring and Evaluation," by Loren DeJonge Schulman and Ainikki Riikonen (April 2021)

"Taking the Helm: A National Technology Strategy to Meet the China Challenge," by Martijn Rasser and Megan Lamberth (January 2021)

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TABLE OF CONTENTS

SOME SEE PRIVATE ENTERPRISE AS A PREDATORY TARGET TO BE SHOT, OTHERS AS A COW TO BE MILKED, BUT FEW ARE THOSE WHO SEE IT AS A STURDY HORSE PULLING THE WAGON.[1]

—SIR WINSTON CHURCHILL

Executive Summary

The relationship between American industry and the U.S. government must change. The nature of the U.S.-China strategic competition, one centered on technology, requires a reset in how America's policymakers and corporate leaders engage. Matters of economic competitiveness and security are increasingly indistinguishable. Officials from former President Donald Trump's administration articulated this in 2018.[2] President Joe Biden followed suit in 2021.[3] Recent events underscored this reality and accelerated the forces behind a broad realignment in global relations. The fallout of the COVID-19 pandemic shone the spotlight on widespread supply chain vulnerabilities such as out-of-balance economic interdependencies. Russia's renewed invasion of Ukraine prompted the world's leading democracies to align on wide-ranging sanctions and export controls; they accomplished both at extraordinary scale and speed.

A core takeaway from these events is that only governments can take certain actions, or prompt them. Also evident is that corporations do not provide of their own volition all that is needed for the national interest. These are statements of fact, not condemnations. Business leaders, especially since the end of the Cold War, have done what they were incentivized to do: maximize profits and shareholder value, streamline and globalize operations. For many years, this worked well. Now, however, the dynamic has changed, with the rise of China as an economic, technological, and military power that rivals, and in some cases surpasses, the capabilities of the United States and its allies. America's current trajectory is perilous and uncertain, leaving at risk its status as the world's leading economic and technological powerhouse.

U.S. leaders must take measures to correct the course. American government policies, largely laissez-faire for decades, indirectly and directly have encouraged off-shoring of manufacturing. Corporate and individual tax laws and defined contribution plans have emphasized shareholder returns over pricey long-term capital expenditures. Growing reliance by the government on private sector innovations has shifted research and development (R&D) intensity away from important but risky basic research to safer applied research with better returns on investment. An era of renewed government involvement with industry is needed to address America's changed reality. Critical manufacturing capabilities must be shored up, while building on U.S. leadership in service sectors.

This paper is not a proposal for a radical overhaul of the U.S. economy or how it is managed. Instead, it proffers a set of pragmatic concepts and actions to promote American competitiveness, actions for effective government engagement with industry within the confines of free market principles. In the past few years, Washington lawmakers have proposed legislation, such as onshoring semiconductor fabrication and critical minerals processing, that is rightfully considered industrial policy—distinct government intervention in economic activity previously left to private corporations. The goal of this report, and future reports as part of this project, is to lay out a coherent and comprehensive pathway for successful government engagement with industry to ensure long-term economic competitiveness while safeguarding U.S. national security.

This paper presents an initial framework for a new American industrial policy, a blueprint for what is needed to ensure the United States has the vision, goals, plans, and resources for an era of sustained strategic competition. The concept, informed by an overarching national technology strategy and a supply chain resilience strategy, is the initial contribution in a larger effort to provide policymakers with a comprehensive toolkit to navigate competition with China and engage with countries around the world, friend and foe alike.[4] To provide tangible real-world examples of a new sensible American industrial policy and to illustrate how policies would vary by sector and over time, subsequent reports will detail what a new American industrial policy would look like in action for three key sectors: biotechnology, semiconductors, and green technologies.

The framework comprises six distinct yet connected actions that will form the foundation for future specific, actionable policy recommendations. The actions are as follows: (1) issue a clarion call; (2) analyze successes; (3) align government and industry; (4) create authorities to adjust policies as needed; (5) accept and mitigate risk; and (6) leverage allies. All of these draw from lessons learned throughout American history, and from past industrial policies of Japan, Taiwan, and Singapore. They are designed to shore up U.S. economic resilience and to contend with a rising China.

First, Biden must articulate what winning the strategic competition means for the United States. The country needs a rallying cry. Americans need to know what they are aspiring toward in order to make tangible abstract notions, such as strategic competition and the China challenge, and to support the renewal of America's industrial capacity. The vision should explain how economic security is national security. The goal should be to secure the United States' standing as the world's premier technology power, so that it can empower citizens, compete economically, and secure its geostrategic interests without compromising its values or sovereignty.[5]

Once that vision is established, U.S. policymakers must turn to monitoring and implementing industrial policy. This requires putting in place capacity to analyze and measure success and engaging with industry to execute these policies. Changes to the U.S. government's structure by creating new positions and giving new authorities will be necessary and a government-wide task force must be set up to determine appropriate metrics. Congress must play its part by mandating and funding the sustained research and analysis of U.S. industrial policies.

> **The goal of this vision should be to secure the United States' standing as the world's premier technology power so that it can empower its citizens, compete economically, and secure its geostrategic interests without having to compromise its values or sovereignty.**

Aligning the national interest with those of America's private sector will be essential. Because public-private partnerships will be a central feature of a new American industrial policy, the administration and Congress should focus on funding new initiatives for research and development in priority scientific and technological areas.

Policymakers should be ready to adjust industrial policies to changing contexts. To sustain policies that have impact and meaning when conditions change, U.S. policymakers must understand how and when to adapt policies. The U.S. government currently lacks this capacity. In a previous report, CNAS researchers proposed a deputy national security advisor for technology competition; this person would be the government's senior strategist for industrial and tech policy, and would serve as the chief advisor on industrial policy.[6] Congress and the White House should work together to create and fund that position and the requisite staff.

A renewed engagement between government and industry will also require a mindset shift in how policymakers tolerate and manage risk. The technology areas that are of greatest consequence to economic growth, societal resilience, and military power—and that have the greatest disruptive potential—are often also those in which the most work remains to be done, and where unknowns are greatest. Fields such as biotechnology and quantum information science are developing rapidly, but acquisition pathways remain unclear. New cutting-edge capabilities require high-risk, high-reward research. America's leaders need to be willing to embrace risk, tolerate failure, and trust the process.

Finally, American industrial policy cannot succeed without robust international partnerships. There are two reasons for this. One, the United States simply cannot go it alone. It rarely has all the pieces of the puzzle, and it needs its allies to play by the same rules. Two, the U.S. network of allies and trusted partners is an unmatched strategic advantage. It would be foolish not to capitalize on this strength. To improve America's ability to collaborate with like-minded countries, Congress and the White House should commit to creating a large cadre of tech diplomats. Together, the world's tech-leading democracies face much better odds of ensuring a beneficial, prosperous, and secure future.

