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# U.S.-Japan Technology Policy Coordination: Balancing Technonationalism With a Globalized World

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## Abbreviations

| | |
|---|---|
| **5G** | fifth-generation wireless networks |
| **ACM** | Alliance Coordination Mechanism |
| **AI** | artificial intelligence |
| **CAO** | Japan Cabinet Office |
| **CFIUS** | Committee on Foreign Investment in the United States |
| **CSTI** | (Japan) Council for Science, Technology and Innovation |
| **CUI** | controlled unclassified information |
| **DOC** | (U.S.) Department of Commerce |
| **DOD** | (U.S.) Department of Defense |
| **DOE** | (U.S.) Department of Energy |
| **DOS** | (U.S.) Department of State |
| **EU** | European Union |
| **FDI** | foreign direct investment |
| **FIRRMA** | Foreign Investment Risk Review Modernization Act |
| **G7** | Group of 7 nations |
| **G20** | Group of 20 nations |
| **GDP** | gross domestic product |
| **HHS** | (U.S.) Department of Health and Human Services |
| **INDOPACOM** | (U.S.) Indo-Pacific Command |
| **IoT** | Internet of Things |
| **ITAR** | International Traffic in Arms Regulations |
| **JAXA** | Japan Aerospace Exploration Agency |
| **JHLC** | Joint High-Level Committee |
| **JSPS** | Japan Society for the Promotion of Science |
| **JST** | Japan Science and Technology Agency |
| **JUSSTIC** | Japan-U.S. Strategic Science, Technology and Innovation Council |
| **JWLC** | Joint Working-Level Committee |
| **KGB** | (Soviet Union) Committee for State Security |
| **METI** | (Japan) Ministry of Economy, Trade and Industry |
| **MEXT** | (Japan) Ministry of Education, Culture, Sports, Science and Technology |
| **MHLW** | (Japan) Ministry of Health, Labor and Welfare |
| **MIC** | (Japan) Ministry of Internal Affairs and Communications |

| | |
|---|---|
| **MOD** | (Japan) Ministry of Defense |
| **MOFA** | (Japan) Ministry of Foreign Affairs |
| **NAND** | 'not and' flash memory chips |
| **NAFTA** | North American Free Trade Agreement |
| **NATO** | North Atlantic Treaty Organization |
| **NEC** | (formerly known as) the Nippon Electric Company |
| **NIH** | (U.S.) National Institutes of Health |
| **NISPOM** | (U.S.) National Industrial Security Program Operating Manual |
| **NSC** | (U.S. or Japan) National Security Council |
| **NSF** | (U.S.) National Science Foundation |
| **NTT** | Nippon Telegraph and Telephone Corporation |
| **OECD** | Organization for Economic Co-operation and Development |
| **OSTP** | (U.S.) White House Office of Science and Technology Policy |
| **R&D** | research and development |
| **RIKEN** | (Japan) Institute of Physical and Chemical Research; or RIKEN Industrial Group |
| **SCC** | Security Consultative Committee |
| **SDF** | Japan Self-Defense Forces |
| **SSA** | special security agreement |
| **S&T** | science and technology |
| **TPP** | Trans-Pacific Partnership |
| **UK** | United Kingdom |
| **USFJ** | U.S. Forces Japan |
| **USTR** | U.S. Trade Representative |

## Summary

### The Resurgence of Technonationalism

The U.S.-Japan alliance sits at a crucial historical juncture as globalization recedes and China's international stature grows. The world is shifting from a technoglobalist-oriented economic and innovation framework premised on reducing barriers to trade, investment, and supply chain development amid harmonized multilateral standards. The technonationalist framework taking its place is prompting countries to intervene more frequently in trade and technological affairs to give their own high-tech industry leaders an advantage over those of other countries.

Now the United States and China are the main protagonists in this technologically driven competition, but Japan remains an indispensable player. The resulting zero-sum landscape has produced protectionist policies that have not been pursued widely since the 1980s and 1990s, when U.S.-Japan economic competition was at its height. The high stakes behind this current shift promise to make this era of technonationalism longer lasting and more intense than earlier periods.

Japan and the United States have watched warily as China's economic heft has grown and as the technological sophistication of its manufacturing base has increased. Beijing's penchant for pursuing a state-driven economic and innovation model has not allayed their concerns. This reemergence of great-power competition is coinciding with the so-called Fourth Industrial Revolution, in which an early lead in technological mastery of certain strategic fields like AI and quantum computing could put a country (and its allies) in an unassailable leadership position. Fear of "losing" this competition is fueling an unprecedented scale of investment and a zero-sum mentality that could tempt countries to overreact in ways that would damage their national interests and broader global interests.

### Rewiring the U.S.-Japan Alliance

The United States and Japan do not have to upend globalization to compete effectively with China. The challenge for Tokyo and Washington is to leverage their common concerns about Beijing's economic behavior and minimize the differences between their respective approaches. The two partners must strike a proper balance between protecting and promoting their technological and economic interests, while avoiding doing too much damage to the overall innovation and economic ecosystem that helps them prosper. In short, Japan and the United States must effectively balance the imperatives of technonationalism and globalization.

To accomplish this, the United States and Japan must work together. Although Washington and Tokyo have a long history of collaborating productively in many areas of science and technology, the legacy of their economic competition three decades ago still inhibits effective cooperation in important ways today. To date, the allies have taken a wide range of steps to pursue their own form of technonationalism including export controls, investment restrictions, research promotion, and information security.

Many of those steps have undoubtedly been worthwhile, yet the allies can do more to improve policy coordination and better balance the impulses of technonationalism and the realities of globalization. The following steps would make a good starting point. To preserve their technological edge, the United States and Japan should:

- update their decades-old bilateral science and technology cooperation agreement, especially by doing more to nurture private-sector collaboration;
- broaden cooperation and deepen funding pools on certain shared strategic priorities, such as artificial intelligence and quantum computing;
- invest in multilateral standard setting;
- improve bilateral policy coordination on export controls and investment screening;
- strengthen the fundamentals of information and technology security in creative ways; and
- be more flexible on collaborating in technological areas that could have military applications.

Tokyo and Washington's overall goal should be to compete effectively with Beijing in ways that elicit broad international collaboration. Only by working together to revitalize domestic innovators and contain the spread of worldwide antiglobalization sentiments can the United States and Japan renew the foundations of their technological edge. These dual tasks are daunting, but they mark the surest way for the two allies to productively compete with China in an array of high-tech sectors.

## Introduction

The U.S.-Japan relationship has broadened and deepened since the end of the Cold War, with new patterns of trade, investment, security cooperation, and diplomatic coordination.[1] However, the two countries' collaboration on science and technology (S&T) has not kept pace. Such scientific cooperation is particularly relevant today as the world experiences a resurgence of technonationalist behavior. Countries are changing how they approach trade policy, supply chain management, export controls, investment rules, research and development (R&D) strategies, and even visa guidelines to gain or maintain a technological edge over competitors. When the United States and Japan coordinate poorly in these areas, their relationship and ability to compete is strained, but if it is handled well, such collaboration can enhance their security and prosperity.[2]

A first step toward reshaping U.S.-Japan S&T collaboration is to better understand how policies are changing in each country and where their interests align. The allies should also seek some common understanding of how globalization is evolving and the goals they want to pursue. U.S. and Japanese policymakers can better harmonize their approaches to find a proper balance between protecting their technological edge through defensive measures without degrading the vital ecosystem for innovation that will keep them at the forefront of technological advances. This innovation ecosystem will be far more productive if the allies support it together, as opposed to letting a balkanized system of technology standards, competing promotional programs, and export restrictions emerge haphazardly over time.

Although the United States and Japan have a long history of scientific cooperation—dating back to the 1960s—their current framework for such collaboration was built largely at the height of their own economic and technological rivalry in the 1980s and 1990s.[3] At that time, Tokyo was the main target of Washington's focus on competitiveness—to the point that U.S. decisionmakers established a private sector advisory panel to support the allies' Joint High-Level Committee on Science and Technology as a means to limit, rather than promote, which U.S. advances were shared with Japan.[4] Many U.S. politicians and business leaders worried that Japan would either exploit U.S. technology for its own gain at America's expense or that Japan would fail to protect the technology from theft by other countries.[5]

The unfortunate legacy of this period of competition is an outdated alliance infrastructure for science and high-tech collaboration in a modern era of rapid technological transformation marked by long-term strategic competition with China. The U.S.-Japan alliance has changed the least in the area that now matters the most: high-tech competitiveness and innovation. The challenge is to preserve the elements of the alliance that work well, accommodate the inevitable differences in each sides' priorities and processes, and coordinate their adjustments to ever-changing technological demands for maximum mutual benefit.

For the United States, going it alone on technological development or trying to dictate its terms is not a feasible strategy. Even as the U.S. government and private firms increase their R&D investments, the U.S. share of global R&D spending continues to decline, from 37 percent to about 25 percent since 2000, and it is still falling.[6] Japan is in an even tougher position, as recent data indicates that R&D spending by the largest five U.S. firms—Amazon, Facebook, Apple, Microsoft, and Google (Alphabet)—will soon eclipse that of Japan's entire private sector.[7]

This trend will continue, and it suggests that no single country will be able to dominate or control technological innovation in isolation. Only a collaborative, multilateral response among like-minded democracies can sustain technological leadership and an open, stable international system during these tumultuous times. Effective U.S.-Japan coordination is a necessary condition for realizing this objective, though this endeavor will also involve other countries.

The prevailing innovation model has changed dramatically—away from one characterized by government-supported domestic basic science and defense research to one that is more dual-use oriented, reliant on the private sector, and international. Policymakers should adopt a balanced approach that combines the public and private sectors, balances both offensive and defensive measures to create (and protect) new technologies, and supports domestic and international partners.

## Technonationalism Versus Technoglobalism

In the late 1980s and early 1990s, a policy debate emerged in the United States and elsewhere regarding the nature and relative merits of technonationalism versus technoglobalism. These two schools of thought offered largely alternative views about how governments should channel technology investment and shape the competitive playing field and supply chains for the benefit of their respective corporations and citizens. The technonationalists believed that national interests were best served by protecting and subsidizing certain domestic firms and limiting technological collaboration with other countries. By contrast, technoglobalists argued that restricting national access to global drivers of innovation carried greater risks to the home country by discouraging domestic investment, limiting market opportunities, and driving away the best talent.[8] Still others emphasized the futility of trying to foster national technology champions given how multinational companies operate globally with employees from around the world and corporate alliances and joint ventures that involve multiple countries.[9]

At the time, technonationalist arguments initially gained favor in the United States amid heightened U.S.-Japan trade frictions and concerns in Washington that Tokyo was leveraging industrial policies to overtake America's lead in semiconductors and other "critical technologies."[10] These concerns led to policy changes in the United States and new laws such as the Exon-Florio Amendment, passed under a 1988 trade bill; this measure gave the president broad powers to prohibit foreign investment in the United States when such investment could harm national security.[11] The amendment empowered the little-known Committee on Foreign Investment in the United States (CFIUS) and made it easier for the president to limit foreign investment in sensitive industries based on the committee's investigations and recommendations. CFIUS is chaired by the U.S. Treasury Secretary and includes the heads of the Departments of Justice, Commerce, and Homeland Security, among others.

Another feature of the 1988 trade bill was an amendment to the Trade Act of 1974 that furnished the U.S. government with powers of trade enforcement beyond those enshrined in the original law's Section 301. This change became known as the Super 301 clause, which further expanded the government's ability to penalize countries over disputes about specific products and made it possible for Washington to target a wide range of trade practices it deemed unfair.[12]

This era also led to the Federal Technology and Transfer Act of 1986, which was meant to make U.S. firms more competitive, boost Defense Department funding for a U.S. consortium of semiconductor and equipment manufacturers called SEMATECH (established in 1987) to help regain an edge over Japan and enact a variety of protectionist trade policies, including export restraint agreements and tariff threats to extract concessions from partners with persistent trade surpluses.[13]

As the 1990s wore on, however, the perceived economic threat posed by Japan receded, globalization accelerated, and multinational supply chains proliferated, causing technonationalism to become less of a government priority. After the North American Free Trade Agreement (NAFTA) was enacted in 1994, Japanese foreign direct investment (FDI) in Canada, Mexico, and the United States increased dramatically, combining with other changes to make the U.S. and Japanese economies much more intertwined.[14] Even the flagship technonationalist venture in the United States, SEMATECH, began accepting international members starting in 1996, as federal funding dwindled.[15] In addition, the number of CFIUS investigations dropped significantly, from fifteen investigations between 1988 and 1992 to just four over the following decade.[16]

Despite occasional (and sometimes severe) financial crises and military conflict in the Middle East, this newfound spirit of technoglobalism continued to flourish thanks in part to liberalized trade and financial flows that, combined with technological innovation, lowered the costs of trade for providers of goods and services.[17] A larger skilled workforce around the world and greater labor mobility also contributed to increased productivity.[18] These changes yielded increased specialization and complex supply chains that fueled further investment, innovation, and economic growth globally.

Although this wave of modern globalization did leave certain domestic regions and groups of people behind as it pushed forward—with notable political consequences—most national economies continued to prosper, leading to marked progress in the growth of global trade and incomes and reductions in poverty. By 2010, for example, the world had attained the first target of the United Nations' Millennium Development Goals—to cut the 1990 poverty rate in half by 2015—reaching this objective five years ahead of schedule.[19]

But today the champions of technoglobalism appear to be in retreat as globalization is buffeted by worsening economic inequality, governance failures, concerns about national vulnerability, and political opportunism, among other factors. The global coronavirus pandemic will exacerbate this trend, and various nations are prioritizing indigenous control over certain technologies and supply chains at the expense of economic efficiency. This policy approach could produce some national benefits for individual countries in isolation—a clear lesson from America's brief technonationalist episode in the 1980s and early 1990s, when the country's leadership focused its attention on enhancing national competitiveness and investing in education. But if technonationalism becomes a broader and more intense practice that many other countries around the world widely copy, it will stunt growth and limit humanity's ability to address collective challenges. The situation resembles a so-called prisoners' dilemma because the worst outcome for a nation would be eschewing technonationalist policies when others pursue them.[20]

Technonationalism is resurgent today in part because many highly advanced technologies—including artificial intelligence (AI), big data analytics, robotics, next-generation telecommunications networks (5G), and the Internet of Things (IoT)—are undergoing breakthroughs nearly simultaneously.[21] This means that the stakes are higher than ever before, because a country with a significant early lead could gain so much technological power and exploit it so quickly that it would be nearly impossible for others to catch up. Ironically enough, these kinds of breakthroughs would probably have been impossible without the technoglobalist era that helped spawn them in the first place.

