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Introduction

In partnership with Schmidt Futures, Young Professionals in Foreign Policy launched the U.S.-China Futures Program with the goal of identifying, cultivating, and connecting the next generation of China experts.

The program recruited a diverse and multidisciplinary community of 87 early- and mid-career leaders from government, businesses, academia, think tanks, and civil society. Participants were tasked with developing policy recommendations for seven of the most consequential dimensions of U.S.-China relations.

The cohort was divided into seven thematic working groups to engage with the following topics: American Rejuvenation, Biotechnology and Global Health, Economic Interdependence and Supply Chain Complexities, Geopolitical Competition and International Institutions, Military-Civil Fusion and Defense Competition, Next-Generation Communications, Technology Governance. Each working group received two senior leaders in U.S.-China policy to serve as advisors and mentors.

Working groups met monthly from June 2020 to March 2021 to develop policy recommendations for the next decade of US-China relations. In all, participants engaged in more than 52 meetings and events that convened senior leaders, subject matter experts, organizational partners, and each other. The following report is the culmination of those efforts.

The program would not have been possible without the guidance of our steering committee of advisors: Elsa Kania, Katherine Koleski, Alexander Titus, Ali Wyne and Chenny Zhang. Nor would it have been possible without the leadership of YPFP’s Chief of Staff, Merritt Ogle, and the funding by Schmidt Futures.

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About U.S.-China Futures Project

The U.S-China Futures Project was established to chart a new course for U.S. policy towards China. With the goal of identifying, cultivating, and connecting the next generation of China experts, Young Professionals in Foreign Policy has curated a diverse, multidisciplinary community of exceptional early- and mid-career leaders from government, businesses, academia, think tanks, and civil society.

The cohort has been organized into seven distinct working groups, each centered around a thematic policy track. Each working group was tasked with producing a deliverable, without a prescribed format, that articulated innovated solutions to critical questions. These deliverables outline each working groups’ policy and strategy recommendations for the next decade of U.S.-China relations. These deliverables have been complied in this Briefing Book and are presented at a Virtual Summit in March 2021.

Mission

To identify rising leaders across academia, government, industry, and technology on issues related to U.S.-China competition and to build a community that works together to shape the next decade of the world’s most important bilateral relationship.

Context

As competition with China intensifies, the most promising emerging leaders across sectors will be called upon to develop and shape U.S. strategies, make informed judgments, and respond to various international crises. Many U.S. government agencies currently make and will continue to make critical decisions regarding China with inadequate information, training, and experience, and often without the crucial network of dynamic relationships that accelerates the flow of information.

Young Professionals in Foreign Policy (YPFP) has launched the U.S.-China Futures Project to develop a cohort of high-potential, emerging leaders focused on U.S policy towards China. Participants were recruited through a highly selective nomination process and have established their expertise in U.S.-China relations, geopolitics, and strategy. The U.S.-China Futures Project is dedicated to promoting diversity and inclusion among the community of professionals engaged in this critical endeavor. Participants represent government agencies, businesses, academia, think tanks, and civil society organizations, and are expected to become critical decision-makers and contributors to policy and research endeavors in the next 5-10 years.
**Cadence**

From June to December 2020, each working group convened to share information and ultimately produce policy recommendations. Each working group had one or two lead participants who were responsible for coordinating efforts within the group, engaging the group’s mentors, and managing progress against each group’s deliverable.

Working Group Virtual Meetings Timeline:
- June 2020: Introductions and Action Planning
- July 2020: Defining the Problem and Context
- August 2020: Refining the Problem Statement
- September 2020: Drafting Policy Recommendations
- October 2020: Refining Recommendations
- November 2020: Cross-Group Pollination of Recommendations
- December 2020: Revision of Recommendations
- January 2021: Finalizing Policy Recommendations
- February 2021: Developing Presentation for Summit
- March 2021: In-Person Summit with All Study Groups

**Thematic Working Groups**

As mentioned, the cohort was organized into thematic working groups to address critical challenges and questions.

Working groups were as follows:
1. American Rejuvenation
2. Healthcare and the Bioeconomy
3. Economic Interdependence and Supply Chain Complexities
4. Geopolitical Competition and International Institutions
5. Military-Civil Fusion and Defense Competition
6. Next-Generation Communication
7. Technology Governance

**Participants**

U.S.-China Futures participants were recruited through a highly selective nomination process and have established their expertise in U.S.-China relations, geopolitics, and strategy. Participants represent government agencies, businesses, academia, think tanks, and civil society organizations and are expected to become critical decision-makers in the next 5-10 years.

**Disclaimer**

Each participant contributed to this report in their personal capacity. The report does not speak on behalf of any institutions with which they are affiliated. The reports included in this book are all in Working Draft. This is a draft pending further revision and proofing. Please do not cite or distribute without the U.S-China Futures Project’s written permission.
About Schmidt Futures
Funding for this program has been generously provided by Schmidt Futures. Schmidt Futures is a philanthropic initiative, founded by Eric and Wendy Schmidt, that finds exceptional people and helps them do more for others together. We knit talent into networks, bet on the most promising ideas through diverse forms of competition and support, and equip people to scale through partners and modern tools. To realize this vision, Schmidt Futures uses a broad set of tools — including gifts, grants, investments, and startup activity — for charitable, educational, and commercial efforts with a public purpose.

About Young Professionals in Foreign Policy
YPFP works to build the next generation of diverse foreign policy leaders. We do this by providing YPFP members with capacity building programs, engaging events, a global community of peers, and opportunities to elevate their voices through writing and publication.

Standing Committee Advisory Group
YPFP would like to extend our sincerest appreciation to the exceptional individuals who helped make this program a reality. These individuals will be serving as the lead participants throughout the program and will shepherd the cohort through the summit.

Elsa Kania is an Adjunct Senior Fellow with the Technology and National Security Program at the Center for a New American Security. Her research focuses on Chinese military innovation and emerging technologies. At CNAS, she contributes to the Artificial Intelligence and Global Security Initiative and the "Securing Our 5G Future" program. She was a 2018 Fulbright Specialist and is a Non-Resident Fellow with the Australian Strategic Policy Institute’s International Cyber Policy Centre. Ms. Kania also works in support of the U.S. Air Force’s China Aerospace Studies Institute through its Associates Program, serves as a Policy Advisor for the non-profit Technology for Global Security, contributes to the Party Watch Initiative at the Center for Advanced China Research, and co-founded the China Cyber and Intelligence Studies Institute (CCISI), a non-profit research collaboration. Currently, Elsa is a PhD candidate in Harvard University's Department of Government. She was a Boren Scholar in Beijing, China, and she maintains professional proficiency in Mandarin Chinese.
Katherine Koleski is currently a Lead Business Analyst at JAB Innovation Solutions, where she provides analysis to the U.S. government on U.S. and Chinese innovation and high-technology development. She previously served as the Research Director for the Research Working Group and a Policy Analyst for the Economic & Trade team at the congressionally-created U.S.-China Economic & Security Review Commission (USCC). In these roles, she managed the Research Working Group’s contracted and staff research and regularly provided analysis to Congressional members and staff related to China-Latin American relations, China’s industrial policies, and China’s pursuit of cutting-edge technologies such as artificial intelligence, biotechnology, quantum information science, and 5G. Prior to rejoining the USCC, she interned at the U.S. Embassy in Beijing and served as a Research Assistant at the Global Development and Environment Institute (GDAE), where she co-authored several publications on Chinese loans to Latin America. Ms. Koleski earned a Bachelor of Arts from Colby College and her Master of Arts in Law and Diplomacy from The Fletcher School at Tufts University. She has advanced proficiency in both Mandarin Chinese and Spanish. Ms. Koleski has published several articles on China that include: The 13th Five-Year Plan, China’s Engagement with Latin America and the Caribbean, The New Banks in Town: Chinese Finance in Latin America, USCC Backgrounder: China’s 12th Five-Year Plan, among others.

Dr. Alexander Titus is a Strategic Business Executive (SBE) at Google Cloud focused on the Global Public Sector. He specializes in healthcare, life sciences, & public health with a focus on bringing Google-scale solutions to global-scale problems. Previously, he was the Assistant Director (AD) for Biotechnology within the Office of the Under Secretary of Defense for Research & Engineering (OUSD(R&E)). As the AD for Biotechnology, Dr. Titus was the DASD-level technical and oversight lead for all relevant research and engineering matters across the biotechnology portfolio, and is responsible for developing the department’s biotechnology roadmap. Prior to OUSD(R&E), Dr. Titus was a management consultant at McKinsey & Company focused on working with the defense & security communities on organizational priorities related to advanced analytics and digital modernization. Before consulting, Dr. Titus held a number of roles as a data scientist at In-Q-Tel, Amazon, and Dartmouth College, where his work focused on artificial intelligence and machine learning (AI/ML) applications in biology, cyber security, and speech and audio processing. Dr. Titus was also a member of the 2018 cohort of the Emerging Leaders in Biosecurity (ELBI) Fellowship through the Johns Hopkins Center for Health Security. Dr. Titus holds a Ph.D. in Quantitative Biomedical Sciences from the Guarini School of Graduate & Advanced Studies at Dartmouth College, where his work focused on cancer genomics and AI/ML applications in biology. He also holds dual BS/BA in biochemistry and biology with an emphasis on quantitative analysis, from the University of Puget Sound.
Ali Wyne is a nonresident senior fellow at the Atlantic Council’s Scowcroft Center for Strategy and Security and a nonresident fellow at the Modern War Institute. He previously served as a junior fellow at the Carnegie Endowment for International Peace (2008-09), a research assistant at the Belfer Center for Science and International Affairs (2009-12), a special assistant to Samantha Power (2013), a member of the adjunct staff at the RAND Corporation (2014-15), and a policy analyst at the RAND Corporation (2017-20). Mr. Wyne received dual degrees in management science and political science from the Massachusetts Institute of Technology (2008) and earned his master in public policy from the Harvard Kennedy School (2017), where he was a course assistant to Joseph Nye. He is a coauthor of Lee Kuan Yew: The Grand Master’s Insights on China, the United States, and the World (2013) and a contributing author to Our American Story: The Search for a Shared National Narrative (2019), Power Relations in the Twenty-First Century: Mapping a Multipolar World? (2017), American Strategy and Purpose: Reflections on Foreign Policy and National Security in an Era of Change (2014), and the Routledge Handbook of Public Diplomacy (2008). Mr. Wyne is currently writing a book on great-power competition, due out in early 2022. He is a David Rockefeller fellow with the Trilateral Commission, a security fellow with the Truman National Security Project, and a former Penn Kemble fellow with the National Endowment for Democracy.

Chenny Zhang is a program manager at In-Q-Tel, the strategic investor for U.S. national security agencies. Ms. Zhang works with startups to enhance their products for particular government use cases. Prior to In-Q-Tel, Ms. Zhang served as the China portfolio lead at the Pentagon's Defense Innovation Board (DIB), an advisory committee charged with catalyzing innovation across the Department of Defense and providing recommendations to its senior leaders. She was responsible for research, analysis, coordination, and policy development on Chinese economic influence in the U.S. national security innovation base while also supporting the DIB’s AI principles project and other initiatives. Before the DIB, Ms. Zhang split time between Beijing and Silicon Valley at a software startup she co-founded. She was responsible for the product development and technical support teams, as well as raising the company’s seed round of financing. Prior to that, Ms. Zhang was a program manager at Cisco Systems. In total, she has lived in China for seven years. She holds an MA from the Johns Hopkins University School of Advanced International Studies (SAIS) with a concentration in International Economics, Strategic Studies, and China Studies, and a BA from Boston College.
Introduction - American Rejuvenation

American democracy began as a great experiment, and with each generation there is a charge to reaffirm that bargain. Over the last year, the United States has been challenged by racial tensions, national disasters, a public health crisis, growing inequality, and increased political divisiveness. Thousands of Americans took to the streets in large-scale protests and riots across the country in response to the deaths of Eric Garner and Breonna Taylor at the hands of police. California faced record-breaking wildfires that created over $10 billion in property damage and burned more than 4 million acres. The COVID-19 pandemic caused a nation-wide shutdown, wide-scale unemployment, and massive economic loss. Disparities in U.S. education, already wide-ranging in quality, worsened with students from low-income households or from families impacted by the unemployment from the pandemic unable to keep up to date with virtual schooling. Xenophobia and racism led to an increasing number of physical assaults and attacks against Asian-Americans. All of this has worsened these internal divisions.

Internationally, the United States faces a more complex global environment from the quick diffusion of technological innovation to transnational issues such as climate change and pandemics to the resurgence of great-power competition. China’s size, economic clout, global economic interdependence, and growing military exemplify this changing landscape. Over the last several months, the U.S.-China Futures Project pulled together the top minds from across industry, government, and academia to more holistically address six aspects of this complex relationship: biotechnology and global health, economic interdependence and supply chain complexities, military-civil fusion and defense competition, next-generation communications, technology governance, and geopolitical competition and international institutions. This report provides an initial summary of these discussions and recommendations in what will be an evolving challenge.

The tools available to the Biden Administration and any future Administration to address this relationship and global challenges such as climate change will depend on the strength of the U.S. economy, social fabric, and military. The U.S. government and its citizens need to reaffirm their commitment and move the country closer to reaching the lofty ideals to which it aspires. America’s strong economy and military are built around open innovation and being the best place in the world to explore ideas and concepts, conduct novel research, and establish companies. From the Manhattan Project to the race to the moon to the Human Genome Project, the country has rallied around phenomenally difficult challenges by way of attracting and supporting the greatest minds in the world.

The U.S. is also home to some of the world’s most innovative companies responsible for improving the lives of all global citizens. These companies rapidly design, build, test, and learn from their mistakes and the mistakes of others, while keeping their eye on the horizon.

Systemic inequality, rising xenophobia and nationalism, and state-led industrial policies, technology theft, and censorship threaten U.S. openness and innovative competitiveness. In the era of great power competition, the United States needs to enable the full innovative potential of all its citizens and strengthen its attractiveness to the world's best and brightest. Simultaneously, the U.S. government needs to work with its universities and private sector to address the growing
technology theft, espionage, and propaganda and censorship risks that undermine the open nature of U.S. innovation and thought leadership. The United States needs to strengthen these advantages going forward to remain competitive and prepared to address the challenges in the decades ahead.
Healthcare and the Bioeconomy

The COVID-19 pandemic has accelerated a reckoning in U.S.-China relations, including on issues of health security and the bioeconomy. Despite prior hopes that the United States and China would collaborate in the face of common challenges during such a global crisis, the two great powers have failed to maintain even minimal coordination despite the urgency of the threats that this novel coronavirus presents. The pandemic has also heightened debates about the rationale for a “decoupling” of the U.S. and Chinese economies. Under these conditions, American dependence on China for active pharmaceutical ingredients, protective gear, and medical equipment has provoked particular concerns. As the U.S. and Chinese governments introduce new policies to promote innovation in biotechnology in the wake of this crisis, a discipline and industries that were previously relatively integrated and collaborative could become divided to the detriment of global progress.

The economic and strategic importance of the bioeconomy have become apparent and will only increase in years to come. As rivalry between the U.S. and China intensifies, there have been persistent concerns that American competitive advantages are being eroded gradually, especially in critical industries. While America possesses notable strengths in this field and the industry, success should not be assumed or taken for granted, nor is predominance by a single actor likely to occur within a discipline that is so diverse in the research involved and globalized in its development. In recent years, China’s rise as a powerhouse in biotechnology, including the ongoing growth of the Chinese bioeconomy, has been variously underestimated and overstated. While the state of play in research and innovation in China continues to lag behind the U.S., China’s bioeconomy has demonstrated distinct strengths, including that of capacity and scalability.

The potential opportunities for the United States and for China with the ongoing revolution in the field of biotechnology are enormous and tremendously consequential. If rivalry between the two countries were to undercut the prospects for sustaining scientific cooperation and maintaining at least minimal collaboration on issues of global concern, the consequences would also be significant, for both countries and for the world. While the growth and success of the bioeconomy has immediate implications for U.S. economic security and national security, an excessive securitization of these issues would be detrimental. At best, competition in this space can be healthy and productive, spurring progress towards advances and outcomes that are mutually beneficial. While there are real and serious concerns about the illicit or extralegal transfers of technology, which can exploit the openness of the U.S. innovation ecosystem, responses that are poorly targeted or disproportionate could undermine American competitiveness.

We argue that the United States Government should promote progress in the U.S. bioeconomy, pursue targeted measures to protect American innovation against harmful behaviors, while recognizing the importance of avoiding overreach or excessive securitization of these issues in ways that could undercut progress in the discipline. Typically, the challenges that China’s rise

presents can be best addressed through robust responses that start at home. This chapter proceeds by first defining the bioeconomy, next reviewing the state of play of U.S.-China relations in healthcare and the bioeconomy, and then raising a series of observations and policy recommendations.

**Defining the Healthcare and the Bioeconomy**

Healthcare and the bioeconomy are two related, but distinct concepts. Healthcare comprises a range of activities relating to maintaining, improving, or restoring a person's health. Healthcare is broad, including research and development (R&D) and production of pharmaceuticals and medical devices; provision of healthcare services, e.g., by hospitals and physicians; provision of health insurance; control and prevention of infectious diseases; as well as education and other policies that address "upstream" determinants of health, such as nutrition, exercise, pollution, or poverty. The bioeconomy, or economic activity based on the life sciences, is a broad and dynamic sector, and thus difficult to strictly demarcate. Healthcare applications include biologically-derived products used to treat or prevent diseases, as well as new types of personalized medicine and diagnostics enabled by advances in the study of genomics. The bioeconomy also includes genetically modified crops and animals and other advances in agriculture, as well as use of bio-based fuels, chemicals, and other materials.\(^2\)

In the United States, revenue in the biotechnology industry has grown by more than 10% annually over the past decade.\(^3\) In 2017 the economy based on engineered biological systems was estimated to account for 2% of the U.S. GDP.\(^4\) The U.S. biotechnology sector consists of hundreds of publicly traded firms and thousands of startups. The high concentration of startups has established a dynamic, innovative sector; however, biotech startups can be especially vulnerable to the so-called “valley of death,” i.e., the period of time between starting operations and generating revenue. In China, the biotechnology industry has grown from 1.3% of GDP 30 years ago to more than 4.5% of GDP as of 2014, and that share is only increasing.\(^5\)

While many estimate that the U.S. is on track to maintain its position as the global leader in many sub-sectors of the bioeconomy for the foreseeable future, the gap between the Chinese and U.S. bio-economies has been closing quickly on some fronts, as indicated by metrics including the numbers of publications, increases in patent filings, growing numbers of start-ups, and increasing investments that highlight long-term potential of this sector.\(^6\)

Both China and the United States are pursuing global leadership in biotechnology and the broader bioeconomy, and this is likely to intensify in the wake of the COVID-19 pandemic. In China, the CCP has identified biotechnology innovation as among the “new poles” and “growth points” for the economy.\(^7\) Cultivating a domestic biotechnology industry has been a priority for the Chinese government since the implementation of the 863 Program. While government funding prioritized agrobiotechnology over human applications of biotechnology until approximately 2015 due to ongoing food security concerns, the Chinese state has reiterated its

\(^2\) USCC - Gryphon Report, pp 10; NAS “Securing the Bioeconomy” Report
\(^3\) https://www.nature.com/articles/nbt.3491
\(^4\) https://static1.squarespace.com/static/545a2222ce4b09adaa346134c/t/5c5f59e893331540001a3ac11/1559600781154/Carlson+Robert+12+March+2019+Testimony_v6.pdf
\(^7\) http://www.gov.cn/zhengce/2016-12/19/content_5150272.htm; https://www.ndrc.gov.cn/xxgk/zcfb/tz/202009/t20200925_1239582.html
ongoing commitment to building biotechnology in almost every major science and technology plan, policy, and program since the 863 Program. More recently, the “Made in China 2025” initiative, which sets self-sufficiency targets in key areas, includes “biomedicine and high-performance medical equipment” (生物医药及高性能医疗器械) among its ten priority sectors. China’s 13th Five-Year Plan (FYP) similarly outlined biotechnology as a priority sector, and the 13th FYP for Informatization called for applying technologies such as big data, artificial intelligence, robotics, and biological 3D printing to modernize and strengthen the healthcare and drug industries. The 14th FYP is expected to re-emphasize the importance of these pursuits while also highlighting the importance of protecting against biosecurity threats.