Introduction

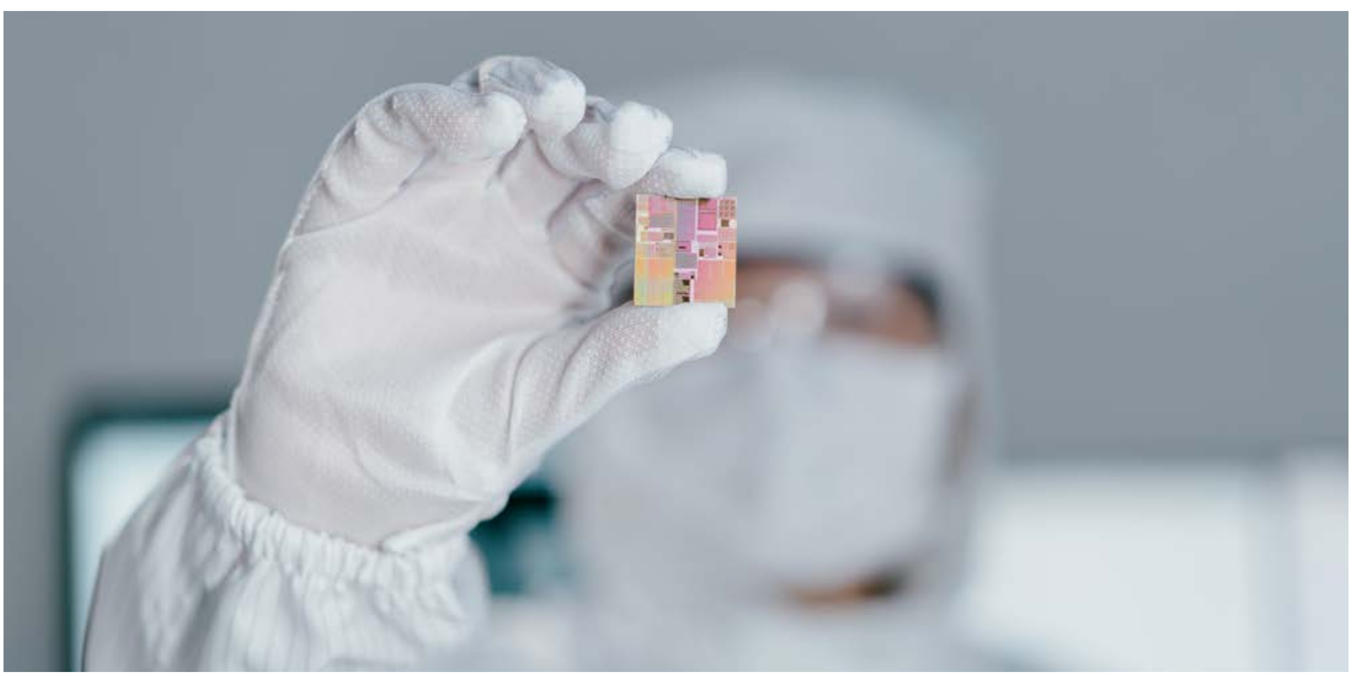
Policymakers need a new response to the geopolitical and geoeconomic reality that America faces today. For decades, the U.S. government has maintained its Cold War approach—staying primarily hands-off as the private sector molded the economy and developed an integrated, globalized system.[7] This strategy worked against a Soviet adversary that was disconnected from the rest of the world, and therefore ill-equipped to benefit from the global economic system. But this is no longer the reality. The United States now faces China—an economic, technological, and military power that is fully integrated into the globalized system. America's economic and security toolkit—predominantly shaped by the Cold War—is insufficient for the geopolitical competition the country faces.[8]

The U.S. government is working to develop the appropriate strategy toward China, one that takes all vectors into account: economic, military, technological, and political. For example, the United States is focused on how to reduce its reliance on China for an array of critical supplies and materials—dependencies made abundantly evident during the COVID-19 pandemic. At the same time, the U.S. government is working to combat China's illicit or anti-competitive economic practices that have eroded many of the benefits of the globalized system.

A key component for this burgeoning strategy will be industrial policy, which generally refers to government-led efforts to promote the development and growth of aspects of a country's economy. Because critics often equate them with heavy-handed government intervention or fruitless attempts to interfere in the free market, industrial policies had by the late 1980s fallen out of favor in U.S. policy circles. More recently, however, policymakers from both sides of the aisle have warmed up to the idea, particularly when applied narrowly to certain industries or sectors.

This report provides a framework for a new American industrial policy strategy. It lays out what an American industrial policy *is* and what it *is not*, focuses on why the nation needs an industrial policy strategy, and offers a schema for how the United States should craft such a strategy. The report also examines the history of U.S. industrial policy. Leaders from Alexander Hamilton to Franklin D. Roosevelt to Donald Trump and Joe Biden have applied industrial policy, even when obscured by different names. Finally, the report includes recommendations for policymakers to develop a blueprint for a strategy that ensures U.S. economic, technological, and national security resilience and competitiveness.

The aim of the report is to give the concept of industrial policy a much-needed reset. The United States faces myriad challenges—both foreign and domestic—with interwoven security, economic, and technological roots. Now is the time for a new approach.



China has increased its research and development spending in recent years to boost its science and technology base. Some analysts argue that China may pass U.S. spending this decade if it maintains its current trajectory. (Sinology/Getty Images)

WHAT DETERMINES SUCCESS IN INDUSTRIAL POLICY IS NOT THE ABILITY TO PICK WINNERS, BUT THE CAPACITY TO LET THE LOSERS GO.[9]

—DANI RODRIK, ECONOMIST

What We Mean When We Say "Industrial Policy"

Few phrases in Washington policy circles are more fraught than "industrial policy." Despite the running joke that it is the equivalent of the worst four-letter swear words and not to be uttered in polite company, the reality is that ideas and legislation percolating across the political spectrum—the America COMPETES Act and the United States Innovation and Competition Act, and smaller bills such as the Onshoring Rare Earths Act of 2020—are industrial policy. Republican Senator Marco Rubio even embraced the phrase in a May 2021 speech on the Senate floor.[10]

The authors of this report chose to call a spade a spade and not come up with a catchy euphemism. In doing so, it is important to clearly state what industrial policy is and what it is not.

What American Industrial Policy Is

American industrial policy is any measure of government engagement in the free market to produce economic outcomes in the national interest that markets would not take on their own. Practically speaking, this means actions by U.S. leaders to develop, grow, or reorient parts or all of the economy to achieve a specific objective.[11] The goal is to ensure long-term competitiveness in critical technology areas, establish secure and resilient supply chains, and safeguard the day-to-day functioning of society in times of crisis.

What American Industrial Policy Is Not

Not on the industrial policy menu are attempts to shield manufacturing jobs in declining industries or 'picking winners and losers' by shaping the business activities of single companies. Such actions create market distortions and moral hazards that are deserved targets of criticism.[12]

Definitions matter. More important, though, is ensuring that words translate into action. How industrial policy is implemented will have outsized effects on the health and growth of the U.S. economy, how the United States engages with its allies, and whether it can outmaneuver China in strategic competition.

Why the United States Needs a National Industrial Policy Strategy

The case for a national industrial policy strategy is twofold. First, the United States needs a strategy to effectively compete against China and lessen its reliance on that country for key inputs. Second, the United States needs an industrial policy that transcends the China challenge because it has a strategic interest in maintaining a strong industrial base—one that can ensure military readiness and emergency preparedness, and make the most of the country's advantages in innovation and competition.

While the United States is already implementing forms of industrial policy, it is doing so in a piecemeal fashion. U.S. leaders need to articulate a clear, long-term vision for a comprehensive industrial policy that moves beyond remedying vulnerabilities revealed by recent crises, such as the COVID-19 pandemic and subsequent supply chain disruptions.

