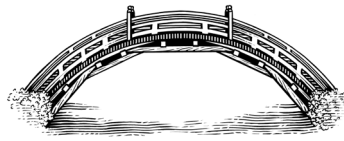ROUNDTABLE

Navigating China's Growing Digital Influence

Emily de La Bruyère

Elsa B. Kania

Jeffrey Ding

Koichiro Komiyama and Motohiro Tsuchiya

Introduction

Doug Strub

The adoption of China's 14th Five-Year Plan in March 2021 further solidified the dominant role of innovation, emerging technology, and advanced manufacturing in Beijing's development strategy, as well as highlighted the government's intention to accelerate the building of a digital economy, society, and government. The plan details China's desire to use data and digital technology to upgrade traditional industries, develop smart cities, and create a "future of shared destiny" in cyberspace.[1] These elements represent pieces of Beijing's broader digital and innovation strategy that seeks to leapfrog China to become a global technology leader and position the country as a dominant player in shaping and controlling the world's digital future. Chinese leaders see accomplishing this as a key means to continuing China's rise and achieving the "great rejuvenation of the Chinese nation."

The strategies used to carry out China's digital ambitions and grow its digital influence are multifaceted and carry significant global repercussions. This *Asia Policy* roundtable seeks to identify these objectives and shed light on their consequences. The following essays analyze the policies China is using to achieve these goals; examine the consequences for the United States, like-minded powers, and others caught in the middle; and offer policy recommendations for both national governments and international rule-setting bodies to mitigate the challenges associated with China's digital rise.

In the roundtable's opening essay Emily de La Bruyère outlines China's digital grand strategy, emphasizing both the vastness of its scope and its centrality in China's long-term strategic objectives. Through the analysis of speeches by Chinese president Xi Jinping, official policy documents, and Chinese-language journal articles, La Bruyère emphasizes the significance of China's digital rise, concluding that the government "sees the IT revolution as an opportunity to claim leadership over the world order." To capitalize on this

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[1] "(Lianghui shouquan fabu) Guihua gangyao cao'an: Jiakuai shuzihua fazhan jianshe shuzì Zhongguo" [(Two Sessions Authorized Release) Draft Planning Outline: Accelerate Digital Development and Build Digital China], Xinhua, March 5, 2021 ∼ http://www.xinhuanet.com/politics/2021lh/2021-03/05/c_1127172969.htm.

opportunity, Beijing is pursuing a "network great power" (*wangluo qiangguo*) strategy that extends beyond the virtual domain to achieve real-world impact.

The network great-power strategy integrates with China's industrial and manufacturing plans through the informatization of industrialization to link production, distribution, circulation, and consumption in a new development pattern that makes greater use of the digital domain and ongoing IT revolution. It also seeks to balance between protecting China's domestic network and taking advantage of access to global networks. After decades of benefiting from asymmetrical integration with the global system—by maintaining relatively closed markets at home while capitalizing on the openness of markets abroad—China is now pursuing a similar strategy in the digital world. Becoming a network great power resides at the core of this strategy, providing "a roadmap for China's rule-setting ambitions in the digital domain" and seeking to catapult China to the forefront of the IT-empowered world.

In the following essay, Elsa Kania zeros in for a closer look at some of the actions the Chinese government is taking to achieve the strategy laid out by La Bruyère. Kania details the increases in expenditures on R&D, basic research, and megaprojects targeting strategic technologies such as artificial intelligence and quantum computing that have demonstrated the magnitude of state-led efforts to advance China's innovation ambitions. In particular, she notes the role of national science and technology in helping China develop vaccines and other tools to recover quickly from the Covid-19 pandemic. China's emphasis on R&D in science and technology has been matched by the incorporation of rhetoric such as "self-reliance" and "autonomous innovation" at the highest levels and in official policy statements, further centering the new development model on domestic innovation and capturing the gains from emerging technology. China's ability to play a leading role in shaping the future of the environment for innovation is critical to achieving its desired national rejuvenation. But Kania also addresses the tensions that China faces between retaining control and autonomy and becoming a global, trusted leader in science and technology fields.

In response to the country's growing digital, technological, and innovative capacities, Kania cautions against using overly broad bans on scientific engagement. She instead recommends considering targeted restrictions on narrow categories of technologies combined, most importantly, with increased domestic investment in basic research. The United States will need to create favorable conditions at home for innovation to retain leadership in this area.

