CARNEGIE
ENDOWMENT FOR
INTERNATIONAL PEACE

公益財団法人 日本国際フォーラム
The Japan Forum on International Relations, Inc.

ALLIANCE POLICY COORDINATION BRIEF

OCTOBER 2019

Competing With China on Technology and Innovation

James L. Schoff and Asei Ito

Competing With China on Technology and Innovation

James L. Schoff and Asei Ito

For your convenience, this document contains hyperlinked source notes as indicated by teal-colored text.

© 2019 Carnegie Endowment for International Peace. All rights reserved.

Carnegie does not take institutional positions on public policy issues; the views represented herein are the authors' own and do not necessarily reflect the views of Carnegie, its staff, or its trustees.

No part of this publication may be reproduced or transmitted in any form or by any means without permission in writing from the Carnegie Endowment for International Peace. Please direct inquiries to:

Carnegie Endowment for International Peace
Publications Department
1779 Massachusetts Avenue NW
Washington, DC 20036
P: +1 202 483 7600
F: +1 202 483 1840
CarnegieEndowment.org

This publication can be downloaded at no cost at CarnegieEndowment.org

CONTENTS

China Risk and China Opportunity for the U.S.-Japan Alliance

How should the risks and opportunities presented by a continually rising, increasingly self-assertive China be addressed? This is a pressing issue for the international community, particularly for the United States and Japan, whose alliance has proactively helped form and maintain the liberal, rules-based international order for the past several decades.

To enhance mutual understanding and encourage effective policymaking, the Japan Forum on International Relations (JFIR) and the Carnegie Endowment for International Peace have convened a small group of U.S. and Japanese scholars to examine the risks and opportunities accompanying China's ascendance. This group includes China specialists, alliance experts, and authorities on trade and security issues in the Asia Pacific.

Led by Matake Kamiya and James L. Schoff, the group has conducted research and facilitated dialogue since April 2017 through private roundtables and public symposia that seek to further U.S.-Japan cooperation and coordination on China policy. The project examines different perspectives between the alliance members and discusses ways in which Washington and Tokyo can effectively respond to China's rise. An accompanying series of policy briefs explores various China-related risks and opportunities for the U.S.-Japan alliance in the areas of regional and international order, trade and technology, security, and foreign relations. To learn more about the project, click here.

JFIR, together with the project's U.S. team members, wish to thank the Japanese Ministry of Foreign Affairs and the Japan Foundation Center for Global Partnership respectively for their generous support, without which this project would not have been possible.

—Matake Kamiya and James L. Schoff, Project Leaders and Co-editors

Policy Brief Series:

- "Managing Risks and Opportunities for the U.S.-Japan Alliance Through Coordinated China Policy"
  Shin Kawashima, Matake Kamiya, and James L. Schoff

- "Responding to China's Complicated Views on International Order"
  Mira Rapp-Hooper, Michael S. Chase, Matake Kamiya, Shin Kawashima, and Yuichi Hosoya

- "Working Toward a Free and Open Indo-Pacific"
  Nicholas Szechenyi and Yuichi Hosoya

- "Bridging the Belt and Road Divide"
  Carla P. Freeman and Mie Ōba

- "Avoiding Friendly Fire Amid Economic Tensions With China"
  James L. Schoff and Asei Ito

- "Competing With China on Technology and Innovation"
  James L. Schoff and Asei Ito

- "Bolstering the Alliance Amid China's Military Resurgence"
  Michael S. Chase, Satoru Mori, and Masafumi Iida

- "Staying in Sync on North Korea's Nuclear Program"
  Evans J.R. Revere and Matake Kamiya

- "Remaining Aligned on the Challenges Facing Taiwan"
  Michael Swaine and Ryo Sahashi

Issue Background

Aside from broader issues of trade and economics, the United States and Japan should consider the specific risks and opportunities related to competition with China in high-tech innovation. A so-called fourth industrial revolution is under way, a revolution characterized by discontinuous technological development in areas like artificial intelligence (AI), big data, fifth-generation telecommunications networking (5G), nanotechnology and biotechnology, robotics, the Internet of Things (IoT), and quantum computing. Breakthroughs in these fields can potentially shift the future balance of economic and military power, prompting governments and large corporations to compete aggressively now over their development and applications.