Tackling the China Challenge

The United States is engaged in a far-reaching strategic competition with a formidable opponent. China poses a direct challenge to the economic strength and national security of the United States and its allies. The development, mastery, and use of technologies—including microelectronics, artificial intelligence, biotechnologies, and quantum science—play an outsized role in this competition, because they hold transformational potential for economies and societies.

The United States, for decades the global science and technology powerhouse, has allowed many of its most valuable strengths—people, research and development (R&D) investments, infrastructure, and resources—to atrophy in recent years. In the 1960s, U.S. total national R&D spending (public and private) was close to 70 percent of all R&D funding globally.[13] Since then, other countries have ramped up their investments, and the U.S. share of global spending has declined, falling to 27 percent by 2019.[14]

China has boosted investments in its science and technology (S&T) base. In 1991, China's R&D spending accounted for 0.72 percent of its gross domestic product.[15] That number rose to 2.14 percent by 2018, according to the Organisation for Economic Co-Operation and Development.[16] A 2022 report from the National Science Foundation found that, "The annual increase of China's R&D, averaging 10.6 percent annually from 2010 to 2019, continues to greatly exceed that of the United States, with an annual average of 5.4 percent from 2010 to 2019."[17] As the R&D spending gap narrows between China and the United States, some analysts estimate that China may surpass U.S. spending by the mid-2020s (in purchasing power parity–adjusted dollars).[18] China has also made remarkable strides in high-tech manufacturing, more than doubling its global share (10 percent to 24 percent) between 2008 and 2018.[19]

The U.S. human capital pipeline—the foundation of the nation's economic and technological competitiveness—is atrophying for lack of adequate talent. Underinvestment in science, technology, engineering, and mathematics (STEM) education and restrictive, cumbersome immigration policies have strained the country's talent base. And while the United States has passed legislation that targets specific sectors (for example Biden's infrastructure package) and has proposed legislation that targets others (for example the America COMPETES Act), these efforts lack an overarching strategy for how the nation should prioritize and allocate its finite resources, investments, and people.

China has also unveiled and implemented a wide range of national strategies, including Made in China 2025, the Belt and Road Initiative, the military-civil fusion strategy, and China Standards 2035. They represent China's approach to industrial policy. Economic practices that are ultimately anti-competitive and, at times, illicit are a hallmark of these policies. China's Dual Circulation Strategy, first announced in May 2020, aims to increase domestic reliance and shield the country from disruption in the global market.[20] Along with other Chinese actions such as intellectual property theft, commercial and academic espionage, and forced technology transfer, these strategies have led to wide-reaching disruptions in the global market.

The United States should obviously not replicate China's version of industrial policy, which opposes the openness on which U.S. political and economic values thrive. A tailored and scoped industrial policy is required, however, to reset the terms of global competition with China.[21] A proactive and unified industrial policy strategy can help the United States prioritize the resources, investments, and technology it needs today, and for the future. An overarching framework for this will help relevant agencies establish effective practices in areas such as taxes, regulations, and immigration, in alignment with free market principles and American values.

A proactive and unified industrial policy strategy can help the United States prioritize the resources, investments, and technology it needs today, and for the future.

When crafting and adopting an industrial policy strategy, the United States must ensure it does not resort to strictly protectionist measures. As Chad P. Bown and Douglas A. Irwin explain in the *The New York Times*, "an industrial policy that is entirely domestic may actually backfire."[22] Instead, the United States should rely on its allies and partners to diversify away from China in critical materials such as medical supplies and technologies such as semiconductors. As Bown and Irwin write, "Without such coordination, even like-minded countries might end up in bidding wars by giving ever larger subsidies to lure semiconductor manufacturers to their shores. That could result in industry excess capacity, trade disputes and tariffs that close off markets."[23] Coordinating this kind of strategy will be challenging, but instrumental to ensure an industrial policy strategy that reaches America's domestic and international economic and security objectives.

Bolstering American Competitiveness

The United States needs an industrial policy strategy to do more than just effectively compete with China. A comprehensive industrial policy strategy should also promote U.S. economic prosperity, bolster national defense, and address societal challenges. Policymakers should develop an approach that tackles issues ranging from

U.S. lawmakers have advocated for using industrial policy tools to tackle climate and clean energy priorities. Green technology, such as wind turbines, could be a key pillar of a U.S. industrial policy strategy. (AerialPerspective Images/Getty Images)

combating climate change to reforming infrastructure to securing the semiconductor supply chain. The new industrial policy strategy should straddle the domestic and foreign policy spheres—providing connective tissue in key areas with both national security and economic security implications.[24]

In the past several years, policymakers have pushed hard for industrial policy efforts aimed at technology to address climate change and clean energy. Biden's infrastructure legislation, for instance, is a clear example of industrial policy. While the package includes investments for what is typically thought of as infrastructure—roads, bridges, rails—it also allocates millions of dollars for initiatives that target high-speed internet access, safe drinking water, and clean energy technologies.[25] National Economic Council Director Brian Deese said of his time during former President Barack Obama's administration, "Some of the biggest opportunities were at the intersection of strategic procurement, what some people would call straight-out industrial policy, and the work we needed to do as a country to scale markets for clean-energy innovation."[26]

An industrial policy strategy could also provide policymakers a roadmap for addressing issues with overlapping national security and economic security objectives. Modernization and growing economic interdependence have caused the two to converge—often linking America's economic goals with its defense priorities. Many of the country's authorities that empower the government to shape, control, or defend critical industries or technology, for example the Defense Production Act and export controls, are built to address national security concerns. An industrial policy strategy, and the economic tools that would put into effect such a strategy, could help policymakers shift their focus to developing a plan that tackles not just national defense, but also national *needs*.[27]

The United States must develop a new toolkit to meet the challenges it faces today. An industrial policy strategy crafted to address a powerful China and formidable domestic challenges is a critical tool at America's disposal. U.S. history holds important lessons for the present.

> THE PEOPLE OF THIS COUNTRY WANT AN INDUSTRIAL POLICY THAT IS FOR AMERICA AND AMERICANS.[28]
>
> **—WILLIAM MCKINLEY**

How the United States Has Used Industrial Policy in the Past

Even though past U.S. industrial policies have been successful, there has been no formal, long-term U.S. national industrial policy strategy to maintain momentum and continue to fine-tune lessons learned. Sporadic successes addressing immediate concerns have kept the United States competitive. But the future of global strategic competition will be defined by the goals and values of the frontrunner. The United States cannot afford to cede that leadership.

This section reviews examples of past U.S. industrial or technology policies. A pattern emerges of employing what can be considered to be industrial policy, while failing to clearly articulate and maintain a long-standing U.S. national strategy.