<table>
<thead>
<tr>
<th>May 2015</th>
<th>Made in China 2025</th>
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<tr>
<td>August 2016</td>
<td>National Science and Technology Innovation Plan (国家科技创新规划)</td>
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<tr>
<td>December 2016</td>
<td>Thirteenth Biological Industry Development Plan (生物产业发展规划)</td>
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<tr>
<td>December 2016</td>
<td>National Strategic Emerging Industries Development Plan (国家战略性新兴产业发展规划)</td>
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<tr>
<td>May 2017</td>
<td>Biotechnology Innovation Special Plan (生物技术创新专项规划)</td>
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<tr>
<td>August 2017</td>
<td>S&amp;T Military-Civil Fusion Special Projects Plan (科技军民融合发展专项规划)</td>
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In the U.S., the Department of Defense established biotechnology as a modernization priority, and multiple pieces of legislation have been proposed to enhance and maintain U.S. leadership in the global bioeconomy. Meanwhile, the Chinese government has elevated biosecurity as an element of the country’s national security system and explored options for applications of biotechnology in national defense.

**U.S.-China Relations in Healthcare and the Bioeconomy**

**Academic Collaboration and the Race to Attract Talent**
The U.S. and China today have a higher degree of interdependence in the biotech sector. This integration manifests in increased co-authorship between American and Chinese scientists,
including high-impact papers in the field. There has also been extensive exchange of talent, and researchers and entrepreneurs who were educated in the United States played a key role in China’s emergence as a powerhouse in biotechnology. Similarly, numerous Chinese and American biotechnology companies operate within—and leverage the advantages of—one another’s respective ecosystems. In recent years, both allegations and known incidents of the theft of biological samples and materials in several cases that demonstrate the real risks of insider threats. However, any U.S. response that involves generalized suspicions or are disproportionate could cause more collateral damage than provide benefit. There are compelling reasons to explore options for research security and expand requirements for reporting and disclosure.

Despite the risks involved, there are compelling reasons to recognize the important contributions of immigrant scientists and foreign-born researchers across all elements of the bioeconomy. Indeed, researchers found that approximately 11 percent of patents filed within the United States include Chinese inventors. Additionally, in the contemporary case of the COVID-19 mRNA-based vaccines, the collaboration of immigrant scientists from multiple countries across multiple continents has built the foundation upon which these vaccines are now designed, manufactured, and distributed.

This free flow of talent and ideas can benefit the United States more than it creates risks. The mobility of inventors and entrepreneurs between the U.S. and China has contributed to progress in the field. Such scientific engagement can be highly impactful. The United States cannot compete for talent by playing defense and responding in ways that make foreign students and immigrant researchers feel unwelcome. To the contrary, proactive approaches can be effective in attracting talent.

Trade and Supply Chains
The COVID-19 pandemic has heightened scrutiny of U.S. dependence on China in healthcare-related supply chains. The 2019 Annual Report from the U.S.-China Economic and Security Review Commission (USCC) provides a glimpse into pre-COVID supply chain concerns, which focused primarily on U.S. reliance on Chinese-produced pharmaceuticals and active pharmaceutical ingredients (APIs), and the health risks arising from under-regulation of China's chemical and pharmaceutical industries. Post-pandemic shortages of items such as personal protective equipment (PPE) has broadened the range of products of concern to policymakers and has suggested the need for more secure supply chains and increased domestic production capacity.

China certainly plays an important role in API and PPE supply chains, but the data is often ambiguous and the reliance overstated. Moreover, there are existing tools under U.S. law

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13 https://www.cotton.senate.gov/imo/media/doc/210216_1700_China%20Report_FINAL.pdf
relating to leveraging the domestic industrial base for national defense and disaster response: the Defense Production Act of 1950 (DPA). The DPA gives the President authority, among other things, to prioritize contracts and expand domestic capacity to ensure reliable supply in emergencies.\(^\text{17}\) Rather than feeding a simplistic narrative of U.S. vulnerability springing from an overreliance on China, we must first look at whether the DPA was invoked in a timely manner and executed effectively - particularly given the mixed messages coming from U.S. political leadership in the early months of the pandemic.\(^\text{18}\)

This new focus on supply chains should not distract from the pre-pandemic issues in the trade relationship. Encouraging and supporting the PRC government to enforce safe practices and effective regulations will help assure safe end products for Americans. Further, export promotion activities, breaking down barriers to trade, and promoting robust intellectual property protections all help sustain the competitiveness of U.S. firms on the global stage.

**Data Security and the Bioeconomy**

Data, including genomic data and other personal health data, is crucial to the ongoing revolution in biotechnology. With advances in precision medicine, data can enable highly targeted medical treatments. Research in bioinformatics leverages sizable amounts of genetic and genomic information to start to gain insights on health and options for treatment.

The US and Chinese governments view the regulation of genetic data through different lenses. While Chinese state has individual level health privacy protections, it views genetic data as a national natural resource that must be protected from exploitation by foreign actors and used to catalyze domestic innovation.\(^\text{19}\) As China’s Biosecurity Law, officially introduced in October 2020, declares in its Article 53:

> “The state is to strengthen the management and oversight of the collection, storage, use, and external provision of our nation’s human genetic resources to ensure the security of human genetic resources and other biological resources.”

This Pursuant to this genetic sovereignty approach, PRC law and policies like the 2020 Biosecurity Law and the 2019 Regulation on the Management of Human Genetic Resources have introduced stringent restrictions against the export or sharing of Chinese human genetic data without first obtaining permission from the Chinese government.\(^\text{20}\)

In contrast, the US has historically characterized genetic and genomic data as a form of personal health information, and thus regulated its handling through a patchwork of different privacy and anti-discrimination laws at the federal and state level. These divergent frameworks of data governance manifest most concretely in the fact that the PRC requires data localization of genomic and other personal health data and the United States does not.\(^\text{21}\) This raises the concern

\(^{17}\) https://www.law.cornell.edu/uscode/text/50/chapter-55
\(^{18}\) https://www.ft.com/content/97dc7de6-940b-11ea-abcd-371e24b679ed
\(^{19}\) Though such policies are always controversial, it should be noted that China is not unique in maintaining national level protections around the use and exploitation of genetic and other forms of biological data. Globally, these protections tend to be motivated less by “defense” concerns, and more by dreams of encouraging indigenous innovation and/or preventing pharmaceutical companies from using a given country’s genetic data and then selling the interventions developed with this data back to the data-generating country at astronomical prices.

\(^{20}\) http://www.gov.cn/zhengce/content/2019-06/10/content_5398829.htm
about potential asymmetries in access to data that can feed further innovations in biotechnology, and whether the United States is at a disadvantage.

Relative to China, one U.S. strength is the diversity of its population, which provides heterogenous data samples essential to disentangling the biological signaling mechanisms at the root of precision medicine. However, data standardization is an ongoing issue\(^2\), and data sharing and accessibility standards in the United States are governed by a labyrinth of federal and state regulations that often diverge based on how the genetic data in question is obtained. At the federal level, governance of health information, and associated information, falls under the purview of the 1996 Health Insurance Portability and Accountability Act (HIPAA).\(^2\)

HIPAA is effective when it applies, but there are significant gaps that allow U.S. personal health data to legally go to countries such as China. For example, in instances where an individual opts-in to sharing health (and related) data with third parties, HIPAA’s ability to protect user data and dictate the protocols for transmitting, using, storing, and destroying this data are essentially nullified.\(^2\) For instance, if a user downloads a commercial health or dating app to their smartphone and populates it with sensitive health data, that data is very likely not protected under HIPAA. State laws may vary, but there are no restrictions on app developers selling that data to third party data aggregators or other firms, including those in China.\(^2\) Additionally, HIPAA’s privacy rule, which includes a de-identification standard that allows appropriately de-identified data to be shared and sold, does not extend to genetic testing for genealogical purposes.\(^2\) The de-identification process requires the removal of eighteen specified identifiers or an expert vetting a risk-assessment certification that determines whether the risk of re-identification is minimal.\(^2\) However, while removing such identifiers from genetic data may help in de-identification, the resulting data may be less useful in terms of research value.\(^2\) Furthermore, it is arguable whether genetic data can ever truly be de-identified to an acceptable standard, and such data may be non-useful for the broader medical research community.\(^2\)

The U.S. healthcare system’s disparate and often uncoordinated patchwork of legal regimes, health insurance companies, hospitals, and related firms can occasionally create headaches for average Americans, but it also has implications for U.S.-China health data competition. The barriers to healthcare interoperability create inefficiencies in provision of healthcare, but also prevent research and development in the bioeconomy from effectively leveraging that data for next-generation biotech innovations.\(^3\)

**Dynamics of Vaccine Development**

While crisis can undoubtedly be the mother of innovation, vaccine development during a pandemic is about pragmatic problem solving rather than showcasing innovation.

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26. [https://static1.squarespace.com/static/](https://static1.squarespace.com/static/)
27. [https://static1.squarespace.com/static/](https://static1.squarespace.com/static/)
28. [https://static1.squarespace.com/static/](https://static1.squarespace.com/static/)
29. [https://static1.squarespace.com/static/](https://static1.squarespace.com/static/)
capacity. While U.S. and PRC efforts to develop a vaccine are often characterized as a race, the reality is that each country’s approach can be positive sum. The world is, at this juncture, alarmingly far from having a sufficient global supply of COVID-19 vaccines. Consequently, every vaccine that reaches the market constitutes a global victory. Although the United States, via Moderna and a collaboration between Pfizer and the German company BioNTech, has been the first to develop highly effective mRNA vaccines, the Chinese vaccines possess certain strengths in the scalability of production and ease of distribution. While the Chinese inactivated virus-based vaccines have proved less effective at preventing mild disease cases than either Moderna’s or Pfizer-BioNTech’s mRNA-based vaccines, inactivated virus-based vaccines are generally cheaper and easier to handle/store than mRNA-based vaccines, while still effectively preventing moderate to severe cases. This can be advantageous when it comes to vaccine delivery in remote areas and developing countries. From a security standpoint, both the US and China benefit from maximizing global vaccination rates, as persistent disease will lead to new variants and a threat of recurrent outbreaks. Moreover, as new COVID-19 variants continue to develop, it is in the global interest to have vaccines based on multiple different technologies in production. Different strains may vary in their susceptibility to different types of vaccines. Ultimately, to say the US “won” the vaccine race is far too simplistic of an assessment at this point. To the contrary, the U.S. and Chinese vaccine development efforts can be regarded as complementary. Moreover, global vaccine distribution could constitute a sphere of aligning interest in which collaboration could prove mutually beneficial.

Military-Civil Fusion and Dual-Use Biotechnology

Although not a priority sector, China’s national strategy of military-civil fusion (军民融合) contains understudied references to biotechnology and healthcare sectors. For example, the 2015 and 2016 military-civil fusion action plans from the State Administration for Science, Technology, and Industry for National Defense (SASTIND) include directives to explore applications of nuclear technologies in the healthcare and medical sectors. In addition, several military-civil fusion demonstration bases include biotechnology and medical-related companies. It is hardly surprising that China is looking to leverage synergies among defense, scientific, and commercial developments in this field. Indeed, the desire to “spin off” (军转民) and “spin on” (民参军) technologies to create a virtuous cycle between the PLA and Chinese industry mirrors U.S. programs such as the Defense Advanced Research Project Agency (DARPA), as well as the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs.

Such linkages clearly warrant close scrutiny, but it would be a facile oversimplification to say that the sole purpose of the military-civil fusion strategy in all cases is to “achieve military dominance,” as this interpretation completely ignores the dynamics of the “spinning off” side of the strategy. For instance, one such military-civil fusion project in the healthcare space involved state-owned China National Nuclear Corporation’s promotion of proton radiotherapy for

When thinking of the intersection of biotechnology, healthcare, and military-civil fusion, the imagination can easily jump to titillating applications such as “genetic weapons” (although there is little to no public information to suggest such applications are seriously contemplated by the People’s Liberation Army). By contrast, it would be challenging to argue that leveraging capacity and expertise of the military and state-owned sector to improve health outcomes for the Chinese public presents a national security threat to the United States. U.S. policy cannot merely use the military-civil fusion strategy as a heuristic for identifying national security threats: a more nuanced and sophisticated understanding of how the strategy is applied will drive better outcomes in the relationship.

**Recommendations for U.S. Policy and Diplomacy**

1. The United States should concentrate on enhancing American competitiveness in healthcare and the bioeconomy, and on using healthcare and the bioeconomy to support overall American competitiveness and prosperity.
   - The U.S. Government should pursue public-private partnerships in the bioeconomy, particularly in areas with positive spillovers for health, jobs, and combating climate change.
   - The United States should dedicate significant investments in biomanufacturing, including through expanding the dedicated centers of excellence, while also supporting the cultivation of technical talents in this space. Additional emphasis should be placed on innovative programs, such as the Biology-based Manufacturing Innovation Institutes BioMADE, ARMI, and NIIMBL.
   - The U.S. federal government should partner with state and local governments and private investment firms to increase financing for startups in the bioeconomy, focusing particularly on promoting incubators and on shepherding firms through the valley of death.

2. The United States should absorb the lessons of the COVID-19 pandemic.
   - Congress should establish a Congressional Commission to investigate the response to the COVID-19 pandemic, including the efficacy of the Defense Production Act, the impact of trade on shortages, testing and contact tracing, and vaccine development and distribution.
   - Based on the Commission's findings, Congress should consider the necessity of reforms to the Defense Production Act, diversification of supply chains and/or permanent increases in domestic production capacity, and maintaining any pandemic-related processes and infrastructure.
   - The U.S. Government should also consider any additional international engagement, collaboration, or even support vis-à-vis China and other countries necessary to prevent and contain any future pandemics.

3. The United States should develop a more sophisticated understanding of the bioeconomy and any potential national security implications.

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33 [http://gfplatform.cnsa.gov.cn/n137/n13098/c6803224/content.html](http://gfplatform.cnsa.gov.cn/n137/n13098/c6803224/content.html)
• The Department of Commerce, in cooperation with the Departments of Health and Human Services, Defense, Agriculture, and other relevant agencies, should conduct an in-depth industrial base survey of the bioeconomy. Such efforts should inform any necessary updates to the North American Industry Classification System or to the "emerging and foundational technologies" classification required under the Export Control Reform Act of 2018.

• The Department of Defense, in cooperation with the Departments of Health and Human Services and other relevant agencies, should conduct an in-depth study of the PRC's intentions, efforts, and actors engaged in military-civil fusion as it relates to healthcare and the bioeconomy. Such efforts should inform nuanced, facts-based evaluations of national security and economic risks to the United States.

4. The United States should pursue and promote pragmatic engagement in issues of biotechnology policy, biosecurity, bioethics, and governance.
   • The U.S. and Chinese government should sustain and increase governmental engagements on biosecurity, agriculture, and environmental protection. Future U.S. and Chinese diplomatic engagements should include a regular mechanism to facilitate dialogue among specialists.
   • The U.S. and Chinese governments should pursue data sharing and coordination mechanisms for pandemic preparedness and surveillance. U.S. and Chinese experts should explore mechanisms to share and exchange information, including through the U.S. Center for Disease Control and China Center for Disease Control.

5. The United States should promote collaborative research on issues of mutual concern and limited sensitivity.
   • The U.S. government should limit restrictions to U.S.-China collaboration in basic research, including as it relates to medical applications, while utilizing proportionate and effective mitigation strategies for insider threats.
   • The U.S. government should explore options to co-fund and formally cosponsor research programming in conjunction with the Chinese government to create formal channels for academic collaboration.
   • The U.S. Government should attract the best talent in the world by offering a pathway to citizenship for foreign students attaining higher level degrees in the biotechnology and healthcare spaces.

6. The United States should prioritize WHO engagement, while exploring alternatives for more flexible multilateral mechanisms cooperation.

7. The United States should ensure data privacy and security, especially in healthcare and for biomedical information.
   • Congress should conduct hearings and investigations into the scope of HIPAA, and any reforms necessary to prevent American’s sensitive health or genomic data from ending up in the hands of malign actors.
   • Congress should also explore reforms to increase efficiency of the U.S. healthcare system by promoting health data interoperability.
- Congress should explore policies to U.S. health data governance that balance data privacy and security with supporting the U.S. bioeconomy’s ability to leverage health and genomic data to further innovations and competitiveness.

**A Race to the Top for the Bioeconomy**

U.S.-China rivalry risks producing worst-case scenarios if preventing important engagement. However, instead of a race to the bottom, American policymakers should concentrate on provoking a race to the top in this field. There are compelling rationales for the United States to spur China to contribute and concentrate on competing constructively.
Economic Interdependence and Supply Chain Complexities

Over the past twenty years, the economic relationship between the United States and the People’s Republic of China has been defined both by growing interdependence and increasing tensions. A U.S. focus on unilateral trade actions during the Trump Administration coupled with China’s increasingly authoritarian and assertive model of state capitalism have raised tensions across the global trading system. At the same time, China remains the United States’ third-largest trading partner and the largest trading partner of key U.S. allies such as Japan, South Korea, and Australia. Chinese firms also play a central role in U.S. and global supply chains—a role the Chinese government often leverages to advance its geopolitical ambitions.

Managing the United States’ important economic relationship with China while addressing the challenges posed by China’s economic model will be a defining challenge of the Biden Administration. Over the past six months, this working group has sought to clearly define the challenges China poses to the United States economy and take a comprehensive inventory of the authorities and policy tools available to the Administration to address these challenges. This policy brief presents a summary of the group’s findings and offers some potential paths forward that align with the Administration’s stated goals of working together with allies and partners in a multilateral environment to confront the challenge China poses to the current global economic system.

Key Assessments

- The United States will be unable to change China’s economic behavior in the short-to-medium term on its own. China’s central role in global supply chains and its growing global economic influence will likely limit the efficacy of unilateral U.S. action. Unilateral actions can also stymie U.S. efforts to coordinate with like-minded countries and run afoul of multilateral trade rules and norms.
- The United States and China will continue to clash over the role of the state in the economy. China’s use of managed trade and economic coercion to achieve geopolitical objectives, and standards governing data, technology, and infrastructure and development financing.
- The evolution of China's economic model will play an important role in determining whether the United States and China can cooperate. If China fails to rebalance toward a more sustainable, consumer-led growth model, and continues to pursue trade-distorting industrial policies, competition with the United States is likely to intensify.
- The United States and China can co-evolve and coexist in the international economic system, but cooperation could be constrained by ongoing concerns about China’s increasingly authoritarian behavior both at home and abroad.

Select Policy Tools

- Defining emerging and foundational dual-use technologies under Export Control Reform Act (ECRA).
- Leveraging the Development Finance Corporation and U.S. Export-Import Bank (EXIM) to provide higher-standard development finance, limit the impact of China’s economic coercion, and promote U.S. exports.
Utilizing U.S. government procurement to build domestic production capacity in critical technology sectors.