As an emerging tech giant, China has demonstrated it can be a leading innovator both globally and domestically. The country is making gains in four broad categories of innovation, including: 1) manufacturing, 2) digital platforms and associated markets (spurred by new apps and small money-based transactions); 3) the utilization of apps and other technologies designed "to solve societal problems" (and reconfigure existing businesses in the process, such as bike share apps and unstaffed convenience stores); and 4) basic science R&D in fields such as computing and biotechnology.

It is useful to think about technological competition through a multidisciplinary lens. From a diplomatic and security perspective, a key issue is how to define critical technologies, while in economic terms, an important question is how to assess the nature of technology as a public good. Technology does not simply bring benefits to certain companies or economies—it can also have strong ripple effects. To cite one example, some international relations analysts and historians point out that AI technology could bring about a "Second Great Divergence" of productivity—allowing countries and firms that are the earliest and most successful adopters to leap ahead of other peers—following the First Great Divergence brought about by the Industrial Revolution. Such technological innovation is affecting virtually all fields.

In several product areas, large Chinese private and state-owned enterprises (SOEs) have preferential access to the country's more than 1 billion consumers—provided they align their work with the policy goals of the Chinese Communist Party—which some analysts argue is creating a form of "digital Leninism." China has roughly 800 million internet users, nearly all of whom own smartphones. In addition, the Chinese government actively supports innovation through targeted, relaxed regulations; widespread wireless internet services; and significant investments in basic research. What's more, China's June 2017 cybersecurity law further tilts the technological playing field in favor of domestic firms, since it requires all firms operating in the country to store data in mainland China and restricts data transfers.

China is leveraging these advantages and striving to become a global technological leader using state-led policies such as Made in China 2025 or the New Generation of Artificial Intelligence Development Plan. One of Beijing's objectives is to raise the domestic content of core components

and materials in high-tech manufacturing to 70 percent by 2025. To help achieve this, China is eclipsing the United States as the world's largest overall (public and private) R&D investor. The Chinese government already outspent the U.S. government on intramural funding in 2017 ($67.4 billion to $47.1 billion), and Beijing likely exceeded U.S. gross domestic spending on R&D in 2018 (after sitting at roughly one-third below U.S. spending levels a decade ago). By comparison, Japan's total R&D investment is about where China's spending was in 2008 (roughly $150 billion), and its intramural government spending only amounts to $12.1 billion.

In addition, China is the world leader in patent applications with 40 percent of the global total, a share more than two times larger than that of the United States and four times larger than that of Japan. China is also poised to overtake the United States in the most-cited 1 percent of published AI papers by 2025, if current trends continue. Though there are some questions about the efficiency and effectiveness of Beijing's push to become a leader in tech, it is undeniable that Washington and Tokyo face mounting competition in innovation.

Even before the emergence of the state-led Chinese strategies mentioned above, Beijing has been prioritizing since 2012 the translation of commercial technological success to military application, or an emphasis on so-called military-civil fusion (*junmin ronghe*). This acceleration of the transfer of people and technologies between the military and civilian sectors is now a major theme of all technological investment in China, and it is a big reason why the U.S. government has sought to limit Chinese commercial investment in a wide range of U.S. firms.

For Washington and Tokyo, China's emergence as a high-tech innovator poses both economic and security challenges, even as it creates potential opportunities for technological collaboration. The U.S. and Japanese governments will likely take steps to limit the extent to which U.S. and Japanese firms can conduct business with Chinese private enterprises or start-ups developing technological advances that could be employed by the Chinese military, so as to avoid inadvertently aiding those advances. This is a major concern for Japanese and U.S. companies. In such cases, it may be difficult for Japanese and U.S. companies to invest in Chinese high-tech unicorns.

The Stakes

Historically, technological advances have increased public knowledge and spread economic benefits over time, but it is possible that the profitability and mastery of next generation technologies under development today could be much narrower. In the past, while it is true that initial inventors and the most successful application designers reaped outsized rewards, the playing field for these products leveled over time and other countries' firms were able to compete successfully. Several such examples come to mind, including automobiles, nuclear energy, computers, semiconductors, and smartphones. In a few cases, the barriers to later entry—for market or technological reasons—were particularly high, and this ended up limiting competition (in the case of aircraft manufacturing, for

instance). In the emerging digital era, however, it is possible that early data monopolies combined with mastery of AI and quantum computing could quickly dominate certain markets and make international competition prohibitive.