In the third essay Jeffrey Ding shifts from China's domestic pursuit of innovation to examine the country's efforts to influence global digital

and technology standards in international bodies. Increasing numbers of submissions to standards-setting organizations and a growing number of Chinese nationals holding leadership positions in these organizations have given rise to concerns that Beijing is exerting too much control over the standards-setting process. Ding highlights the importance of recognizing this challenge, but he also cautions against overhyping this trend, noting that greater Chinese participation in the global standards-setting process can bring benefits as well as risks. He argues that the United States should increase its own engagement with these bodies, and that the organizations should take measures such as strengthening anonymous voting procedures to prevent excessive Chinese influence.

The roundtable concludes with a view of the emerging triadic digital power struggle between the United States, China, and global tech companies. Koichiro Komiyama and Motohiro Tsuchiya examine the power dynamics unfolding in the digital domain, arguing that the biggest tech companies are now competing with national governments for dominance in cyberspace. As the United States' desire for a free, open, and democratic cyberspace collides with China's push for cyber sovereignty, major tech companies are pursuing their own goal of increased digital globalization. The authors argue that only two of these visions can be achieved at the same time, and that this situation has given rise to a power struggle between the three entities. Their essay closes with an analysis of how middle powers, international organizations, and other outside entities factor into this situation. These groups, despite perhaps having their own visions of or ambitions for cyberspace, find themselves forced to align with one of the three major-power poles, often compromising their own goals in the process.

These essays articulate many of the challenges and risks of China's growing digital influence and underscore the need to develop more effective policy responses to preserve liberal values and safeguard U.S. and like-minded countries' interests in an increasingly digitalized world. The digital grand strategy and associated actions China is taking to propel itself to the forefront of the digital innovation frontier—as laid out in these essays—should encourage policymakers to re-evaluate their strategies for addressing the corresponding challenges. As these trends continue to reshape the world and redefine global power, navigating China's digital rise will be a critical issue for those who do not share China's vision of the future. ◈

The Network Great-Power Strategy: A Blueprint for China's Digital Ambitions

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EXECUTIVE SUMMARY

This essay seeks to explain China's network great-power (*wangluo qiangguo*) strategy, including its aims and means, the environment to which it applies, its metrics for success, and the digital ambitions that it propels.

MAIN ARGUMENT

China sees the information technology (IT) revolution as an opportunity to claim leadership over the world order. The network great-power strategy is Beijing's blueprint for the country to leapfrog the U.S. The strategy drives China's competitive, global ambition to define the digital era architecture, just as the U.S. claimed similar definitional influence over the post–World War II system. Today's IT-enabled environment, however, comes with higher stakes.

POLICY IMPLICATIONS

- The network great-power strategy and its ramifications extend well beyond the cyber realm. The emerging digital architecture is poised to shape the real as well as the virtual domains. China's network great-power strategy relies on efforts in, and seeks influence over, both.

- Beijing assesses that the network power contest hinges on scale, the ability to apply technology, and relative autonomy. Frameworks for understanding China's competitive capabilities should take this into account.

- Beijing pursues the network great-power strategy through asymmetric integration whereby China establishes a critical role for itself in the international division of labor while keeping its own system relatively protected. Such asymmetry has defined decades of Chinese industrial and technological policy. But whereas in the past China leveraged this approach primarily to acquire access to resources and influence over markets, its asymmetric positioning now gives the country outsized influence over the international architecture.

- The U.S. and China are candidates for systemic leadership at an inflection point that will shape the world. Today's determinative IT contest is not about developing the best, newest, or shiniest digital technologies but about defining the international architecture.