Coordinating with allies and partners to offset the negative effects of China’s state-led economic model on the global economic system.

**Shaping Future Norms and Standards with Allies**

1. Promoting a secure, rules-based, and sustainable international order, and ensuring secure, transparent, and accountable norms for the development and application of emerging technologies must be at the core of any U.S. strategy toward China.

2. The United States can strengthen its position by working with allies and like-minded partners to shape norms and standards across:

   - **Emerging Technologies:** Artificial intelligence, biotechnology, electrification, and the Internet of Things are quickly diffusing across the world, creating new segments of the economy. The United States—as both a global leader and early adopter of these technologies—can push for more transparent norms in the development and applications of these new technologies.

   - **The Digital Economy:** New approaches for managing competition across the domains of sovereign and private digital currencies, cross-border data flows, and digital privacy.

   - **Development Finance:** A key challenge for the United States is China’s efforts to promote its global leadership through development finance, loans, and investments in developing countries.

**U.S. – China Economic Cooperation and Competition**

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  - The Digital Economy: New approaches for managing competition across the domains of sovereign and private digital currencies, cross-border data flows, and digital privacy.
  - Development Finance: A key challenge for the United States is China’s efforts to promote its global leadership through development finance, loans, and investments in developing countries.
As economic ties between the United States and China have deepened, so have U.S. concerns about the compatibility of the United States’ relatively open, market-based economic model and China’s state-driven trade and investment practices.\textsuperscript{35} There is a growing consensus in the United States, as well as in like-minded countries, that Chinese state capitalism is increasingly at odds with core tenets of the post-World War II international economic order.\textsuperscript{36}

China today is one of the United States’ top trading partners, a vital export market for U.S. farm goods, and a major source of demand for U.S. services. Differences in the structures and norms governing the two countries’ economic systems, however, have been a persistent source of tension. The United States’ relatively open consumer and capital markets have provided Chinese firms with reliable export markets and a vast pool of growth capital. Meanwhile, U.S. engagement with China’s growing economy has been hampered by trade and investment practices coordinated at the Party level that advance the Chinese government’s core security and economic interests, often at the expense of global markets.\textsuperscript{37}

Areas where U.S. and Chinese economic interests will continue to clash include:

- **The Role of the State in the Economy:** The United States and its allies value free and open markets. This stands fundamentally opposed to China’s state-capitalist model in which the state guides and supports strategic industries, privileges state-owned enterprises, and creates an unpredictable market environment for the private sector. By controlling access to its market and supporting its “national champion” firms, China has tried to leverage the relative openness of global markets to secure capital and acquire large global market share across a range of industries.\textsuperscript{38}

- **Open Trade vs. Managed Trade:** The push for transparent rules and open markets by the United States and allies faces strong competition from China’s restrictive approach to trade and investment that positions Chinese firms to dominate key emerging sectors and markets.\textsuperscript{39} At the same time, China’s support of the Regional Comprehensive Economic Partnership (RCEP) and bilateral trade agreements signed with regional partners show some willingness to lower select trade barriers to advance business interests and for broader geopolitical gain.\textsuperscript{40}

- **International Economic Institutions:** Both China and the United States have sought to reform institutions such as the World Trade Organization (WTO) for different reasons. Although U.S. policymakers have expressed concerns that organizations such as the WTO are not adequately addressing China’s harmful trade and investment practices, these institutions still serve as a strong means of enforcing international trade rules, as well as a valuable forum for coordinating with allies.\textsuperscript{41} Meanwhile, China has worked to further its own influence and build coalitions of its own through more engagement in the WTO and existing international economic institutions. China is also creating alternate

\textsuperscript{35} https://www.banking.senate.gov/hearings/us-china-winning-the-economic-competition-part-ii-ji
\textsuperscript{37} https://crsreports.congress.gov/product/pdf/IF/IF11284
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\textsuperscript{41} https://foreignpolicy.com/2020/05/27/world-trade-organization-united-states-departure-china/
institutions in which it has greater representation, such as the Asian Infrastructure Investment Bank (AIIB).42

- **Intellectual Property and Strategic Technologies:** China’s strategy of “indigenous innovation” in emerging technology sectors relies on the intellectual property and technical knowhow of foreign companies to fill key technology gaps in its domestic supply chain. As U.S.-China commercial ties have expanded, so too has the need for U.S. firms and the U.S. government to protect valuable intellectual property.43

- **Data and Technology Standards:** The United States and several key allies have pushed for clear and transparent standards on the use of data and certain emerging technologies such as 5G. U.S. trade agreements and international standards generally promote the unimpeded flow of data across borders. China, on the other hand, has pursued a model of “cyber sovereignty” that emphasizes control over the flow of data and information and approaches standards-setting in emerging technologies as an opportunity to secure a dominant position for its firms.44

- **Development and Infrastructure Financing:** China’s Belt and Road Initiative (BRI), an extension of China’s decades-long international financing practices, provides an alternate model of development and infrastructure financing on a scale that rivals financing from multilateral institutions such as the World Bank.45 Although BRI in part seeks to address longstanding infrastructure gaps, the U.S. government has limited its engagement with BRI due to China’s non-transparent lending practices and investment in dual-use infrastructure that may reinforce China’s growing power projection capabilities.46

- **Sanctions and Economic Coercion:** Both the United States and China have used the strength of their respective economies to achieve geopolitical objectives. While the U.S. government has levied bilateral sanctions against various individuals and firms tied to China’s military and state security services, China has pressured other countries (including U.S. allies) by restricting access to its market and imposing various informal economic and trade restrictions.

- **Military-Civil Fusion:** U.S. commercial engagement with China faces a growing risk of supplying China with critical technologies and investment capital that may ultimately undermine U.S. national security. China’s policy of “Military-Civil Fusion” promotes deep ties between China’s military and private sector that the U.S. government has sought to address through capital market reform, export controls, and new foreign investment review authorities.47

- **Supply Chain Transparency and Security:** China’s role as a global manufacturing hub has formed the backbone of its current economic model, but multinational firms and governments worldwide are seeking to diversify production away from China following the supply chain disruptions caused by COVID-19. There are also broader concerns about the security of Chinese technology products in U.S. supply chains and consumer markets. Additionally, the Chinese government’s forced labor programs in Xinjiang have created the risk of human rights abuses in China-centric international supply chains.48

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43 https://ustr.gov/sites/default/files/Section%20301%20FINAL.PDF
The United States is not alone in its concern that China’s growing economic power potentially threatens democratic global norms and institutions. U.S. allies and partners, including South Korea, Australia, and Canada, among others, have faced steep unilateral economic punishment meted out by the Chinese government for a host of perceived political offenses.\(^4^9\) At the same time, these allies and partners are deepening their commercial and financial ties with China, including through trade and investment agreements, complicating potential multilateral cooperation on addressing common challenges posed by China’s actions. U.S. multilateral efforts with even its closest allies and partners will become more challenging.\(^5^0\)

**China’s State-led Economic Model**

China’s economy has grown substantially over the 40 years since Beijing began introducing economic reforms and selectively opening its market to foreign trade and investment. China’s earlier rapid economic growth can be attributed to large-scale capital investment financed by high domestic savings and an influx of foreign investment, and productivity growth driven by economic reforms, rural-urban migration, and the adoption of foreign technology. This combination of national economic planning, state-supported investment in strategic growth sectors, and the buildup and subsequent export of excess capacity, helped China capitalize on other economic drivers (e.g., urbanization, demographic dividend, high returns on investment) and establish a stronger presence in sectors the United States has historically been dominant. These sectors include telecommunications, financial technology (fintech), and advanced manufacturing.

How effectively China can continue to expand into new growth sectors and how the United States responds will determine the future of economic cooperation and competition between the United States and China. Key factors that could impact China’s future economic strength include:

- **China’s Future Growth Model:** China sustained GDP growth and outperformed most expectations of export growth during COVID-19. China’s future economic growth will heavily depend on the Chinese government’s ability to implement a “dual circulation” strategy across the wider economy and rebalance away from investment-led growth with diminishing returns toward more sustainable, consumption-led growth.\(^5^1\) In particular, China will need to find new drivers of productivity and growth via investments in core technologies such as integrated circuits and other high-value products at scale.

- **Continued Dependence on Export Markets:** China has continued to rely heavily on export-led growth throughout the last decade and during the economic disruption caused by COVID-19. China’s role in certain critical supply chains during the COVID-19 crisis has led the United States and like-minded countries to explore ways to diversify away from Chinese exports, creating potential counter pressures on Chinese exports in the future.\(^5^2\)

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• **China’s Financial Stability:** China's rapid buildup of local government and corporate debt, particularly shadow banking assets, coupled with moral hazard created by the government's implicit guarantee of such debt, poses a long-term systemic risk to China's financial system.53

Although tensions in the U.S.-China economic relationship are at a high point, there is still room for the two countries to co-evolve and coexist within the existing international economic system. Several factors will influence future cooperation between the United States and China, including:

- The degree to which both sides continue to adopt unilateral trade actions against the other.
- The role of the major economies such as the European Union, Japan, and South Korea in aligning and opposing U.S. and Chinese economic practices.
- Global macroeconomic stability.
- Addressing global issues such as climate change and pandemics.
- CCP’s use of forced labor in Xinjiang, violation of human rights in Inner Mongolia, Tibet, Xinjiang, and other authoritarian measures.

*After-Action Report on the Trade War and the “Tech War”*

Under the Trump Administration:

- The Office of the U.S. Trade Representative’s (USTR) Section 301 report laid out the case for taking retaliatory action against China for its discriminatory intellectual property and technology transfer practices against U.S. businesses.
- USTR subsequently implemented tariffs of between 7.5 - 25% on roughly three quarters of all products imported from China.54
- The Department of Commerce (DoC) added over 275 Chinese companies, including Huawei, to a list of entities subject to stringent export licensing requirements for U.S. technology (Export Administration Regulations), and tightened the relevant rules to cover products manufactured outside the United States.55
- The Department of Treasury expanded the Office of Foreign Assets Control economic and financial sanctions to penalize human rights abuses in Xinjiang.
- The Department of State and Department of Homeland Security restricted or canceled the visas of Chinese students and scholars suspected of economic espionage; implemented tighter restrictions on Chinese diplomats and journalists; and closed the Chinese Consulate in Houston.
- The Department of Justice launched a nation-wide China initiative to identify instances of Chinese technology and IP theft and raise broader awareness across industry, academia, and government.56
- The Department of Labor restricted Thrift Savings Plan investment, the retirement fund for federal employees, in Chinese companies and the broader Chinese market.
- The Securities and Exchange Commission enforced disclosure and transparency requirements, limiting Chinese companies access to U.S. capital markets.

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• Congress expanded export controls via the Export Controls Reform Act to cover dual-use emerging and foundational technologies.57

• Congress expanded coverage of Chinese investment in the United States via FIRRMA and ECRA, leading to additional scrutiny of Chinese investment in dual-use, high-technology sectors.

While the Trump Administration has taken significantly more direct action on China than previous administrations, its policies have largely failed to effect structural changes in China’s economy or address entrenched problems associated with state capitalism.58 Its use of tariffs caused immense collateral damage to the American economy59 while doing little to decouple supply chains.60 This report outlines other tools that the Biden administration has at its disposal (see Table 1 below). These include targeting specific dual-use technologies through use of the Entity List, export controls, and investment restrictions, strengthening U.S. innovation via R&D financing and talent development, leveraging government procurement, and working with allies and partners to promote liberal norms and countering the negative spillovers of China’s state-driven economic model.

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58 https://www.washingtonpost.com/politics/2020/01/21/us-china-finally-signed-trade-agreement-who-won/
60 https://www.csis.org/blogs/trustee-china-hand/decoupling-between-washington-and-western-industry
Table 1: U.S. Economic Policy Toolkit

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<thead>
<tr>
<th>Department</th>
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<th>Export Controls</th>
<th>Investment Restrictions</th>
<th>Finance Restrictions</th>
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For the United States, developing a comprehensive strategy for managing the China challenge means acknowledging that this competition does not happen in a vacuum. Many countries around the world—some allied with the United States, others undecided or adversarial—are also confronting the negative impacts of Chinese trade-distorting trade practices, coercion, and propaganda. Over the past several years, policymakers around the world have also begun to come to terms with the profound limitations of attempting to regulate or check a state-driven economic model like China’s with tools designed for liberal, market-driven economies. Even as the United States and other liberal economies grapple with managing state-directed subsidies, overcapacity, and other long-standing challenges posed by China, new and emerging dimensions of global economic engagement and technological development demand policymakers' attention. Because these emerging issues are global in scope, they will require global solutions, and better coordination with like-minded countries to achieve positive long-term outcomes.

Protecting and promoting a safe, secure, rules-based, and sustainable international order, and ensuring liberal norms for the development and application of emerging technologies must be at the core of any long-term U.S. strategy for competing with China.

**Digital Economy:** The United States benefits from, and seeks to sustain, a rules-based international trade system that seeks to ensure compliance with commitments, equitable application or regulations, and free flows of capital, assets, and data. With the emergence of the digital economy, the United States needs to develop new approaches for managing competition
in this domain, including sovereign and private digital currencies, cross-border data flows, digital privacy, and others. Already, the rapid commercialization of digital business is exceeding the capabilities of regulators around the world. For example, U.S. trade laws are a poor fit for measuring the flows of services trade or valuing companies’ IP as a contribution to the domestic or global economy.

This complex environment is made even more so by authoritarian regimes like China increasingly leveraging their innovative capabilities and commercial strength to advance their political objectives on the global stage. While both the EU and China have rolled out their vision for data governance, the United States lacks a single unifying framework. Given the intrinsic link between data and innovation, lack of high-level U.S. coordination risks undermining U.S. leadership not only in data-driven technologies but also in setting the global norms for how data flows are governed. China is also rolling out a digital currency that will both allow it to promote the internationalization of its currency and insulate it from the discipline of the dollar-dominated global financial system.

U.S. policy for managing digital trade in a globalized context could emphasize:

- Developing new metrics to accurately assess the importance of digital trade (to include data flows and IP) to U.S. economic health;
- Creating a centralized framework for data governance that seeks to promote U.S. interests while harmonizing approaches with other democracies;
- Ensuring new multilateral trade rule making (including under the WTO) emphasizes new tools for managing barriers to digital trade and mitigates the risks of divergent standards being developed by China and other autocratic regimes;
- Balancing market openness and cross-border data flows with protection of digital privacy and national security priorities;
- Monitoring the development of private and sovereign digital currencies, with a particular emphasis on their potential for enabling evasion or circumvention of sanctions and other tools of formalized economic rulemaking.

Development Finance: A key dimension of the U.S. competition with China is addressing China’s attempt to promote its global leadership through development finance, loans, and other types of investment in developing countries. The United States supports a transparent model of international development that prioritizes good governance, economic feasibility, and environmental sustainability. This approach provides a bulwark against the China-led model of development finance that is nontransparent, does not engage in multilateral coordination, and prioritizes Chinese access to markets, extractives, or networks to the exclusion of host countries or other participants.

Though the BRI—the most visible manifestation of China’s engagement with the developing world—promotes the rhetoric of win-win cooperation, Beijing’s core objective is finding new markets for Chinese goods and services, such as steel, rail, and construction. Many countries accepting loans from China realize their own vulnerability to China’s interest, but are either unaware of the risks or have limited options. China’s rising role as a creditor to developing economies is thus, in no small part, due to the failure of the existing multilateral development institutions to step in.
For the United States, the creation of the U.S. Development Finance Corporation and expanded role of the U.S. Export-Import Bank, are important first steps. The next level of engagement would entail the United States:

- Focusing on incentivizing sustainable democratic governance in recipient countries, including by promoting the implementation of the G7 Ise-Shima Principles for Promoting Quality Infrastructure Investment;  
- Working with allies’ development institutions to extend the reach of liberal development norms;
- Collaborating with allies to develop joint assistance programs, to include technical assistance and capacity building to address infrastructure;
- Ensuring multilateral financial institutions demand from recipient governments transparency on amounts, financing terms, and conditions of their bilateral borrowing (including from China);
- Supporting grassroots NGOs and independent media in recipient countries to sustain accountability, transparency, and anti-corruption in development projects;
- Working with U.S. companies to focus on supporting transparency, accountability, and human rights in their commercial partnerships and supply chain networks.

**Emerging Technology:**

Emerging technology such as artificial intelligence, biotechnology, and the Internet of Things are quickly diffusing across the world, creating new segments of the economy, and challenging existing ethical use and governance principles. The United States supports the secure and accountable application and development of emerging technologies. This approach focuses on safeguarding user privacy and genetic information, facilitating the free flow of data, and preventing the abuse or unethical application of these technologies.

Rapid technological innovations such as facial recognition, human genome editing, and smart city surveillance are raising new ethical questions. The U.S. government has already pushed for the ethical use of artificial intelligence, most notably by the Department of Defense. While these efforts are still nascent, the United States as both a global leader and early adopter of these technologies can play a central role in the global development and application of these new technologies.

In support of these efforts, the United States should:

1. Actively develop and promote transparent, secure, and accountable norms in emerging technologies at global standard-setting bodies and multilateral institutions;
2. Direct U.S. representatives in international organizations to use their voice and vote to raise awareness of emerging technology being used to violate human rights, censor free speech, and implement various authoritarian measures;
3. Expand information-sharing with like-minded countries about the security vulnerabilities of emerging technologies;
4. Collaborate with allies and partners and through international institutions such as the United Nations, World Trade Organization, and Organization for Economic Co-

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operation and Development to establish global governance norms and practices for emerging technologies;
5. Ensuring multilateral institutions incorporate these global governance norms and practices into their use and application of emerging technologies in global infrastructure investment and development financing such as smart cities.
Geopolitical Competition

“What If” Analysis of Diverging U.S.-China Competition Outcomes

The Geopolitical Competition and International Institutions group performed a “backcasting” exercise to identify courses of action for U.S. policymakers. We started by choosing three future great power competition (GPC) scenarios:

The People’s Republic of China (PRC) outcompetes the United States.
Sustained Rivalry: Neither the PRC nor the United States emerges as the dominant power.
The United States outcompetes the PRC.

For each of the above scenarios, we developed a list of key overarching assumptions and characterizations of each scenario; identified implications for the United States and its partners; and crafted recommendations that prioritize the security and prosperity of the United States and its allies. For scenario one where we assume that the PRC has outcompeted the United States in key measures of global power we provide recommendations with an eye to prevent as well as for how Washington might handle this outcome if it ever became unavoidable.

Scenario One: The PRC outcompetes the United States in key measures of global power, including political, economic, and military areas.

Assumptions:

- The People’s Republic of China (PRC) overtakes the United States as the largest economy in the world, and countries see China, not the United States, as the leader of the global economy. The PRC succeeds at achieving and maintaining healthy economic growth fueled primarily by domestic consumption rather than government intervention, and attains technological self-sufficiency.
- The Communist Party of China (CPC) is still in power. As such, PRC core interests, strategic goals, and developmental objectives remain consistent, namely to maintain the PRC’s territorial integrity, including reunification with Taiwan; deter and decrease the United States and its allies’ military presence on China’s periphery; achieve economic and technological superiority, and boost PRC international leadership while overturning rules and norms hostile to PRC interests.63
- The PRC succeeds at converting its economic might into a military that has reached technological parity with the United States, can threaten U.S. assets in most regional contingencies, and can project power anywhere in the world. Effective military organizational reforms, continued investment in national defense and deeper PLA-civilian integration as prioritized in the PRC’s Military Civil Fusion (MCF) strategy make the PLA a more efficient force and allow PRC commercial and military sectors to mutually benefit from innovations and resources.
- Democratic and authoritarian regimes alike increasingly align with the PRC in the UN and other international fora. Countries accept - or are at least unwilling to counter - PRC-led ideas of “economic and social rights,” over inalienable civil or political rights.64

64 www.cnas.org/publications/reports/peoples-republic-of-the-united-nations.
notions of internet sovereignty enjoy widespread appeal. One Belt, One Road (OBOR) is endorsed and perceived as a highly-desirable premier international development project by a large number of countries across the world.