Governments have not and will not be able to predict or design the ideal trajectory of technological innovation. Consider how protectionist sentiments in the United States in the 1980s were keenly focused on preventing U.S. telecom giant Motorola from giving away too much semiconductor technology to the Japanese firm Toshiba—among other similar scenarios. It is fortunate that U.S. policymakers did not become overly protective of Motorola, because neither it nor Toshiba were destined to remain on the cutting edge of a changing marketplace.[22]

The U.S. and Japanese bureaucrats promoting industrial policy and technonationalism at that time could not foresee the growth of the internet and how it would evolve in tandem with the smartphone and other new digital technologies. They could not conceive of AI-enabled cyber hacks of cloud-based data centers or stimulate the rise of internet titans like Google, Amazon, or the modern version of Apple. These companies flourished in the technoglobalist era and avoided single-firm product models by incorporating the best components of various leading technologies into their own product lines. Now these firms possess some of the world's most coveted technology, investing more than most governments do to push new boundaries and accelerate change through design and systems integration.

Another lesson is that governments generally overreact to perceived technonationalist threats. Many U.S. policymakers and scholars during the 1980s viewed competition with Japan over technology as a form of economic warfare and regularly assumed the worst about the Japanese government's intentions.[23] American fears that Japan would come to dominate technological fields like semiconductors, supercomputers, satellites, and aerospace in the same way they pushed U.S. manufacturers out of the production of radios and televisions simply never happened, and U.S. initiatives such as SEMATECH or Super 301 trade dispute cases had only a marginal effect. After all, Japanese firms became members of SEMATECH within ten years, and many market-opening Super 301 cases against Japan involved products (like dynamic random access memory chips) that were soon overtaken by new technology or—in the case of satellites—were eventually subject to U.S. export controls. U.S. firms prospered because of their ability to innovate and compete effectively, not because of such technonationalist or protectionist measures.

So why was the U.S.-Japan relationship able to weather the storm of economic competition in the 1980s and 1990s? In part, it was because Japan was (and remains) a U.S. ally and took steps as it grew to accommodate the existing global system. Tokyo became a founding member of the G7 in 1975, revalued its currency through the Plaza Accord in 1985, and increased its contributions to international organizations throughout the 1980s and 1990s.[24] U.S.-Japan trade negotiations were never easy and often did not have the effects Washington desired, but Japan did make adjustments to accommodate foreign suppliers, combat collusion among large domestic companies, and reduce many import tariffs to address various U.S. demands. Japan also made large investments in the United States and other NAFTA countries in response to U.S. pressure. As a result, despite some ugly moments, Washington and Tokyo quickly avoided the most damaging effects of a long-term technonationalist struggle.

The current U.S. trade dispute with China is, by all accounts, quite different with far higher stakes. Today's historic juncture for innovation comes amid even more intense strategic friction between the United States and China, compared to U.S. competition with Japan some three decades ago. As before, some policymakers in Washington see technological competition with China in nearly existential terms, but few expect that China will be as accommodating now as Japan was then.[25] Unlike the Japan case, U.S. officials accuse China of the large-scale theft of American intellectual property worth up to $600 billion annually; there is simply no comparison between the huge campaign of economic espionage China has undertaken and Japan's more modest version decades earlier.[26] More importantly, both Washington and Tokyo are acutely concerned that Beijing will leverage its large defense budget and civil-military fusion policy to find military applications for new technologies and practice coercive diplomacy throughout Asia.[27]

U.S. policymakers have been quite forthright about the risks. As U.S. Secretary of Defense Mark Esper put it, "Beijing . . . is combining direct state investment, forced technology transfer, and intellectual property theft to narrow the gap between U.S. and Chinese equipment and weapons systems, while also developing the asymmetric capabilities to counter our strengths."[28] Esper and other U.S. government officials emphasize the problem of intellectual property theft, noting that "since 2018 the Justice Department has filed charges against Chinese nationals and entities in at least seven separate economic espionage cases, including a conspiracy to steal trade secrets from a major U.S. semiconductor maker."[29]

Similarly, during testimony before the Senate, a senior Justice Department official said that between 2011 and 2018, "more than 90 percent of [its] cases alleging economic espionage by or to benefit a state involve China, and more than two-thirds of the Department's theft of trade secrets cases have had a nexus to China."[30] This U.S. official went on to say that "in all of these cases, China's strategy is the same: rob, replicate, and replace. Rob the American company of its intellectual property, replicate the technology, and replace the American company in the Chinese market and, one day, the global market." To underscore this point, he highlighted a recent case involving a U.S. semiconductor firm called Micron Technologies that has accused a Chinese rival of intellectual property theft.[31]

The emerging competition with China over technology and trade will be far thornier and more prolonged than the United States' previous bout with Japan. The world could be in for an extended era of technonationalism lasting several decades. China has demonstrated success not only as a rapid adaptor of various foreign-derived technologies with strategic applications but also as an innovator in certain areas like internet services, e-commerce, and telecommunications.[32] The advent of long-term U.S.-China strategic competition produces a zero-sum mentality between the two countries. It is reminiscent of the rivalry between the United States and the Soviet Union during the Cold War—with each side trying to prevail over the other and recruit other countries to join its respective technological circle.

Neither the United States nor Japan can afford to enter this competition ill-prepared or on its own. A fundamental challenge for the allies is that China is a massive economy with a powerful and expanding military, not afraid to flex its muscles even though it still has some characteristics of a developing economy. China's per-capita gross domestic product (GDP) remains low, for example, ranking seventy-three in the world behind countries like Botswana and Turkmenistan.[33]

Competition with China will have very high stakes, but this rivalry should not be completely unrestrained. It is true that China's economic interests are not in full alignment with those of Japan and the United States, particularly when it comes to issues beyond the mere gains of trade such as financial liberalization or limitations on subsidies. In addition, the two sides' different political systems exacerbate mistrust and have led to the physical separation of data and information flows. And the military dimension of this competition does raise the stakes and fuels a dangerous and potentially destructive security dilemma in the region. For those reasons, the United States and Japan should plan for long-term competition and leverage their complementary strengths to protect their economic well-being, while also recognizing some basic common interests that all three countries share. These include preserving a sustainable environment, maintaining overall economic stability, and mitigating damage from natural and manmade disasters.

The allies should look for coordinated ways to minimize the severity of the security dilemma whenever possible. Seeking military supremacy or economic dominance vis-à-vis China would be costly and unproductive. The allies' goal should not be to defeat China but instead to sustain their own high level of competitiveness and foster an open global economy with enforceable rules that maximize international involvement, encouraging Chinese participation whenever possible as an equal member. This is still the best-case scenario for the United States and Japan (and other countries). Barring that, close U.S.-Japan coordination can also help the two allies protect their interests against a less desirable outcome—continued cutthroat economic competition and military tensions with China.

## U.S.-Japan Alliance Science: So Close Yet So Far

In the last few years, Tokyo and Washington have each made a variety of policy and legal changes related to how they approach this challenge, but coordination has been difficult with an unpredictable U.S. administration led by President Donald Trump. Trump's executive orders on these issues frequently catch Tokyo by surprise and often involve extensive follow-up discussions to clarify their scope. Before examining these recent policy changes and their implications, it is useful to explain the evolution and current state of U.S.-Japan S&T cooperation as a baseline for later policy recommendations.

## The Foundations of U.S.-Japan S&T Cooperation

The U.S.-Japan alliance has never been just a security pact. Beginning with their 1960 Treaty of Mutual Cooperation and Security, the United States and Japan have long framed their alliance beyond just security cooperation—targeted then at deterring the Soviet Union—to include close economic and political engagement. This approach opened a path for various scientific dialogues such as the Committee on Scientific Dialogue (1961) and the Cooperative Science Program (1963).[34] These early government-wide frameworks focused on specific scientific fields. For example, the U.S.-Japan Cooperative Program in Natural Resources was created in 1964 to foster cooperation in environmental conservation through a series of research panels. Meanwhile, in 1965, the U.S.-Japan Cooperative Medical Sciences Program sought to jointly tackle health problems in the Asia-Pacific. This initiative later led to endeavors such as the International Conference on Emerging Infectious Diseases in the Pacific Rim, which has met nearly annually since 1997.[35]

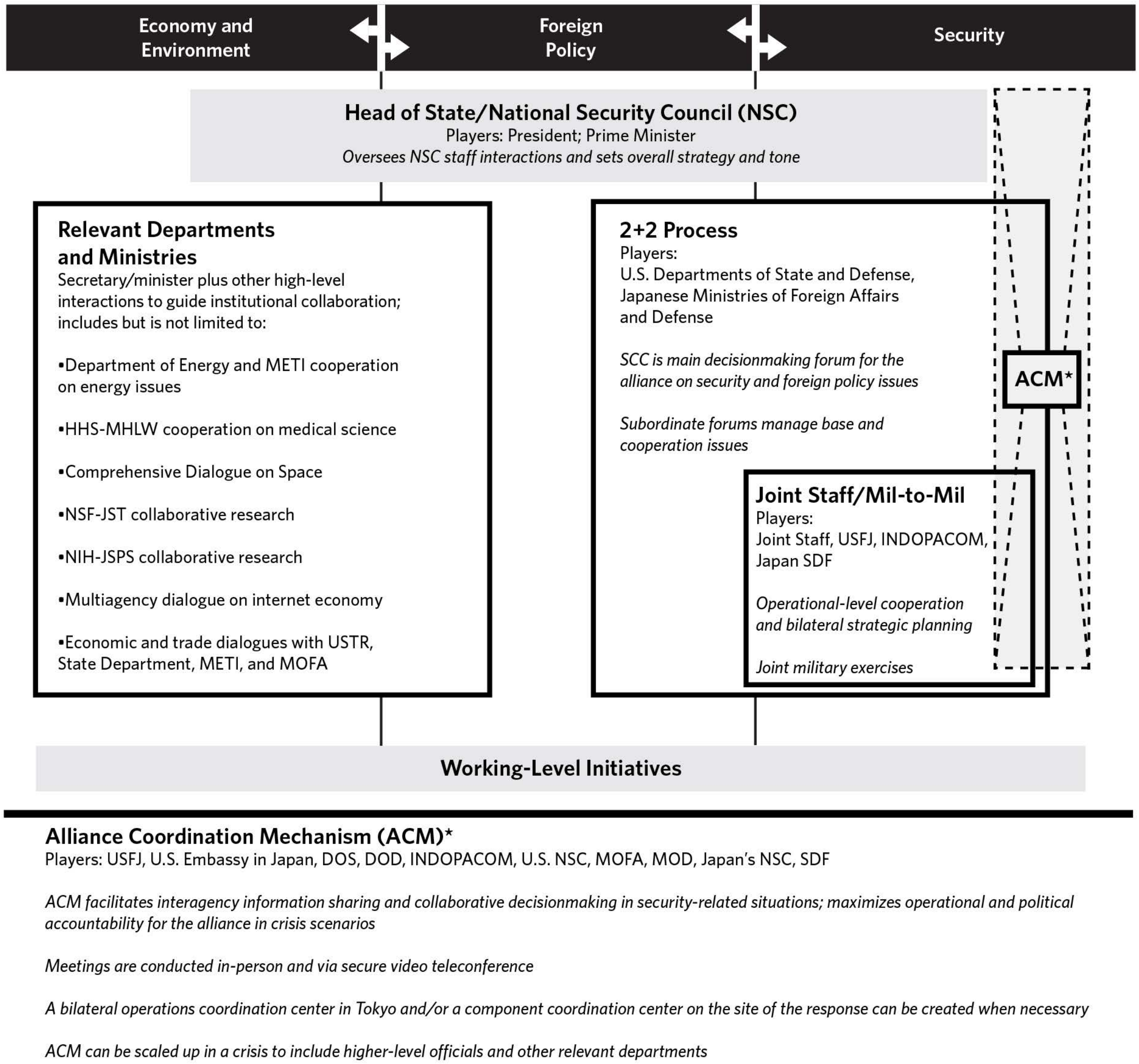
Most of these forms of scientific cooperation are overseen by the bureaucratic offices of a single ministry, department, or agency in each country that is responsible for a particular issue. Over the years, these initiatives have produced direct lines of communication and strong institutional relationships between specific U.S. and Japanese government offices and the research community in both countries that their funding supports. More recently, as S&T issues increasingly cut across the domains of security, economics, and foreign policy, interagency models of S&T dialogue have emerged, even as the mechanics of cooperation at the working level remain much the same as before (see figure 1).

In the 1970s, three other bilateral initiatives were introduced: the 1975 U.S.-Japan Agreement on Cooperation in Environmental Protection, the 1979 Cooperation on Energy, and the 1979 Standing Senior Liaison Group for space.[36] The latter two forums respectively have evolved over the years into an Energy Policy Dialogue (since 2015) and the Comprehensive Dialogue on Space (since 2013), with the latter signaling an important shift toward cooperation on space security and information sharing, particularly in terms of situational awareness in space.[37] These space-focused agreements led to new links between the Japan Aerospace Exploration Agency (JAXA) and U.S. Strategic Command and later produced a bilateral agreement for Japanese satellites to host U.S. sensors for enhancing situational awareness in space.[38]

Defense-applicable scientific cooperation was formalized with the 1980 U.S.-Japan Systems and Technology Forum, which became the allies' primary dialogue for coordinating bilateral cooperation involving defense equipment and technology.[39] The U.S. Department of Defense and Japan's Ministry of Defense have facilitated joint programs through the forum to make procurement more efficient; make equipment more interoperable; and spur improvements in certain technological areas

FIGURE 1

**Current U.S.-Japan Alliance Management Schematic**




**NOTE:** Please see the list of abbreviations at the beginning of this publication for full names.

such as fighting vehicle propulsion, ducted rocket engines, and advanced materials.[40] More recently, alliance managers have given some thought to restructuring the forum to account for a major reorganization within the Department of Defense's acquisitions and technology offices in 2018–2019—notably the creation of a new post for an undersecretary for research and engineering.[41]

Another impetus for modernizing the Systems and Technology Forum is a higher degree of alliance cooperation on defense equipment and technology, starting from 2015 when the allies named it a "bilateral enterprise" in revisions to the Guidelines for U.S.-Japan Defense Cooperation.[42] This change put defense technology cooperation on par with intelligence sharing, which implies a greater degree of leadership attention, dedicated manpower, and operational connections than previously existed.