According to Xi Jinping, "a new round of technological and industrial revolution with information technology at its core is emerging."[1] In the previous industrial revolution, Beijing lost ground. This new one offers the chance to reset the playing field—and, ultimately, to claim leadership over the world order.[2] In February 2014, Xi announced the blueprint for that leapfrog: he would "build China into a network great power" (*wangluo qiangguo*), which was subsequently endorsed as an important strategy of the 13th Five-Year Plan.[3] Since then, the goal of becoming a network great power has been nearly omnipresent in discussions of China's digital ambitions.[4] Xi, as well as other Chinese government and academic sources, consistently frame the strategy in terms of six key pillars: (1) construction of physical and virtual information infrastructure at home and abroad, (2) control over so-called core technologies, (3) network security, (4) network governance, (5) recruitment of talents, and (6) influence over the emerging network architecture.[5]

The IT revolution is creating a new set of foundational global systems, governed by a new set of rules. 5G is an example. Other examples are e-commerce and digital payment methods, data privacy and storage, logistics platforms, and the industrial Internet of Things. Together, these will form a new architecture that will govern how the world works. Through its network great-power strategy, Beijing seeks both to build and to scale core components of this new architecture as well as to set its standards.

In the process, China benefits from asymmetric integration into the global system: Beijing develops a critical role for itself in the international division of labor while keeping its own system relatively protected. Such asymmetry has defined decades of Chinese industrial and technological policy. Historically, China has used this approach to defend its own critical resources, whether information or minerals, while benefiting from those of other countries. Applied in the current environment, China's asymmetric integration could grant Beijing outsized influence in defining a new

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1 "Xi Jinping zhi di si jie shijie hulianwang dahui hexin" [Congratulatory Letter from Xi Jinping to the Fourth World Internet Conference], Xinhua, December 3, 2017.

2 Ministry of Industry and Information Technology of the People's Republic of China (PRC), "Jianding buyi jianshe zhizao qiangguo he wangluo qiangguo" [Unswervingly Build a Manufacturing Power and a Network Great Power], *Qiushi*, November 24, 2020.

3 "Xi Jinping: Ba wo guo cong wangluo daguo jianshe chengwei wangluo qiangguo" [Xi Jinping: Build My Country from a Network Big Power to a Network Great Power], Xinhua, February 27, 2014.

4 "Zhonggong shiba jie wu zhong quanhui gongbao (quanwen)" [Communiqué of the Fifth Plenary Session of the 18th CPC Central Committee (full text)], October 29, 2015.

5 See, for example, Wang Xinhuan and Liu Tian, "Xuexi guanche Xi Jinping zongshuji wangluo qiangguo zhongyao sixiang jiakuai tuijin wangluo" [Study and Implement General Secretary Xi Jinping's Important Thoughts on Making a Network Great Power and Accelerate the Advancement of Network Security and Informatization], *Military-Civil Fusion on Cyberspace*, no. 3 (2020): 65–68.

industrial era. The United States claimed similar definitional influence over the post–World War II era. Today's IT-enabled environment comes with different stakes.

This essay relies primarily on statements from Xi, as well as academic and policy commentaries, to elucidate China's network great-power strategy, including its aims and means, the environment to which the strategy applies, its metrics for success, and the digital ambitions that it propels. Sources were assessed for authoritativeness based on author, publisher, and the degree to which their arguments echo others strains of Chinese strategic discourse. This methodology does not assume that any single source has perfect explanatory value. The goal instead is to present a representative picture of Beijing's framing.

THE SCOPE OF THE NETWORK GREAT-POWER STRATEGY

"Network great power" can also be translated as "cyber great power." However, Chinese sources consistently assign the strategy, and the information revolution on which it capitalizes, a scope that exceeds common Western conceptions of the term "cyber." The "network" of network great power refers to a new competitive domain and the tools with which to attack it.[6] This domain has been created by the IT revolution but extends beyond the realm of IT, encompassing the real as well as the virtual. As Feng Yangsong of the e-commerce research expert group at the Ministry of Commerce put it in 2016, "Like steam power in the first industrial revolution and electricity in the second, internet technology is not limited to any specific field, but has penetrated the entire social and industry chain."[7]

Accordingly, China's network power framing includes both the physical and the virtual. Chinese discourse and policy emphasize that data and other informational resources are the "new production factors," while the Internet of Things is the "new infrastructure" in the modern digital revolution.[8] However, both overlap with legacy and physical production and infrastructure. Chinese policy and leadership from Xi Jinping on down call for the "integration of

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[6] Feng Yahui, Mao Shengbing, and Wang Lei, "Xianjin guojia wangluo anquan rencai peiyang jizhi fenxi ji qishi" [Analysis and Enlightenment of Network Security Talents Training Mechanism in Advanced Countries], *Military-Civil Fusion Cyberspace*, no. 6 (2020): 43–49.