The Birth of an Industrial Nation

American statesman Alexander Hamilton is the founding father of U.S. industrial policy. He pioneered the early government's employment of investments, tariffs, and subsidies in support of private industry and manufacturing—pursuing public ends through private means.[29] While serving as the first Secretary of the Treasury, Hamilton vigorously strove to pay off outstanding debts from the War of Independence, to promote the creation of a national bank, and to solidify his vision of a truly independent economic system through ratification of the U.S. Constitution on June 21, 1788.[30]

Building on Hamilton's call for a national economic identity, Speaker of the House Henry Clay spent two days on the House floor and wrote 40 pages in March 1824, championing protective tariffs in support of "a genuine American System."[31] Clay argued: "we must naturalize the arts in our country, and must naturalize them by the only means which the wisdom of nations has yet discovered to be effectual—by adequate protection against the otherwise overwhelming influence of foreigners."[32] Calling for the filling of American gaps with American goods, Clay's two-day speech was a hit among Middle Atlantic and Northwestern states and helped spur into law the Tariff of 1824.[33]

Hamilton's approach of bringing together resources from the public and private sectors, alongside Clay's ideal of an "American System," resurfaced a number of times over the following decades, but perhaps most prominently to tackle the major global crises of the first half of the 20th century. The onset of World War I saw the establishment of the 1917 War Industries Board; Franklin D. Roosevelt's National Industrial Recovery Act precipitated the National Recovery Administration in 1933; and the World War II War Production Board was created in 1942. These bodies sought to facilitate industry, labor, and government coordination of U.S. manufacturing, pricing, and distribution of goods and services to address an immediate need—and they also set the stage for future, strategic peacetime collaboration.[34]

A New Frontier for Science and Technology

Massachusetts Institute of Technology engineering professor Vannevar Bush, who also founded Raytheon and eventually led the Manhattan Project, was the driving force for the industrial policies that set the stage for U.S. success in the Cold War.

Concerned about the United States' lack of technological preparedness at the onset of World War II, Bush advocated for the establishment of the National Defense Research Committee (NDRC) in 1940 to focus on research and development of defense technologies. He served as chairman of the NDRC, before becoming director of the newly minted Office of Scientific Research and Development (OSRD) in 1942.[35] Both the NDRC and the OSRD sought to convene various scientific experts to coordinate and prioritize government contracts with universities and industrial laboratories. With the aim of harnessing private sector innovation and quickly reestablishing a competitive technological edge, such collaboration avoided pouring resources into building more national laboratories.

In his hallmark report, "Science, the Endless Frontier" (1945), Bush continued to champion the importance of basic research from private industry and academia. He had witnessed the unprecedented coordination between industry, government, and academia during World War II, to "produce war materials with little concern for such complications as international competitiveness, antitrust laws, or competing national objectives."[36]

Bush's persuasive arguments inspired decades of R&D investments and the creation of the National Science Foundation, which today maintains an annual budget of $8.8 billion and funds roughly 25 percent of all federally supported basic research put forward by U.S. academic institutions.[37] His contributions helped generate an innovation environment conducive to the emergence of technologies such as the global positioning system and early internet, which continue to underpin today's advancements.[38]

Cold War Era Ebbs and Flows

The R&D investment groundwork laid by Vannevar Bush, in conjunction with a vigorous military buildup, primed the United States to eventually surpass Soviet forces in technological might during the Cold War. But not before the Soviet Union kicked off the U.S.-USSR space race by successfully sending the world's first satellite, Sputnik I, into orbit in October 1957. This lag on the part of the United States rattled the American public, especially after the Soviets launched a second satellite, Sputnik II, and the United States failed in its first attempt to do so.[39]

The need for sustained R&D and a rapid revamp of the U.S. science and technology base was clear, as was the need for a common battle cry or national objective. As a matter of national pride and necessity, government, industry, academia, and the general public were invested in building expertise and streamlining U.S. technological dominance in space.[40]

The United States whipped into action by dramatically ramping up federal support for R&D. It incentivized students to study STEM and funded their STEM and foreign language training through legislation such as the National Defense Education Act (NDEA) of 1958.[41] Congress formed the National Aeronautics and Space Administration (NASA) in July of the same year—with a massive annual budget of $100 million to land a man on the moon—as well as the Advanced Research Projects Agency (ARPA), later the Defense Advanced Research Projects Agency (DARPA), to ensure that the United States would be "the initiator and not the victim of strategic technological surprises."[42] Both NASA and ARPA led to innovation far beyond the scope of the Cold War, including technologies ranging from computed tomography scans and artificial limbs to stealth aircraft and voice recognition.[43]

The need for sustained R&D and a rapid revamp of the U.S. science and technology base was clear, as was the need for a common battle cry or national objective.

This sudden expansion of resources and collaboration catapulted the United States into a new era of technological competitiveness. The U.S. government continued to bolster S&T during the next 30 years via more targeted legislation. The 1980 Bayh-Dole Act and Stevenson Wydler Technology Innovation Act, along with the 1982 Small Business Innovation Research program, encouraged more collaboration between industry and government through intellectual property sharing and technology transfer frameworks.[44]

When needed, the United States has engaged more directly, as was the case with the U.S. semiconductor industry in 1987. Up against highly competitive Japanese firms, U.S. global semiconductor production dipped from a steady 60 percent in the preceding two decades to below 40 percent by the end of the 1980s. To mitigate this budding crisis, the federal government partnered with SEMATECH (Semiconductor Manufacturing Technology), a consortium comprising 14 U.S.-based semiconductor companies, and contributed approximately $870 million of DARPA funding to fortify the industry. That sum was ultimately matched by industry participants, and within 10 years the U.S. chip-making industry was back in a position of global leadership.[45]

More Recent Industrial Policies

In the past 30 years, the U.S. government has taken a more laissez-faire stance on regulation, with private companies primarily pushing technological development. Government engagement in industry developments has periodically ramped up to address immediate issues, but the Trump administration's National Strategy for Critical and Emerging Technologies was lackluster, as was the Onshoring Rare Earths Act of 2020, especially by comparison with Operation Warp Speed (OWS) in 2020, which streamlined COVID-19 vaccine development via government partnership with vaccine providers.

Articulating a broad, overarching vision without deploying targeted implementation represents only paying lip service to grand strategy, while disjointed sector legislation is fired off without a unifying call to action. Such an approach promises inefficiencies and mission burnout. A successful and sustainable industrial policy push requires both a shared national objective and, pursuant to its end, the deployment of various tools and sub strategies by all relevant stakeholders. Reflecting on recent successes and failures underscores the importance of this two-pronged approach.

The Trump administration formally announced OWS in May 2020, just two months after the World Health Organization declared the COVID-19 outbreak a global pandemic. The initiative, shared by the Defense Department and the Department of Health and Human Services, provided a means by which the federal government could partner with six vaccine providers to streamline clinical trials on a parallel basis, in the hopes of accelerating the development of various promising vaccines via Defense Production Act authorities.[46] Outlined in a McKinsey and Company report released in March 2021, OWS contributed to the development of these critical vaccines in roughly 10 short months. By contrast, it took 10 years to develop a measles vaccine, and 43 years to develop an Ebola vaccine.[47] As U.S. Army Materiel Command Chief General Gus Perna, who ran OWS, stated in an interview with *Defense News*, the operation's impressive success was rooted in a clear purpose, "absolute priority and resources to do the mission," and "unity of effort" across government, industry, and the academic and scientific communities—making it comparable in those ways to the space race.[48]

Meanwhile, broader efforts not tied to a particular dynamic or objective, such as the Trump administration's National Strategy for Critical and Emerging Technologies (October 2020), lacked teeth for implementation and enforcement. Mary Brooks of *The National Interest* called the strategy "underdeveloped and underleveraged."[49] More specific efforts such as the National Quantum Initiative Act (December 2018), the Maintaining American Leadership in Artificial Intelligence Executive Order (February 2019), the Onshoring Rare Earths Act of 2020, or even Biden's infrastructure package have been hobbled by not being tied to a clearly articulated, overarching national strategy.[50]

Without a common objective, hodgepodge efforts often fall flat—if they make it through the partisan wringer. The U.S. Senate and House of Representatives have yet to come to an agreement on key legislation to better position the United States for competition with China. The U.S. Innovation and Competition Act, passed by the Senate, includes $52 billion worth of federal investments for semiconductor fabrication plants (fabs) and new R&D funding. The House passed the similar America COMPETES Act in February 2022, but, just as in the search for a modified version of the Facilitating American-Built Semiconductors (FABS) Act to provide semiconductor investment tax credits, key differences between the two chambers have yet to be resolved.[51] The original bills comprising this legislation were introduced more than a year earlier and have been languishing in a partisan tug of war, pointing to the peril of not having a unifying and shared strategic objective.