Additionally, an enhanced Systems and Technology Forum could take advantage of a closer relationship between the Department of Defense and Japan's Ministry of Economy, Trade and Industry. In recent years, the two began coordinating on export control and supply chain issues and have also convened a "dual use dialogue" to identify "pathfinder" projects that can support the Department of Defense's needs and create opportunities for Japanese businesses.[43] This interministry relationship blossomed from 2012 onward when the two sides sponsored a "robotics challenge" involving private sector and university teams. A Japanese team won the first challenge before leaving the competition to become part of Google.[44]

A pair of government-convened committees oversee much of this U.S.-Japan S&T collaboration—in theory, at least. The Joint High-Level Committee (JHLC) and the Joint Working-Level Committee (JWLC) on Science and Technology Cooperation were formed under the 1988 U.S.-Japan Agreement on Cooperation in Research and Development in Science and Technology. The JHLC (and the JWLC that supports it) have a complicated history and a complex governing structure, which have contributed to its underwhelming track record as a control tower for allied S&T activity. Still, even if the JHLC has a limited ability to organize and manage bilateral S&T cooperation, it does influence priorities and provides a bird's-eye view of allied S&T activity from which all stakeholders benefit.

The JHLC is constrained from doing much to foster cooperation on technology with military applications more by norms than by law. That said, there are some limited ways it could conceivably do more. Currently, it focuses mostly on the "frontiers of science," a little bit on "capacity building" within the alliance, and even less on "strategic intent" or efforts to maximize "dual benefit civilian science."[45] The 1988 U.S.-Japan S&T agreement is limited to "cooperative activities for peaceful purposes." Many officials in both countries see a need and opportunity for the JHLC to play a stronger role in better aligning bilateral S&T cooperation with their respective national strategies, particularly with respect to dual-use technologies.[46] After all, virtually any new technology could have military applications of some kind, so it does not make sense to define dual use too broadly in ways that would prohibit joint work.

Still, some Japanese officials are quick to warn against too explicit of a "strategic" or defense application for JHLC agenda items, as such endeavors could provoke a political backlash in Japan.[47] To date, JHLC leaders have avoided such controversy by focusing on civilian science that clearly falls within the category of "peaceful purposes," but, increasingly, political leaders in both countries are pushing for technological advances in AI and quantum computing precisely because they can benefit both economic and military competitiveness.

The two committees are led collectively by the White House Office of Science and Technology Policy, Japan's minister of state for science and technology policy, and Japan's Ministry of Education, Culture, Sports, Science and Technology. These committees draw attendees from many different agencies to government-wide meetings to promote information sharing and high-level policy attention to potential collaborative projects (see figure 2). The meetings are steered by offices within Japan's Ministry of Foreign Affairs and the U.S. Department of State (especially for the JWLC's work). Japan's Council for Science, Technology and Innovation in the Cabinet Office has gotten increasingly involved ever since Tokyo established a stronger National Security Council and supporting secretariat in late 2013.

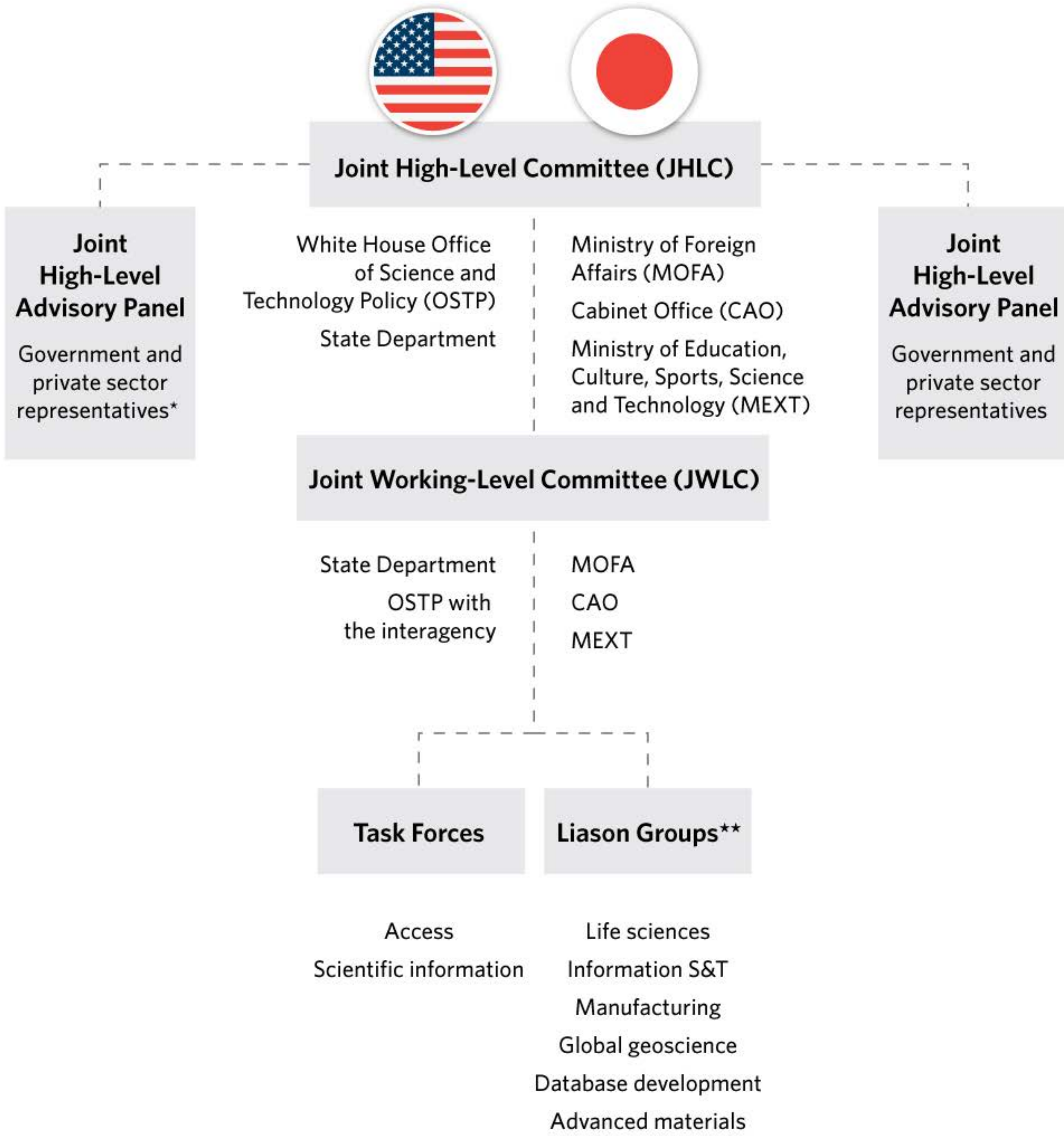
Japan's Council for Science, Technology and Innovation is a more natural counterpart to the White House Office of Science and Technology Policy, given its policy role across different parts of the Japanese government, but neither of these offices have large staffs or full authority to manage the alliance's whole technology portfolio on their own. Still, the council is likely to play a more important leadership role on the Japanese side if the prime minister gives the office sufficient support. While the JHLC fosters information sharing and provides some oversight, it operates with a limited mandate. It cannot direct funding toward specific research, and it is reluctant to intrude on the jurisdictions of individual departments and ministries that have their own long-established initiatives.

The JHLC apparatus often responds to current events and is shaped by prevailing political winds, especially in the United States given the central role the White House plays. The administration of former president George W. Bush, for example, shifted from the lofty language of former president Bill Clinton about how science and technology would be at the forefront of U.S. strategy going into the new millennium to a homeland security–focused framing: the "Framework Initiative for a Safe and Secure Society." In doing so, the Bush administration sought to emphasize technologies that could be used for security and counterterrorism purposes in the wake of the September 11, 2001, terrorist attacks on the United States.[48]

This Bush-era emphasis on national security led to an agreement between the United States' National Science Foundation and the Japan Science and Technology Agency that produced a wide range of collaborative projects on subjects like cryptography, digital forensics, biomedicine, and subsurface

FIGURE 2

**Committee Structure Based on U.S.-Japan Agreement on Cooperation in Research and Development in Science and Technology (1988)**




*The Department of Commerce initially took a leadership role on the U.S. side of advisory panel activities, but this role shifted to the State Department later in the 1990s and eventually the entire panel's activities dissipated throughout the early 2000s.

**Task forces and liaison groups began in the 1990s to review policy priorities for each country and related scientific activities. When a group was no longer active, the two sides could agree at a JWLC to 'graduate' a particular group or task force. A number of these groups listed were graduated in the mid-2000s. By 2014, the terms liaison group and task force did not appear in JWLC reports. Source: author interview with State Department officials, May 27, 2020.

imaging.[49] The two entities later expanded this foundation into additional workshops on sensor technologies and robotics cooperation during the years of U.S. president Barack Obama's administration. Ostensibly an independent administrative institution under the Ministry of Education, Culture, Sports, Science and Technology, the Japan Science and Technology Agency overseas S&T programs in support of government policies. In this sense, the agency has some organizational similarities to the National Science Foundation, although the agency tends to be more mission-driven rather than curiosity-driven, and its total annual budget (roughly $1.2 billion) is 15 percent the size of the U.S. foundation's $8 billion allotment.[50]

The Obama administration expanded on the Bush era's emphasis on security for U.S.-Japan S&T cooperation with a return to more traditional applications like clean energy, cancer treatment (including vice president Joe Biden's Cancer Moonshot initiative), outer space, natural disaster response, and human resources development in the sciences.[51] Later, the JWLC introduced new priority areas in data science (including AI, big data, and the IoT), many of which were highlighted in a 2015 joint statement that Obama and Japanese Prime Minister Abe Shinzo signed after the two governments extended their S&T cooperation agreement in 2014.[52]

Around this time, the allies began expanding their regular policy dialogue to focus on specific technological areas and their economic or societal implications. The two governments had touched on such subjects in the past primarily regarding energy, but, in 2010, they launched a new Dialogue on the Internet Economy to consider the policy implications for these new technological markets and how they might affect businesses.[53] Part of this dialogue involved sessions with private sector representatives via the U.S. Chamber of Commerce and Japan's business federation Keidanren, underscoring the close link between technological innovation and its impact on companies' competitiveness and economic prospects.

Similarly, Tokyo and Washington created companion-type dialogues in 2013 by way of the U.S.-Japan Cyber Dialogue and the Cyber Defense Policy Working Group, which promoted an interagency cooperative approach to capacity building, openness, and interoperability in cyberspace as well as strengthening cybersecurity and accountability. The bilateral Comprehensive Dialogue on Space began that same year. It solidified a turning point in alliance collaboration that included not only promoting the science behind new technologies but also advancing the partners' shared national interests by seeking to shape the global policy environment so as to help their companies prosper and keep their citizens protected. The emergence of this new format of allied technology policy dialogues reflects the partners' closer economic interdependence, similar policy views, and deeper mutual trust when it comes to national competition. However, the new format has not yet been applied explicitly to collaboratively funded R&D programs.

As they have expanded cooperation on S&T, Tokyo and Washington have become closer in other related ways, such as trade involving the defense industry. In 2014, Abe replaced a virtual ban on the export of Japanese-made military hardware with new guidelines that permit the limited export of defense equipment to select countries that have sufficient rules in place to prevent proliferation—including the United States.[54] Later, in 2016, the U.S. Department of Defense and Japan's Ministry of Defense signed a pact on reciprocal defense procurement, making Japan the first Asian country to join the ranks of twenty-seven signatories who have reached such agreements with the U.S. government—including Israel, Sweden, and many members of the North Atlantic Treaty Organization (NATO). The signatories' defense products and services are exempted from U.S.-promulgated Buy America laws and other protectionist provisions.[55] This pact also applies to contracted R&D.

When it comes to U.S. exports, Japan is among the most trusted countries that face the fewest restrictions, given its membership in all major international nonproliferation regimes.[56] In 2018, for example, the United States' Bureau of Industry and Security reviewed 1,903 export/reexport applications from Japan valued at $5.0 billion. A total of 1,688 (88.7 percent) of the applications valued at $4.7 billion were approved, a higher percentage than the United Kingdom's (UK) proportion (1,739 or 85.5 percent of its applications) and those of all overall destinations worldwide (29,032 or 85.8 percent of applications).[57] No such Japanese applications have been denied since 2015. Washington also considers Japan a major non-NATO ally, a designation that provides certain benefits including opportunities for cooperative R&D projects with the Department of Defense and an exemption from some licensing requirements in areas of space-based research.[58]

## Obstacles to Further U.S.-Japan S&T Cooperation

But despite all these extensive signs of robust U.S.-Japan S&T cooperation, there is still room for improvement and hurdles to further collaboration remain. Some obstacles are inherent, such as difficulties with communicating in different languages, misaligned fiscal and academic calendars, different models for evaluating program efficacy, and a big disparity in terms of the role that defense-related spending supports basic and applied scientific research. This last point when combined with a cultural stigma in Japan that discourages academic and private sector researchers from doing direct military work—with some exceptions—limits opportunities for bilateral R&D that might have defense applications.[59]

In addition to these enduring structural challenges, other policy-related hurdles persist. These limitations are both a legacy of the U.S.-Japan innovation rivalry in the 1980s and a product of Japan's different standards for export controls and classified information. While conditions are changing, Tokyo has still not reached the levels of bureaucratic access that some of Washington's most trusted allies receive. For example, the United States has security-of-supply arrangements with nine other countries but not with Japan.[60] These agreements allow for the mutual supply of defense goods and services on a priority basis, when requested.

There are other examples too. Japan was also not included in an expanded National Technology and Industrial Base framework; the U.S. Congress pushed to include Australia, Canada, and the United Kingdom in this initiative to "bring together our closest allies and figure out a way to make progress in innovation and integration of our technologies."[61] Moreover, Japan has always remained outside some of Washington's closest intelligence circles—including the English-speaking intelligence-sharing framework (known as Five Eyes) established during World War II. Japan's absence from this framework has limited some sharing of counterintelligence information that is useful when evaluating the integrity of foreign researchers and investors. Most recently, in 2020, Japan was not included on a short list Washington drafted of countries that are excused from heightened levels of scrutiny with regard to FDI, although the door was left open for possible inclusion in the future.[62]

## Defensive Technonationalism

It is worthwhile to assess some of the most important measures the U.S. and Japanese governments have employed to try to protect classified and proprietary information while keeping their technological edge.