China has a less open economy than most G20 nations, and Chinese market advantages could easily limit the medium- to long-term growth potential of U.S. and Japanese firms. This challenge would be exacerbated if Chinese technological standards in these emerging fields become widely adopted around the world. This is true not only in the context of ancillary product compatibility—such as apps designed to work only with Chinese platforms—but also in terms of complementary support systems and practices in such areas as data privacy, data localization, and cloud sourcing. Moreover, if Chinese standards and networking equipment dominate the marketplace, it will be very difficult to ensure that allied critical infrastructure is secure from cyber threats. Some U.S. and Japanese policymakers are concerned that any near-term setbacks in the technology race with China could have potentially devastating long-term consequences for their national security. Chinese leaders, of course, think similarly.

In addition, given the dual-use nature of these technologies, the qualitative military advantages that the United States and Japan enjoy could easily be lost if they cannot compete successfully with China in the innovation race. The reemergence of "great power competition" referenced in the National Security Strategy of U.S. President Donald Trump's administration as it applies to China is predominately about technological rivalry, or as Vice President Mike Pence described it: a battle for the "commanding heights of the 21st century economy." He accused the Chinese Communist Party of the "wholesale theft of American technology" and of using it to turn "plowshares into swords on a massive scale." Some Trump administration officials—though not all of them—see the technological competition with China in such existential terms.

Another issue to consider is the technological decoupling that could result in two broad sets of standards and protocols. Such a decoupling would create all sorts of inefficiencies but might provide more security assurances. Banning equipment that poses a security risk to U.S. government agencies might be justified in certain cases, but if such bans limit information and market access for U.S. and Japanese companies—as well as their business development opportunities—then it could have long-term negative effects. If, for instance, Huawei's 5G technology becomes the dominant standard in several countries around the world while a competing European-U.S.-Japan consortium makes gains in other nations, each market will become smaller, less efficient, and less interoperable with the rest of the world. The problem would be worse for the allies if leading European and Korean companies chose not to limit their commercial opportunities in that way and collaborated with Chinese firms instead.

Recent Developments

While Trump has focused primarily on the large U.S. trade deficit with China, his administration and key members of Congress instead have prioritized the protection of U.S. technology and attempts to undermine Beijing's state-sponsored efforts to take the global lead in these fields. Early on in the Trump administration, U.S. Trade Representative Robert Lighthizer carried out a Section 301 investigation of Chinese economic practices that could be "harming American intellectual property (IP) rights, innovation or technology development." This investigation resulted in four rounds of U.S. tariffs being applied to certain imports from China by September 2019. Washington has been using these tariffs as leverage in broad trade negotiations with Beijing that seek to address both the trade imbalance and concerns about China's bid for future technological dominance.

On a related note, the Trump administration is working to limit the private sector's interactions with certain Chinese companies that Washington believes pose technological security risks. In one such step, Congress approved new restrictions on inward foreign direct investment (FDI) in August 2018 by expanding the jurisdiction of the Committee on Foreign Investment in the United States (CFIUS), which can prohibit outside investments in U.S. firms if it believes they will harm national security. The chilly U.S. atmosphere for Chinese FDI is having an impact, as Chinese investment dropped in 2018 to only $4.8 billion, compared to $29 billion in 2017 and $46 billion in 2016. When accounting for divestitures, net Chinese investment in the United States was negative in 2018.

What's more, this same piece of U.S. legislation also banned the U.S. government from using Chinese telecom equipment, and it started a process by which there could be tougher export licensing requirements for specific emerging technologies if they are sold to China. In one early example of the potential impact, the Fujian Jinhua Integrated Circuit Company is now subject to tightened export restrictions that are crippling its ability to manufacture semiconductors. The stakes got even higher when the U.S. Justice Department charged Huawei Chief Financial Officer Meng Wanzhou (the daughter of the company's founder) with various crimes including technology theft and sought for her to be extradited from Canada, where she was detained at the request of the United States.

Top U.S. officials have also demanded that allies restrict their purchases of telecom equipment from Huawei and other Chinese providers or risk reduced intelligence sharing from Washington, due to cybersecurity concerns. In December 2018, Japan effectively banned government procurement of Chinese telecom equipment. These developments reflect concerns about Huawei that have existed for several years, including media reports that allege close links between the company and the People's Liberation Army or the installation of backdoors in the company's routers. To date, however, scant concrete evidence has been presented publicly regarding these specific allegations.