> **A successful and sustainable industrial policy push requires both a shared national objective and the deployment of various tools and sub strategies, by all relevant stakeholders, pursuant to its end.**

More recently, this past February, the White House announced the Biden-Harris Plan to Revitalize American Manufacturing and Secure Critical Supply Chains in 2022, following the one-year anniversary of Biden's Executive Order on America's Supply Chains.[52] This tranche of legislation and supply chain framework could provide a platform for the development of a more unifying U.S national industrial policy strategy. However, it requires the articulation of consistent, key actions that can be more narrowly applied to the realities of each sector and scenario.

Industrial policy, as defined in this report, is fundamental to America's identity and legacy. There have been moments of impressive, rapid innovation and mobilization, but U.S. history overall shows a chronic lack of continuity between various industrial policies and long-term national objectives—thus, a disparity between stakeholder motivation and resource allocation. An overarching U.S. national industrial strategy offers that linkage.

Chip Vignettes: Other Countries' Industrial Policies

A national industrial policy can take many forms, particularly because it must play to a country's strengths. There is no viable one-size-fits-all strategy. As noted, the United States has adopted varying degrees of industrial policies in the past to either safeguard American competitiveness or buttress strategic industries. The following section broadens the aperture of this discussion by looking at the industrial policies deployed by other countries that sought to promote and protect an identified critical industry. Although these case studies are useful for distilling lessons, successes in other countries do not necessarily translate to success in the United States. Similarly, as industry and the geopolitical landscape evolve, so too do market forces that shape industrial policies.

This section explores three countries, each pursuing indigenous semiconductor design or manufacturing capabilities for strategic purposes. The first example is Japan's rapid rise in the late 1980s, through government incentives and the creation of the Very Large Scale Integrated (VLSI) Semiconductor Research Project, which catapulted Japanese design ahead of the once-dominant American industry. Next it turns to the Taiwanese government's identification of semiconductor manufacturing as a strategic industry and the policies Taiwan pursued to create its crown jewel: the Taiwan Semiconductor Manufacturing Company (TSMC). Finally, this section closes with an analysis of Singapore's failed attempts to replicate Taiwan's semiconductor manufacturing industry with its Chartered Semiconductor Manufacturing company (CSM), showing how government intervention can swing too far by hurting strategic industries when mismanaged with underlying market forces.

Japan Takes on the Semiconductor Market

The rapid rise of Japanese semiconductor design and manufacturing capabilities offers an example of an industrial policy that identified a strategic industry and leveraged the country's domestic strengths to achieve success. Through government incentives, cooperation among competitors, and risk-tolerant policies, Japan became one of the dominant semiconductor equipment producers by the late 1980s. In the late 1970s, American suppliers provided nearly 90 percent of the world's semiconductor manufacturing equipment and were at the cutting edge of research and design. Only a decade later, in 1989, Japanese firms flipped the script and held close to 70 percent of the market.[53]

The United States established itself as the leading semiconductor producer in the 1950s, through heavy government investments and public-private partnerships.[54] At first, semiconductor producers largely made their own chips in house. But as the semiconductor industry grew and matured, design requirements became more complex and firms began to outsource manufacturing to specialized contactors. As a result, costs decreased and productivity soared.

Two U.S. companies took advantage of this shift: Perkin-Elmer and the Geophysics Corporation of America (GCA). By the 1970s, the two were market leaders in their respective design techniques, largely enabled by government research grants. The Perkin-Elmer Micralign, a family of aligners, had success in dramatically accelerating integrated circuit manufacturing by lowering defect rates.[55] Because this aligner technique was limited in how much detail it could project onto a wafer, GCA ultimately pursued a new form of manufacturing procedure using steppers.[56] Although steppers had lesser defect rates than the aligners used by companies such as Perkin-Elmer, they were far slower and more expensive.

Semiconductors are a key element of critical technologies that societies rely on in the 21st century. Multiple countries have implemented industrial policies aimed at promoting and protecting their semiconductor industries. (Sinology/Getty Images)

Japanese leaders identified a market opportunity. If Japan could establish an indigenous semiconductor industry that offered high performance manufacturing at a fraction of the cost of processes used in the United States, it would be a highly desirable alternative. The only challenge was that Japan did not possess the necessary capabilities. As an initial approach, in the 1960s the Japanese government adopted a policy of semiconductor technology transfer, which required foreign companies wishing to enter the Japanese market to form a joint venture with a local business.[57] Japan hoped this would give local players the chance to absorb as much knowledge as they could from the foreign company, with hopes of eventually replacing them. The policy was largely a success, with Japan's semiconductor market managing to keep pace with America's booming industry.[58] However, Japanese firms still did not possess the ways and means to develop their own equipment or manufacturing techniques. In response, Japan's government established the new Very Large Scale Integrated Technology Research Association. The organization's successful VLSI Semiconductor Research Project transitioned Japan from being a fast follower to a global leader.

> **If Japan could establish an indigenous semiconductor industry that offered high performance manufacturing at a fraction of the cost of processes used in the United States, it would be a highly desirable alternative.**

As demand for semiconductors continued to grow throughout the 1970s, the disparity between the United States and Japan became clearer. Until this point, U.S. producers still outpaced Japan and maintained the gap. With Perkin Elmer and GCA dominating chip-making equipment, Japanese officials recognized the impending danger of a lagging industry. Japanese politician Hashimoto Tomisaburo urged, "we have too many computer makers in Japan to cope with the monster, IBM . . . the reorganization of the computer industry and the establishment of a more unified and more integrated development organization for VLSI technology are urgently needed."[59] Shortly thereafter, Japan's Liberal Democratic Party successfully lobbied the Ministry of International Trade and Industry to form the Very Large Scale Integrated Semiconductor Research Project in 1976, which would last four years.