### Traditional Defensive Tools

Some technonationalist policies are defensive, designed to restrict other countries' firms and spies' access to technologies and industrial know-how deemed critical to a nation's security (economic or otherwise). In contrast, offensive tools are designed to proactively promote the competitiveness of domestic industries. At a certain level, defensive policies are always in place, usually to protect military technologies and secrets by employing a tiered classification system that limits access to specific individuals and companies that undergo an extensive clearance process overseen by central governments. Additionally, governments use special licensing requirements, export controls, and investment constraints to enforce a desired level of foreign access to intellectual property, products, or corporate control. Companies must comply with the minimum standards and approval processes that governments set, and they also can employ their own industrial security practices to protect trade secrets that in some cases go beyond government requirements.

The United States and Japan have used a variety of regulatory means to manage export controls for military and dual-use products during the technoglobalist era. For decades, the United States has governed defense-related exports with a munitions list that requires special licensing for certain products, services, and related data.[63] The items on this list are subject to a U.S. regulatory regime called the International Traffic in Arms Regulations (ITAR), which is overseen by the Department of State's Directorate of Defense Trade Controls. The oversight of this regime makes commercial transactions more complex and secure, but there is an important tradeoff: it can also limit sales of such products. When Congress placed U.S. satellites and related items on the munitions list in 1999, for example, the U.S. satellite industry lost about a quarter of its global market share over the next decade and arguably fell behind on the innovation curve.[64]

Items and services (including data) that are not considered munitions but that nonetheless have potentially sensitive commercial and military dual-use applications end up on a separate Commerce Control List regulated by the U.S. Department of Commerce. These export rules are not as cumbersome as ITAR, but such products still attract greater scrutiny depending on the import country and the specific import company or individuals involved. In this case, the proposed end use and end user are the primary concerns, rather than the product being sold. Finally, for certain end uses and users linked to possible cases of weapons proliferation, many countries—including the United States and Japan—use a catch-all system to make sure even unlisted items are not exported to certain people and places that might try to use the products for nuclear, chemical, or other weapons programs.[65]

Japan only began allowing defense equipment sales overseas starting in 2014 (effectively), and its exports are negligible compared to U.S. exports.[66] The few defense goods Japan exports must be approved by the Ministry of Economy, Trade and Industry's trade control department, and if the exports are politically sensitive enough, the National Security Council must decide. Like the United States, Japan uses a list approach for its high-tech exports (arms and dual-use items) and catch-all provisions. Both countries, along with forty others, implement their export rules in line with the Wassenaar Arrangement, an international agreement to apply certain standards of control and transparency related to arms and dual-use trade.[67]

Above and beyond export controls, protecting information from theft has become an increasingly important and difficult task for governments, private companies, and universities. In addition to its own classified information management system, the U.S. government created a National Industrial Security Program in 1993 to protect classified information as it contracts with the private sector and academia. The National Industrial Security Program Operating Manual (NISPOM) provides detailed requirements for how classified and unclassified information must be stored and transferred in connection with a government contract. This manual also outlines a minimum level of investments in physical security, the management of subcontracts, and a wide range of other security-related details.

Japan generally handles such contract requirements on a ministry-by-ministry basis (rather than a national basis), a point that has generated some alliance friction when government-protected information is at stake and private companies are involved. U.S. government security clearances cannot be issued to foreign companies or even U.S. companies if they are under foreign ownership, control, or influence, unless the U.S. government is satisfied that the foreign connection poses no risk.[68] This stipulation can be mitigated by various means, including a special security agreement (SSA), although such bureaucratic safeguards add costs for the companies involved and will often limit a foreign management team's access to information related to the U.S. firm in question.[69]

The Nippon Telegraph and Telephone Corporation's (NTT) acquisition of Dell Services in 2016 required this kind of special security clearance permission, given Dell's existing contracts with the Department of Defense. Overall, Japanese companies have a good track record of concluding SSAs when necessary over the past two decades. But the Trump administration has indicated a desire to discriminate more aggressively against "foreign-owned producers" when it comes to national security, even if the producers are U.S.-based, so some Japanese executives are concerned that their investments could be somewhat curtailed.[70]

## Export Controls Amid Broadening Conceptions of National Security

But government oversight of sensitive exports has expanded beyond the narrow purview of military applications and national security in recent years, a notable transition that underscores the resurgence of technonationalism. The U.S. government in particular has sought to extend the use of these export controls and classified information protections beyond pure military or weapons proliferation concerns to other specific technologies with the broader goal of protecting more general national economic or innovation advantages. A good example is the United States' Export Control Reform Act of 2018, which requires the Commerce Department to determine updated controls on certain "emerging" and "foundational" technologies that are "essential to the national security of the United States."[71] The department requested input from the U.S. public about how it should define these types of technologies, a policy development that will affect (among others) Japanese firms doing business in the United States and Japanese companies that utilize certain U.S.-made components and software.[72]

The Commerce Department's initial proposal in late 2018 worried a lot of business executives in the United States and globally.[73] The department received comments from over 230 companies and industry associations around the world.[74] These industry actors voiced apprehension that the proposal's new U.S. export licensing requirements would apply to too many items and would make cross-border research and production much more difficult and expensive.

Both U.S. and Japanese companies noted that these proposed changes could significantly restrict their joint research, product development, and trade involving a wide range of technologies. The department's initial proposal, for example, included several expansive "representative technology categories" such as biotechnology, AI, semiconductor technology, and additive manufacturing (including 3D printing).[75] Private sector respondents urged the Commerce Department to make a finer distinction between truly emerging technologies and many mature technologies that are already widely available. They also wanted the U.S. government to focus on the military applications of certain inventions (in terms of end use) instead of the underlying technologies themselves, so that many lucrative commercial uses would not be affected.

Other companies stressed the need to avoid restricting intracompany research collaboration that might take place across borders or involve joint venture partners based in other countries. Many Japanese and U.S. firms have mutually beneficial high-tech research centers in the other country. Such firms also often have facilities in India and other countries. Would these ventures all be treated the same way under this proposal? On a related note, several companies recommended that the Commerce Department avoid unilateral definitions of these technologies and seek broader multilateral consensus with other parties, including the European Union (EU), Japan, and others, so that market conditions would be optimized and private sector competition around the world would be fair and consistent.

This public criticism resonated with some Trump administration officials, leading to intense debates that lengthened the decisionmaking process.[76] It took the Commerce Department until January 2020—an entire year after its extended comment period closed—to decide on just one newly proposed rule, a provision restricting exports of AI-enabled geospatial imagery software.[77] Only Canada is exempted from new export licensing requirements for this technology, but, overall, this first decision on emerging technologies has reassured the U.S. and Japanese private sectors that the Commerce Department is unlikely to be hasty or sweeping in how it implements the mandates enacted in this reform. Instead of restricting AI-enabled software generally, for example, the rule was limited to the use of such software for digesting satellite imagery so that the stipulation would impact fewer firms and should allow for more timely license application reviews.

More disruptive and unpredictable has been the Trump administration's use of the so-called Entity List (another export control tool) to limit U.S. exports to China and undermine certain Chinese high-tech firms in the process. The Commerce Department uses the Entity List to require licenses for all U.S. firms' transactions involving a particular foreign company or individual, and the majority of listings tend to presume that such transaction requests would be denied. Originally focused on preventing the proliferation of weapons or the support of terrorist organizations in the late 1990s and early 2000s, Trump early on took aim at some of China's largest telecom and technology firms—first by placing the ZTE Corporation on the Entity List in 2016, then by targeting leading Chinese 5G conglomerate Huawei Technologies in 2019, and then by moving against AI champions including Hikvision and SenseTime in 2019.[78]

The Trump administration is pushing U.S. firms—and foreign firms that use a lot of U.S. technology—to distance themselves from these Chinese companies by threatening to cut off future transactions with these Chinese firms. (While Trump has continued issuing temporary general licenses that have exempt most transactions from the Entity List restrictions and have kept sales flowing through the early summer of 2020, these exemptions are being revisited every ninety days and could be rescinded whenever the administration chooses to stop issuing them.) The future impact of this policy is unclear but potentially significant if it forces supply chains to be realigned and ties between the world's two largest economies to be partially decoupled.[79] So far, the combination of exemptions and general licenses has moderated the effect. These exemptions allowed Huawei, for example, to actually boost its purchases from U.S suppliers by 70 percent in 2019, despite the nominal Entity List designation.[80]

Trump's Entity List decisions triggered a related debate about how much U.S. content a particular product is required to contain to qualify as a U.S. export subject to these special licensing rules. The Commerce Department currently applies its ruling to products with 25 percent or more of U.S. content by value, providing many U.S. companies with a way to evade the Entity List and keep selling to blacklisted Chinese firms even without a general license.

When China hawks in the Trump administration proposed lowering this de minimis rule to 10 percent for Huawei specifically (a level that frequently applies to a few sanctioned countries like Iran and North Korea), U.S. industry leaders pushed back and found a sympathetic advocate in the U.S. Department of Defense.[81] The Pentagon worried that lost sales could weaken U.S. firms' financial position and restrict their ability to invest in new technologies that the Defense Department relies on for next-generation weapon systems. China, after all, consumes about half of the world's semiconductors and accounts for roughly one-third of U.S. semiconductor revenues. Losing this market could be damaging, although with supply chains in flux, it is possible that the firms that utilize these chips will disperse their manufacturing operations across more countries in the future.[82]

Yet other administration officials and some Republican senators were unmoved by the Pentagon's rationale. Senators Tom Cotton of Arkansas, Marco Rubio of Florida, and Ben Sasse of Nebraska wrote to Defense Secretary Mark Esper in January 2020 demanding an explanation: "Huawei is an arm of the Chinese Communist Party and should be treated as such," they wrote. "It is difficult to imagine that, at the height of the Cold War, the Department of Defense would condone American companies contracting with KGB subsidiaries because Moscow offered a discount." Other members of Congress raised similar concerns, and the Pentagon's opposition softened.[83]

The Trump administration eventually amended its foreign-produced direct product rule narrowly to require foreign companies that use U.S. semiconductor chip-making equipment—or otherwise make their products based on U.S. technology—to obtain U.S. licenses before selling their chips to Huawei and its affiliates.[84] U.S. firms worry that this decision will simply drive away their customers to other suppliers, and a lot will depend on how the rule is implemented. "There is a lot of lobbying going on right now in DC from the U.S. side," said one U.S. analyst.[85]

The Trump administration's defensive technonationalism vis-à-vis China has been most comprehensive in relation to Huawei, primarily because of its perceived lead in 5G telecommunications. As Democratic Senator Chris Coons of Delaware explained, "The very real potential that China will be the winner in this next generation of technology, and that will allow them to both exploit and benefit from and potentially disrupt what we be [sic] always on, always present, central networks that drive everything, from literally our vehicles, to health care, to national security, to our power system, is chilling and concerning."[86] Similarly, Democratic Senator Minority Leader Chuck Schumer of New York has said plainly that "allowing China to dominate global 5G networks threatens America's national security."[87] Brendan Carr, commissioner of the Federal Communications Commission, said that "we cannot treat Huawei as anything other than a threat to our collective security."[88]

Given this bipartisan sentiment in Washington, the U.S. government's pressure campaign against Huawei since 2016 has been aggressive—if episodic. In addition to the Entity List designation and the new amendment on restricting overseas chip exports to Huawei mentioned above, the U.S. government has prohibited federal purchases of Huawei's (and some other firms') equipment; has subsidized the removal of Huawei and other Chinese companies' equipment from U.S. rural telecommunications networks; and has filed legal charges against Huawei for alleged racketeering, industrial espionage, and sanctions evasion.[89] A bipartisan group of U.S. lawmakers also submitted a bill in March 2020 that could deny Huawei access to the U.S. financial system, based on allegations that the firm covertly cooperates with the Chinese government in conducting espionage.[90] As Republican Senator Rick Scott of Florida described it, "we know Huawei is supported and controlled by the communist regime in Beijing, which continues to violate human rights and steal our data, technology, and intellectual property."[91]

The Trump administration has also been active—with support from Congress—in pressuring other countries to prohibit the use of Huawei equipment in their networks. Esper told NATO and other allies that "reliance on Chinese 5G vendors could . . . jeopardize our intelligence and communication-sharing capabilities, and by extension it could jeopardize our alliances."[92] Republican Senator Lindsey Graham of South Carolina added, "We are very firm in our commitment—Republicans and Democrats—that if you go down the Huawei road you are going to burn a lot of bridges." U.S. allies like the UK are wary of potentially burning such bridges, so London is exploring a more coordinated approach among like-minded countries—a so-called D-10 coalition that would involve the G7 nations plus Australia, India, and South Korea—to mitigate China's technology and supply chain dominance.[93]

## Japan's Own Pace of Defensive Technonationalism

Japan also decided in late 2018 to limit the domestic use of Huawei products, but it did so more subtly than Washington did.[94] Tokyo prohibited potentially compromised equipment on government networks without mentioning specific company names. Japanese private firms seemed to understand the subtext, however, as mobile carrier and tech investor SoftBank subsequently took expensive steps to remove Huawei equipment from its own networks in Japan.[95] It is no wonder why Japan prefers a more subtle approach: although Tokyo wants to compete effectively with Beijing and limit technological and economic vulnerabilities as much as Washington does, China is still vital to Japan as a market and a manufacturing base, not to mention an imposing regional military power.

Indeed, in various ways, despite traditionally being considered a "paradigmatic case of techno-nationalism," Japan today is pursuing a more moderate approach than the United States.[96] Japan has hardly tightened its export control procedures amid Trump's Entity List designations, and when it has done so it is usually acting in concert with other nations, as it did with respect to military-grade cybersecurity software and manufacturing technology for weapon-capable semiconductor parts in 2020 under the Wassenaar Arrangement. Japan also quietly strengthened penalties for violating export controls in

2017.[97] When Japan has made headlines with unilateral moves on export controls in recent years, it has been either to relax rules for Japanese defense equipment exports (in 2014) or as part of a bilateral dispute with South Korea that had nothing to do with protecting domestic industry.[98]

When Japan has been more aggressive in other areas of defensive technonationalism—most notably by imposing additional restrictions on inward FDI and protecting national secrets and intellectual property—its actions have been due at least partially to encouragement or prompting from the United States. After Washington took steps to strengthen its FDI rules in 2018 (a step that the European Commission later took too), Japan amended its Foreign Exchange and Foreign Trade Act in 2019 to lower the purchasing approval thresholds (from 10 percent to 1 percent ownership of the company involved) for transactions in certain sectors that could pose national security risks.[99]

Readouts from the Ministry of Economy, Trade and Industry explaining the new investment rules highlight the "global trend to strengthen measures from the national security viewpoint," and, privately, Japanese officials worried that tighter U.S. standards could frustrate their companies' investments if they did not demonstrate stricter control themselves.[100] If a Chinese firm that posed national security concerns sought to acquire, say, a 5 percent stake in a Japanese firm, that transaction could disqualify the Japanese company from making investments of its own in the United States, unless the Japanese government could demonstrate that officials had carried out their own due diligence.