[7] Zhao Xiaomeng and Kou Shangwei, *Nongye hulianwang: Chanye hulianwang de zuohou yipian lanhai* [Agricultural Internet: The Last Blue Ocean of Industrial Internet] (Beijing: China Machinery Industry Press, 2016).

[8] "Fenfayouwei, zhashi tuijin wangluo qiangguo jianshe" [Work Hard and Steadily Promote the Building of a Network Great Power], *Network Communication*, no. 4 (2020): 9–18.

informatization and industrialization"[9] as well as the "integrated development of the real economy and digital economy."[10]

The network great-power project is frequently framed as a twin to the manufacturing great-power project enshrined in the Made in China 2025 plan. The two ambitions are unified through the integration of informatization and industrialization.[11] Their relationship is spelled out in a 2020 *Qiushi* article by the Party Group of the Ministry of Industry and Information Technology (MIIT). Establishing that accelerated "construction of a manufacturing great power and a network great power is an inherent requirement for building a new development pattern," the article explains the interaction between the two fields as follows: "The key to industry and information technology is to realize the smooth flow of economic circulation and industry linkages" and to ensure proper connections among "production, distribution, circulation, and consumption." In other words, IT promises control over production and flow of resources. If China can harness such control, the country can "integrate more deeply into the global industrial supply chain and division of labor" to its benefit.[12]

Moreover, China's network power framing and ambitions extend to other virtual elements of the modern system that are less commonly associated with Western conceptions of the "cyber" domain. For example, Zhao Xianquan of the Central Radio and Television Strategy describes the role of radio and television in supporting China's move from a "network big power to a network great power."[13] He outlines plans to "accelerate the promotion of China's international discourse power in network space, make full use of the global communication characteristics of the internet, express China's position, tell

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[9] The concept of "integration of informatization and industrialization" was proposed in the report of the 17th National Congress of the Chinese Communist Party. See Zhou Hongren, "Dali tuijin xinxihua yu gongyehua de ronghe" [Vigorously Promote the Integration of Informatization and Industrialization], *Zhongguo xinxihua* 3, no. 1 (2008).

[10] See, for example, Xi Jinping, "Zai wangluo anquan he xinxihua gongzuo zuotanhui shang de jianghua" [speech at the Symposium on Network Security and Informatization], Xinhua, April 19, 2016.

[11] Ministry of Industry and Information Technology (PRC), "Jianding buyi jianshe zhizao qiangguo he wangluo qiangguo."

[12] Ibid. According to the article, this integration creates dual promotion of the international and domestic cycles.

[13] In the simplest terms, "network big power" refers only to quantity, while "network great power" refers to quality as well as quantity. China's scale of network users and connections makes it a network big power. Network great-power status requires leading industry and technology, government control, and, broadly, global competitiveness. An analysis of Xi's network great power by Ni Guangnan at the Chinese Academy of Engineering states the following: "Network great power can be summed up in 16 characters: Clear strategy, advanced technology, leading industry, and integrated offense and defense. Measured by this, China is just a network big power rather than a network great power." Cited in Qin Zhiwei, "Jianshe wangluo qiangguo de 'si da mubiao'" [The Four Goals of Building a Network Great Power], *China Science News*, January 18, 2019.

Chinese stories, and use Chinese voices to create a good international public opinion environment."[14]

A GLOBAL, COMPETITIVE AMBITION

The network great-power strategy is designed to capture the leapfrog opportunities of the digital revolution. "The current and future period is one of major strategic opportunities for China to move from a large manufacturing and network country to a manufacturing great power and a network great power," advised Chen Zhaoxiong, deputy minister of MIIT, in 2019. He continued:

> Throughout the history of world civilization, every technological revolution and industrial transformation has brought incalculable effects to and influences on human society, triggering a profound adjustment of the global economic and political structure. In the period of starting and rapid development, new historical opportunities are endless but fleeting; this is an important window of opportunity to achieve leapfrog development.... In the face of major development opportunities, whoever can follow the trend of development, grasp the historical trend, and make the first move will win the development initiative (*yingde fazhan zhudong*).[15]

Zheng Anqi of the China Academy of Information and Communications Technology describes Beijing's strategy in terms of a competitive, international contest: "Building a network great power is the key to seizing the commanding heights of the new round of industrial competition.... The arena of competition among major powers has shifted to network space."[16] The Party Group of MIIT argues that "industry and information technology are…in the vortex of global competition."[17]

This competition plays out in a globalized arena where resources are constantly exchanged, and the space that permits their exchange—the

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[14] Zhao Xianquan, "Wangluo qiangguo zhanlue yu guangdian xin lu di" [Network Great-Power Development Strategy and New Space for Radio and Television], *China Radio*, no. 8 (2019): 1. Zhao also suggests that the ambition is a competitive one vis-à-vis the United States.