**Implications:**

1. In this scenario, the PRC leads in at least some critical emerging technologies.
   - As the largest economy and leader in setting global technology standards, the PRC can outcompete and even close out other countries in overseas markets by setting relevant technology standards.
   - The developing world in particular gains a stronger preference for PRC foreign assistance and infrastructure finance, including initiatives like OBOR and AIIB.

2. The CPC keeps political factions and dissent at bay through rigid social controls and ideological unity. PRC efforts to tighten its grip in Xinjiang, Tibet, and Inner Mongolia through actions previously deployed in Xinjiang worsen human rights violations in China.
   - CPC consolidates control over Hong Kong and Macau and Party officials dispense with “one country, two systems” formula, cementing CPC authority in all areas of the country.
   - CPC propaganda and disinformation efforts whitewash unsavory PRC actions. Abroad, China sows doubt in U.S. legitimacy and leadership.

3. Advances in the MCF strategy and years of advanced PLA reforms and training facilitate People’s Liberation Army (PLA) modernization, power projection capabilities, and an increasingly offensive approach to advancing PRC core interests.
   - A PLA that can project power anywhere in the world and with technological sophistication on par with any Western military, threatens the U.S.’s ability to defend Taiwan and U.S. allies in Asia, undercuts regional countries’ support for U.S. basing and access in the Indo-Pacific, and increases the chances of more dangerous encounters with U.S. military assets.
   - The CPC uses political, economic, and military tools to erode Taiwan’s autonomy and isolate it from the international community with an eye toward unification.
   - The CPC further militarizes features in the South China Sea, while restricting the maritime rights and freedoms of other parties.

4. The PRC secures enormous influence in global governance by increasing and consolidating leadership across international organizations, including achieving stated goals in its technical standards promotion campaign. The PRC uses economic coercion in select instances where economic levers fail to get results.
   - The PRC uses international concern about U.S. decline to position itself as the only viable alternative, increasing its role in international organizations and influence on individual countries’ governance systems.
   - The PRC is able to successfully block debate on any UN measures condemning domestic human rights abuses.
Scenario 1 Recommendations:
U.S. leaders can take the following steps to prevent the scenario from occurring:

- Increase U.S. government and private sector involvement and seek leadership roles in standard-setting international organizations such as the International Organization for Standardization (ISO), the United Nations’ International Telecommunication Union (ITU), and the International Electrotechnical Commission (IEC). Encourage partners and allies to do the same. Washington should deepen involvement in global and regional organizations to ensure a strong and enduring voice in underlying norms, values, and rules that govern these institutions.

- Invest domestically in STEM. Balance attracting and retaining world-class talent with establishing holistic security mechanisms to prevent IP theft via cyber-attacks and human recruitment.

- The PLA targets this IP for innovation directly or indirectly through strategies like MCF. Protecting U.S. innovation will ensure it cannot be leveraged for PLA modernization. The U.S. should also be alert to other sources of potential PLA innovation and advanced training, for example, through foreign military exchanges, especially with Western militaries.

- Better integrate economic relations and human rights abuse concerns in U.S. foreign policy. PRC surveillance technology, which has benefited from technological cooperation with U.S. firms, plays a key role in these abuses, and some of that same technology has appeared in other countries like Venezuela and Ecuador.
  - In coordination with the international community and allies leverage a combination of bilateral and multilateral targeted sanctions and curtailment of cooperation with PRC entities in technologies that have been shown to or are assessed to enable abuses until the PRC addresses human rights concerns.

- The United States should actively embed Taiwan in regional and global U.S.-led initiatives. It should support Taiwan’s participation in international organizations like the World Health Organization, a development that would benefit global public health, and encourage allies and partners to do the same. As the PRC expands its overseas propaganda and disinformation campaign, Washington and others could learn from Taiwan’s approach to dealing with PRC political warfare tactics, including robust official efforts to counter disinformation on social media and the incubation of “watchdog” organizations in civil society.⁶⁵

- Study PRC propaganda and disinformation, including key domestic players and strategies, to inform and build a global campaign with strong countermeasures COVID-19 revealed an expansion in typical PRC propaganda tactics beyond information suppression and portraying the CPC in a positive light to actively pushing disinformation aimed at undermining the United States and its partners. This was most recently evident in irresponsible attempts to push disinformation about the effectiveness of U.S. and partner country-developed vaccines against SARS-CoV-2 in the wake of reporting that PRC vaccines are not as effective.

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If the scenario is unavoidable, the U.S. should pursue the following steps:

- Build global and regional institutional netting to constrain the PRC’s ability to press its advantage in the international system. The United States would get the most help building this netting while it still can influence institutions’ norms, values, and rules. Institutions are sticky; this netting would still endure even if the PRC supplants the United States. By using institutions to spread power in global governance, Washington would secure long-term influence after its material power resources have lost effectiveness.

- Diffuse governance of establishment international organizations. Lobby to extend permanent membership on the UN Security Council to major states whose interests may not align clearly with either Washington or Beijing, such as India and Brazil, and make a concerted effort to deepen U.S. ties with said countries. Leverage the PRC’s desire to be perceived as a responsible, global leader to encourage China to contribute to global public goods the U.S. also desires, such as addressing climate change.

- Seek involvement and influence in Chinese-led multilateral institutions, such as AIIB. The longer Washington were to wait if the scenario became inevitable the less influence it will retain as the PRC ascends to global leadership and the more it risks marginalization in a world whose center has shifted to China.

- Build an international intellectual property-sharing regime with membership contingent on human rights compliance to blunt the PRC from imposing a restrictive global IP regime to preserve its advantage. Link open IP and human rights as parallel U.S. global governance goals and signal U.S. commitment by encouraging high-profile Silicon Valley partnerships with emerging markets.

Scenario Two: The PRC and United States maintain power parity, leading to sustained rivalry with neither becoming dominant.

Assumptions:

- The PRC and U.S. vie for economic primacy, with the PRC leading in size but the U.S. leading in innovation and attraction to foreign investment. The dollar weakens as a global reserve currency, but the renminbi does not entirely replace it. While the PRC dominates in high tech platform production, the United States out-performs in software development.

- The CPC retains its domestic hold on power, but its international agenda is constrained. The United States and its international partners maintain a steady and well-funded competitive approach to the PRC that allows countries to remain independent and resist PRC coercion.

- PLA-civilian integration provides a technological advantage that fuels China’s military modernization. However, the PLA remains untested in major conflicts and complex operations on China’s periphery, and has limited power projection beyond China’s near seas.

- Democratic and authoritarian regimes balance and hedge between the PRC and the United States. While a small number of states fall fully in the U.S. or PRC orbit, the vast majority of countries across Europe, Africa, Latin and South America, and South and Southeast Asia maintain close ties with both countries.
Implications:

- In this scenario, the PRC leads in some critical emerging technologies but would be unable to translate that lead into decisive political or economic power.
  - Global standards might fracture into blocks with “Asian” models and “Western” models that inhibit global growth and competition.
  - PRC initiatives like OBOR and AIIB are still attractive to developing countries, but the PRC finds that its investments continually underperform.
  - To analysts outside China, calling China the “world’s next superpower” is beginning to sound stale. Like Japan before it, it looks like China will approach the doorstep of superpowerdom but never quite step over it.

- The CPC continues to obfuscate or suppress its most egregious actions against religious and ethnic minorities, stifle UN criticism of PRC internal affairs, and quietly build sympathizers among other illiberal states for its human rights positions. China’s repressive actions in Xinjiang, Tibet, and Inner Mongolia will result in increasingly unified U.S. and European Union condemnation limiting Beijing’s ability to exert soft power.
  - In an effort to rebuild its public image, the PRC would reduce corruption and coercion in its foreign policy and temporarily return to less confrontational diplomacy. The United States would focus on economic and military elements of competition, as more countries accept PRC outreach and positive messaging about its “Community of Shared Future,” which calls for a less U.S.-centric system and global governance according to principles China favors.
  - Global privacy, free speech, corruption, and rule of law norms would weaken and become more inconsistent, reflecting a variety of different influences. On the one hand, some online users might accept greater monitoring and curbs on free speech. On the other hand, the internet will continue to be a key source of support for civil society around the world, much to China’s suspicion. As a result, internet governance might become increasingly fractured.

1. The PRC’s limited combat experience and power projection prevent it from taking a more decisive approach globally. ASEAN pressure and increased military coordination among U.S. and allies and partners, including India, force China to continue a gradual, opportunistic approach to the South China Sea. After initially expanding its nuclear arsenal, the PRC resists getting drawn into a strategic arms race with the United States and Russia. Beijing prioritizes OBOR, specifically the development and operation of critical infrastructure like ports, as it seeks to secure commercial and military access.
  - A number of non-fatal military incidents occur between U.S. and Chinese forces, including collisions during U.S. Freedom of Navigation Operations (FONOPs). Both sides seek to avoid major military conflicts as the costs of direct confrontation will be prohibitive.
  - The PRC tentatively and quietly signals willingness to engage in confidence-building strategic arms dialogue with the United States because it wants to lessen U.S. pressure on other bilateral areas and leaders feel an uncontrolled arms race would undercut economic development.
2. The PRC and the United States achieve near-parity in global institutions, with developing nations as critical swing votes. An unstable multipolar world order emerges. While the PRC can use its economic might to build global support for positions that advance its interests, it does not retain clear leadership in most organizations.
   - The United States is able to prevent most PRC agenda items it disagrees with from becoming adopted by international organizations. Despite growing economic influence, China struggles with building political acceptance of Beijing’s agenda and ideas. Chinese leaders perceive the United States is the dominant international player and capable of threatening Chinese interests, despite belief among many that the United States is in decline.
   - With neither side having primacy, both the United States and the PRC increasingly sidestep international organizations, rapidly eroding the global order into disparate blocs and endangering long-term global stability.

**Scenario 2 Recommendations:**
With neither the United States nor the PRC in ascendancy, the greatest risk to global stability is the stagnation and fracturing of the international order. Both countries may find it expedient to circumvent multilateral organizations for short-term gain if organizations such as the UN, WTO, and World Bank become deadlocked. In the long run, however, such a “no rules” rivalry will be unstable, uncertain, and costly for both sides. Our recommendations are geared toward avoiding such a negative equilibrium in the first place. Competitive dynamics will persist regardless, but long-term U.S. interests (as well as long-term Chinese interests) are better served if competition takes place within an institutional order that clarifies expectations and facilitates bargaining in place of unchecked geopolitical rivalry.

3. Give middle powers in Europe, Africa, Latin and South America, and South and Southeast Asia a greater stake in maintaining the current world order. Throw U.S. support behind the Human Rights Council and other mechanisms favored by Europeans to shore up multilateral institutions. Expand permanent UN Security Council membership to include major states whose interests may not align clearly with either Washington or Beijing, such as India and Brazil, and deepen U.S. ties with said countries.
4. Loosen veto powers in international organizations to enhance their responsiveness. Lobby to abolish the veto power of permanent UNSC members and convert the UNSC into a supermajority entity (e.g. resolutions pass with the support of two-thirds of permanent members as well as two-thirds of all members). Reduce consensus requirements as part of WTO reform.
5. Restore the WTO’s and other economic dispute settlement mechanisms. Offer compromises with Chinese positions on WTO reform issues on the condition that China accepts “developed country” status in the WTO. As the United States and PRC approach competitive parity, focus reform efforts on areas where U.S. and Chinese positions will likely converge, such as intellectual property protections.
6. Seek an agreement with China on foreign aid that commits both sides to channel the same share of development assistance through multilateral institutions rather than bilateral arrangements, which are easier to weaponize for geopolitical ends.
7. Identify areas of potential security cooperation that allow China and the United States to practice operating together to reduce tensions, such as transnational crime or disaster relief operations.
8. Orient human rights sanctions toward ensuring the U.S. is not complicit in PRC crimes rather than altering PRC behavior. In a rough power parity scenario, the United States is especially unlikely to change PRC actions in areas like domestic stability, which the CPC views as a central interest.
9. Maintain a steady footprint in East Asia sufficient to deter PRC aggression, while focusing on conflict mitigation and strategic arms reduction. Press Asian and European partners to take a stronger military posture in East Asia.

Scenario Three: The PRC’s position peaks without overtaking the United States and then deteriorates.

Assumptions:
- China’s economy stagnates and falls into the middle-income trap. Its transition from investment-led to consumption-led growth stalls indefinitely. Momentum for further reform evaporates and the population declines as birth rates continue to fall.
- CPC rule looks brittle and cracks appear. The economic slowdown has eroded the social contract-- i.e., prosperity for obedience--that has long sustained CPC rule. The CPC no longer has the upper hand in the technological race against would-be dissidents.
- The PLA’s modernization has plateaued. China cannot continue plowing resources into its military without risking becoming a garrison state, i.e., over-investing in its military at the expense of economic development and other governance goals.
- China has little support internationally. China has not won followers for its leadership and lacks a reliable network of allies or partners to help it project power on a global scale. It receives constant criticism for its authoritarianism and human rights abuses.
- The U.S. political situation is stable. The chaos and hyper-polarization of the Trump presidency turned out to be an aberration rather than a trend. Far-right extremism has been marginalized from mainstream politics and core U.S. governing institutions have held firm.

Implications:
- China’s domestic situation
  - China may not be able to smooth out the dislocations of post-industrial transition. Millions of workers may be left in the lurch as China shifts away from manufacturing, creating the first class of Chinese to see a decline in their standard of living since 1978.
  - Attempts to stave off such a transition by doubling down on industrial SOEs leads to a growing drain on state resources propping up inefficient enterprises. Though workers nominally get to keep their jobs and benefits, the economy as a whole is saddled with misallocated capital and labor. Standards of living top out or even begin to deteriorate. Rent-seeking opportunities blossom in the rat race for ever-increasing government subsidies.
  - Economic malaise and rising inequality fuel the most severe challenges to CPC rule since 1989. Authorities struggle to keep a lid on protests against stagnant wages and rising
prices of essential goods. Heavy-handed repression fuels a fresh wave of indignation, leading to a game of whack-a-mole the CPC can’t seem to get ahead of.

- The urban-rural divide widens as hukou reform dies in the hands of entrenched urban interests. Mounting rural and migrant resentments clash with urban anxieties, opening schisms in the CPC.
- Persistent unrest throughout China’s periphery, including Hong Kong, Tibet, and Xinjiang further drains state resources.
- Fearing for its survival, the CPC turns inwards; regime collapse is not beyond contemplation.

**Chinese Foreign Policy**

- Without economic success as a calling card, China’s leaders contemplate risky foreign policy moves to bolster their political standing. These could include more border skirmishes with India over disputed territory or increased saber-rattling over Taiwan.
- Whether these gambles succeed or not in their own right, they would likely provoke a strong balancing response from regional powers. China’s underperforming economy would no longer present the kind of allure that makes states hesitant today to antagonize China. Regional powers such as Japan, Australia, Vietnam, South Korea, and India may increase defense spending and deepen mutual security cooperation. Some may even contemplate nuclearization. Russia is unlikely to make up the balance - it either seeks to exploit China's new isolation or experiences decline (e.g., continued demographic freefall). Some Chinese begin to view “holding the line” on territorial claims as a hindrance to achieving more urgent objectives.
- OBOR and other grand geo-economic overtures have not earned Beijing the hoped-for world leadership role. China’s multilateral ventures would atrophy and lose international buy-in. Across the Eurasian steppe, abandoned cranes creaking in the wind and half-paved highways overgrown with weeds will be the lasting legacy of OBOR.

**Scenario 3 Recommendations:**

What Chinese leaders will value most in this scenario is an out: a face-saving de-escalation of external animosities to rekindle commercial relationships and shift the focus of political legitimacy back to steady economic progress. U.S. policy preparations for this contingency should pave a path of honorable retreat for China. As Washington uses its leverage to press and secure PRC commitment to back down from long-held positions, it must also take care not to back PRC leaders into a corner with domestic supporters. A humiliated and insecure PRC will be more intransigent. The U.S. should also aim to forestall PRC national collapse, given the substantial economic and security risks this would present.

1. Articulate a positive vision of China’s place in international economic integration. Press for continued PRC participation in organizations like the IMF and World Bank while holding Beijing accountable for following the rules. Giving China a baseline amount of continued prestige will relieve pressure on Chinese leaders to “seize” international status via foreign adventurism before their star has faded too much.
2. As the PRC’s economy weakens, demand greater concessions on human rights, climate policy, and internet governance as a precondition for stronger economic linkages with the United States. While the United States will have greater economic leverage, keeping demands quiet will give China maximum flexibility with its citizens.
3. Strengthen security cooperation with other South China Sea claimants while conducting FONOPs around both Chinese-held and non-Chinese-held territorial features. Position the U.S. as a credible guarantor of a future multilateral agreement, which China will be in a greater hurry to conclude if it finds its position slipping. Stronger security ties with Vietnam, Malaysia, and the Philippines signal that China has run out of room to grow its regional footprint, and Washington will act as a constraining influence on those states not to press their position against a weakening China after a deal is struck.

4. Balance a strong, clear, credible U.S. commitment to Taiwan with assurances to PRC leaders that the U.S. does not seek Taiwan independence. Leaders of a faltering China will feel intense pressure to strongly counter perceived movements toward Taiwan independence. The U.S. should be alert and make every effort to distinguish saberrattling from actual mobilization, to avoid unintended escalation. The U.S. must also hedge against the possibility of a last-ditch effort to take Taiwan sooner rather than later. Concerted U.S. diplomacy should impress on PRC leaders that peaceful economic and/or diplomatic solutions are still viable means to achieve their goals with Taiwan, to avoid painting them into a corner with their domestic public. An equally concerted effort with Taipei should make U.S. commitments and expectations explicit.
Military-Civil Fusion and Defense Competition

China’s military-civil fusion (MCF) strategy seeks to synergize efforts to achieve military and economic modernization in promoting the People’s Republic of China’s (PRC) 2049 goals of national rejuvenation. MCF intends to break down the barriers between the military and economic systems to ensure the free flow of technology, material, talent, financial, and other state resources within an integrated industrial system. Within China, the Chinese government has established a range of mechanisms to promote this initiative, including: MCF platforms and laboratories, MCF development zones, dual-use technology transfer centers, MCF industrial-university-research alliances, and investment funds, among others. Internationally, MCF efforts have involved a mixture of investment in private industry, talent recruitment programs, state-guided academic and research collaboration that can support military modernization, licit and illicit transfers of knowledge and technology, intelligence collection, and outright theft.