The coronavirus pandemic and the resulting economic stress have heightened concerns in Tokyo on this front, and a group of ruling lawmakers are considering new policies to make sure that smaller businesses with important technologies are not snapped up by foreign entities: "Economic security is just as important as military power," former economic revitalization minister Akira Amari said in a June 2020 interview.[101] More broadly, the Abe administration created a new economic security team within the National Security Council in April 2020 to manage policy coordination related to many of these types of technonationalist policies.[102]

These developments reflect the expansion of national security concerns to include safeguarding economic competitiveness and protecting domestic innovation. In the United States, this impetus produced the Foreign Investment Risk Review Modernization Act (FIRRMA) of 2018.[103] FIRRMA strengthened the role of CFIUS in reviewing any noncontrolling investment in U.S. businesses involved with critical technology—beyond defense interests—or collecting Americans' personal data. The biggest worry that triggered this policy shift has been the billions of dollars Chinese firms have sought to invest in innovative U.S. high-tech start-up companies.[104] FIRRMA also allows CFIUS to discriminate based on the source country of investment, which is how the Department of Treasury created exemptions for Australia, Canada, and the United Kingdom.[105] This special treatment was credited to these three countries' "robust intelligence-sharing and defense industrial base integration mechanisms with the U.S." This is a level of U.S. confidence that the Japanese government aspires to reach.

A similar action-reaction interplay between U.S. and Japanese defensive technonationalism has been evident in terms of protecting classified information and intellectual property, as well as research integrity and security (including stepped-up scrutiny of scientists and researchers involved in projects on advanced technology). On this first point, U.S. officials have long complained to their Japanese counterparts that Japan's information security protections were inadequate, citing insufficient legal foundations for personnel clearances, the lack of a classified court system, and weak penalties for divulging secrets, among other critiques.[106] These issues have been discussed frequently in the U.S.-Japan Bilateral Information Security Consultations, which were created in 2007 following an incident in Japan that compromised some information about the U.S. Aegis radar system.

Many Japanese defense specialists and security-minded politicians subsequently have pushed for stricter and more uniform rules.[107] For some, the main goal is to improve Japan's national security capability for its own sake, but for many others it is about strengthening alliance cooperation. As Chief Cabinet Secretary Yoshihide Suga explained in 2013, "Japan can only share information with foreign governments on the presumption that Japan protects information by means of having proper laws in place."[108] Japan cannot afford to lose access to valuable U.S. intelligence.

The most significant step Japan has taken was enacting a new December 2013 law called the Act on the Protection of Specially Designated Secrets (or *Tokutei Himitsu Hō*). This legal change created an updated method for government offices to keep secret certain defense, diplomatic, or other information deemed vital to Japan's national security for up to thirty years initially, with the possibility of an additional thirty-year extension.[109] This law also covers secrets that other countries have shared with Japan. Its provisions stiffened penalties for divulging designated secrets and made the clearance process for government officials and some contractors more uniform.

But even this law has certain limitations. It did not centralize the clearance process, so each ministry has a degree of autonomy regarding how it follows the law. Failing a clearance review is extremely rare, as the government reported just one failed evaluation out of more than 150,000 people from 2015 through 2018.[110] A total of 412 state secrets have been designated by four ministries (predominantly by the Ministry of Defense and the Ministry of Foreign Affairs), and oversight mechanisms have detected fewer than ten procedural "violations."[111] It is possible that some of these violations are serious and involve divulging secrets, but Japan's lack of a classified court system makes prosecutors reluctant to pursue such accusations because they could not air classified evidence in public trials.[112]

A U.S. defense official described the Japanese reform as positive but "low hanging fruit" that leaves the information security system "too stove piped" and still requires program-specific SSAs in order to comply with U.S. standards for the treatment of confidential material related to new collaborative R&D initiatives.[113] Another official points out that—while the U.S. government has a unique and detailed professional classification for security specialists (GS-0080) across all departments including various specialties, grading positions, and training opportunities—Japan lacks such a professional cadre.[114]

Despite these limitations, overall, U.S. officials have applauded Japan's enactment of this new law as a step in the right direction and a good foundation for further reform. Combined with Japan's relaxation of its own arms export restrictions in 2014, the new law was seen as a way to enable closer U.S.-Japan defense industrial cooperation, but it quickly became apparent that Japan would probably need to take other steps to take full advantage of this reform's potential. One area that U.S. officials and company representatives emphasize consistently is strengthening Japanese industrial security, so that U.S. and Japanese firms could collaborate more seamlessly on government-sponsored projects that involve both classified and unclassified information.[115]

Partly to address U.S. concerns, Japan amended its Industrial Competitiveness Enhancement Act in 2018, creating a set of uniform standards for domestic industrial security and a process to certify that Japanese companies are meeting those general criteria.[116] U.S. officials also saw this as a positive step, but unlike NISPOM in the United States, Japan's new certification process only covers unclassified material and companies' proprietary information, not the protection of classified material in the private sector. Additionally, Japan's system is still ministry-by-ministry, so certification for a telecom company is slightly different than that for an aerospace company, because these sectors are regulated by different ministries. Moreover, the budgets of the firms overseeing the certification process come from fees submitted by applicant companies, creating some concerns about potential conflicts of interest. One U.S. industry executive observed that real change will come when Japanese firms view "higher levels of industrial security as an investment, rather than just a cost."[117]

When it comes to Japanese information security, it is possible to see the glass as both half-full and half-empty. Clearly, Japan has improved its information protection infrastructure and practices, and these improvements have enhanced information sharing between Washington and Tokyo. In addition to the examples already mentioned, the Five Eyes intelligence network is reportedly expanding cooperation with a few other trusted countries—including Japan—to address certain shared interests related to China and North Korea.[118] More regular interactions between Japan's Ministry of Economy, Trade and Industry and the U.S. Department of Defense are strengthening information sharing about supply chains related to China, among other improvements.

But a variety of remaining challenges—some already mentioned—make effective U.S.-Japan cooperation on technonationalist policies more difficult than it could be. Improving the Japanese clearance system and building a cadre of Japanese information security professionals would help significantly, because the hurdles to international collaboration are only getting higher. For example, the Department of Defense is elevating the cybersecurity requirements for companies that want to contract with the Pentagon, and these standards extend beyond primary contractors to include many of the subcontractors they enlist.[119] If small and mid-sized Japanese firms cannot keep up with the demands of the United States' new Cybersecurity Maturity Model Certification, they will have a harder time partnering with U.S. firms on defense-related business. Pentagon officials say that all Department of Defense contracts will contain these new requirements by 2026. Japan also lacks a classified patent system, making it and Mexico the only two G20 nations without one.[120]

U.S. officials also need to reevaluate certain aspects of their approach. Their current operating model could unnecessarily limit the pool of potential partners by creating ever stricter security requirements and providing little flexibility in terms of how those requirements are met. Industry executives from both countries complain that U.S. officials focus too often on prescriptive processes and equivalent bureaucratic structures or legal powers as a measure of foreign partners' compliance, without considering local laws, customs, or logistical parameters. Instead, they argue, the evaluation of firms' security measures should be based on whether the foreign partner's approach achieves an equivalent effect or outcome.[121] Such a reconceptualization would help both countries achieve a desired level of security while maximizing their available market opportunities.

A final area worth mentioning is heightened U.S. scrutiny of the integrity of scientific research from a national security perspective, particularly regarding Chinese researchers working in the United States or U.S.-based scientists collaborating with Chinese institutions (or what the Justice Department calls nontraditional collectors).[122] The Trump administration has placed new limits on Chinese graduate students' access to U.S. universities since 2018, shifting from five-year student visas to single-year visas for Chinese students in certain academic fields. In May 2020, Trump further suspended the entry of Chinese nationals for graduate education or research if they had any history of military affiliation.[123] The Trump administration has also cracked down on undisclosed affiliations with Chinese counterparts.[124] The Federal Bureau of Investigation arrested a Harvard professor in one high-profile case in 2020, and scientists from at least five other universities have been prosecuted since 2018.[125] In addition, a two-year probe by the National Institutes of Health led to fifty-four scientists losing their jobs or being fired for failing to reveal foreign funding ties—93 percent of which involved a Chinese institution.[126]

Supporters of this crackdown hail the progress and want even tougher measures to be enacted, but people responsible for R&D in the United States warn that the Trump administration could be driving talent back to China and India, leaving the United States shorthanded on skilled labor. In the fields of computer science, mathematics, and engineering, nearly 60 percent of the U.S. doctoral-level workforce is foreign born, and a report for the National Science Foundation urged "an evidence-based description of the scale and scope of problems posed by foreign influence in fundamental research," lest U.S. authorities overreact.[127] The ability of U.S. universities to carry out government-sponsored research or to partner with U.S. and Japanese industry actors could be negatively affected if things are taken too far.

U.S. officials raised these researcher assurance issues with Japanese counterparts at JHLC preparatory meetings in early 2019, looking to stimulate greater Japanese attention to these concerns and keep the allies in sync.[128] As with other issues including security clearances, industrial security, and cybersecurity, developing a truly harmonized allied approach on researcher assurance will be difficult due to various legal and cultural differences.

At just a logistical level, Japan's consulates and its embassy in China are not staffed properly to carry out the background reviews necessary to screen Chinese student visa applicants for these kinds of sensitivities, so they have to develop new ways to coordinate with Japan's National Policy Agency on these issues.[129] Moreover, as in the United States, some Japanese universities will be reluctant to completely accept the central government's perception of the threat that China poses and the costly restrictions that such policies require. In fact, at least a few universities have even embraced this as an opportunity to attract top Chinese talent, if the United States decides to reject them.[130] Needless to say, Japanese officials who share U.S. government concerns are dismayed by any downplaying of the risks associated with Chinese researchers and scientific funding, and they want to avoid a scenario in which a U.S.-blacklisted Chinese grad student winds up at a high-profile Japanese university.

Overall, U.S. and Japanese policymakers should be encouraged that they enter this new technonationalist era with similar threat perceptions and many common interests: they are already well-positioned to share sensitive information and align their defensive policies. Japan is close to being within the United States' most trusted circle of partners, but there is room to improve so that both countries can further maximize their position. The Trump administration is in danger of moving too aggressively and too unilaterally, and it would benefit from a more collaborative approach to designing and implementing these measures. Moreover, Trump will undermine his stated objectives vis-à-vis China if he does not stop applying punitive trade policies against allies and demanding exorbitant payments for alliance security cooperation. Japan, for its part, will need to take more significant steps to upgrade its technological and information security if it wants to take full advantage of its alliance with the United States, and this includes investments in its intelligence and defense enterprises.

A high-profile but soon forgotten bilateral initiative during the Trump-Abe era was the Japan-U.S. Economic Dialogue (from 2017 to 2019) led by Vice President Mike Pence and Vice Prime Minister and Finance Minister Asō Tarō.[131] This so-called Asō-Pence dialogue was an opportunity to tackle many of these challenging issues with a sense of urgency and a level of authority that is rare in bilateral relations, given the involvement of each nation's second-highest political leader. Instead, it became a forum for shadow boxing between the two sides over Trump's long-standing complaints about the U.S. trade deficit with Japan, even though the language of their joint statements suggested a much broader and more strategic approach.[132] Some constructive discussions did occur during its short tenure, but mutual suspicion about true motives and domestic infighting in both capitals produced very little from this exercise.[133] After the next U.S. presidential election, the winner would be well-served by trying again, but this time with a set of agreed-upon common objectives and priorities for these bilateral consultations.

## Offensive Technonationalism

Successfully implementing well-targeted defensive technonationalist policies can help protect valuable intellectual property and contribute to allied competitiveness, but over the long term these defensive policies will yield few benefits unless they are combined with the effective promotion of U.S. and Japanese innovation and economic prowess. This capacity should be considered in broad terms, encompassing education, research and infrastructure investment, economic efficiency and resiliency, and collaboration with capable partners.

A more offensive mentality also includes leveraging cutting-edge commercial technology for national security purposes, something the Department of Defense tries to foster through its Defense Innovation Unit—started up in 2015—with offices in Silicon Valley, in Boston, in Austin, and at the Pentagon. In 2020, the unit's current head, Michael Brown, highlighted the importance of fielding a good offense: "We're focused too much on the defensive side, and that's the wrong balance," he said at a public forum, before recommending a big boost to government investment in scientific research and its enabling talent pool.[134]

The Trump and Abe administrations—like their predecessors—have produced a fair number of special commissions, analytical reports, and national strategies aimed at improving national competitiveness and innovation. Unlike before, these policy debates are trying to focus on multiple technological areas simultaneously even as the stakes and political tensions with China rise. The United States and Japan have produced multiple national strategies on AI, quantum science, cybersecurity, and space since 2017, together with various road maps and investment initiatives developed in cooperation with private sector business groups.[135]

These strategies have tended to highlight common themes like increased government support, talent development, and technology adoption. But with government resources stretched by the response to the coronavirus pandemic and spread across so many different priorities simultaneously, it will be essential for Tokyo and Washington to build technology-based alliances and ecosystems and expand their intellectual, material, and financial resource bases.[136] The U.S.-Japan alliance is well positioned to contribute to these goals.