[15] Chen Zhaoxiong, "Tuijin gongye he xinxihua gao zhiliang fazhan" [Promote the High-Quality Development of Industry and Informatization], *Wangxin Junmin Ronghe*, July 9, 2019.

[16] Zheng Anqi, "Lizu xianshi jichu tuidong wo guo wangluo qiangguo jianshe" [Promote My Country's Network Power Construction Based on Reality], *Communication Management and Technology*, no. 3 (2020).

[17] Ministry of Industry and Information Technology (PRC), "Jianding buyi jianshe zhizao qiangguo he wangluo qiangguo."

network—becomes the object of the competition. A 2019 piece in *People's Rule of Law* explains:

> Whoever has the information, whoever has the network, will own the entire world. In the world, countries that have mastered the core technology of the network can influence or even manipulate the entire world internet system, can formulate the rules of the internet industry's games such that they suit their interests. This is a hidden, difficult-to-detect, doctrine of hegemony.[18]

Beijing assesses that the resultant competitive dynamic may play to China's strengths. First, scale grants a particular advantage in the information era. "In the era of digital economy," explains Tao Guolin of the Baiyin Chinese People's Political Consultative Conference, "the greatest wealth is in numbers and the greatest strength is also in numbers."[19] In sum, China has scale.

Scale alone is of course insufficient. Network great-power status also demands advanced technology, industry, and infrastructure. In past industrial revolutions, acquiring those required cutting-edge innovative capacity, an area where China admits that it continues to lag.[20] However, the globalized environment—which allows resources, including technological resources, to be exchanged relatively freely—may make innovative capacity a less determinative input. "Talent and Innovation Lead Economic Globalization's Flows," reads a 2016 headline in *China Youth Daily*.[21] With talent and innovation flowing, the contest becomes one to control the channels of their movement: networks.

Finally, Xi Jinping suggests that network great-power ambitions are impossible without relative autonomy. The great vulnerability in the network contest is dependence: "If core components rely heavily on foreign countries and the 'life gate' of the supply chain is in the hand of others, it is like building a house on someone else's foundation. No matter how big and beautiful it is, it will not withstand wind and rain, or a strike."[22] On this front, too, China's centralized, controlled economic and network system might grant it an advantage.

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[18] Si Chunlei and Chen Jingjing, "Xin shidai wo guo wangluo kongjian anquan mianlin de tiaozhan ji yingdui" [The Challenges and Countermeasures of My Country's Network Space Security in the New Era], *People's Rule of Law*, 2019.

[19] Tao Guolin, "Shuzi jingji yu shiti jingji jiang shendu ronghe fazhan" [Digital Economy and Real Economy Will Be Deeply Integrated and Developed], *Economy*, no. 12 (2020): 31.

[20] Industrial Internet Research Group of Wuhan University, "'Shisiwu' shiqi gongye hulianwang gao zhiliang fazhan de zhanlue sikao" [Strategic Thinking on the High-Quality Development of Industrial Internet in the "14th Five-Year Plan" Period], *China Soft Science* 5 (2020): 1–9.

[21] Wang Huiyao, "Rencai he chuangxin zhudao jingji quanqiuhua liudong" [Talent and Innovation Lead Economic Globalization's Flows], *China Youth Daily*, June 8, 2016.

[22] Xi, "Zai wangluo anquan he xinxihua gongzuo zuotanhui shang de jianghua."