Despite these restrictive trends, new U.S. rules and scrutiny meant to curb high-tech investment involving China have not yet significantly slowed the flow of bilateral venture capital—especially

from the United States to China. Admittedly, there are some indications that the pace is slowing in 2019. Yet cross-border venture capital investment between the United States and China hit an "all-time high," reaching nearly 600 transactions in 2018, driven in part by the rise of large deals (those valued at more than $100 million), which more frequently involve international partners. More than 64 percent of such investment volume stemmed from U.S. investors in 2018, whereas two years earlier, Chinese investors were the source of 63 percent of such venture capital flows. Japanese FDI in China is also rebounding slightly (more than $10 billion in 2018), after dropping significantly following 2012 due to a rise in bilateral political tensions.

As for Japanese companies, for now they retain a competitive advantage in areas like robotics, transportation equipment, and certain electronic components. Relevant supply chains feature a certain division of labor between Chinese and Japanese companies, with much of the design and higher-end component manufacturing still taking place in Japan. However, much fiercer competition is expected in the future, as Chinese firms seek to move up the value chain and reduce their reliance on imported components. In addition, Japanese companies have to adapt to the U.S. government's tightening restrictions on technology, such as stricter export controls, investment restrictions, and prohibitions on doing business with certain Chinese firms. For example, the transfer of an algorithm developed by a Japanese company in a laboratory in Silicon Valley to its Japanese headquarters may require the approval of the U.S. government. What's more, transferring such information to a Chinese subsidiary will be even more difficult. Large U.S. firms face the same challenges. Detailed communication among the U.S. and Japanese governments and the private sectors in both countries will be necessary to minimize disruption and help harmonize allied responses.

Potential Risks

Allied technological competition with China poses multiple risks to Japan and the United States. These include the potential for:

- **A Chinese monopoly on global technology standards**: If China achieves persistent or widening technological advantages in emerging fields, this could allow its firms to act like monopolies outside the country, shaping global technology standards to their own benefit and providing economies of scale that boost their revenues, expand their data pool, and fuel future R&D advantages. The outcome will have less to do with China's technological accomplishments and more to do with Japanese and U.S. innovation and competitiveness. Undermining China in this area is less important than building up allied capabilities.
- **A Chinese military edge in dual-use sectors:** A commanding technological lead would give China military and national security advantages, especially in the domains of cyberspace and outer space. This risk extends beyond the Chinese military itself to include private Chinese companies, since the country's 2017 National Intelligence Law creates affirmative legal responsibilities for Chinese firms to provide access, cooperation, or support for Beijing's

intelligence-gathering activities. In the telecom sector—particularly with respect to 5G and the IoT—Japan and the United States could face heightened vulnerability to Chinese industrial espionage if the Chinese government ultimately secures privileged and clandestine access to global communications networks.

- **The commercialization of a Chinese technological lead**: China could also parlay a persistent technological edge into a commercial advantage, making sure that its telecoms equipment, cloud networks, or cashless payment systems are only compatible with other Chinese-made equipment. There is a risk of inefficiency if this behavior were to result in a decoupling of technical standards, if a China-led standard develops in many countries in a way that limits future economic opportunities for U.S. and Japanese competitors and requires multinational companies to invest in two different systems. U.S. and Japanese firms must guard against IP theft and Chinese industrial espionage too.
- **The spread of high-tech surveillance and other authoritarian methods**: There is a risk that other countries could adopt China's form of "digital Leninism," especially through their involvement in China's push to invest globally in infrastructure through the Belt and Road Initiative. If more countries try to use Chinese technology to control their societies and limit political openness, there will be less receptivity worldwide to a rules-based international order and the allies' vision of a Free and Open Indo-Pacific.
- **Diluted ethical standards for research in emerging fields**: A persistent Chinese technological lead raises the stakes for efforts to maintain ethical behavior, transparency, and accountability in terms of how these technologies are developed and used. In the case of biotechnology, for example, the Chinese scientist He Jiankui claimed to be the first to create genetically modified humans, something that is against the law in most countries but is less clearly prohibited in China. The field of AI poses similar risks.
- **Unintended crossfire of economic sanctions**: There is also a risk of poor economic policy coordination between Washington and Tokyo, if one country tries to undermine Chinese technological progress too aggressively, creating collateral damage for the other country. The Trump administration's involvement in the Canadian arrest of the Huawei executive Meng, for example, led Beijing to retaliate against Ottawa's interests. The Trump administration's use of Section 232 tariffs citing national security prerogatives has negatively impacted some Japanese firms; CFIUS even prohibited one Japanese company from selling a building materials subsidiary to a Chinese firm. U.S. visa restrictions that limit Chinese researchers' ability to work in the United States can adversely affect some of Japan's U.S.-based firms, even if they do not pose a security risk. Japan has also taken steps to limit procurement from certain Chinese firms.
- **Fallout of Chinese economic countermeasures**: U.S. and Japanese firms could risk being shut out of the Chinese market due to either Chinese government retaliation or public backlash if Chinese officials or citizens feel that the country is being bullied or unfairly targeted. Apple's iPhone sales figures in China, for example, have fallen in part due to punitive U.S. actions against Huawei. In addition, aggressive moves by Washington and its partners to limit Chinese