## Boosting R&D Investment by Pooling Resources

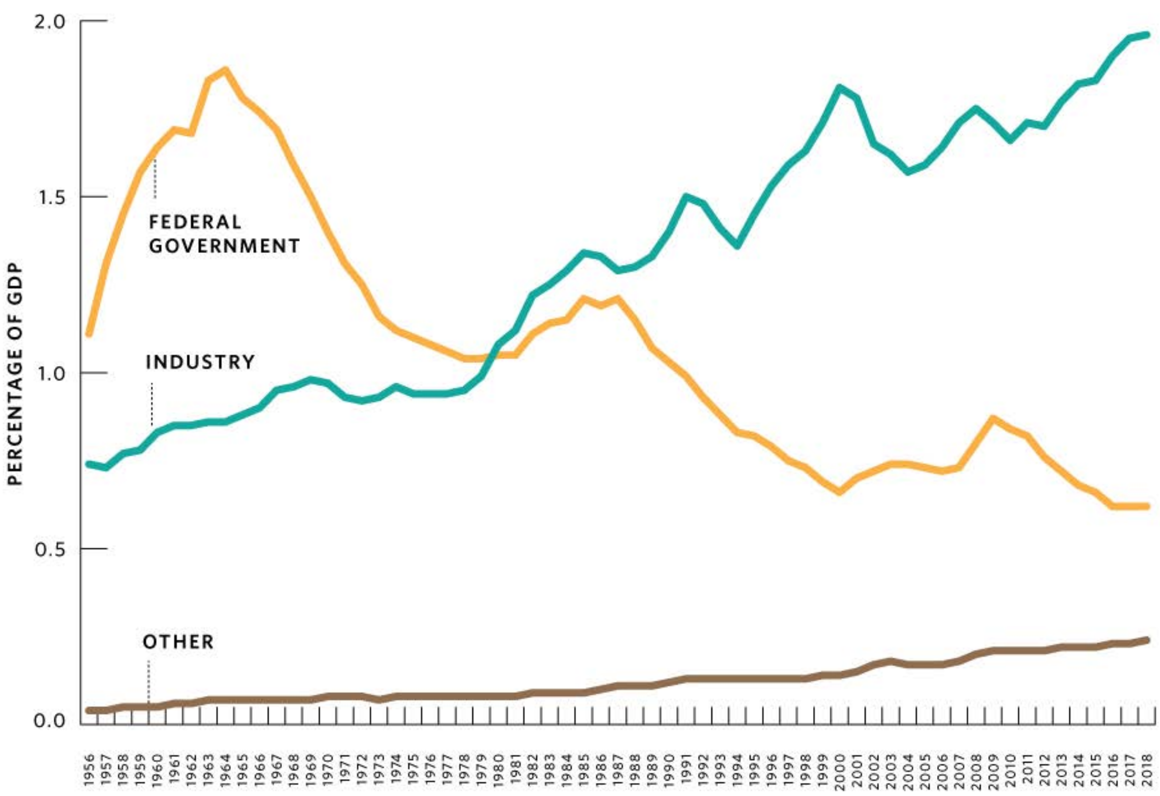
The most prevalent policy recommendation for offensive technonationalism is to spend more as a country on research and development, whether that means tax breaks to incentivize private sector R&D or increased government investment in basic science research. Government spending on basic science is emphasized because, unlike the private sector, it generally is more conducive to longer time horizons and is less directly concerned with near-term profitability. Advocates suggest that such public-supported research can produce more fundamental scientific breakthroughs with long-lasting returns to the nation, though others add that important S&T contributions come from various types of research. Google's breakthrough technology, for example, stemmed from a modest digital library project supported by the National Science Foundation in 1994.[137] Most of the foundation's R&D portfolios (that is, groupings of different funded projects aimed at particular research goals) combine basic and applied research.[138]

Regardless of the type, there is also a question of how widely the results of basic research should be shared with (or involve) other countries. Traditional U.S. government policy says that the "products of fundamental research" it supports (basic and applied in science and engineering) should "remain unrestricted . . . to the maximum extent possible" and that the only acceptable method of control is classification.[139] This prevailing policy raises a high bar for limiting who could benefit from the results of government-funded research, and it stems from a belief that "the key to maintaining U.S. technological preeminence is to encourage open and collaborative basic research."[140] The approach creates high walls (in terms of classification) around narrowly defined research areas, rather than moderate walls around a wide range of scientific inquiries.

The Trump administration has explored the idea of making it easier to control some fundamental research and its dissemination, but a report commissioned by the National Science Foundation on this issue reaffirmed the value of traditional U.S. policy.[141] The report recommended that the foundation "should discourage the use of new CUI [controlled unclassified information] definitions as a mechanism to erect intermediate-level boundaries around fundamental research areas." Still, as noted previously, the report also suggested that research integrity should be defined more broadly to include “full disclosure of commitments and actual or potential conflicts of interest” so as to actively engage foreign researchers in the United States to “foster [such] openness and transparency in fundamental research, nationally and globally.”

The U.S. and Japanese approaches to this wider definition of research integrity must be harmonized to facilitate alliance collaboration in government-funded research. The reason why the allies should consider expanding bilateral collaboration in government-funded research is because of the budget constraints they both face and the amount of funding catch-up they must do. After all, government-funded research spending has dropped significantly since its Cold War peak, down to around 0.7 percent of GDP in the United States from a high of nearly 2 percent in the 1960s (see figure 3).[142]

FIGURE 3
**U.S. R&D Funding by Sector**



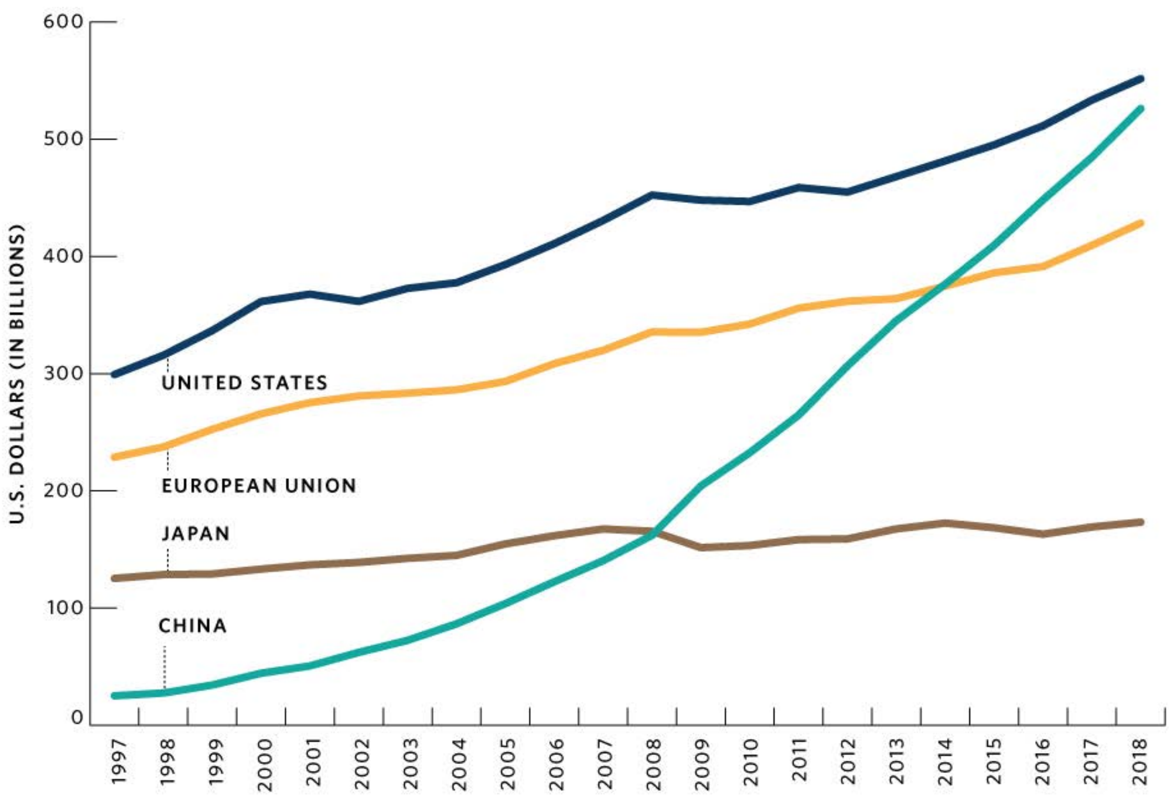

**SOURCE:** National Science Foundation, “National Patterns of R&D Resources: 2017–18 Data Update,” Table 1, https://ncses.nsf.gov/pubs/nsf20307/.

**NOTE:** Totals are approximate due to rounding. “Other” includes funding for U.S. R&D by nonfederal government, institutions of higher education, and other nonprofit organizations.

U.S. private sector research investment has moved in the opposite direction, largely offsetting the government's spending decline. That said, because private sector R&D focuses more on proprietary and profit-driven applications, private firms tend to prioritize research that is qualitatively different and less widely shared than public sector basic science research.

In Japan, the ratio of government-funded research has been low traditionally—less than 20 percent of total R&D spending domestically.[143] And with the highest government debt-to-GDP ratio among members of the Organization for Economic Co-operation and Development (OECD), Japan is always looking for ways to leverage partnerships and maximize its limited government R&D investments.[144] China's spending on R&D in terms of GDP eclipsed that of Japan around 2009, and it rocketed up to three times larger than Japan's total over the decade that followed (see figure 4).

FIGURE 4
**Total National and Supranational R&D Expenditures**




**SOURCE:** "Gross Domestic Spending on R&D," OECD Data, accessed April 16, 2020, https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm.

Notably, OECD data on domestic R&D investment captures all spending by resident companies, universities, and government laboratories, so these figures include foreign companies conducting research in one's country. For example, all the work on AI and robotics that the Toyota Research Institute carried out at its facilities in Massachusetts, Michigan, and California counts as U.S.-based research. Strikingly, Japanese companies were the second-largest group of investors in local R&D among foreign companies invested in the United States, and they likely exceeded UK firms when the numbers for 2020 are tallied. Japan is clearly an integral part of the U.S. R&D landscape.[145]

The U.S. and Japanese governments have jointly funded collaborative R&D for many years, and such joint initiatives are under way in a variety of areas such as lunar exploration, smart cities, big data integration, wireless systems, wired and optical networks, and quantum information science. These forms of collaboration are often facilitated by joint funding agreements—or memorandums of cooperation—that U.S. agencies like the National Science Foundation, the National Institutes of Health, the National Aeronautics and Space Administration, and the Department of Energy have signed with Japanese counterparts such as the Japan Science and Technology Agency, the Japan Society for the Promotion of Science, JAXA, the Ministry of Economy, Trade and Industry's New Energy Development Organization. When such agreements are reached, the participating organizations issue a public call for joint proposals by U.S. and Japanese institutions for a specific research area subject to the reviews of both governments. Successful applicants are usually funded by their respective governments in a coordinated fashion and according to a proposed budget.

Such collaboration allows each country to increase the number of active test beds (or research platforms) focused on an issue of shared interest, sometimes permits them to share data sets, and allows them to leverage a larger number of unique and expensive research assets such as supercomputers or special laser platforms. Currently, China has nearly twice as many supercomputers as the United States; China, the United States, Japan, and the EU alike are all developing exascale computers (next-generation supercomputers) with different types of architecture.[146] U.S.-Japan-EU collaboration can help close the gap with China now, and the partners' different design approaches give them all a better chance at successfully developing exascale computing capabilities for the future. At a congressional hearing in 2020, the vice president for research at the Georgia Institute of Technology urged lawmakers to "increase our cooperation with allies who share our values in pursuit of technical and policy solutions to solve global problems, and to safeguard the resulting technologies . . . [because] cooperating with our allies has a multiplicative positive effect."[147]

To date, the allied approach has been a relatively effective model that combines some top-down indications of priorities with incentives to stimulate bottom-up research proposals and activities. Over the years, some of this joint funding has promoted enduring relationships between research institutions in Japan and the United States, such as cooperation between Osaka University and the

Lawrence Livermore National Laboratory. There are also other supplemental programs to stimulate bilateral collaboration, such as the Japan Society for the Promotion of Science's Kaitoku–National Institutes of Health program that supports biomedical and behavioral research projects that young Japanese postdoctoral researchers undertake in National Institutes of Health laboratories for up to two years. The Japanese Embassy in the United States, the New Energy and Industrial Technology Development Organization, and the Japan Science and Technology Agency also held a U.S.-Japan Digital Innovation Hub workshop in both 2018 and 2019 to foster collaboration among universities and labs in both countries, with plans to exchange researchers and establish a new funding scheme.[148]

Despite all these efforts, however, such joint funding represents just a small percentage of overall scientific activities spread over a wide range of disciplines and research objectives. For example, one 2014 study showed that U.S. scientists publish jointly more than twice as often with Chinese partners as they do with Japanese collaborators.[149]

For the United States and Japan to maximize the benefits of additional government-funded basic research more effectively, they could seek to narrow down the priority areas for new investment and widen the aperture for collaboration with other countries. Such changes would entail coordinating bilaterally and acting multilaterally by injecting new money into a small number of strategically important research areas. It is possible that some of these areas would include applied research with military relevance that could be classified, but the majority of it would be open, perhaps carried out under a more broadly designed and rigorous concept of research integrity to which all participating partners would agree. To facilitate such bilateral coordination, the allies could amend their 1988 S&T cooperation agreement and empower the JHLC to identify specific shared priorities and enable it to direct additional catalyst funding for collaborative R&D in these areas.[150]

Some of this U.S.-Japan collaboration could take advantage of new funding to support ventures like the Japanese government's so-called Moonshot Research and Development Program, which identified a few medium- to long-term R&D goals and is funding a variety of proposals to achieve them.[151] Through the Moonshot initiative, Tokyo is actively promoting international collaboration and has identified six broad goals; it will invest close to 100 billion yen (or about $900 million) of previously uncommitted funds over five years to support various proposals that involve AI, robotics, quantum computing, and other related technologies.[152] In theory, this approach has a greater tolerance for failure on the part of any given proposal as long as one of the funded research efforts achieves the goal. The EU and the United States each have their own similar programs, respectively called Horizon Europe and 10 Big Ideas. The three partners could consider adding a jointly conceived goal or two that they could organize around as a collective moonshot initiative.

## Cultivating S&T Talent

In addition to more and better-targeted national R&D spending, many technology advocates highlight the need to invest in both domestic and foreign scientific talent. Boosting domestic education initiatives for science, technology, engineering, and mathematics at all levels is not controversial, even if policymakers disagree on the best way to do this and where the money should come from.

But the role of foreign researchers is more hotly debated. Former Google chief executive Eric Schmidt told Congress that "we also need to attract more global expertise to America . . . [because] around 80 percent of computer science PhD students who come from abroad to study end up staying in the United States after graduation."[153] Without a strong talent retention program, he argues, the best scientific minds in the world will conduct their work in other countries. Many in Congress and in the Trump administration, however, worry about the other 20 percent of graduates who leave the country, documenting many cases where Chinese talent recruitment has siphoned off the benefits of U.S. taxpayer-funded research.[154]

Schmidt and others point out that the United States is simply unable to satisfy its science and engineering needs with U.S.-born specialists. In his role as chair of the United States' National Security Commission on Artificial Intelligence, Schmidt said bluntly that "we are dependent upon Chinese researchers and Chinese graduate students . . . [and] a decoupling at the human level would hurt the United States."[155] The chairwoman of America's National Science Board also points out that "as of 2017, over 40 percent of our doctoral-level science and engineering workforce was foreign born . . . [and] the higher the degree level, the greater the proportion of the workforce that is foreign-born."[156] She notes that the U.S. stay rates for graduates from the two largest sources of foreign talent—China and India—are declining as graduates have more opportunities than before in their home countries.