THE SIX PILLARS OF THE
NETWORK GREAT-POWER STRATEGY

The six key pillars of the network great-power strategy stem from, and capitalize on, this competitive diagnosis. With the first pillar—construction of physical and virtual information infrastructure, at home and abroad—Beijing is cultivating scale. Wang Xinhuan and Liu Tian of the China Academy of Information and Communications Technology express confidence about China's domestic network great-power building because of the project's scale as measured by user connection, physical infrastructure (e.g., telecommunications base stations, Internet Protocol version 6 infrastructure, and Narrowband–Internet of Things network size), and virtual platform size (e.g., e-commerce and e-payment). They highlight that China boasts the world's highest number of 4G users and largest Narrowband–Internet of Things network.[23] Cao Miao of the China Academy of Information and Communications Technology expresses similar confidence about the international dimension of China's project, pointing to a global infrastructure layout that increasingly challenges the reach of U.S. and European systems.[24] Focusing on a different kind of scale, the Ministry of Natural Resources and its local branches assess network great-power implementation in terms of the types and quantity of resources integrated into their information platforms.[25]

The next two pillars, mastering core technology and strengthening network security, are intended to shore up domestic autonomy. "Core technology" refers to technologies like high-end integrated circuits, key materials, basic software, and sensors that are foundational for IT applications and the Internet of Things. Per Xi Jinping, "the core technology of the internet is our biggest life gate and the control of core technology by others is our biggest hidden danger."[26]

Similarly, the fourth pillar, cyber governance, depends on Chinese Communist Party (CCP) control. "It is necessary to improve comprehensive network governance," declared Xi in 2018, "and form a comprehensive grid

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[23] Wang and Liu, "Xuexi guanche Xi Jinping zongshuji wangluo qiangguo zhongyao sixiang jiakuai tuijin wangluo."

[24] Cao Miao, "Xinxi tongxinye guojihua zhanlue cuoshi yanjiu" [Study on Strategic Measures for Internationalization of the Information and Communication Industry], *Information and Communication Technology*, no. 14 (2020): 57–62.

[25] "Ziran ziyuan bu xinxi hua jianshe zongti fang'an" [The Overall Plan for the Information Construction of the Ministry of Natural Resources], Ministry of Natural Resources (PRC), November 2019; and "Duo gui he yi shuzi zhili" [Multi-Compliance and One Digital Governance], *China Construction Information*, no. 21 (2020).

[26] Xi, "Zai wangluo anquan he xinxihua gongzuo zuotanhui shang de jianghua."

bureau that combines party committee leadership, government management, corporate responsibility, social supervision, and self-discipline of netizens."[27] In other words, the party provides core leadership of the network space, guiding its layout. The government provides administrative management, overseeing implementation. Companies execute, "expanding market space and improving competitiveness" overseas. Social organizations advise and supervise. Netizens participate.[28]

This system of network governance is intended to ensure CCP control over the technological, market, and physical dimensions of China's network efforts both at home and abroad, even as Chinese companies fuel them and China's population generates scale. The party's role is also to shape content and disseminate CCP ideology, thereby influencing values, opinions, and actions. In 2016, Xi described the imperative to "give play to the role of the network in guiding public opinion."[29] Authors from the Chinese Academy of Social Sciences interpret his language in straightforward terms: the idea is to "use new mainstream media communication power, guidance, influence, and credibility to guide the people's specific practices and daily behavior."[30] A 2020 compilation of Xi's statements about network governance notes that these ambitions extend internationally, through global information-sharing platforms.[31]

The next pillar of the strategy—talents—leverages the technological fruits of the open, globalized environment. In 2016, Xi described the network competition as a "talent competition."[32] However, he did not suggest that those talents must be homegrown: "It is necessary to gather talents from all over the world and use them to provide strong talent support for the development of China's network industry."[33] Parsing Xi's network great-power theory, Wu Qing of the Hunan Provincial Party School describes a "two-pronged approach of self-reliance and the introduction of foreign aid to create top-level scientists,

[27] "Xi Jinping hui jiu wangluo qiangguo xin shidai" [Xi Jinping Paints a New Era], CCTV, April 25, 2018.

[28] Wu Shijuan, "Wangluo kongjian zhili xiandaihua: Yiyi, zuzhi yu tuijin tujing" [Modernization of Cyberspace Governance: Significance, Obstacles and Ways to Advance], *Journal of Nanjing University of Science and Technology* 33, no. 3 (2020): 38–43.

[29] Xi, "Zai wangluo anquan he xinxihua gongzuo zuotanhui shang de jianghua."