Over the past five years, the U.S. government’s policy responses have focused on traditional nonproliferation tools, such as export controls, visa screening, and investment screening, to counter illicit technology transfer and theft, academic and research collaboration for China’s military, and state-guided acquisitions. U.S. policy measures to mitigate this risk have sought to find a delicate balance between risk mitigation and continued collaboration, especially in the S&T space, where U.S.-China collaboration remains vital to innovation. The U.S. government should expand its interagency collaboration and information-sharing on MCF and take the following additional measures to respond to the PRC’s MCF strategy:

- Establish an open-source interagency institution focused on analysis of advanced technology to increase awareness and education, promote international collaboration, and support long-term S&T planning.
- Increase funding of domestic research and development, provide additional support and early-stage start-ups, and expand resources dedicated to the prototyping and acquisition of critical technologies.
- Create scholarships and programming to support the development of a robust domestic workforce in critical technologies.
- Develop a joint strategy on priorities in science and technology with trusted allies and partners to include collaboration research and development, investment, coordination on standard-setting, and talent exchanges to promote workforce development.
- Improve the intelligence community’s (IC) expertise and capacity on China. IC agencies should coordinate to foster a new generation of China analysts, preparing them with the language and area studies skills required.\(^6\)

Evaluation of Military-Civil Fusion

China’s military-civil fusion (MCF) is a strategy that will play out over decades to come in reorienting and reimagining the entire Chinese system. This effort will require broad systemic reorganization to succeed. In the near term, the most likely indicators of MCF’s successful implementation will involve the development of laws, regulations and new bureaucratic institutions, which will be critical to achieving MCF goals for resource sharing and allocation. In the near future, progress along these lines is likely to be incremental, uneven, and nonlinear. It is

important to keep in mind that “success” or “failure” is not a clear end state, but rather will involve a mix of progress and setbacks that the Chinese government may continue to adapt to at least over the coming decade.

Ideas like MCF have existed as a staple in Chinese policy since Mao; however, the term and concepts have seen several shifts across the decades. Each Chinese leader has sought to compel the “commercial” or “civil” elements of Chinese society to support the military by promoting various terms like “military-civil integration” (军民结合) or “military-civil unity” (军民团结),” among others. However, these shifts in concepts and terminology also raise the possibility that Beijing may employ tactics for obfuscation, as an extension of a pattern often prevalent over the past few years. Terms that have received negative attention in the United States and internationally — such as “Made in China 2025” or the “Thousand Talents Plan”— seem to have either disappeared, or had their terminology adjusted by the Chinese government to avoid such intense scrutiny. While the Chinese Communist Party (CCP) and Chinese government have toned down references to MCF in key Party documents since 2019, MCF remains a cornerstone as a strategy that continues to be implemented.

**Rationale and Strategy for MCF**

Xi Jinping, starting from the 19th Party Congress and in subsequent speeches, has noted China must “Form a deep pattern of military-civil fusion, and build an integrated national strategic system and capabilities.” Although lacking detailed information on the desired attributes of an integrated national strategic system and capabilities, MCF serves this overall goal by breaking down the barriers between the military and economic systems to ensure the free-flow of technology, material, talent, financial, and other state resources within a singular industrial system. The purpose is for China to simultaneously achieve military and economic modernization in driving towards 2049 goals of national rejuvenation. These 2049 goals include achieving an economic leading position globally and the development of a “world-class military.”

In October 2020, the CCP assessed the world is experiencing “profound changes unseen in a century,” including undergoing a new round of technology and industrial revolution. These revolutions have been driven by advances in emerging technologies, including artificial intelligence (AI). Beyond the importance of these industries to China’s economic development, their impact is expected to extend to the future of conflict, including to spur a new “revolution in military affairs” leading to what Chinese strategists call “intelligent warfare.” In particular, the Chinese People’s Liberation Army (PLA) has recognized the significance of commercial technologies and developments. MCF is a response to the reality that China’s private sector is driving advances in domains that are increasingly important to future military capabilities.

The pursuit of MCF is intended to ensure China can leverage synergies in technological developments that are driving economic modernization and to underpin military

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67 https://www.airuniversity.af.edu/CASI/Display/Article/2217101/chinas-military-civil-fusion-strategy/
68 https://chinadigitaltimes.net/chinese/2018/10/
69 http://www.xinhuanet.com/politics/2018-07/16/c_1123132733.htm
70 https://www.airuniversity.af.edu/CASI/Display/Article/2217101/chinas-military-civil-fusion-strategy
71 http://www.xinhuanet.com/politics/2020-10/30/c_1126679597.htm
These efforts include ensuring that basic standards of technology and equipment can feasibly be leveraged for military and economic purposes, establishing and enforcing intellectual property protections for private advanced technology firms, training and developing current and next-generation scientists and engineers, and ensuring a qualified cadre of technologically competent military officers.

Although advanced technology is not the only element of MCF, the comprehensive strength of a country is reliant on two pillars: economic and military strength. Within this context, the national defense technology industry is the most important pillar of MCF to ensure achievement of these goals. To be sure, China has pursued an S&T-driven military modernization since the 1990s, and efforts to streamline the flow of material and technology between the civil and military systems have been undertaken since that time. In some regards, MCF is a continuation of those efforts — the next iteration of a series of policy changes over the past several decades the Chinese government has implemented to achieve military modernization.

While this history indicates that MCF is largely evolutionary within the Chinese system, should the Chinese government succeed once and for all in breaking some of the entrenched bureaucratic barriers to successful implementation of MCF, this evolutionary process may also deliver revolutionary results within the Chinese system. In this regard, perhaps the most important factor in whether or not MCF will be successfully implemented may be Xi Jinping himself. By most assessments and measures, Xi is personally and bureaucratically significantly more powerful than his predecessors Jiang Zemin and Hu Jintao, who both implemented policies that share lineage with MCF. This may give him the ability to force systemic change in ways his predecessors were unable, not dissimilar to his ability to marshal the system to implement the massive PLA reforms that started in 2015, demonstrating a capacity to force through painful changes that had eluded his predecessors.

To implement the MCF strategy, the Chinese government has established a tiered bureaucratic set of institutions that reflect the Leninist state. The Central Commission for Military-Civil Fusion Development was established in 2017 as the central-level coordination mechanism for implementation. Less than a year later, all 31 provinces and regions developed institutional reform plans that were approved by the Party Central Committee and the State Council. These reform plans included the establishment of provincial-level Military-Civil Fusion Development Offices, which are charged with overseeing the day-to-day implementation of MCF within their respective provinces. Importantly, many of these offices incorporated select responsibilities from existing provincial bodies, including the provincial-level National Development and Reform Commission offices, the provincial-level State Administration for Science, Technology, and Industry for National Defense-offices, and provincial National Defense Technology-offices (see Figure 1 below).


Beyond the MCF offices being established at the central, provincial, and local levels to implement the MCF, a multitude of other mechanisms have been established over the past ten years to ensure implementation of MCF guidance and orders. These include MCF platforms and laboratories, MCF development zones, dual-use technology transfer centers, MCF industrial-university-research alliances, and investment funds, among others that have been well detailed in various reports and accounts on MCF.

**MCF Priorities**


76 [https://static1.squarespace.com/static/](https://static1.squarespace.com/static/)
MCF is predominantly a domestic project for the entire Chinese system with significant implications on a global scale. This strategy is being implemented in an attempt to drive a systemic reorganization of the entire science and technology enterprise, coupled with a reimagining of the interactions between the state, civil society, the PLA, and other institutions. However, despite this overwhelming concentration on the domestic administrative, legislative, and bureaucratic reorganization that must take place to achieve the goals of MCF implementation, there remain components of MCF that rely on and exploit international engagement. A significant focus of MCF is the evolution of China into an innovation-dominant system as it seeks to “seize the commanding heights of the international competition” in key ‘forward-looking, exploratory, disruptive technologies’ such as AI, unmanned systems, new energy, and advanced electronics, among others.77

China continues to pursue advanced, strategic emerging technologies globally to drive this strategy. Chinese entities and individuals acquire technology through forced technology transfer agreements required for market access in China, collaborative R&D in university research labs, in technology incubators, and through mergers and acquisitions and investments in technology firms around the world. The Chinese government also continues to apply traditional espionage and cyber theft towards this effort. A series of Department of Justice (DOJ) indictments have highlighted the continuing risks of illicit technology acquisition, such as through theft by insiders or enabled by individuals working on behalf of the PLA or Chinese intelligence services.78

The Chinese government has been investing heavily in attracting the top science, technology, and innovation talent to relocate to China to undertake research in Chinese universities and national labs and to teach the next generations of Chinese scientists and engineers in Chinese universities.79 These tactics also involve pursuing investments in start-ups and other research enterprises, in some instances in order to capture new inventions and cutting-edge research.80

Although these actions may be legal, their impact may be problematic nonetheless as the bar to assess risk to U.S. interests is not one of legality, but rather the net effect of all of these different vectors for technology and talent acquisition. William Hannas and Huey-Meei Chang argue that Chinese foreign technology transfers occur in legal, illegal, and extralegal fora. “Extralegal” in this context refers to instances of technology transfer where the action is not typically subject to outside scrutiny and the legality is therefore unknowable; for instance, Chinese overseas scholars organizations or professional associations.81 In this context, although the activities undertaken to acquire advanced sensitive emerging technology and global talent represent only a small component of all of the changes being made domestically in China to position the Chinese system for success, they could have significant ramifications for the global balance of power.

Systemic Challenges for MCF
A number of inherent weaknesses and inefficiencies in China’s system remain, leading the Chinese government to double down on its MCF efforts. Rather than view these outstanding

77 https://cset.georgetown.edu/research/the-13th-five-year-special-plan-for-st-military-civil-fusion-development/
80 https://admin.govexec.com/media/duix_chinatechnologytransferstudy_jan_2018_(1).pdf
81 https://cset.georgetown.edu/research/chinas-access-to-foreign-ai-technology/
problems as vulnerabilities, they should instead be observed as China’s attempts to overcome constraints and adjust their system as MCF grows and shifts overtime. According to a 2017 report by MCF chief architect Jiang Luming, China’s MCF system as it stands today is restricted by a set of complex and diverse factors. At the top of his concerns, Jiang argues that bureaucratic inefficiencies and immaturities have arguably been the biggest roadblocks in MCF development. Some of these have already been tackled. For instance, prior to the establishment of the Central Military-Civil Fusion Development Committee (中央军民融合发展委员会) in 2017 (hereafter “Development Committee”), there was no entity at the state or Party level for coordinating MCF. Instead, there were multiple departments across the Party and state working on similar issues, leading to wasted efforts and resources.

Even after the establishment of the Development Committee, bureaucratic issues still exist. At the local level, Jiang argues that the majority of inter-military and local coordination agencies are primarily tasked with communication duties and maintain little to no decision-making authority or supervisory/managerial power, which further contributes to fragmented MCF results across the government and military. Across the state and military, Jiang also believes that each system suffers from “longitudinal strength and lateral weakness”. The vertical relationships within the military and the state individual are relatively well-coordinated; however, the horizontal connection between the two systems remains lacking. He argues that this has affected the formation of a unified MCF system and has slowed the pace of reforms in defense procurement, among other important elements. It is too early to tell whether or not the new provincial-level and local-level MCF development office will be able to address some of these concerns, however, the establishment of this bureaucratic system may prove important to helping get over some of the issues with which Jiang has been concerned.

Beyond Jiang’s assessment, others have highlighted issues related to enterprise participation and supply chains. Researchers at the Academy of Ocean of China [AOC; 国家海洋局] noted a mismatch between high-end military demand and technological supply capabilities, likely from a lack of state/Party coordination. On the topic of enterprise participation, AOC researchers argue that military industrial groups should conduct internal reforms to better align with MCF goals and priorities; for instance, they suggest encouraging qualified military industry enterprises to go public, or injecting military industry assets into already listed firms. Regarding “private” enterprises, AOC researchers state that it is necessary to reduce the costs for private firms to participate in national defense construction and MCF. In some cases, they argue that priority protection should be given to support “civilian participation of the army” (民参军) through incentives such as land use, utilities, investment and financing, talent introduction, and more. Beyond this, they suggest the creation of industry “hidden champions” in support of national defense and military construction. To be sure, many of these observed challenges are precisely what MCF implementation seeks to help the Chinese system overcome, only time will tell if they will be successful and it is difficult to know both how to measure success as well as

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82 https://www.airuniversity.af.edu/CASI/Display/Article/2217101/chinas-military-civil-fusion-strategy/
83 http://www.mod.gov.cn/jmsd/2017-02/10/content_4772135.htm.
84 http://www.mod.gov.cn/jmsd/2017-02/10/content_4772135.htm.
86 http://aoc.oue.edu.cn/7f05/c9824a229125/pagem.psp.
what incremental successes look like in continuing to improve the system without necessarily
achieving all goals under MCF.

**Future Trajectory of MCF**

**Beijing’s Plans for MCF Deepening and Expansion**

Given the CCP views MCF as a key approach to advance China’s national development and
global engagement goals, the strategy has a number of core components that will likely dictate its
overall success. Core components include domestic economic policies, as well as a domestic
emerging technology acquisition system which involves a mix of investment in private industry,
talent recruitment programs, state-guided academic and research collaboration for military
modernization purposes, technology transfer, intelligence collection, and theft.  

**MCF and Major State Guidance, Strategies and Initiatives**

The current national system (新型举国体制) largely seeks to channel China’s technological
development capabilities to more effectively increase national power in terms of economic,
political, and military might. Additionally, Beijing has signaled interest in–and begun enacting
policies aimed at–improving domestic indigenous technology development and innovation in
part to increase economic predictability to support MCF and greater national ambitions.

The year 2020 saw the announcement of the 14th Five-Year Plan Communique for 2021-2026,
with the full plan expected to be released in March 2021, as well as China Standards 2035, the
announced adoption of the “dual circulation” economic strategy, and likely the next iteration of
the National Medium- to Long-Term Program for Science and Technology Development.
Ongoing domestic and international plans of import to MCF include: Made in China 2025
(MIC2025), and the Belt & Road Initiative (BRI/一带一路), including its subcomponents, such as
the Digital Silk Road (DSR/数字丝绸之路).

While MCF is meant to capitalize on China’s defense industrial system, the relatively recent
economic policy pivot to “dual circulation” (两个循环/内外循环) is intended to grant overall
economic predictability and stability by balancing between global and domestic markets and
supply chains. Both strategies and their corresponding policies are meant to enhance
technological innovation and capitalize on cross-sector collaboration to increase economic and
political security, predictability, and stability. MCF therefore supports Chinese leaders’
requirements for the PLA to become a “world class military” by 2049 via technological
advancement.

The policy is focused on competition and opening up, including lowering domestic regulatory
barriers for foreign investors, securing regional trade pacts such as the Regional Comprehensive
Economic Plan (RCEP), and supply-side structural reform of state-owned enterprises (SOEs).
Dual circulation aims to bolster China’s technology innovation, globalize and advance Chinese
companies in the global value chain, increase Chinese household incomes to expand the middle
class, and stimulate domestic demand. Dual circulation is likely to become a key priority for the

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CCP’s 14th Five-Year Plan (2021-2025), and will likely be more comprehensively unveiled around March 2021.90

New Domains & ‘Growth Points’ for MCF
Beijing sees the use of electronic, networked, and space domains as central to developing a world class military.91 Each identified sector and technology of interest to Beijing carries with it a unique set of complex, messy, and oftentimes opaque industry drivers, dynamics, and relationships. In an effort to understand some fundamental unique drivers of MCF in sectors Beijing considers strategically important, the following section provides an example overview of the goals and role of MCF in fostering innovation and competition in China’s orbital space launch sector.

Case Study: Understanding MCF’s Unique Features in China’s Orbital Space Launch Sector
As a burgeoning global power, Beijing understands the importance of pursuing advanced spacefaring capabilities, with the maturation and growth of an industry built on indigenous innovation fundamental for maintaining long term national space power.92 In particular, China has watched the development of the U.S. space orbital launch sector with considerable interest — especially with regards to the rise of SpaceX, among other private space companies — and has modeled parts of its domestic commercial space orbital launch sector to align more neatly with its MCF strategy.93 MCF serves to support China’s effort to become as self-reliant as possible in this sector — and its respective sub sectors, such as launch vehicle development.

In Beijing’s view, the country’s historically government- and SOE-led space sector prior to 2014 led to limited efficiency in technological innovation as well as cost, resource, and talent effectiveness in space-related R&D. A major remedy to this relative sector innovative atrophy was Beijing’s 2014’s space sector regulatory opening to introduce private investors and fresh commercial-oriented talent to the market, competing with one another and to some degree the major sector defense SOEs in a bid to most efficiently develop strategic technologies for steadily cost-effective prices. This said, while the CCP’s release of the 2014 policy opened the door for private investment in China’s domestic space sector, and has fostered an increasingly dynamic commercial space sector, the country’s major aerospace defense SOEs remain the primary driving force for commercial space practices.94

The key difference between public-private relations in the U.S. and China’s respective domestic orbital space launch sectors is the underlying source driving innovation and research and development (R&D). Relative to their Chinese counterparts, U.S orbital space launch companies are more incentivized to balance between public and private customer needs and interests, as well as to “innovate better” to win mission and service specific contracts over their commercial competitors.95 To Beijing, the introduction of China’s nominally private orbital space launch companies is currently primarily incentivized to help drive competition for core sector SOEs,

95 https://www.ft.com/content/8351b52a-790a-4148-b4c8-4e11b7919126
thus encouraging greater innovation, increased industry R&D resource efficiency, and generally decreased costs of space domain access, such as lowering launch costs.96

Figure 2. Comparison of Space Launch Sector Public-Private Relations in the U.S. and China

The State Administration for Science, Technology, and Industry for National Defense (SASTIND)—administratively overseen by the Ministry of Industry and Information Technology (MIIT)—is responsible for military-related R&D defense SOEs. SASTIND encourages MCF to foster increased defense industry competition, and provides policy guidance to key defense SOEs conducting R&D related to aerospace—including missiles, electronics, and nuclear technologies, among others. China’s military cyber and space force — the Strategic Support Force (PLASSF) — is particularly reliant on tools and technologies developed by these key defense SOEs, and along with the Ministry of State Security (MSS), plays a role in national technology transfer efforts to the benefit of these SOEs.97

Whereas the U.S. commercial space (launch) sector ecosystem is dynamic in its mix of varied civilian, military, intelligence, and private customer needs, the heart of China’s space sector is its major defense SOEs — primarily China Aerospace Science and Technology Corporation (CASC) and China Aerospace Science and Industry Corporation (CASIC).98 Beijing largely views the domestic rise of commercial space (launch) companies as critical to fostering competition between commercial entities, and to consequently drive increased efficiency in important areas of SOE R&D, as well as decrease the price of commercial space launch and

96 https://www.uscc.gov/sites/default/files/2020-05/China_Space_and_Counterspace_Activities.pdf; https://spacepolicyonline.com/topics/commercial-space-activities
98 https://jamestown.org/program/the-rise-of-the-military-space-faction/
technologies. Although it is worth noting China’s nominally private space launch companies have yet to win a launch contract with the government, this may be due to these companies still working through their respective product trial and testing phases, similar to the early years of SpaceX.

Implications for Defense and Economic Competition
The benefits the PLA derives from military-civil fusion are not merely inputs that lead to a more technologically advanced and capable PLA in the aggregate. Rather, military-civil fusion has distinct implications for the PLA across the spectrum of its military capabilities. This ranges from systems acquisition to shaping the doctrine, training, human capital development, logistics, and readiness that enable a modern military to fight and win wars. For example, organizationally, recent PLA reforms aggregate space and cyber forces and capabilities within the PLASSF, which harnesses the benefits of MCF implementation to improve its technological acumen, including benefitting from civilian talent.

A new organization called the Joint Logistic Support Force harnesses civilian infrastructure and commercial logistics systems for military uses and integrates them into training exercises, particularly to improve national defense mobilization. As part of the acquisition process, MCF improves the sophistication of technology integrated onto weapon systems and platforms, and speeds the processes by which new systems are designed, tested, and fielded within the PLA. On the human capital front, PLA sends researchers abroad to collaborate with civilian scientists on technologies with military applications, “leverag[ing] overseas expertise, research and training to develop better military technology” for PLA use. China also uses programs like the Thousand Talents Plan to incentivize Chinese researchers working overseas to return to the mainland to support economic and military modernization priorities under MCF.