With countries competing more aggressively to attract the best scientists, Washington needs to consider new ways to help retain young students who come to the country's best universities, rather than make life difficult for them. The Trump administration created a new office at the White House in 2017 called the Office of American Innovation, and federal adjustments to talent-based immigration policies is one of the areas they are discussing with U.S. businesses.[157] Some of these efforts, however, will naturally conflict with other steps mentioned earlier for expanding the scope of research integrity and scrutinizing foreign affiliations more rigorously.

Japan's relatively low level of central government funding gives it fewer tools to entice visiting researchers to stay in Japan, but Tokyo knows that it needs to expand this pool to help compensate for the country's demographic decline in terms of its working-age population: "If we rely only on domestic scientific talent, our impact globally will decline," said one Cabinet Office official.[158] This is why the Japan Science and Technology Agency and the New Energy and Industrial Technology Development Organization are actively recruiting foreign-born researchers to submit proposals under the Moonshot program. Meanwhile the Japanese government is also striving to make it easier for foreign students in Japan to start their own companies by expanding residency options and even subsidies from the Ministry of Economy, Trade and Industry for such new businesses.[159]

The Japanese private sector is particularly important, given the high percentage of Japanese R&D activity that takes place there. Japanese companies are more actively partnering up with universities and research institutes than they used to. For many years, Japan's Institute of Physical and Chemical Research (also known as RIKEN) was one of the few domestic examples of successful partnerships between a public institute and the private sector, stretching as far back as the 1930s and the RIKEN Industrial Group.[160]

Japanese firms have traditionally been more active partnering with research universities overseas, but, in 2016, the government introduced an investment matching program for domestic partnerships. Since then, new multiyear initiatives have been launched between SoftBank and the University of Tokyo on AI, Hitachi and Kyoto University on smart cities, and between several other partners in other areas. In addition, some Japanese firms like NEC (formerly known as the Nippon Electric Company) and Fujitsu are making exceptions to their seniority-based pay scales to attract young AI engineers with entry-level salaries of $100,000 per year or more.[161]

Japan and the United States are not unique in wanting to attract high-level engineers and scientists. Canada and Australia regularly rank among the highest in skilled labor migration permits, and, in early 2020, the United Kingdom unveiled a new Global Talents visa program as it prepares to compete more vigorously with the EU for employees with special skills.[162] China is recruiting aggressively, and more engineers and scientists from India are returning home after graduate studies compared to before.[163] At a certain point, it will be more advantageous for countries and scientists alike to have a less cutthroat and more inclusive environment for researcher mobility, since such an atmosphere would provide researchers with more options throughout their careers, give companies and research centers more flexibility to staff their projects, and make the process more affordable for governments.

Allied governments need to establish a proper policy framework to accomplish these goals, again by coordinating bilaterally and acting multilaterally. A useful framework would provide some support for strengthening international institutional relationships (including personnel exchanges, reciprocal access to certain high-value research assets, and pooled funding for such assets and related test beds) among relevant national laboratories and specific universities and research organizations in key strategic areas. Such a framework could include harmonized rules for researcher mobility and research integrity and transparency. Its provisions could also include targeted promotion of science, engineering, and math education that incorporates science-related study abroad programs in each other's countries.[164] All of these activities would help to increase the effectiveness of international R&D collaboration over the long term.

### Enabling Greater Private Sector Collaboration

While government support for fundamental research is important, it is unlikely to ever approach the scale of private sector investment. About 70 percent of all U.S. R&D funding comes from businesses—roughly the OECD average—and in Japan the ratio is about 80 percent.[165] Moreover, the largest U.S. investors operate in areas where government has some of the least leverage. For example, the giant defense contractor Lockheed Martin budgeted only $1.2 billion for R&D in 2018, or about ten times less than Apple and twenty times less than Amazon.[166] Together, the top five U.S. companies spent around $76 billion on R&D in 2018, and analysts forecast that they will likely spend more than $160 billion in 2022.[167] Meanwhile, the top five defense contractors spent a combined $8 billion in 2018. For the allies to form an effective strategy to bolster their technological strength, they must involve the private sector and facilitate cross-fertilization—when appropriate—among partner nations and between the defense and commercial sectors.

The Trump administration's approach to defensive technonationalism, however, risks inadvertently undercutting closer private sector collaboration internationally. Hitachi, for example, warned in its formal comment submission on proposed export controls that "an overly broad—even ambiguous—definition for 'emerging technologies' could . . . cause delays in research and . . . [make compliance] overly burdensome, driving some firms to move R&D centers and their best and brightest abroad."[168] On the direct investment side of things, Washington's decision to keep Japan off its list of exempted countries adds costs and uncertainty for Japanese companies in the United States. Improving Washington's coordination of these defensive steps with allies and narrowing gaps between them on the most consequential end uses of affected technologies will help foster greater technological collaboration and still meet relevant defensive objectives. Keeping U.S. and Japanese policy in sync will also improve both countries' negotiating leverage vis-à-vis China.

In this respect, Trump's broader trade agenda has been counterproductive. Specifically, his rejection of the Trans-Pacific Partnership (TPP) regional trade agreement and his unilateral tariff war with China make alliance cooperation more difficult and accelerate Beijing's investments in indigenous capabilities. In a sign of China's progress on this front, its largest semiconductor maker announced in 2020 that it will be selling some of the world's most advanced chips before the end of the year, on an accelerated schedule due to U.S. trade restrictions. These chips, known as 'not and' (or NAND) flash memory chips, are high-capacity data storage devices that are poised to become the industry standard.[169] Among other benefits, U.S. participation in TPP would have brought about 40 percent of the global economy under a common set of digital trade rules that aims to maximize data portability, prohibit data localization, and protect personal information.[170] Many of these goals are being pursued via the G20 Osaka Track on digital rules—or what the Abe administration promotes as "data free flow with trust"—but these rules would have had a stronger head start with the United States as part of TPP.[171]

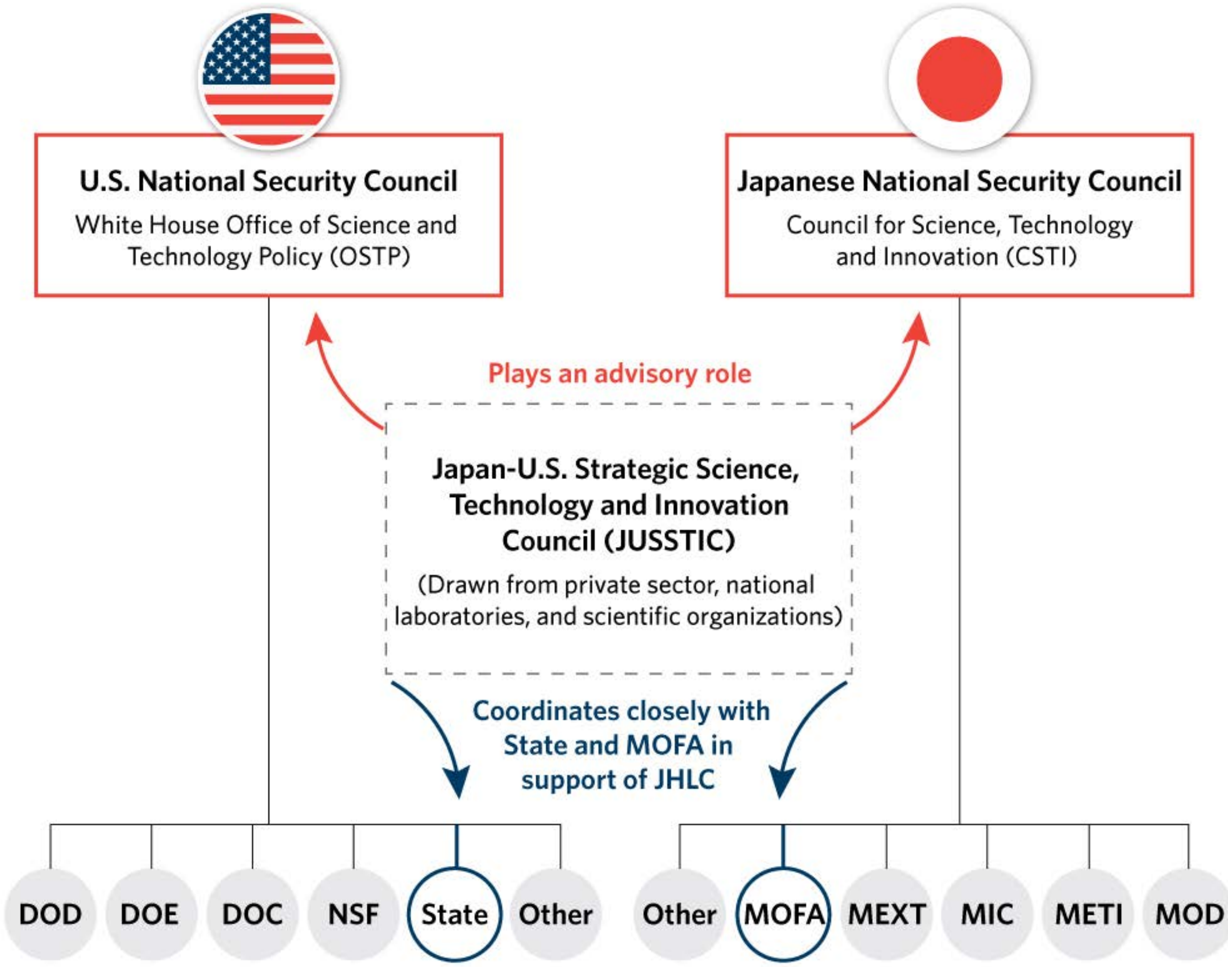
Because the commercial private sector is such an important driver of research and innovation, from a national security perspective, it will also be important to improve the defense industry's adaptation of new technologies to keep pace with competitors. Analysts note a dangerous shortage of software development talent in the U.S. defense sector, and with big growth in autonomous or cloud-enabled systems expected, the role of software and AI engineers will become increasingly important.[172]

The U.S. Department of Defense and Japan's Ministry of Defense (and Ministry of the Economy, Trade and Industry) are trying to strengthen ties between these two sectors within each country and to some extent between each other. In both cases, there are disincentives to overcome due to costly additional bureaucratic layers and commercial sensitivities to military applications of these technologies, but these barriers are more significant in Japan. Google, for example, has withdrawn from some high-profile pursuits of Pentagon contracts due to employee protests, while Japan's pacifist political tendencies, combined with low defense product profitability, have discouraged Japanese firms from fully exploring dual-use technologies.[173]

To fully promote this kind of overall synergy—between public and private sector entities and between the defense and commercial sectors—the allies should consider establishing a bilateral public-private interdisciplinary body to work in support of top U.S. and Japanese policymakers. This council could draw from top laboratories and corporations to help policymakers leverage allied S&T collaboration in new ways and delineate clear priorities amid fiscal constraints. It could be similar to the consultative, private sector–oriented Joint High-Level Advisory Panel established (but later abandoned) by the 1988 U.S.-Japan S&T cooperation agreement, or it could be a separate bilateral commission that proposes joint funding initiatives to the National Security Council secretariats of both countries for inclusion in annual budget proposals.[174]

One possible approach is outlined below (see figure 5), developed by the author and an experienced consultant for U.S.-Japan science collaboration programs, Douglas Rake.[175] The primary benefit of this approach is that it puts a wider range of scientists and technology specialists in closer and more regular contact with policymakers from both countries. Such an approach can tighten the loop that connects national strategic policy priorities, funding choices, and knowledge about the world's most advanced technologies.

FIGURE 5
**Possible Approach for a Public-Private Strategic Science Advisory Council**




During the earlier protectionism scare involving Japan in the 1980s and 1990s, private sector input was designed to reassure U.S. companies that Washington did not share too much commercially sensitive technology with Japan. But today there is a better opportunity to align U.S. and Japanese national and corporate strategies. Many more U.S. and Japanese companies are partners in innovation today—partnerships facilitated by Japanese R&D and venture capital investments in the United States through new entities like NTT Research or Toyota AI Ventures, both headquartered in Silicon Valley.

It is possible to prioritize bilateral R&D for peaceful purposes while acknowledging that virtually any S&T breakthrough can have defense applications eventually. This fact should not restrict either private or public sector bilateral basic research, even if the source of that funding is a defense agency. Japan's Ministry of Defense began increasing its support to outside research institutes and universities in 2015 through the National Security Technology Research Promotion initiative; even though the amounts were relatively small, the program quickly sparked controversy.

The Science Council of Japan in 2017 reaffirmed its earlier "commitment to never become engaged in scientific research for military purposes" and discouraged its members from participating in the program.[176] This caused a big drop in university participation, from an initial peak of 109 universities in 2015 down to eventually only eight in 2019. Meanwhile, government-affiliated research institutions have picked up the slack and are carrying out this work, in many cases through joint appointments whereby university scientists can be affiliated with an outside research lab.[177] Overall, Japan should continue looking for ways to promote greater cross-fertilization between nondefense and defense-related science R&D communities so that potentially dual-use technology areas benefit fully from the country's scientific expertise.[178]

The notion of dual-use technology is not just a matter of the potential military applications of commercial technologies: proprietary S&T assets in the commercial arena are highly valuable and have a great deal of strategic importance in their own right. In that respect, each side of the dual-use concept is as important to national security as the other. Accordingly, current technonationalist trends are raising the level of scrutiny and sensitivity over many nonmilitary technologies including communications, semiconductors, and encryption.

While many of the United States' closest allies maintain mutual security of supply arrangements covering defense items, the coronavirus pandemic has revealed bottlenecks in the global supply chains for medical equipment, medicines, and component parts for different types of manufacturing. Part of Japan's pandemic response legislation included funds to support domestic companies in realigning or supplementing supply chains for medical equipment to increase flexibility. It might be possible for a pool of close allies to consider this kind of approach for a wider range of sensitive high-tech products.

## Technology-Specific Considerations

As for where the United States and Japan should focus their attention, there are some obvious candidates. The allies have already identified some promising technological areas but have yet to pursue them with any new collective effort. As a sign of the Trump administration's bias toward defensive technonationalism over offensive technonationalism, it took nearly two years to put a science adviser (and director of the Office of Science and Technology Policy) in place and designate an appropriate leader to host the administration's first JHLC meeting with Japan.[179]

The Japanese government was waiting for this appointment before it engaged fully on a new S&T cooperation agenda, because it believed that a JHLC meeting without such an appointee would be an "empty vessel."[180] The meeting finally occurred in May 2019 on short notice, and the resulting joint statement highlighted AI, quantum science and technology, and bilateral space cooperation.[181] By extension, data governance and data sharing will be important components of such collaboration too.