The VLSI consortium brought together some of Japan's top semiconductor leaders to design the next generation of chip-manufacturing techniques. By working together, companies such as Fukitusa, Hitachi, Mitsubishi Electric, NEC, and Toshiba complemented each other in the R&D process and created an environment that incentivized cooperation over competition.[60] This was not always easy, given the cultural differences and these companies' identities as former competitors, but under the leadership of VLSI Managing Director Masato Nebashi, the consortium succeeded. By the end of the VLSI project, Japan was no longer just a fast follower but a clear leader in semiconductor manufacturing knowledge and design. The joint research efforts pursued through the consortium produced more than 1,000 patent applications, 16 percent of which included members of different companies.[61]

Through this government-initiated research consortium, Japan sped past its competition to develop electron beam technology, enabling the production of cutting-edge 1-micrometer chips. It was an industrial policy that would set up a decades-long dominance by Japanese firms in chip design and manufacturing equipment. While in the long run Japan did not maintain the dominance of its lithography industry, this case study offers a useful example of a proactive government approach that identified a strategic industry and developed incentive structures that created cooperation among competitors and benefited them all.

Taiwan and the Rise of TSMC

No discussion of the global semiconductor industry is complete without mention of the Taiwan Semiconductor Manufacturing Company. Accounting for more than 50 percent of the global market for semiconductors, TSMC far outpaces other chip-manufacturing companies in the world. In 2020, it reported $115 billion in annual revenue.[62] Industrial policies deployed by the Taiwan government created the conditions for TSMC's success and its position as the world's largest and most advanced semiconductor manufacturer. Taiwan used public-private partnerships to accelerate the blossoming chip-manufacturing industry.

Compared to the United States, which practically created the semiconductor industry, Taiwan entered late in the game. It first tapped into the industry just as semiconductor producers began to outsource manufacturing to specialized contractors. Because of this, Taiwan's Ministry of Economic Affairs recognized that specializing in semiconductor manufacturers offered a strategic opportunity and began laying the groundwork

A technician examines a silicon wafer, a material used for producing semiconductors. Taiwan's capacity to manufacture semiconductors is unmatched and Taiwan has become the semiconductor hub of the world. Taiwan's manufacturing base is a direct result of a thorough and scoped industrial policy implemented by the Taiwanese government. (Kecl/Getty Images)

for TSMC's rise. During the early 1970s, however, Taiwan lacked the industrial base and indigenous knowledge to be a global competitor. Its economy was primarily agrarian and housed only a small electronics manufacturing capability.[63]

From the beginning, debates within the Ministry of Economic Affairs centered on the best approach to building Taiwan's semiconductor market competitiveness and leveraging the country's relative strengths. Wu Ta-you, a prominent figure in these arguments, would later become director of the National Science Council. Ta-you supported policies for funding foundational electrical engineering sciences for semiconductors, with the intent of rooting the industry in Taiwan. Chiang Ching-kuo, premier of the Republic of China, went further than Ta-you by saying, "we should not spend our limited resources on basic research, but should focus on applied research for industrial purposes."[64] Accordingly, the focus would be on tangible, applied research that would propel Taiwan from being a small agricultural country to a modern-day technological powerhouse.

To overcome the dramatic technological barrier and launch this program, Taiwan needed significant public and private sector investment. Naturally, private firms were averse to investing capital in the risky venture, especially one as capital-intensive as semiconductor manufacturing. Overcoming this situation is a model example of an industrial policy that, while shaping industry, also leveraged free market forces and competition. First, in 1973 Taiwan created the Industrial Technology Research Institute (ITRI), which would serve as a publicly funded laboratory and conduct applied research.[65] Through this initial up-front investment, Taiwan hoped the advancements made at ITRI would be transferred to private companies, thus benefiting the country's indigenous manufacturing industry.

Shortly thereafter, ITRI created the Electronics Research and Service Organization (ERSO), which would serve as the governmental arm for semiconductor-related industrial policies. ERSO's first project was to reach a technology transfer agreement with U.S.-based Radio Corporation of America (RCA), which occurred in 1975. This agreement, the "CMOS IC Technology Transfer Licensing Agreement" (complementary metal oxide semiconductors integrated circuits), would be the catalyst that created the modern-day chip powerhouse. Paying the company several million dollars for one of its chip-manufacturing processes—called CMOS—Taiwan launched its semiconductor industry. As part of the deal, RCA sent groups of engineers to the ITRI campus to share the basics of chip manufacturing, industry knowledge, and even management techniques, all of which had a significant effect on Taiwan's industrial understanding and culture.[66] Concurrent with the RCA deal, the government also invested more than $10 million in the basic technology research that was needed to support the growing semiconductor industry.[67]

An important aspect of the RCA agreement was that it did not give Taiwan state-of-the-art technology, instead providing only equipment that was a few generations behind. While the country gained invaluable experience and expertise, it was not at the forefront of the field as it is today. RCA's exit from the semiconductor industry, however, gave Taiwan the complete license over its technology, which played significantly to Taiwan's favor. The specific type of chip Taiwan obtained from RCA—CMOS—at the time was a niche corner of the chip market and still in early stage development. Through a bit of luck, but primarily a proactive and strategic approach by the Taiwanese government, this gamble paid off in a major way for the country, as CMOS would later become the dominant chip-manufacturing method process.

Using the technologies gained through the RCA agreement, in 1980 ERSO created its first foundry, called the United Microelectronics Corporation (UMC).[68] The Taiwanese government provided UMC with the technology and played an active role in recruiting and training engineers at the foundry. Unsurprisingly, UMC quickly became the most profitable manufacturer in the country—but did not become the chip leader Taiwan wanted, because it was not competing with foreign companies at the level necessary. UMC quickly found itself stuck in lower-end chips that would not accelerate the industry.

> **Accordingly, the focus would be on tangible, applied research that could propel Taiwan from a small agricultural country to a modern-day technological powerhouse.**

Enter the Taiwan Semiconductor Manufacturing Company. TSMC, founded in 1987, was meant to address the ongoing absence of private sector investment in Taiwan's chip industry. While the government heavily funded the foundry's creation, it stipulated it would hold only 50 percent of the company's shares. Taiwanese government officials recognized that pure injection of money into the industry would not be sustainable or effective. Instead, it needed to stimulate sufficient buy-in from private companies that, in the long run, would advance the industry. Philips Electronics, a Dutch company, partnered with Taiwan by taking 35 percent of TSMC's shares and agreed to provide its advanced 1.5 micron manufacturing process.[69]

As a result of early investments in a strategic industry, the Taiwan government laid the groundwork for what is now the country's crown jewel. As the demand for semiconductors continues to accelerate, TSMC is the linchpin supporting the industry. A decade after TSMC's founding, the company continued to make successive advancements in state-of-the-art chip-manufacturing techniques, opening an $800 million fab site in 1994 and a $1.2 billion facility in 1995.[70] By successfully investing in the early technologies, and accepting a degree of risk with the RCA CMOS process, the Taiwanese government was able to step back and adjust its engagement with TSMC to focus on complementary efforts. In 2021, for example, it announced a $300 million investment in advanced-degree programs and other R&D-focused programs.[71] The successful early government intervention, paired with a pragmatic approach, makes TSMC a premier example of industrial policy in action.

Singapore's Shortfall: Chartered Semiconductor Manufacturing

During Taiwan's ascendancy in semiconductor manufacturing, Singapore also tried to become a global leader with its leading company, Chartered Semiconductor Manufacturing. Like Taiwan, Singapore pursued industrial policies that leveraged partnerships between the private and public sectors and played to the country's strengths. But unlike their Taiwanese counterparts, Singaporean firms emphasized partnerships with foreign corporations. During the 1970s, its government leaders decided that with its business-friendly environment and already growing S&T base, the nation was ripe for developing semiconductor manufacturing capacity. But during the next few decades, Singapore's efforts would not mature as Taiwan's did, due to lack of protectionist policies against China and other competitors.