For day-to-day operational activities, MCF enhances information flow to military commanders and units, channels better technology onto more sophisticated platforms that operate at greater speeds, ranges, lethality, and maneuverability. China can also leverage improved military and paramilitary integration, state-owned enterprises, and commercial assets in the gray zone to strengthen its presence vis-a-vis fellow claimants in areas of territorial and maritime disputes. In a potential conflict, MCF could harden the resiliency and redundancy of key military enablers like C4ISR and logistics, while eroding adversaries’ core military capabilities to China’s advantage.

MCF will likely play a role in improving the capabilities of the PLA’s growing overseas presence, whether at traditional basing arrangements such as the PLA’s first overseas base in Djibouti, or at “strategic strongpoints” that leverage PLA requirements and standards in the development of commercial infrastructure such as ports.

100 https://www.ft.com/content/8351b52a-78ba-4148-b4e8-4e11b7919126.
101 https://cyberdefensereview.army.mil/.
102 https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF.
Case Study: Improving National Defense Mobilization
National defense mobilization has and will continue to be a top MCF priority. Prioritization of these efforts began in 1994 with the joint establishment of the National Defense Mobilization Committee [国家国防动员委员会] by the State Council and Central Military Commission.106

In 2010, the National People’s Congress released the “National Defense Mobilization Law,” further solidifying the significance of national defense mobilization in the Chinese system.107 Among its key tenets, the National Defense Mobilization Law encourages participation in mobilization efforts from both the military and civilian sectors, stating that everyone should “support the task of converting and expanding military products to develop and apply advanced dual-use technologies for both military and civilian use” in preparations during both wartime and peacetime.108

The 2016 PLA reorganization included the addition of a National Defense Mobilization Department [中央军委国防动员部] under the CMC, in addition to the preexisting Defense Mobilization Committee under the State Council.109 Although it is unclear where and how responsibilities between the two organs differ, the National Defense Mobilization Department appears to be in charge of synchronizing mobilization efforts across the PLA, whereas the Committee is likely tasked with ensuring that the civilian side is prepared to assist the military if need be.

As part of these efforts, Beijing has emphasized the concept of “economic mobilization for national defense” [经济动员], which entails preparing the economy to mobilize in support of national defense. This entails the transferring of various sectors of the national economy from a normal state to a wartime state, and Chinese scholars note that this requires a high degree of consistency between the defense and civilian spaces during peacetime in order to sustain future conflict. Liu Zhiming, deputy director of the Beijing National Economy and Equipment Mobilization Office describes this concept by relating back to the end of the Gulf War, when the United States used an estimated 40,000 containers to transport remaining equipment and supplies back home.110

Implications of MCF for Economic Competition
This strategy of MCF the future trajectory of MCF trends toward greater R&D collaboration between SOEs, nominally private companies, and the non-defense linked university system on government identified technologies and capabilities of interest. MCF will likely continue to support the development of a technologically cutting edge, self-innovative, and efficient defense industrial ecosystem largely built around core SOEs and nominally private “champion” companies.

106 https://archive.vn/RH8k2
107 https://archive.vn/YzyVK
108 https://archive.vn/YzyVK#selection-757.45-757.56
109 https://archive.vn/h3DdD
110 https://archive.vn/jOsHz
It is important to note that MCF goes beyond military modernization. Several prominent assessments of MCF in the United States have articulated the “spin-on” aspect of MCF—the concept of “encouraging advances in commercial technology to ‘spin on’ into military applications.” But beyond this, MCF looks to address an insufficient “spin off” of defense technologies into the commercial sector. For example, MIIT, SASTIND, and the Ministry of Finance in 2014 approved the “Military-Civil Integration Public Service Platform: an online hub designed to better coordinate defense S&T priorities and promote commercial spin-offs of military technologies.” Furthermore, Peter Wood and Alex Stone argue that the velocity for the spinning-on and spin-off of new technologies in China is “greater than ever before.” This presents a number of implications for economic competition with China, as it increases the possibility of U.S. entities inadvertently collaborating with or assisting Chinese military modernization efforts.

**State of Play of U.S. Policy Responses**

MCF explicitly seeks to reduce, even eliminate, barriers between the PRC’s national economic system and the national defense system with the intention to pool national resources, including in emerging technologies. A key challenge this poses to nonproliferation lies in the end-user commitments that have long governed international trade in sensitive dual-use technologies. The expressed intention to ensure civilian advanced technologies drive military modernization, while not unique to China, is here juxtaposed with a history of a Chinese government that has a track record of at best limited transparency and a poor record on nonproliferation. The PRC’s misuse of access to technology internationally extends from theft, to targeted intrusion, to copying, which has given the U.S. government less basis to have confidence in end-user certificates.

Over the past five years, the U.S. government has started taking actions and implementing policies to reduce the risks posed by the PRC’s implementation of MCF on advanced and emerging technologies. U.S. policy measures to mitigate this risk have sought to strike a delicate balance between risk mitigation and continued collaboration, especially in the S&T space, where U.S.-China collaboration is vital to innovation. The Biden Administration is likely to maintain high-level focus on MCF and may continue policies to mitigate the risks of MCF. However, against the backdrop of ongoing reviews of Trump’s policies on China, elements of the authorities and scoping of such policy instruments may be recalibrated or reoriented going forward, building upon lessons learned from these recent efforts.

To date, the U.S. government has focused policy responses on traditional tools of nonproliferation, centered on export controls, visa screening, and investment screening. These include a new civil nuclear licensing framework that seeks to mitigate the unique risks of MCF implementation to collaboration on advanced, next generation nuclear reactors, enhanced visa screening to mitigate the risks of academic collaboration and joint research, preventing investment in companies directly tied to military R&D, tighter investment screening under CFIUS as authorized by the Foreign Investment Risk Review Modernization Act, expansion of

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112 https://jamestown.org/program/in-drive-for-tech-independence-xi-doubles-down-on-civil-military-fusion/.
113 https://static1.squarespace.com/static/
114 https://www.airuniversity.af.edu/CASI/Display/Article/2217101/chinas-military-civil-fusion-strategy/.
export controls to emerging and foundational technology as outlined in the Export Control Reform Act, and requirements for researchers in Department of Energy facilities to disclose foreign funding for research. These measures, among others, have been working to find a balance that maintains an open, collaborative research and academic environment, while recognizing clear risks posed by PRC and PLA targeting of advanced and sensitive technologies internationally under its MCF development strategy.

As an example, despite an established framework for cooperation on civil nuclear technology, including technology transfers, a key Chinese company, China General Nuclear Power Corporation, was indicted, along with other parties, for a decades-long conspiracy to acquire U.S. nuclear technology. In 2014 five members of a PLA unit were indicted for hacking Westinghouse Electric Company, stealing confidential and proprietary technical and design specifications. Importantly, in both cases the U.S.-China 123 Civil Nuclear Cooperation Agreement had provided a legal path for transfer of nuclear technologies. A raft of DOJ indictments over the past decade have further highlighted the illegal tactics by which China approaches technology acquisition within the United States. As a result, and given this history, it is more difficult to trust that Chinese entities will not illegally or otherwise transfer dual-use technology in ways proscribed by technology transfer agreements, given such demonstrated willingness to undertake illegal means to acquire technology to which they have legal paths for acquisition.

**Considerations for Policy**

The U.S. government should continue its interagency collaboration and information-sharing on MCF and take the following additional steps to respond to the PRC’s MCF strategy:

- Establish an open-source interagency institution focused on analysis of advanced technology to increase awareness and education, promote international collaboration, and support long-term S&T planning.
  - For example, a recent report from the China Strategy Group, a collection of U.S. policymakers and influential tech CEOs, argues for the establishment of a National Science and Technology Analysis Center (NSTAC) that would act as an independent collection, analysis, and decision support entity outside the intelligence community.

- Increase funding of domestic research and development, provide additional support and early-stage start-ups, and expand resources dedicated to the prototyping and acquisition of critical technologies.

- Create scholarships and programming to support the development of a robust domestic workforce in critical technologies.

- Develop a joint strategy on priorities in science and technology with trusted allies and partners to include collaboration research and development, investment, coordination on standard-setting, and talent exchanges to promote workforce development.

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• Improve the intelligence community’s (IC) expertise and capacity on China. IC agencies should coordinate to foster a new generation of China analysts, preparing them with the language and area studies skills required.117

Next-Generation Communications

In popular press and in many political debates, 5G has become shorthand for all that’s frightening about Chinese technology, synonymous with state champion Huawei – not just its ambitions for global dominance, but its tightness with Beijing authorities and its perceived willingness to prioritize Chinese government demands over user privacy. In this formulation, the United States must stop Huawei from building out 5G networks and replace that firm with others, perhaps using an “open RAN” approach that’s won increasingly many Western advocates.

The truth is messier, requiring more patience, vision, and money from the United States than a simple Huawei ban would. Huawei is, to be sure, a powerful force in 5G infrastructure. But it’s part of a far larger and more complex ecosystem of vendors and providers offering everything from devices to chips to cloud computing. Huawei indeed provides inexpensive and effective 5G physical infrastructure. Open standards for that infrastructure, so-called “open RAN,” will force Huawei to work harder to provide the globe’s 5G infrastructure and may reduce its market share, but by definition, they won’t freeze Huawei out either.

Meanwhile, the work of setting global technical standards across 5G hardware and software is expensive and time consuming. Worse from a U.S. perspective, China is working harder to shape them. The Chinese state works closely with Chinese companies and funds participants to attend standards meetings and submit proposals. By contrast, the United States generally leaves that work to the private sector. But the private sector considers its own interests, not national security equities and externalities, when deciding how many proposals to submit or how many people to send to standards meetings.

America could simply create its own standards, but it shouldn’t. A world with country specific standards is a more challenging one for innovative U.S. firms to do business in and win in. Rather than ceding global dominance to China by walking away from multilateral standards-setting bodies, the United States should double down on them. This involves funding the government agencies and liaisons that interact with these bodies, broadening U.S. funding of private sector 5G tech, and making the United States the best, most welcoming place for developing cutting-edge tech standards.

How to accomplish this? The U.S. Government (USG) must address a persistent market failure to incentivize faster 5G buildout. Private U.S. firms are underinvesting because the returns fall short of the ROI from spectrum auction spending. By contrast, Chinese firms like Huawei, which act as appendages of the government and therefore consider national security equities, are building 5G base stations at a dizzying clip. To have any chance of catching up, the USG should either reinvest the massive funds private companies spend on spectrum auction spending, or require firms to allocate major amounts to 5G buildout in order to bid on spectrum in the first place. Like the Chinese government, the USG should also become the customer of first resort for domestically produced telecom equipment in order to spur further investment.

Erecting further barriers to technological development isn’t what America’s good at. Writing the rules of the road, and becoming a magnet for talent and innovation is. Over a period of decades,
this approach has vaulted American innovation to the world’s leading position. In the 5G arena, even in the face of a great challenge from Chinese firms, it’s still the right tack.

The 5G Ecosystem
This section provides a stakeholder map of the 5G ecosystem (see chart below) to help policymakers create the right incentives. The map categorizes ecosystem players into three categories: physical, software, and priming players.

Physical Players
Fiber / transport infrastructure are a diverse group of actors that use copper or fiber optic cables to connect the physical components of a network infrastructure. Traditionally, consortiums of large internet service providers (ISPs) financed undersea cable operations with increasing investments coming from internet companies in the last decade. Microsoft, Google, Facebook, and Amazon now own or lease over 50% of undersea cables.118 Because of the high cost of installing transport infrastructure from regulatory or capital requirements, the geography of existing transport infrastructure is a main factor in determining where 5G base stations can be deployed.

By now, most policymakers recognize Huawei, ZTE, Nokia, Ericsson, and Samsung as leading 5G infrastructure vendors. These infrastructure vendors build the base stations in the radio access network (RAN), which comprises the antenna, radio unit, and baseband unit. The vertically integrated RAN market is now shifting to an “open” RAN architecture to allow for new market entrants.119 The assumption is that an open architecture would commoditize hardware components enough for new entrants to innovate on the software layer. In Washington, open architecture is often touted as a way to field an alternative solution to Huawei, though the

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118 Submarine Cable Map by TeleGeography; How the Internet Travels Across Oceans (NYT) 
119 For a general explanation of an open RAN architecture see Nokia's Open RAN post
effectiveness of this is debatable. China’s relative advantage in RAN manufacturing will likely mean a large portion of commoditized RAN hardware in the market remains Huawei or Chinese made.

**RAN operators / service providers** provide the last link between the network and the end user. Incumbent service providers like AT&T and Verizon usually purchase multi-billion dollar licenses to use a portion of the radio frequency (RF) spectrum exclusively. Because these licenses are treated as indefinite-lived intangible assets under the Financial Accounting Standards Board (FASB) accounting standards, there is no financial incentive for service providers to quickly operationalize their spectrum.

**Device manufacturers** make the various devices by which users (humans or machines) access the internet: wearables, drones, self-driving cars, factory machines, smart home appliances, etc. Inside all of the devices from base stations to Apple Watches are semiconductors or chips designed by **chip suppliers** who rely on **foundries** to manufacture their chip designs. U.S. 5G deployment is highly dependent on a steady chip supply and collaborative partnerships with the semiconductor ecosystem.

**Software Players**

Once all the hardware components from base stations, data centers, and cables are connected, a software overlay is required to manage the network and ensure data traffic flows effectively. If the RAN infrastructure is the highway, the network management vendors ensure the highways are open for service and cars are taking optimal routes so backups don’t happen. As low-latency data traffic (e.g., live stream video, AR/VR) increases with 5G, networks will require more computing resources at the edge, provided by **network edge infrastructure** vendors such as Dell and VMware.¹²⁰

Most traffic over the internet passes through **content delivery networks (CDNs)**¹²¹ that help the network run efficiently. As of June 2020, 90% of internet traffic originates from CDNs. Through the internet, consumers interact directly with **content providers** such as Netflix, and YouTube. The largest cloud providers like AWS, Azure, and Google Cloud provide computing resources powered by large physical data centers around the globe in highly secured facilities. **Cloud providers** save companies the hassle and cost of purchasing, managing, and maintaining their own servers. By contrast, when companies prefer to own their servers, they can offload the maintenance and operations to **colocation centers (colo)**. These centers are essentially large hotels for servers where companies rent the space to house their own servers and the colo handles the cooling, power, bandwidth, and security of the facility. Today, many enterprises use a combination of cloud and colo, giving rise to the “hybrid cloud.”

**Priming Players**

Besides the physical and software players, several other ecosystem actors play an outsized role in priming the conditions for U.S. 5G deployment. At the center are the spectrum regulators, namely, the Federal Communications Commission (FCC) and National Telecommunications and Information Administration (NTIA), who have direct authority over who uses what parts of the

¹²⁰ [Dell Technologies and VMware Deliver the Roadmap to 5G Network Architecture](#)

¹²¹ [Network traffic insights in the time of COVID-19: June 4 update](#)
RF spectrum. NTIA of the Department of Commerce regulates spectrum use for the federal government while the FCC regulates for non-federal use. America’s pace of 5G deployment is highly dependent on the amount of spectrum and the speed with which the FCC and NTIA can open up for commercial use. Spectrum management red tape is unique in the United States because it is one of the only countries where spectrum responsibility is partitioned into two agencies.

Once regulators allocate spectrum, spectrum access systems implement the spectrum policies. For example, the Citizens Broadband Radio Service (CBRS) band is unlicensed spectrum open to anyone but SAS will ensure Tier 1 users have priority access when multiple users are in the same area.

Standards bodies like 3GPP are the primary fora for establishing 5G architecture, standards, and protocols. Participation in these international organizations often determine whose standards are implemented. Commercial companies, universities, and research labs can send personnel to participate in the standards process. Trade organizations are closely tied to standards bodies and play a significant role in influencing regulators and standards bodies.

As mentioned before, 5G deployment requires significant physical labor, from replacing antennas in high towers to installing cables. The hundreds of thousands of electricians and engineers needed to deploy and service a network are often represented by labor unions.

5G Standards Development
Technical standards are design features or product specifications that allow different products to work together seamlessly regardless of where they were made or which firm made them. International technical standards are vital for the Information and Communication Technology (ICT) sector because the basic function of ICT devices is premised on a variety of devices in different locations communicating with each other. Internationally, ICT standards are set across a range of forums including but not limited to the International Telecommunication Union (ITU), the International Standards Organization, the International Electrotechnical Commission, the Internet Engineering Taskforce, and the Institute of Electrical and Electronics Engineers. The Chinese government has increasingly sought to dominate international standards bodies in service of its own industrial policy goals by coordinating action between leading Chinese firms, installing Chinese nationals in key positions, subsidizing and instituting cash bounties for standards contributions by Chinese participants, and flooding standards bodies with participants and low-quality proposals. These practices undermine U.S. technological leadership and lead to the process being driven less by innovation and competition and more about aligning with China’s political agenda and interests.

The development and deployment of 5G has heightened concerns about maintaining U.S. standards leadership. Chinese firms like Huawei and ZTE - with financial support and subsidies from the government - have played a leading role in developing key 5G standards, and have captured the decision-making process in fora like the ITU. As the United States and like-minded countries seek to push back against Chinese influence in these fora, it is vital that interoperability and international standards themselves do not become a casualty of continued tensions. Seeking to exclude China entirely, or developing country-specific standards to replace global ones, would
lead to a fractured technology ecosystem thereby decreasing innovation, increasing costs, and limiting the ability of consumers to use all types of technologies.

As U.S. strategy and policymaking in this area continue to develop, it is vital that it is grounded in the nature of technical standards and the current U.S. approach to standards:

- **Standards are not technology.** While standards may contain embedded intellectual property, they are not in and of themselves technologies and serve primarily to describe the parameters within which technologies function and interoperate.
- **Standards are not cutting-edge.** As a general matter, companies treat cutting-edge research and development as proprietary. Technologies reach the realm of standards development when they are well-developed and need to become interoperable with other systems.
- **The private sector leads.** The United States has historically been the global leader in setting global standards because the private sector drives innovation through various standards development organizations. Instead of picking winners and losers through state-run systems as is the case in both the EU and China, companies build standards through consensus and adopt them based on market demand.
- **Private-public partnerships drive international engagement.** In part because participation in some Standards Developing Organizations (SDOs) is based on country and others are based on company or on the basis of individual engineer participants, partnerships between government and the private sector are vital in advancing shared objectives.
- **Standards-setting takes a long time.** International standards take years to develop and require extensive collaboration and consultation through a deliberative process to build consensus. This, however, is not always the case. Individual companies or smaller consortia may also end up establishing standards or accelerated adoption into international standards by virtue of their widespread use in the market. Examples here include the use of Apple’s “lightning” cable interface for their devices or the more rapid development of CBRS spectrum sharing by WInnForum.

The concerns with China in the context of standards development have been that the country is using standards development as a tool of international industrial policy, flooding SDOs with participants pushing substandard proposals and promoting standards based on political factors over technical merit. This is a real concern. However, the way to address it is not to box China out of the international standards system and back into largely country-specific standards as was the case in the 90s with TD-SCDMA, TD-LTE, and WAPI. Rather, the United States and global partners must rise to the occasion to lead and set inclusive global rules-of-the-road for ICT. This will require the development of an affirmative vision: expanding government support for U.S. standards leadership and innovation, building new structures in the government to work in tandem with the private sector on standards issues, and doubling down on the use of international standards as the cornerstone of American ICT supremacy.