access to certain products or punish individual companies could convince Beijing that further efforts at technological self-sufficiency are more vital than ever. Washington and Tokyo want Beijing to stop subsidizing its drive for high-tech self-sufficiency, but U.S. and Japanese countermeasures will likely push China further in this direction.

Potential Opportunities

- **The general benefits of Chinese technological advances**: Chinese innovation and technological progress can contribute to the public good, and the country's heavy investment in basic science and R&D can provide chances for international collaboration and help improve humanity's collective ability to address environmental challenges, learn more about outer space, and a variety of other shared interests (including cybersecurity and the stability of the financial system). In addition, China can be a great IoT laboratory, if it is willing to collaborate in this area with outside players. Japan, the United States, and their private sectors could benefit significantly if they are able to partner effectively with certain Chinese companies.
- **An opening to set suitable multilateral standards**: Most nations in the G20 also harbor concerns about China's bid for technological dominance. This alignment of interests creates an opportunity for Tokyo and Washington to be leaders in encouraging multilateral standard setting and enforcement/accountability for emerging technologies. Such standard setting will be more effective if China is involved, and it is in Beijing's self-interest to make sure Chinese innovation is compatible with developing international standards. The goal should be to promote a level playing field and high ethical and environmental standards for new technologies. China's market is a prize that should not be easily abandoned.
- **Expand U.S.-Japan collaboration on science and technology**: To maximize competitiveness, the allies can expand bilateral science and technology cooperation and strengthen their human and institutional networks in key technological areas. Both governments should foster more strategic science and technology collaboration and facilitate such cooperation by private firms. These steps can also be taken in partnership with other nations committed to a rules-based approach, sufficient transparency, and accountability.

Next Steps

In response to China's concerted attempt to lead the way in technological innovation in critical strategic fields, Japan and the United States should:

- **Invest in and collaborate on science and technology**: Maintaining the United States' and Japan's edge in terms of innovation and competitiveness is more important than trying to restrain China's advances, so Tokyo and Washington should pursue adequate investment, a relatively light regulatory touch, and more strategic alliance cooperation in science and technology cooperation.
- **Drive the agenda for multilateral standard setting**: The allies should develop a consensus among themselves and with other like-minded nations. This includes suitable rule making and standard setting to ensure a competitive playing field in certain high-priority technological spheres (including 5G telecommunications, AI, and IoT) and maximize system compatibility with reasonable transparency. This means allowing purchasers of one company's system (for 5G and derivative telecom infrastructure) to later switch to another company's equipment and provide a means for verifying system integrity. Engaging China on this front is important, since rule making will be more meaningful if all players are involved. It would be prudent to focus on shared interests first.
- **Craft shared regulations for IP protection**: The allies can also work together and with others to develop common rules for technology transfer (when its firms invest overseas or accept foreign investment) and data transactions. This could include an effort to harmonize technology protection statues and FDI review processes for protecting national security. Alliance collaboration on technology protection measures is also advisable not only to strengthen IP protection but also to keep the partners in sync and avoid putting each other's firms at a disadvantage.
- **Factor in technology's societal effects**: Technological competition should not only involve policies that boost industrial competitiveness but also take into account the needs of a healthy society. Japan and the United States should discuss together (and with other countries) the potential ramifications of introducing new technologies and what kind of societies they seek to promote. Japan's Society 5.0 concept focuses on how technology can be harnessed to address pressing societal issues such as its aging population rather than simply seeking an economic or military advantage.

About the Authors

James L. Schoff is a senior fellow in the Carnegie Asia Program. His research focuses on U.S.-Japan relations and regional engagement, Japanese technology innovation, and regional trade and security dynamics.

Asei Ito is an associate professor at the Institute of Social Science at the University of Tokyo, where he specializes in the Chinese economy and industrial development.

Notes

For your convenience, this document contains hyperlinked source notes as indicated by teal-colored text.

1779 Massachusetts Avenue NW | Washington, DC 20036 | P: + 1 202 483 7600

CarnegieEndowment.org