[30] Huang Chuxin and Liu Meiyi, "Zou xiang xin shidai wang xin shiye zui qiang yin" [Play the Strongest Voice in the New Era of Cyberspace], *Network Communication*, no. 8 (2020): 12–15.

[31] Qin Youjun et al, "Xi Jinping guanyu wangluo shehui zhili de zhongyao lunshu yanjiu" [Research on Xi Jinping's Important Statements on the Governance of Network Society], *Journal of Panzhihua University* 37, no. 4 (2020): 30–35.

[32] Xi, "Zai wangluo anquan he xinxihua gongzuo zuotanhui shang de jianghua."

[33] Ibid.

engineers, and innovative teams, allowing China to occupy a larger state in the internet field and firmly control the 'life gate of the internet.'"[34]

Buoyed by those resources of globalization, the network great-power strategy targets rulemaking power over the emerging global architecture—the sixth pillar. According to Xi, IT has "turned the world into a 'global village.'"[35] It has created universal platforms of international exchange and rules governing that exchange, which Beijing works to oversee and set. Xi describes the effort as one to develop a "heightened international voice in cyberspace" and greater "rulemaking power."[36] Gao Yuan and Yang Yaohui of the National University of Defense Technology offer a clear interpretation of China's purpose in this pillar: Beijing "builds a community with a shared future in cyberspace and enhances its discourse power in cyberspace, establishing a position that aligns with its status as a major country and expanding its comprehensive strength and influence in cyberspace."[37] In other words, China works to set international rules to project international power. Mechanisms for doing so include China-based programs like the World Internet Conference, China-led international programs like the Digital Silk Road, and bilateral partnerships and influence over multilateral standards-setting institutions.

CONCLUSION

The network great-power strategy, as reflected in its six pillars, entails a delicate balance between protecting domestic systems and integrating the country into the globalized system. Chinese sources acknowledge as much. Discussing the "philosophical foundation of network great power," Jiang Xiaoming and Li Wenjing of Mudanjiang Normal University argue that "it is not feasible to engage in network construction behind closed doors." They elaborate: "We must adopt an open attitude to draw on and absorb foreign advanced technology and experience. However, opening up is not the

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[34] Wu Qing, "Xi Jinping wangluo qiangguo zhanlue sixiang de yiyun chan lun yu jianxing celue" [The Interpretation Theory and Practicing Strategy of Xi Jinping's Strategic Thought of Network Power], *Pandeng* 38, no. 6 (2019): 8–14.

[35] "Full Transcript: Interview with Chinese President Xi Jinping," *Wall Street Journal*, September 22, 2015.

[36] "Shiba da yilai Xi Jinping guanyu wangluo qiangguo zhanlue de jingcai lunshu zhaibian" [Excerpts from Xi Jinping's Wonderful Expositions on the Network Great-Power Strategy since the 18th National Congress], Hebei Provincial Government, June 15, 2020.

[37] Gao Yuan and Yang Yaohui, "Cong guojia wangluo qiangguo zhanlue kan jundui xinxi qiang jun" [Viewing the Strengthening of the Army by Information from the National Network Great-Power Strategy Perspective], *Military-Civil Fusion on Cyberspace*, no. 10 (2019): 29–33.

same as letting go. Nor does it mean that we must go abroad and lose our independence." They call China's response "the dialectical unity of openness and autonomy."[38]

Such unity is a long-standing component of China's competitive orientation. It undergirds the four-decades-old "two markets, two resources" theory, which proposes that China integrate with foreign markets and resources while maintaining relative control over its own market and resources. Historically, this approach has allowed China to develop asymmetric access to, and influence over, global markets.[39] Over the past decade, an expanded framing as "two markets, two resources, two rules" (*liang zhong ziyuan, liang ge shichang, liang lei guize*) has begun to appear.[40] This expansion could indicate codification of China's new, rule-setting ambitions. It also indicates an interplay between those ambitions and China's asymmetric access to markets and resources.

The network great-power strategy lays out a roadmap for China's rule-setting ambitions in the digital domain and the balance of openness and autonomy undergirding them. As a new, IT-empowered world emerges, Beijing is working to define its network architecture. The United States shaped the last such definition in the late 1940s and 1950s, resulting in a U.S.-led world order. China's network great-power strategy outlines a blueprint that might allow China to claim precisely that sort of structural advantage in the digital era.