**Working with Allies and Partners**
Cooperation with U.S. allies and partners is vital for developing a trusted ecosystem of 5G vendors and technology. The Biden Administration should build a coalition of democratic nations focused on building trusted ICT manufacturers.
On the technology side, the United States should work with trusted foreign partners to overcome barriers to vendor diversity in the Radio Access Network (RAN). While U.S. firms play a vital role in the network core, handsets, and in the manufacture of various devices the RAN is dominated by a small group of non-U.S. firms that include Nokia, Ericsson, Samsung, and Huawei. One challenge in convincing allies and partners to exclude Huawei from their 5G networks is the dearth of alternatives within the RAN infrastructure market. The United States should work with its partners to explore open interfaces for the RAN to increase vendor diversity and decrease operator costs. In the medium-term, widespread use of open interfaces would enable smaller vendors from the United States and other countries to gain a toehold in the 5G market while offering network providers the option to incorporate RAN equipment from multiple vendors, instead of single, vertically-integrated suppliers. As mentioned previously though, while an open architecture enables diversity in the RAN market, it does not guarantee a clear alternative to Huawei. What it will do is provide additional competition, allow network operators to swap out network elements as they are found to be unreliable, and create opportunities for new U.S. entrants.

On the diplomatic side, the first priority should be to double down on partnerships with European countries, Japan, and South Korea. Timely deployments of 5G in the United States will require engagement with suppliers from partner countries. For instance, establishing or funding laboratories and trials for trusted foreign suppliers to work with U.S. operators to test, demonstrate, and share results to inform technical specifications and best practices, which could reduce market barriers for smaller players in the industry. Looking past 5G, the United States should promote research and development (R&D) collaboration in emerging communications technologies with wireless technology leaders like Finland, Sweden, South Korea, and Japan to encourage supply chain diversity over the long term.

The United States should also focus on strengthening relationships with large, growing democracies such as India. As the world’s second most populous country with a prime minister keen on leapfrogging India into the future to compete with its regional rival China, the United States can help ensure India’s next generation RAN networks are built on trusted equipment. That said, there are significant barriers to expanding cooperation with India. The country’s continued insistence on promoting a 5G New Radio standard that is incompatible with existing networks, its protectionism and high, non-WTO compliant tariffs on ICT products, and its expansion of technical barriers to trade through the byzantine MTCTE (Mandatory Testing and Certification of Telecommunication Equipment) testing regime will continue to make working with India a challenge going forward.

Finally, the United States should build a competitive development finance system to ensure that emerging market economies have a real choice in developing secure telecommunications infrastructure. As it stands now, U.S. export credit and development finance are grossly inadequate to the task at hand. The Export Import Bank (EXIM) is underfunded due to years of Congressional squabbling, and its high domestic content requirements have long hamstrung the ability of U.S. exporters to access EXIM support. EXIM’s decision in December 2020 to lower the domestic content threshold required for medium- and long-term transactions from 85% to 51% in connection with its Program on China and Transformational Exports is a major step in
the right direction. EXIM should consider further lowering the domestic content threshold for 5G equipment and factor in the value of intellectual property and R&D into domestic content calculations. While the U.S. Development Finance Corporation (DFC) has a mandate to fund ICT projects abroad, it too has struggled to compete with China in the export credit space because of restrictions on the types of projects it can finance and the challenges of lending to developing markets. On the horizon, new institutions such as the Multilateral Telecommunications Security Fund authorized in the National Defense Authorization Act (NDAA) for Fiscal Year 2021 may provide a valuable tool for expanding cooperation as it provides funding to invest in secured telecommunications technologies.

Policy Recommendations

U.S. 5G Deployment

1. Open up more “sub-6” spectrum, which is the spectrum below 6 GHz and optimized for broad area coverage. The United States is unique in that its sub-6 spectrum is mostly owned by the government, limiting access to the commercial sector. By sharing more sections of the sub-6 with the commercial sector, the U.S. government can help accelerate the pace of U.S. 5G deployment.

2. Set aside FCC spectrum auction proceeds into an escrow that finances 5G deployment activities, including base station installations and cell site construction. This arrangement would not only incentivize auction bidders to use funds for spectrum procurement but also toward 5G deployment.

3. Change FASB accounting standards so that spectrum licenses are not considered indefinite-lived intangible assets. The current accounting treatment effectively allows the license to sit on a company’s balance sheet without depressing earnings, which does not incentivize large service providers to quickly operationalize their spectrum. This is another reason contributing to the relative slow pace of 5G deployment in the United States.

4. Further streamline permitting processes for 5G deployment to prevent local jurisdictions from unduly disrupting deployment plans developed on the state and national levels.

Standards Development

1. The U.S. government should support company participation in standards development organizations. Standards-setting is costly and requires companies to dedicate substantial resources to pay for membership fees to trade associations, travel to participate in international standards forums, staff time, and patent filing fees. The U.S. government can encourage more participation by U.S. firms by expanding existing R&D tax credits to cover standards-related expenditures and providing grants where appropriate.

2. Ensure government agencies responsible for global standards engagement are suitably staffed and funded to partner with the private sector in standards-related initiatives. This includes NIST, the State Department, and NTIA.

3. Establish NIST detailees in embassies around the world. Having NIST staff at key diplomatic posts would allow the government to more effectively engage with our allies and partners on standards issues and more comprehensively monitor standards being developed at the regional and national levels.
4. Eliminate export control restrictions on U.S. participation. Make sure U.S. organizations can fully participate in global standards development by affirming that the Export Administration Regulations (EAR) does not apply in the context of standards development.

5. Support industry-led efforts to develop trust and transparency in the ICT supply chain. U.S. standards development organizations such as the Telecommunications Industry Association are developing standards and certification processes to enhance ICT supply chain security by creating trust criteria and creating a process to certify equipment to this standard.

6. Make the U.S. the best, most welcoming place to develop standards through inclusive visa policies and dedicated facilities. This would give the U.S. “home-field advantage” and decrease costs for participant U.S. entities.

7. Work with global partners on governance reform in SDOs to address the problems posed by China flooding the field with participants and low-quality proposals.

Allies and Partners

1. Double down on partnerships with European countries, Japan, and South Korea, and strengthen relationships with large, growing democracies such as India. Timely deployments of 5G in the United States will require engagement with suppliers from partner countries.

2. Expand the ability of EXIM and DFC to finance digital infrastructure expenses to provide alternatives to Chinese-only solutions.

3. Explore open interface radio access architectures for ICT networks with global partners to ensure greater competition over the medium term.

4. Build a competitive development finance system to ensure that emerging market economies have a real choice in developing secure telecommunications infrastructure.
Technology Governance

Maintaining leadership in global technological competition requires the United States to utilize its built-in advantages and bolster its international engagement to shape the global governance environment. Rather than reacting to policies and decisions set by the People’s Republic of China’ (PRC), the U.S. should capitalize on its unique strengths. U.S. policy should achieve the desired effect of making the PRC’s approach costly and difficult to achieve. To be successful in maintaining leadership, the U.S. should harness its open research and innovation ecosystem that is being challenged and serves as the foundation upon which American technological strength is built.

Technological competition between the U.S. and the PRC will unfold over the next decade, if not longer. The expectation of a constant rivalry far more complex than the one between the U.S. and Soviet Union warrants deeper introspection about what “winning” means in the long run, as opposed to a primary focus on short-term actions. Technological competition encompasses a vast variety of issues and sectors that trying to be the global leader in all of them may undermine the United States’ ability to lead in the ones that matter most. Counter to the assumptions inherent in much of the frenzied debate around the PRC’s ascent, its role in technology development is too influential to become a pariah. Therefore, competition and cooperation between the two countries must coexist. Cooperation with the PRC can even hone the U.S. approach to broader bilateral strategic competition.

To this end, the United States has several questions it must answer while embarking on technology competition in earnest.

- What is the distinction between principles and interests in American technology policy?
- What advantages does the U.S. hope to gain by harnessing emerging technologies, and what threats and externalities does it hope to prevent?
- Conversely, what defines the United States and what does the U.S. want the international society to look like a decade from now? Are end goals, or the means by which the U.S. hope to achieve them, at all incompatible with our national identity and needs?

This introspection should pair with a strong dose of humility. While the U.S. finds its presence and influence still welcome in many foreign capitals, wariness of the resurgence of isolationist sentiment in U.S. politics may persist. As a democracy, it is a measure of strength that the U.S. acknowledges different countries’ disagreements over the specific promises and perils that technologies pose. Competition with the PRC cannot succeed without allies and partners. Their concerns and pressures are different from that of the U.S. and cannot be overlooked if the U.S. hopes to rebuild their trust as a reliable partner. In this sense, the “norms” the U.S. seeks, in contrast to those the PRC aims to gain global prominence so as to favor its own interests—are merely aspirational unless shared.

It is important to note that the American approach to “free and open” \(^1\) lies on a spectrum, and may diverge from other countries’ views when questions of sovereignty are involved. \(^2\)

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example, in the cyber domain, data can quickly and easily cross jurisdictions, upending longstanding notions of sovereign rights and powers. Meanwhile, this raises new issues around privacy, access to information, freedom of expression, and more. The Trump administration’s efforts to regulate and restrict Chinese-owned social media platforms like TikTok and WeChat reveal some of the tensions at play today where questions of data governance intersect with sovereign rights and national security interests, as well as privacy rights, and rights to “free and open” expression. President Trump’s Executive Orders restricting U.S. citizens’ use of these apps were a product of his administration’s concerns over the national security implications of provisions in China’s 2017 National Intelligence Law, which suggested any Chinese company, public or private, could be compelled to turn over any data it collected anywhere to the PRC government.

The Executive Orders prompted immediate questions and concerns from private citizens and the business community. Some of the most pressing questions revolved around the lack of clarity as to the orders’ scope. As social and commercial interactions have become transnational, conflicts of law between nation states and claims of extraterritorial jurisdiction have also been on the rise. Did the administration intend only to restrict use of the app within the United States, or to restrict use of the app by U.S. citizens at home as well as abroad? What might this mean for U.S. companies operating within the PRC that, for example, relied on WeChat to process Chinese customers’ payments? The orders also pitted the government’s assertion of rights to act in the interest of national security against U.S. citizens’ civil liberties. Judges granted injunctions to delay enforcement, partly because they agreed with petitioners that the restrictions threatened to undermine First Amendment freedoms in the United States.

To some, the Trump administration’s effort to force the sale of TikTok’s U.S. business to an American buyer at least offered a path that would allow Americans to continue using the platform while also reducing the risk that their data might be exploited by the PRC government. To others, forcing a foreign company to sell its proprietary technology to a U.S. business was a slippery slope that could set a bad precedent for U.S. companies and persons seeking protection of their own intellectual property (IP) rights in foreign markets. For enabling technologies, the U.S. has long encouraged the “sovereignty” of inventors by promoting intellectual property rights and protections that transcend national law. Ordering a foreign company to sell its U.S. operations and proprietary IP to a domestic buyer ran counter to such longstanding U.S. principles, and could be perceived as a move to forcibly procure TikTok’s cutting edge algorithmic technology.

Similar departures from past norms have been on display in the United States’ recent deployment of visa restrictions and export controls in the U.S.-PRC context. Visa restrictions and export controls, often enforced in tandem with allies and partners, were regularly-used tools.

130 https://history.state.gov/milestones/1921-1936/immigration-act
throughout the 20th century. However, they were seemingly used to a minimal extent, only when necessary, in critical areas, and nearly always under the presumption that such measures were temporary. Where more permanent restrictions were deemed necessary, such as nuclear nonproliferation, the U.S. has often pushed for institutionalization through international agencies.\(^{132}\) But the PRC’s long history as a poor policer of IP theft and forced tech transfer have created counter pressures. Beijing’s blurring of boundaries between the state and private sector, especially where state military interests are concerned, has also fueled some U.S. policymakers’ convictions that access to American technologies must be much more tightly controlled or protected. The lists of Chinese entities restricted from acquiring U.S. tech and the lists of U.S. tech restricted from being sold to these users continue to grow. By Proclamation, visa suspensions and limitations were placed on researchers and professionals who are PRC nationals conducting research in support of the PRC’s “military-civil fusion” strategy.\(^{133}\) The ripple effects lead to diminishing public and private sector opportunities for collaboration in both foundational and applied research.

The increasing restrictions on U.S.-PRC tech engagement, from limits on PRC nationals’ access to the U.S. market where sensitive tech and data are involved, to increased oversight over sales of certain U.S. tech to PRC customers, and limits on collaborative research and development conflict with the “free and open” principles that have come to define much of American engagement with the world. The United States has certainly erected boundaries before in order to better manage relations with rival competitors, but the PRC poses a different, unique set of challenges for the 21st century. It is the United States’ third largest trading partner, and as the world’s second largest economy, it also trades heavily with our allies and partners.

Unilaterally restricting collaboration and commercial engagement with the PRC has negative repercussions for U.S. interests, creates opportunities for other countries and their companies to benefit from increased engagement with the PRC, and is therefore unlikely to sway Beijing’s practices to which the U.S. objects. A unilateral and punitive approach also will not consistently prevent PRC acquisition of technologies the U.S. deems sensitive. Where the United States is not the sole country in possession of a particular advanced technology or know-how, acting unilaterally blocks the U.S. domestic tech sector from selling what China can easily buy elsewhere. This places the United States’ most innovative companies at a disadvantage in the global marketplace compared to their competitors.

A unilateral, and punitive effort to cut off the PRC’s pursuit of technological advancement also does little to foster a global environment where the rules and norms reflect what is considered to be responsible and ethical behavior. “Responsible behavior” requires buy-in from other states. Existing international mechanisms like the Wassenaar arrangement are imperfect fora for building stronger multilateral controls to address security threats posed by the PRC’s access to certain critical technologies, but offer a better path forward than going it alone. Successfully setting the terms of what constitutes “responsible behavior” also means seeking buy-in from rival competitors, who have their own interests and philosophies.\(^{134}\) In other words, the United States’ is more likely to bring behaviors closer into alignment by engaging the PRC in a principled

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\(^{134}\) https://doi.org/10.26153/tsw/10950.
manner, rather than decoupling. U.S. interests have long been better served by remaining engaged in multilateral settings and seizing the opportunity to shape the inexorable product of the discussion, even if U.S. interests might have been better served if the discussion itself were not legitimized.

Still, the intended benefits of working with China to define mutually agreed upon rules for technology governance unavoidably clash against hard realities of the PRC’s policies and practices in this space, many of which diverge sharply from U.S. policies, practices, and fundamental U.S. principles and values.

**Key Features of China’s Approach to Technology Governance**

The PRC’s approach to technology governance has been comprehensive, covering everything from national innovation subsidies to intricate technical policies. This State push for domestic and global dominance has, no doubt, threatened America’s tech dominance. Among the core conflicts over governance approaches is the PRC’s bold push for directing global standards. In its "China Standards 2035" blueprint, for instance, China's leaders are looking to set global standards for the next generation of technologies, including artificial intelligence and the Internet of Things. More specifically, on wireless standards like 5G, Chinese-owned organizations have conducted a full-court press on destabilizing the hold of once unrivaled Western leaders, like Qualcomm, Ericsson, and Nokia. Chinese companies have led in 5G patents and proposals, with Chinese-owned companies submitting 830 technical documents on wireless standards to the International Telecommunication (ITU) last year.

One of the PRC’s key ways of advancing its vision of technology governance is through its approach to surveillance. Since 2008, at least 80 countries have adopted Chinese surveillance technology platforms. Furthermore, Beijing’s surveillance approach to combating coronavirus may lend its overall approach further legitimacy post-pandemic, deepening Chinese surveillance companies’ worldwide footprint. It has become increasingly clear that if democracies persist in their inertia to create and promote more rights-protecting surveillance systems, the PRC’s window of opportunity to more fully assume the mantle of global tech governance will only widen. Moreover, as noted in the 13th Five Year Plan, the PRC has been working to develop new big data applications to establish a “national system for overall controls and social governance.” As the PRC government applies big data among varying industries, is greater state capacity and service conveniences worth giving up civil liberties?

China’s influence over developing countries in particular, including those in South and Central America, should not be taken for granted. Building alliances around rules, norms, and standards that are consistent with U.S. values and interests will require that the United States proactively engage and negotiate with allies and partners. The U.S. cannot assume that its preferred norms will be embraced by other countries. The U.S. must make sure that what it is advocating for is desirable when weighed against what the PRC offers.

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138 [https://doi.org/10.1017/S0020818320000417](https://doi.org/10.1017/S0020818320000417).

Key Features of the U.S. Approach to Technological Governance

Questions about America’s approach to technology governance hinge on several complications. First is the multiplicity of actors in the technology arena - various government organs, of course, but also human rights groups, for-profit companies, special interests, technologists, and the American public, all of whom operate in the relevant spaces but only indirectly influence policy. Increasingly, the U.S. government has moved from the role of exclusive technology producer to end-user. U.S. authorities have ostensibly embraced a “multi stakeholder model” of governance,140 but the relationship between government and the private sector remains fraught and indisputably hierarchical. The difference between the U.S. system and command economies is that, in the former, the private sector has elevated agency. This means that trust and cooperation are crucial components that can serve either as a force multiplier or critical hindrance, depending on how they are cultivated.

While federal funds can and should be allocated to support the enhancement of America’s technological competitiveness, the American private sector is now and should continue to be a major backer of domestic research and development (R&D). Market forces help to ensure that the private sector is comparatively efficient in its use of resources, and this is a distinct advantage of the United States in our competition with China. More than 70 percent of US research and development is funded and conducted by the private sector.141 Many major players in the US tech industry, in turn, derive a significant portion of their revenue from commerce with China, i.e., it is a critical market and source of the global revenue funnel led into technological advancements at home. The U.S. must erect high walls around the crown jewels of our tech treasure chest, but we should also endeavor to maintain and expand open doors for cooperation and commerce wherever available. This engagement not only helps to generate the revenue necessary for domestic R&D efforts, but also offers greater real-time awareness of China’s technological strengths and progress as compared to our own.

In addition to encouraging the private sector to embrace its role as a backer of research and development, the U.S. government should incite the private sector to play a more responsible role in tech governance through country- and company-agnostic regulation that governs access to U.S. technologies. Companies that pose U.S. national security concerns for their development of AI, 5G technologies, and biotech will require rigorous vetting. Such an assessment could come in the form of an annual audit of the companies’ user bases to ensure that companies are proactively evaluating for nefarious users. In pursuit of aligning tech governance with democratic values, social media companies present exacerbated challenges for the United States. Existing efforts like Birdwatch demonstrate that self-regulation by social media companies is possible but likely insufficient, as these companies remain driven to increase traffic in order to generate profit.142 Arguments have also been made for the creation of a competitive market of middleware companies with transparent algorithms to take control of the editorial duties in curating content.143 However, such middleware presents their own issues, such as the likely exacerbated creation of filter bubbles with potentially criminal content. Regardless of the method of U.S. government regulation, the private sector must embrace rather than resist these government efforts to maintain democratic values in their technologies.

140 https://doi.org/10.2139/ssrn.2354377.
Ultimately, given the outsized power that technology companies wield over the implementation of often neglected international rules and norms governing emerging technologies, the private sector wields an important role as reinforcers of democratic values in the international tech governance arena. U.S. industry participation in international standards setting bodies has already proven critical to the development of these international tech governance norms. Moving forward, U.S. industry engagement in these bodies will be even more necessary to ensure the U.S. retains a leadership role in defining what technologies countries adopt, determining how they manage cross-border information and data sharing, and ensuring access to an interoperable digital economy.