At first glance, Singapore's leadership had a much stronger foundation to build on compared to their counterparts in Taiwan. Chartered Industries of Singapore (CIS)—a group of companies interested in science, technology, and financial services later known as Singapore Technologies Group—was already a vendor for defense technologies by the time the government identified chip manufacturing as a critical national industry. The government selected CIS to initiate the country's semiconductor industry, leading to the creation of CSM in 1987.[72]

CSM became Singapore's national champion for semiconductors and made considerable progress. By partnering with U.S. chip maker Sierra Semiconductor, CSM improved its manufacturing process and achieved its 0.6 micro process in 1994—a major milestone for the company and for the industry at large.[73] Soon thereafter it partnered with Toshiba, which prompted the building of more foundries in Singapore. At the same time, the government backed CSM's development through risk-tolerant policies and tax incentives for companies to transfer their manufacturing capabilities to Singapore. Unlike Japan and Taiwan, Singapore developed its capabilities through foreign direct investment from global companies, particularly Micron and GlobalFoundries.[74]

A small country, Singapore could not bring to bear the resources that the United States has to adjust industrial policies and to take on the China challenge.

Singapore's semiconductor industry experienced a period of rapid success. In 1960, the country had a developing economy and per capita income of $1,300. By 1995, this figure had skyrocketed to $25,000, and the Organisation of Economic Co-Operation and Development classified it as a dynamic Asian economy.[75] The semiconductor industry employed more than 21,000 technical experts by the late 1990s, generating USD $8.3 billion in 1996 alone.[76] But the success did not last long.

In 2009, Abu Dhabi's sovereign wealth fund purchased CSM, a bookend to the small nation's silicon aspirations. Part of Singapore's semiconductor industry downfall is attributable to the influx of low-cost semiconductor fabs from China, which significantly upended the semiconductor manufacturing market. After entering the World Trade Organization in 2000, China began offering heavy government subsidies to incentivize foundries to relocate within its borders, capturing portions of the lower-end semiconductor value chain.[77] China's firms gained knowledge of the technology used to manufacture chips in the same way Singapore's foundries did—by learning from and ultimately replacing foreign talent. This enabled China to quickly catch up and offer an attractive alternative to Singapore-backed foundries. Chip designers such as Intel and IBM were likewise incentivized to choose these Chinese fabs, given the lower costs.

Being boxed out by Chinese alternatives was not the only force that led to CSM's demise. In 1998, TSMC announced it would form the Systems-on-Silicon Manufacturing Company in Singapore, investing SGD $2 billion into the project to pressure CSM and inject more low-end chip manufacturers into the market.[78] As a result, CSM had to lower its prices, quickly eating into its gross margins and starving the company of resources needed to keep pace with TSMC. The final nail in CSM's coffin was Samsung's decision to enter the top-tier chip-manufacturing space by building its own foundry, which was made possible by its deep coffers and convenient experience in the sector. Samsung quickly pushed past CSM and left it in a failing market.

Singapore's policies were highly successful at first, capitalizing on the country's educated population, existing tech sector, and targeted incentives. However, the eventual collapse of its semiconductor industry is a cautionary tale about how quickly winds can shift. The industry evolved rapidly, but government policies did not adjust accordingly. A small country, Singapore could not bring to bear the resources that the United States has to adjust industrial policies and to take on the China challenge.

Lessons from American history and other countries should inform what a new U.S. industrial policy should be. By examining them in the current context of a strategic competition with technology at the center, core actions to guide American industrial policy are clear.

Key Actions for Executing a New American Industrial Policy

Deploying industrial policy well will require a sustained and disciplined set of actions by America's political leaders, along with active support and engagement by industry executives. These policies must be planned, implemented, and updated within the framework of a national technology strategy. As defined in an earlier CNAS report:

> The strategy must be a whole-of-nation approach—including human capital, infrastructure, investments, tax and regulatory policies, and institutional and bureaucratic processes—to preserve its current advantages and to create new ones. The overarching goal for this strategy should be to maintain the United States' standing as the world's premier technology power so that it can empower its citizens, compete economically, and secure its national interests without having to compromise its values or sovereignty.[79]

Six distinct but interrelated core actions are key to successfully executing industrial policy. These actions, paired with top-level recommendations, form the framework for a new American industrial policy. A forthcoming report will offer an in-depth analysis of the American industrial policy toolkit, as well as specific actionable policy recommendations.

Issue a Clarion Call

A new American industrial policy will ensure that the United States produces the technology and knowledge it needs to outcompete. What is missing is a clarion call. The lack of a unifying message and the elaboration of an ambitious, yet achievable objective makes it challenging to enact comprehensive legislation, prioritize resources, and rally society.

As such, the president should:

- **Articulate a vision and objectives for continued American economic competitiveness and technological leadership.**

This vision should explain how economic security is national security. The goal of the vision should be to secure the United States' standing as the world's premier technology power so that it can empower its citizens, compete economically, and secure its geostrategic interests without having to compromise its values or sovereignty.[80] Part of the U.S. success in the Cold War was its ability to establish attainable national objectives with clear metrics. President John F. Kennedy's call to land a man on the moon was unambiguous, which helped government agencies direct their R&D investments and inspired the public to galvanize around a common objective.[81]

Failing to articulate America's strategic objectives and how to achieve them will blunt the effectiveness of otherwise well-intentioned legislation. U.S. policymakers have only nibbled at the edges with reactive executive-branch actions and legislation on issues such as chip shortages and concerns over rare earths supply chains. These efforts would be more effective as part of a comprehensive approach. In the case of semiconductors, for example, the overwhelming focus has been on building new fabs. Little discussed are other key parts of the value chain—R&D, design, assembly, packaging, testing, capital equipment, and human talent—and the reality that there are clear limits to what the United States can do alone and where international partnerships are necessary.

Achieving these objectives also requires tradeoffs. Policymakers need to convey what technology areas to prioritize in order to craft relevant policies. Clear guidance on where the country must maintain its lead, where it needs to catch up, what it must protect, where it can afford to be a fast follower, and how it should engage internationally, all these factors affect which actions and policies are relevant and constructive.

Analyze Success

In order to make informed decisions, U.S. policymakers will need ongoing monitoring and evaluation of inputs and processes that are relevant to technology strategy and industrial policy—among others, R&D spending needs, workforce issues, education needs, barriers to innovation, infrastructure shortfalls, supply chain constraints, and foreign dependencies. The U.S. government at present lacks the bureaucratic connective tissue to accomplish this.[82] If policymakers do not bolster the U.S. government's ability to conduct sound analyses of which policies are working, which are not, and why, a major disadvantage will be the result. But this is avoidable.

To get ahead of the problem, the National Security Council and White House Office of Science and Technology Policy should:

- **Lead a review of current authorities and capabilities, identify shortfalls therein and financial resources required to implement and assess industrial policies.** The results of this study will form the baseline for defining the U.S. government's capacity for sustained industrial policy implementation.