An encouraging aspect of the meeting was a unique co-hosting arrangement with U.S. Deputy Chief Technology Officer Michael Kratsios, which could become a pattern for future replication. Such an arrangement would foster basic science collaboration in the areas of energy, healthcare and the biological sciences, space, and computer science (all topics of discussion in the newly dubbed science track of the JHLC), with more specific technological priorities in the areas of quantum computing and AI.[182] Linking the S&T tracks in ways that support national strategic objectives makes sense, especially if these tracks can be explored with some degree of collective international effort.

Looking first at AI, the United States' National Security Commission for AI issued an interim report in November 2019 that made five recommendations for the U.S. government, among them marshaling global AI cooperation.[183] The commission sees an opportunity to maximize national security benefits from AI development—through better planning, data sharing, and interoperability—by leveraging international cooperation among "like-minded nations." Such efforts would also give participants an opportunity to shape the global rules and norms surrounding future AI deployment in ways that are consistent with their political systems and that support their strategic interests in terms of stability and safety.

This AI network "could include more coordinated AI R&D spending and cooperative arrangements in data sharing, hardware, export controls, and talent exchanges," along with collective efforts to build a more robust AI-literate workforce in participating countries.[184] They could "more efficiently allocate alliance resources and . . . increase collective AI capacity." Importantly, while the commission strongly advocates protecting intellectual property and takes a comprehensive view of research integrity, it also says that "to enhance collective competitiveness, the United States and its partners need to lower the barriers to the movement of people and data among nations," particularly because of China's large advantages on data quantity and human resources.

The commission went on to make more specific recommendations in its first quarter report for 2020 including efforts to establish national security points of contact for AI among allies, develop an "allied assessment of comparative strengths in AI research and applications," and create a multilateral working group for AI collaboration and interoperability that uses this information to foster more effective cooperation.[185] Of course, AI is a very wide branch of S&T that cannot be explored sufficiently by a single working group or initiative, but it will be useful for the commission—and perhaps others like it in different areas—to channel bilateral and multilateral collaboration systematically in light of participating countries' national strategies.

As of now, however, the commission focuses only on the Five Eyes countries as AI security partners. This approach makes little sense when one compares the depth and breadth of U.S.-Japanese military interactions with those between the United States and New Zealand, for example. Moreover, this policy ignores the vast amount of AI expertise and R&D activities taking place in Japan and between U.S. and Japanese companies. The Five Eyes construct has its value, but too often it can become a crutch for cooperation on a wider range of areas because it is viewed as unassailably safe.

Some analysts and Japanese policymakers have pushed to turn Five Eyes into Six Eyes by including Japan, with the idea that this would automatically incorporate Japan into a wider range of cooperative activities.[186] But such a policy shift would force Japan to adjust many laws and procedures to fit the Five Eyes' rigid military intelligence criteria. A better approach would be to involve Japan in a new, wider trusted circle focused on technology security and data sharing that could include other countries beyond the Five Eyes partners, like France, South Korea, and possibly Taiwan.

For its part, Japan's AI R&D strategies should probably focus more on international collaboration, specifically with the United States and other traditional technology partners. The multilateral dimension of such cooperation got little mention in a recent Cabinet Office strategy document, except in the context of trying to attract high-quality foreign AI talent to work in Japan.[187] It is not that Japanese officials are averse to such collaboration, but more likely that these patterns of cooperation are not well established or deeply understood by government officials. This oversight is in some ways ironic, because many Japanese officials believe that Japan is in danger of falling behind on AI development globally, so one would think they would see that the country has more to gain than lose from international collaboration.

Another area that both countries are prioritizing is quantum science and quantum computing. In December 2019, the allies signed an agreement on quantum cooperation that could facilitate some jointly funded research in the coming years.[188] Private companies in both countries are making major investments and reporting important breakthroughs, but this is a decades-long R&D marathon to which China is equally committed. Twenty-one years ago, NEC first demonstrated how superconducting quantum bits, or qubits, can store and process exponentially more information than the bits that traditional computers use (and do so far more rapidly).[189] The quantum R&D landscape continues to evolve as a host of firms make continuous advances. In 2019, Google announced that it had achieved "quantum supremacy" by producing a quantum device that performed at a high level not feasibly achievable by a classical computer. Toshiba plans to offer quantum cryptography services in 2020, and the Japanese telecom firm NTT aims to commercialize its optical network approach to quantum computing within ten years in collaboration with U.S. partners.[190]

There is still a long way to go for Japan and the United States on this front. China is launching the world's largest quantum research facility in 2020 with an estimated $10 billion investment.[191] The Abe administration is pursuing a ten-year plan to support production of a 100-qubit machine, while the Trump administration established a National Quantum Initiative to bolster U.S. competitiveness in this area.[192] Likewise, the EU has a Quantum Technologies Flagship program that will invest at least 1 billion euros over the next ten years in support of its industries.[193] The U.S.-Japan agreement on quantum cooperation provides a useful starting point for closer coordination of national research efforts in support of industry actors, but this coordination is only just beginning and will no doubt be inhibited by the coronavirus pandemic.

The good news is that the research marketplace is already responding to the opportunities in quantum computing and exploiting strong U.S.-Japan relationships. As noted earlier, NTT Research established a new R&D facility in Palo Alto in 2019 with a focus on quantum computing, for example, and within the year it concluded joint research agreements with six U.S. universities, one U.S. government agency, and one Canadian firm. Such initiatives can build upon several decades of international collaborative work in high-performance computing funded by the National Science Foundation and Japanese ministries, and there are new quantum-specific opportunities embedded in the National Science Foundation's 10 Big Ideas program and Japan's Moonshot initiative too.[194] Both initiatives have new funding available to invest in quantum research, though the challenge remains how to connect these opportunities to the strategic goal of fostering bilateral cooperation in quantum science and computing, as articulated in the 2019 joint statement. Creating a consultation mechanism like the Japan-U.S. Strategic Science, Technology and Innovation Council (JUSSTIC) can facilitate this coordination.

## Priorities for Bridging the Gaps in U.S.-Japan S&T Cooperation

The coronavirus pandemic has damaged the global economy severely and heightened U.S.-China tensions, but the United States and Japan cannot afford to neglect or mishandle their cooperative ventures on technology issues. U.S. and Japanese policymakers should not lose their sense of balance on technology competition. The long-term impact of the pandemic is unclear at this stage. It could be significant in different—even conflicting—ways: for instance, the worldwide response could accelerate the adoption of new technologies and spur countries to compete to adapt to more virtual activities in light of social distancing imperatives, or it could perhaps slow things down as government and corporate debts pile up and as R&D funding sources are diverted.

The future environment for international technology standards and data treatment is clouded too, as these arenas become new geopolitical battlegrounds that could turn even more tumultuous as countries suffer economically and look to either China or the United States for aid and investment. For Washington and Tokyo, this uncertainty, coupled with the hardships that all countries are facing, places a premium on international cooperation in support of shared strategic goals.

Technonationalist policies have a potentially constructive role to play in this process, because they can help leaders pay attention to their respective nations' foundations for competitiveness and help them fix weaknesses. However, such policies can easily swing out of balance if they are formed based on ideology rather than evidence and careful deliberations. This has happened within the Trump administration to some extent, especially in the areas of immigration and trade policy. There are also gaps that could be filled between Japanese and U.S. technonationalist approaches to further improve bilateral collaboration.

Current U.S. policies overemphasize defensive measures versus offensive ones, particularly when it comes to export controls. U.S. studies indicate that intellectual property theft from industrial espionage, cyber hacking, and lawful investments in U.S. companies are far bigger problems than reverse engineering from U.S. exports.[195] History has shown that overly broad export controls tend to harm domestic firms without appreciably limiting target countries' technological gains.

Additionally, the Trump administration's unilateral approach risks reducing market opportunities for U.S.-based firms and makes it harder to effectively influence Chinese behavior in concert with other countries. It might seem counterintuitive, but international cooperation and integration can be important assets that strengthen national competitiveness. The United States and Japan have prospered to date specifically because they have not been overly insular and protectionist, instead enhancing innovation and expanding market opportunities. There are several steps Tokyo and Washington can take to keep enhancing such cooperation and developing a more balanced and constructive technonationalist approach.

**Revisit the bilateral S&T agreement**: On the offensive side, the United States and Japan should consider updating their 1988 agreement on S&T cooperation to address two areas of imbalance, namely insufficient coordination between the public and private sector for R&D investments and inadequate flexibility on dual-use technologies. On R&D investment coordination, some version of the JUSSTIC concept could be adopted and supported through annual funding or a joint endowment. Meanwhile, dual-use technology will continue to be politically sensitive in Japan for the foreseeable future, but there should be ways to respect this reality while expanding the cross-fertilization of ideas in ways that a separate track of bilateral cooperation can follow up on (by means of, say, a handoff of sorts between bilateral S&T collaboration and the Systems and Technology Forum).

**Broaden cooperation in strategically significant sectors**: A key objective of a revamped U.S.-Japan agreement would be to dedicate new resources for sustained cooperation in strategically significant areas of S&T, as determined by the JHLC or a similar body with input from JUSSTIC. Rather than trying to influence each other's priorities, the allies should instead identify shared priorities that will benefit from long-term collaboration. One difference of this approach compared to how the JHLC functions now is that such a change would allow a wider range of scientific leaders (in academia, national labs, and the business world) to contribute to bilateral government discussions on S&T priorities, going beyond lists of activities to strengthen partnerships and the collaborative infrastructure in select strategic areas.

**Deepen R&D funding pools**: Another new aspect of an updated U.S.-Japan S&T agreement would be the addition of dedicated public resources for bilateral collaboration. These resources could be appropriated each year to allow for more direct legislative oversight, but another option would be to jointly establish an endowment with some legislative involvement that supports the JUSSTIC process and provides catalytic funding for selected projects or partnerships. These partnerships could stimulate private sector contributions for specific projects. Successful endowment examples of this kind exist between Israel and the United States and the United States and India.[196] In an era of significantly strained resources, this kind of endowed and coordinated investment can pay dividends efficiently year after year.

**Invest in standard setting:** A final priority for allies on the offensive side of technonationalism is data governance and standard setting for emerging technologies, particularly in the area of telecommunications and the rollout of 5G and related technologies such as the IoT. No one country can address or shape these norms and standards sufficiently, and these issues will be prime candidates for an approach grounded in bilateral U.S.-Japan coordination and multilateral action in concert with as many countries as possible. Primary goals would be to establish standards that are clear, consistent, and widely adopted, while favoring individual privacy and security over the state and promoting transparency, accountability, and fair competition.

The abandoned Asō-Pence dialogue would be a potentially useful venue for coordinating these types of policies as a bridge to greater advocacy for such norms and standards in multilateral forums. Such efforts could utilize the dialogue's pillars of "cooperation in economic and structural policies" and "sectoral cooperation."[197] This kind of high-level, structured coordination would be more productive than ad hoc pleas by Trump administration cabinet officials calling on other countries to avoid buying Huawei 5G equipment. The Asō-Pence dialogue should be revived in some form along these lines, probably by leveraging a newly emerging economic security dialogue between the two governments if high-level leadership can be harnessed to this end.[198] If so, each country will have to manage the domestic interagency coordination process more successfully than they did the first time around.

**Improve coordination on export controls and investment screening**: Defensive technonationalism is important, but the allies are already taking concrete steps to screen FDI and foreign venture capital more effectively, as well as tightening export controls and better understanding their supply chains related to critical technologies. In fact, the United States is probably going too far with export controls and is in danger of harming its own companies.

The allies can better coordinate (with each other and with other nations) to protect a narrow range of technologies more effectively, limit friendly fire so that defensive measures do not harm friendly nations' companies unfairly (and vice versa), and harmonize technology security practices while building capacity, especially in the cybersecurity arena. The allies can also improve the ways they share intelligence about Chinese companies and investors to screen investment in a more refined, effective way. Japan's new economic security team at the National Security Council can help with these objectives, but it will need a clear and empowered counterpart within the U.S. government.

**Strengthen the fundamentals of information and technology security**: Building up Japan's absorptive capacity on the technology security front is an important part of improving bilateral coordination on technonationalist policies, as is less U.S. rigidity over the acceptability of Japanese security processes that focus more on achieving equivalent effects rather than uniformity of processes. Tokyo and Washington should also coordinate bilaterally and act multilaterally to explore the creation of a new trusted network of information sharing and technology security that could include other countries beyond the Five Eyes partners, including France, South Korea, and possibly Taiwan.

**Bolster U.S.-Japan military cooperation on technology**: Finally, U.S.-Japan military technology cooperation deserves a more prominent place on the bilateral agenda, although a combination of Japanese government and private sector efforts are needed to make this endeavor more feasible. Key challenges include a lack of predictable export approval procedures by the Japanese government, the weak international competitiveness of Japanese domestic firms due to decades of limited market opportunities, limited cross-fertilization between the commercial and defense sectors, and industrial security capacity throughout extended supply chains.

Fortunately, Japan's need for a replacement fighter aircraft for its F-2 gives the allies an opportunity to upgrade how they cooperate on defense technology, if they can overcome differences in the ways that they approach these kinds of defense development programs. The F-2 replacement program might be too imminent and important for experimentation with broad and brand-new ways of bilateral collaboration, but it is a perfect opportunity to try a few innovative approaches to the design and testing of certain components that can enhance bilateral interoperability and performance.

The global technology landscape and accompanying regulatory environment are changing rapidly. And with the coronavirus pandemic simultaneously deepening U.S.-China strategic competition, all of these factors combine to challenge any single country's ability to manage the ensuing dynamics coherently. On top of this, nations face all manner of domestic challenges that handicap their policymakers, including political divisions and dysfunction, demographic changes, debt burdens, environmental crises, natural disasters, or others. Beggar-thy-neighbor trade policies and zero-sum technonationalist strategies will work to each nation's detriment in the long run, and such policies will make recovery from the pandemic even more difficult. In this sense, a little technonationalism goes a long way, and a more balanced approach pursued in close coordination with allies and international organizations will deliver better results for Japan and the United States alike.

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## Notes

1 For an analysis of the evolution of the U.S.-Japan alliance since the end of the Cold War, see James L. Schoff, *Uncommon Alliance for the Common Good: The United States and Japan After the Cold War* (Washington, DC: Carnegie Endowment for International Peace, 2017), https://carnegieendowment.org/2017/01/23/uncommon-alliance-for-common-good-united-states-and-japan-after-cold-war-pub-67742.

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