Especially disruptive technologies allow their adopters to access and operate with increasing frequency in new domains - sea, air, space, and cyberspace - where public and private interests may not always intersect. For many years, “free and open... albeit within the bounds of responsible behavior” has been the American rallying cry in all domains except land. Despite significant contestation in the early years, this model has more or less prevailed. U.S. leadership was critical to many of these agreements, such as the Chicago Convention on International Civil Aviation and the Outer Space Treaty. In instances where the U.S. was not a concluding party, its involvement was nonetheless pivotal to the corresponding shape of the agreement (e.g. the Hague Conventions, the Paris Convention of 1919, and the United Nations Convention on the Law of the Sea). Too much private sector involvement without sufficient weight given to the public interest can hamper consensus, as it did with the Geneva Protocol of 1925, but the government must acknowledge that it cannot decide the rules by fiat in emerging technological contexts today given commercial origins and ownership.

Areas of Conflict
Vastly different U.S. and PRC approaches to technology have given rise to new conflicts and rivalries. Most importantly, the simpler challenges of technological competition, in recent years, have been overshadowed by fundamental concerns over market access, unfair trade policies, and national security. The best example of which may be the ongoing Huawei saga.

In 2018, the U.S. Congress raised national security concerns over the Chinese telecom giant’s footprint into the U.S. telecom sector. Over the last three years, the conflict over the state-funded company’s global expansion and prospects has led to several rounds of economic sanctions and reprisals, greatly exacerbating calls to compete and de-couple. The power and influence of the PRC’s model of governing connected technologies is potentially formidable. It includes requiring alignment with party-state objectives, significant surveillance powers, development priorities meant to encourage a geopolitical vision inconsistent with our own and a competitive orientation in terms of offering an affordable, interoperable, attractive alternative.

As a result of growing technical competition, the U.S. government has begun to step up a diplomatic offensive to counter the PRC’s technological expansion. Numerous U.S. allies have now adopted policies that restrict Chinese-owned tech firms from managing key parts of telecom

144 https://www.ft.com/content/7f85a5ff-326f-490c-9873-013527c19bf8f.
infrastructure based on U.S. designation that Huawei, ZTE, SMIC, and other Chinese-owned “national champions,” subject to PRC law, could obligate them to cooperate with the PRC’s intelligence service.\textsuperscript{147} Despite PRC claims that Huawei and other companies are employee-owned or independent, many countries have reassessed allowing Chinese tech firms to exist within their critical infrastructure.\textsuperscript{148} In July, for instance, the United Kingdom moved to ban Huawei from its infrastructure. Huawei’s telecom equipment must now be removed by a deadline of 2027.\textsuperscript{149} Other U.S. allies - such as Australia, New Zealand, Japan\textsuperscript{150} - have taken similar stances.

To better close the PRC’s window of opportunity for assuming greater tech governance leadership, the United States and its allies must act collaboratively to shape the environment. This means working closely with allies and partners, but it also means resisting inclinations to limit the PRC’s access to multilateral fora where rules and norms are being established. Engaging with the PRC in standards setting bodies, for example, is not the lesser alternative to blocking them from shaping international standards. Rather, the greater alternative is a China that feels compelled to create and promote an alternative universe of standards and compete with the United States for other countries’ buy-in.

\textit{Areas of Cooperation}

The U.S.-PRC relationship cannot sustainably exist in a purely competitive paradigm. While the United States must maintain a realistic view of Beijing’s strategic intentions, an exclusively zero-sum approach to the bilateral relationship will condemn both countries to a fate not in either’s interests. Cooperation between the two countries, while never eclipsing partnership with U.S. allies, is crucial for the United States and the PRC to co-exist as two powerful entities in the international system, particularly in regards to tech governance.

- **Standards-Setting**: The United States and China should begin discussions to agree upon and enforce some high-level principles for the ethical use of AI. The U.S. Department of Defense (DoD) adopted ethical principles for AI in early 2020,\textsuperscript{151} its utility can shape a common set of principles for other militaries to adopt for the responsible use of AI. Outside of the realm of technology policy, several opportunities exist for the United States and the PRC to cooperate. Cooperation on agreed standards-setting and current international norms, and bilateral dialogue regarding joint pandemic preparedness, humanitarian assistance and disaster relief (HADR), and space situational awareness can be mutually beneficial for both the United States and the PRC. This cooperation will not only deliver inherent benefits but also serve to build understanding and de-escalate tensions, improving prospects for engagement on more difficult issues such as tech governance.

- **Basic Research Cooperation**: Basic, non-applied, scientific research benefits from extensive collaboration. Chinese and American scientists have both benefited from collaboration in theoretical physics, chemistry, mathematics and other fields.\textsuperscript{152} Scholars from the PRC study in the United States and contribute to the growth of research in the

\textsuperscript{148} https://www.reuters.com/article/us-huawei-usa-5g-specialreport/special-report-hobbling-huawei-inside-the-u-s-war-on-chinas-tech-giant-idUSKCN1SR1EU  
\textsuperscript{149} https://www.theverge.com/2020/7/14/21322880/uk-bans-huawei-5g-network-infrastructure-trump-administration-pressure  
\textsuperscript{150} http://www.theguardian.com/technology/2019/apr/19/where-huawei-is-banned  
\textsuperscript{151} https://www.defense.gov/Newsroom/Releases/Release/Article/2091996/dod-adopts-ethical-principles-for-artificial-intelligence/.  
\textsuperscript{152} http://english.cas.cn/newsroom/news/201902/t20190218_205409.shtml.
United States. Reinvigorating basic research collaborations will ensure the continued competitiveness of the U.S. scientific ecosystem.

- Social Scientific Research Cooperation: Beyond basic research, social scientific research collaborations on areas of technology policy offer an important potential bright spot. Scholars working together have the opportunity to develop and advocate for global norms that have the potential to incorporate both countries’ needs and interests. Such research collaborations at the Track 2 (non-government), or even Track 1.5 (mix of official and non-official actors) may help to reinvigorate government-to-government dialogue between the U.S. and PRC in areas of potential cooperation. At a minimum, they allow scholars and think tankers to identify problem sets and issue areas where there might be room to work together.

- Climate Cooperation: Climate change presents an existential global challenge. Any possibility for climate collaboration in the tech sector needs to be taken seriously. Without cooperation with China, forward movement on decarbonization, adaptation, and mitigation becomes more difficult. To the degree possible, climate cooperation needs to be a carve-out for enhanced focus on US-PRC tech cooperation.

**Conclusion and Recommendations**

Both strategic interest and philosophy can serve policy objectives, but distinguishing them can help us choose between them whenever they might be in conflict. By sacrificing interests for ideals, countries risk undermining their own position and ability to influence future events. But interests can change unexpectedly, and the full picture is often hard to see. Adhering to philosophical ideals can transcend immediate concerns but zealously is also potentially an obstacle to compromise. Because each comes with tradeoffs, Americans should decide for themselves which is more important before doubling down on a comprehensive technology governance strategy.

The U.S. has an array of options in its toolkit it can use on its own to bolster its global stature. These include:

1. Invest further in technologies that diminish the efficacy of the PRC’s AI-enabled surveillance apparatus. Such an effort would hamper Beijing’s attempts to export its techno-authoritarian model to other countries that may be less adept than the PRC at blocking U.S. support to non-state actors trying to evade state-led digital intrusion. Just as China enhanced its surveillance capabilities by means of a determined pursuit of advances in the field, technology-driven countermeasures developed in democratic countries, including the U.S., could offset the possible success of China’s competitive advantage. Tim Hwang of Georgetown University’s Center for Security and Emerging Technology (CSET) argues that this approach would constitute a “terrain strategy” that helps the U.S. “leverage the malleability of the AI field and shape the direction of the technology to provide structural advantages to itself and other democracies” and “alter the global playing field.”

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155 https://doi.org/10.51593/20190029
2. Leverage technical expertise to create alternate U.S. facial recognition standards at the UN ITU. Chinese companies have been lone proposers of standards that will be fast-tracked for approval.\textsuperscript{156} It is especially necessary to provide viable alternatives at this venue, as Chinese standards have been criticized for promoting policy recommendations over technical specifications, and ITU standards are often adopted by developing nations with insufficient technical wherewithal across Africa, the Middle East and Asia.\textsuperscript{157} One venue for an allied approach can be the Global Partnership on AI.\textsuperscript{158}

3. Launch and accelerate undertakings to reduce a reliance on large datasets. Despite little evidence thus far that the PRC’s data-collection advantages over the U.S., in terms of the scale and scope of data, has translated into a distinct military advantage,\textsuperscript{159} the PRC’s prowess in this area is still a concern. The reason is that the PRC is building the world’s most extensive data labeling infrastructure that can be harnessed once it becomes clearer how to apply AI to tangible use cases in the defense space. The U.S. government will never be able to match the speed and breadth of China’s construction of the digital scaffolding that undergirds AI capabilities, but it can advance the AI field such that China’s advantage is less impactful. For example, few-shot learning,\textsuperscript{160} one-shot learning\textsuperscript{161}, and less than one-shot learning is nascent machine learning techniques that don’t require large datasets. Focusing on such approaches,\textsuperscript{162} including reinforcement learning as well,\textsuperscript{163} would obviate the need to try to catch up to or overtake China’s lead in data collection and labeling, and would reinforce the U.S.’ ability to play its own game, rather than compete with China on a tit for tat basis.

4. Nationally fund privacy-preserving systems for wider adoption. National research funding organizations such as the National Science Foundation (NSF) and the Defense Advanced Research Projects Agency (DARPA) should support research on privacy-preserving computer vision systems. Examples can be methods that obscure individuals’ faces, or counter-surveillance technologies, including specially designed clothing and other techniques that can attack image systems. Bodies such as the National Institute of Standards and Technology (NIST) should also expand prior research on error mitigation in facial recognition.\textsuperscript{164}

5. Reinforce the positive link between immigration and national security. While the Biden-Harris Administration seeks to ease immigration, restrictions instituted in the last several years, reverting to the pre-2017 immigration system may be insufficient to address the competitive threat that the PRC poses today. Given the centrality of technology expertise to gaining global strategic advantage,\textsuperscript{165} the U.S. Government could devise or declare a national security focus for particular types of visas, such as the extraordinary ability visa, one version of which grants permanent residency and the other version offering

\textsuperscript{156} https://doi.org/10.51593/20200016
\textsuperscript{157} Ibid
\textsuperscript{158} https://doi.org/10.51593/202100016
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\textsuperscript{164} https://doi.org/10.51593/20200016
\textsuperscript{165} https://doi.org/10.51593/20190009
temporary but renewable status. Highlighting the connection between attracting international technical talent and increasing our competitive advantage over the PRC— with relentless public messaging that showcases critical work from individuals most Americans would never otherwise know about - will help elevate the often-heated national conversation on immigration.

6. Shift legitimate efforts to protect U.S. technology from theft away from the current racialized framework. In recent years, many more Americans have recognized that U.S. influence around the world is a result of attempts, however flawed, to make the U.S. union a little more perfect every day. One way to do so is to advance the cause of racial justice, which has not historically been viewed as essential to achieving our traditional national security objectives but has nonetheless played a role in our global affairs for many decades. Today, as the U.S. Government boosts efforts to protect U.S. intellectual property and research from PRC economic espionage and technology transfer, it is all too easy to overstep and view ethnic Chinese-Americans or PRC nationals working in the United States as PRC spies. The People’s Republic of China undoubtedly maintains the world’s most extensive network of U.S.-based actors working to steal U.S. technology, but accusing individuals of working on behalf of the Chinese Communist Party (CCP) without sufficient evidence not only helps the CCP with its own narrative, but also fosters an environment that makes researchers and business leaders think twice about working in the United States. It is imperative that U.S. law enforcement agencies and other government entities operating in this space do the following: 1) adopt a country-neutral framework that will drive investigations of individuals suspected of potential technology theft; and 2) devote robust training and resources to this new and more nuanced kind of threat, not unlike the way the FBI significantly retooled its workforce and reprioritized its budget to address counterterrorism threats after the attacks on September 11, 2001. However, the U.S. national security community acknowledged too late that prioritizing surveillance of Muslim communities in the U.S. hurt more than helped counterterrorism efforts. Committing similar mistakes with Chinese-Americans and the Chinese-ethnic diaspora in the U.S. would serve Beijing’s interests more than ours. While the CCP’s unique espionage apparatus has penetrated deep into the U.S.’ commercial and social fabric, it is incumbent upon the national security community to strike the right balance between relentless yet responsible pursuit of illicit behavior and preservation of the diversity that underpins and strengthens the American technological and innovation ecosystem.

7. Work with the commercial sector in new and uncomfortable ways. It is no secret that the U.S. national security agencies are, by and large, not properly structured, staffed, incentivized, or resourced to work with non-traditional technology companies interested in working with the government. In contrast, PRC law - specifically 2017 National Intelligence Law - signals that any Chinese company must comply with PRC requests for
The separation between the U.S. state and the private sector usually provides more room for innovation, and Beijing’s model of commercial coercion should not be replicated in the United States. Yet, the fact remains that the U.S. government, with DoD as the chief actor, has struggled to adapt to the reality that it no longer controls how and where new military-relevant technologies are developed. The reports, white papers, articles, and theses written on this topic are legion, so DoD and other agencies have widely recognized this challenge, but their efforts to solve it, while admirable, are mostly marginal. Decades of collaboration between government agencies and legacy companies whose days as the world’s foremost technology leaders are behind them have fostered an organizational culture that is not meant to embrace agile projects that require modern software development. While traditional companies still have an invaluable role to play in this ecosystem, their business model is centered around the way DoD and other agencies have operated for decades, so these companies are not incentivized to change in significant ways, either. U.S. national security leaders today consistently mention AI, 5G, advanced robotics, and other technologies in speeches and public remarks, but have not fully grasped or accepted how much effort will be needed to modify the way the government must interact with non-traditional companies if we are to develop novel technical capabilities. In DoD’s case, for example, it must embrace ideas such as reducing or eliminating requirements for software-driven programs so vendors are not hamstrung by unnecessary technical specifications as they write code; ensuring all data being collected via DoD sensors is machine-readable from the onset and can be stored in a cloud environment so vendors can more quickly develop useful algorithms; and including clauses in contracts with vendors that allow DoD access to data that has historically been vendor-owned, among other ideas. None of these solutions is unprecedented, but they have been seen only in pockets scattered across the defense enterprise, rather than at the scale commensurate with what the DoD mission requires. These and similar changes will not be easy to implement, and time-consuming turf battles within the bureaucracy will inevitably emerge, but national security leaders must push the government to respond to the demands of the modern era, accept that this shift will be uncomfortable but vital, and acknowledge that maintaining the status quo will doom the U.S.’ competitive and technological advantage.

8. Reorient the way the Intelligence Community (IC) tracks China’s technological progress. The scale and type of actions the PRC has taken to gain technological superiority are unlike those of any other competitor, past or present. Conventional U.S. intelligence-gathering approaches have sometimes struggled to meet the need for critical information, despite the collective understanding that the PRC is the United States’ most potent competitor. To address this challenge, the IC should undertake a three-pronged approach:
   o Emphasize the importance of open-source intelligence and analysis. The IC traditionally values classified information over unclassified or open-source information. While certain China-related tasks within the IC will always require classified assessments, a significant amount of information linking U.S.-based actors

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173 https://www.reuters.com/article/us-china-security-lawmaking-idUSKBN19I1FW
175 https://www.brookings.edu/events/a-conversation-with-chairman-of-the-joint-chiefs-of-staff-general-mark-a-milley/
engaged in illicit technology transfer to entities affiliated with or backed by the PRC is available in the public domain (e.g. government procurement documents, records of PRC-sponsored technology competitions, etc.). The IC should expand the use of open-source investigative methods for more of its China work, especially now that the value of open-source intelligence has been proven.  

- Address the information asymmetry gap. While the U.S. and the PRC are each other’s greatest strategic competitor, U.S. national security practitioners have access to relatively fewer resources dedicated to understanding China’s actions and behavior, whether in the technology realm or in general. It is evident that more of the PRC’s military, intelligence, and national security officers - not to mention members of its technology research community - speak English than their American peers who speak Mandarin. Far more Chinese students, some of whom go on to work for PRC-affiliated entities, study in the U.S. each year than the number of Americans studying in China. While this asymmetry is explicable, it has led to a gap on our end in translating key documents, drawing on in-person experience to comprehend certain behavior, and appreciating the nuances of the U.S.-PRC technology competition that are often ignored or overlooked. While the IC cannot solve all the aforementioned challenges, it should place a greater premium on reversing this information asymmetry within the bounds of its remit. Hiring or training analysts who can read and understand Mandarin, and are familiar with Chinese history, culture, and politics, is a necessity.

9. Work with U.S. government customers to ensure taskings are appropriate for the modern era. Since the IC works in support of other U.S. government entities that request information, the IC can help these entities help themselves by becoming better customers and consumers of information. The IC has a long history of monitoring shipbuilding, tank formations, missile silos, and the like in other countries, in great part because its customers within the U.S. government are asking for information about them. The IC’s attempts to ascertain other countries’ advances in hardware are well-established, as they represent something tangible and understandable, but if future technological competition depends more on software-based progress, then the IC needs to strengthen its collection and analysis capabilities accordingly. With the help of forward-thinking government customers asking the right questions, and an appropriate push from intelligence leaders to do so, the IC can devote more attention to China’s development and application of new technologies that initially may be more difficult to track due to IC infrastructure that is designed to understand hardware-based technological advances. It is possible that the U.S. already possesses key information about China’s software progress that has been collected via existing sources and methods, but this information was caught up in a separate tasking so has not been reviewed yet. While difficult, the IC should find ways to effectively comb through information it already has to extract previously unexamined intelligence.

177 https://www.thecipherbrief.com/column_article/staying-competitive-crowded-open-source-world
178 https://warontherocks.com/2015/06/so-you-want-to-be-a-pla-expert
10. Continue to leverage carefully designed export controls, and increase public knowledge of surveillance supply chains. Export controls aimed at limiting sales of surveillance and other sensitive technologies to concerning Chinese-owned end users have multiplied in recent years. The Bureau of Industry and Security (BIS) has already added multiple Chinese-owned surveillance companies and PRC public security bureaus to its Entity List for violating human rights in Xinjiang. The Department of Defense has identified a growing list of “Communist Chinese military companies” with whom U.S. business must be restricted. However, there remains great ambiguity as to the criteria used to add new items and end users to these lists. There is also little transparency into how effective these export controls have been at stemming sanctioned Chinese-owned companies’ access to U.S. inputs, such as advanced chips and storage solutions. Public knowledge of surveillance supply chains, as well as greater awareness of key companies contributing, allows for greater transparency into companies contributing to rights abuses abroad.

Both countries have unique objectives and approaches to how technology governance should function in the future. These differences make it challenging to achieve more structural integration within a common global technology governance strategy. However, each framework, although different, has room for potential cooperation. The PRC's ability to lead in technology governance relies on whether its model provides a compelling alternative to the United States. The U.S. only furthers Beijing's ambitions by alienating global partners, including its competitor. Even if the U.S. decides not to pursue tactical cooperation with China on global technology governance, it will still need support from U.S. allies and partners to address the shortfalls this decision might create. Ultimately, the consequential policy decision whether to cooperate with the PR or diverge based on U.S. principles, interests, and objectives does not only affect the United States but the entire world. As a nation that has led technological innovation for decades, it is evident that the U.S. has what it takes to lead global technology governance. However, leading by flexing muscles alone and perceiving cooperation as a weakness on the international stage can be short-sighted. It also runs the risk of potentially harming the liberal order and impedes the ability to solve future technological complex universal challenges. Nonetheless, the U.S. maintains a remarkable level of credibility to lead in technology governance through its democratic ideals and its well-established leadership in international cooperation - leading to sustained global prosperity.

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