The legislative branch also has an important role to play. Based on the findings and recommendations of the review just described, Congress should work with the administration to:

- **Bolster the government's organizational framework to craft, execute, monitor, and sustain a new American industrial policy.** This concerns legislation to ensure the necessary organizations, authorities, and resources are in place and sustained for long-term strategic competition.

To gauge the success of these policies, a robust analysis of outputs and outcomes is needed. First and foremost is the need to define measures of success. Here too, such metrics will vary in different technology areas based on the overarching objectives for each field. Useful metrics are wide-ranging and can include solving specific technological problems, achieving wholesale breakthroughs such as novel capabilities, making incremental improvements to existing technologies, reducing or eliminating supply chain single points of failure, stimulating economic growth, creating jobs, and dominating the global market, among many others.

In response, the White House should:

- **Establish a task force charged with developing metrics for industrial policy goals.** The task force should be comprised of representatives from the Departments of Commerce, Education, and Defense; the Office of Science and Technology Policy; the National Security Council; the National Science Foundation; and stakeholders from industry and civil society.

At the same time, Congress should:

- **Mandate sustained research and analysis of U.S. industrial policies and reporting thereof.** Long-term fiscal appropriations will be required to sustain this effort.

If the U.S. government analyzes and measures the effectiveness of its policies, this will ensure the transparency and accountability required for sound policymaking.

Align Government and Industry

Measures of success will be most relevant and impactful when those of government and industry are aligned. To paraphrase Rich Ashooh, former Assistant Secretary of Commerce for Export Administration, industrial policy does not succeed without the commercial success of the private sector and the firms that should be the beneficiaries of industrial policy. Public-private partnerships must be a central feature of a new American industrial policy.

A prime historical example is SEMATECH, a partnership between the U.S. government and 14 U.S. semiconductor firms that was launched in 1987 and focused on bolstering American competitiveness in microelectronics.[83] A current effort is ComSenTer, a microelectronics research center focused on 6G telecommunications technologies. The center represents a collaboration of leading U.S. universities, funded by DARPA and a consortium of corporations via the Semiconductor Research Corporation.[84]

The ability to align the U.S. government's financial resources and objectives with those of industry and the world-class capabilities of U.S. universities and research institutes is a strategic advantage that few other countries can come close to matching.

The White House and Congress, with the input of industry and academia, should double down on this strength with an effort to:

- **Identify opportunities to establish public-private partnerships in priority technology areas and scientific disciplines.** Each partnership should have clear objectives rooted in broader industrial policy goals pertaining to general technological leadership, supply chain resilience and security, and specific scientific and technological breakthroughs.

Create Authorities to Adjust Policies as Needed

An effective American industrial policy will be dynamic and adaptable. How the U.S. government engages with industry sectors will vary by technology area and over time. Factors, such as the goals for a specific sector, maturity of and applications for technologies, supply chain interdependencies, and relative U.S. strengths and weaknesses, will determine what government incentives, policies, regulations, and initiatives are most appropriate and when. Determining how and when these policy shifts should occur rests squarely in the U.S. government's ability to analyze, assess, and align.

Managing and updating sustained effective industrial policies will be difficult in the best of circumstances. To maximize the odds of success, new authorities and leadership are needed.

To that end, the president should:

- **Appoint a deputy national security advisor for technology competition.** Ideally, this person will report to the national security advisor, the director of the National Economic Council, and the director of the Office of Science and Technology Policy. Staffed by a coordination office, this should be the senior-most U.S. government position tasked with making recommendations for industrial and tech competition policy, based on continuous analysis of ongoing efforts.[85] An alternative to the coordination office could be the National Advanced Industry and Technology Agency, as proposed by Rob Atkinson of the Information Technology and Innovation Foundation.[86]

Accept and Mitigate Risk

Greater government engagement in industry and investments in academic research will require greater tolerance for failure. Scientific and technical advances are rooted in high-risk, high-reward research. U.S. political culture is anathema to the required mindset,

Technology alliances with like-minded allies and partners will be key to implementing a successful American industrial policy strategy. Without adequate cooperation with allies, economic competitiveness and certain national interests may be less attainable and more vulnerable to malign actors. (Pool/Getty Images)

and this poses one of the biggest challenges to successful use of industrial policies to promote long-term American competitiveness. Politicians should resist the temptation to use a research effort that falls short to score cheap political points. Lawmakers also face a challenge in explaining to taxpayers why failure is a feature, not a flaw, in the context of overall scientific and technological achievement.

One way to mitigate the impact of failure is to adopt a portfolio approach to technology development and innovation. This entails making R&D investments in desired capabilities by funding a range of actors. As with a mutual fund in finance, one spreads risk. While many individual components fall short, the goal is a net gain across the portfolio. This approach avoids "picking winners and losers" and having failures become career-ending events for government bureaucrats. To accomplish this, red tape must be eliminated, and a devolution of decision-making power is required.

The White House and Congress should:

- **Commit to reframing oversight to support more agile industrial and tech policy implementation.** The White House has to trust mid-level bureaucrats and avoid micromanaging. Congress must be willing to raise the threshold for investments that it must directly approve. Both require a change in how oversight is carried out at present.

Leverage Allies

American industrial policy will require international partnerships. This is a pragmatic reality, given the global diffusion of technology and related know-how. More important, it is a great strength. The collective economic heft of the world's leading democracies, most of which are U.S. allies, dwarfs that of China and Russia. Better alignment on matters of technology policy will improve the odds that the outcome of the strategic competition is to the benefit of openness and freedom. Cooperation in areas ranging from R&D investments to standard-setting to supply chain resilience will strengthen the economic competitiveness and national interests of all.

The Biden administration has made important strides in this regard with its efforts in the Quadrilateral Security Dialogue, the Australia-United Kingdom-United States partnership, and the EU-U.S. Trade and Technology Council. The next step is to make sure these efforts can be sustained and scaled. Building U.S. capacity for tech diplomacy will be key.

The proposed appointment of a special envoy for critical and emerging technology, along with the nascent corps of regional technology officers at the Department of State, represent important steps. The Department of Commerce's digital attaché program is another initiative of note and a potential model to emulate.

Congress should build on this momentum and provide appropriations to:

- **Establish a cadre of U.S. tech diplomats.** These officials will be the vanguard for implementing the international aspects of U.S. industrial policies, including cooperative research agreements, human capital exchanges, infrastructure development, and export controls.

Conclusion

A U.S. national industrial policy strategy must be long lasting and forward thinking. It must also be fundamentally American, instilled with U.S. values that advantage democracy both at home and abroad. It should adhere to concrete and concise national security and economic objectives and offer a diverse toolkit of policy options that can be curated for each sector and updated as technologies evolve. It should cement the United States' position as a global industry and technology leader, and articulate key principles for the long-term cultivation and maintenance of that position.

China did not invent industrial policy—the United States and its partners and allies have been using it for centuries—but the international community runs the risk of having an authoritarian Beijing redefine it. A new American industrial policy, together with the policies of its allies, will provide the affirmative answer to attempts by authoritarians to shape the world politically and economically to their benefit. A new partnership between government and industry is needed to counter the Chinese Communist Party's economic and technology strategies. A new U.S. industrial policy that blunts those efforts and promotes American strengths will ensure that the United States' economic future is strong, its technological leadership is assured, and its vision for a free and open future prevails.

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