The nature of IT is such that China's resultant influence could be greater than that of the United States today. The status of the dollar allows the United States to benefit from lower relative costs of capital. If China builds and scales the dominant global e-payment systems, it could acquire an equivalent advantage. On top of that, it could also obtain visibility into and even leverage over international transactions. This would be

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38 Jiang Xiaoming and Li Wenjing, "Xin shidai wangluo qiangguo zhanlue sixiang de zhexue diyun" [The Philosophical Foundation of the Strategic Thought of Network Power in the New Era], *Journal of Mudanjiang Normal University*, 3 (2020): 48–57. Their research is supported by the National Social Science Fund.

39 Emily de La Bruyère and Nathan Picarsic, "Two Markets, Two Resources: Documenting China's Engagement in Africa," U.S.-China Economic and Security Review Commission, November 2020.

40 Hong Xianghua and Yang Runcong, "Tigao tongchou guonei guoji liang ge daju de nengli" [Improve the Ability to Coordinate the Overall Domestic and International Situations], China Discipline Inspection and Supervision Report, October 23, 2018; and "Shixian kaifang fazhan bixu jianchi tongchou guonei guoji liang ge daju" [To Achieve Open Development, We Must Insist on Coordinating Domestic and International Situations], Ministry of Commerce (PRC), February 15, 2016.
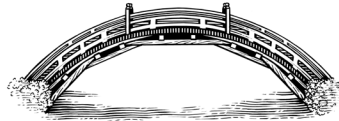
analogous to China becoming Amazon, whereas the United States has been Walmart.

The United States and China are candidates for systemic leadership at an inflection point that will shape the world. Today's determinative IT contest is not about the best, newest, or shiniest digital technologies. It is about defining the international architecture. ◈

China's Drive for Innovation within a World of Profound Changes

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EXECUTIVE SUMMARY

This essay examines China's drive for innovation as part of its national development strategy and addresses the tensions China faces between retaining control and autonomy in relevant sciences and technologies and becoming a global leader in these fields.

MAIN ARGUMENT

The Chinese Communist Party (CCP) has assessed that the world is undergoing "profound changes unseen in a century" in part as a result of rapid advances in science and technology. The Covid-19 pandemic has heightened the impact of these changes and added to the disruption of the current global order. Such conditions present unique challenges and opportunities for China in the course of its national rejuvenation. Xi Jinping has accelerated the pursuit of China's rise as a great power, and the 14th Five-Year Plan highlights the country's capacity for innovation and to leverage science and technology in pursuit of that objective. Progress toward this goal, however, has been uneven. Although China aspires to be a new "high ground" in science and technology, the capacity for innovative Chinese technologies to go global may be undermined by a deficit of trust and transparency. If China does emerge as a leader in new frontiers of innovation in the course of the fourth industrial revolution, this shift could present significant implications for the future balance of power.

POLICY IMPLICATIONS

- China's drive for innovation will continue to confront certain incongruities. While the CCP has prioritized innovation, the imperative of party control may undermine the necessary conditions for it. And while China has risen within and benefited from a world of open science, intense competition in the geopolitical environment is complicating that paradigm.

- China and its technology companies have shown increasing technological prowess (e.g., in coping with the Covid-19 pandemic) but still face technical impediments to overcoming strangleholds in key areas, such as semiconductors, that act as chokepoints.

- For the U.S. to sustain its traditional leadership in science and technology, it will need to revitalize and reinvest in innovation domestically.

The Chinese Communist Party (CCP) has assessed that the world is undergoing "profound changes unseen in a century" (*bainian wei you zhi da bianju*), under which conditions its quest for national rejuvenation must occur.[1] This determination, officially proposed and endorsed as of June 2018, has become a central element of China's diplomacy and outlook on the current international environment.[2] These profound changes allude to historic transitions in the balance of power that are believed to be occurring against the backdrop of the fourth industrial revolution, with ongoing scientific and technological transformations across societies, economies, and militaries.[3] The CCP seeks to remain a "learning party" (*xuexi dang*) that can adapt to such changes, which are already presenting unique challenges and opportunities for China's rise as a great power.[4] China's drive to assume global leadership within new frontiers of innovation has targeted domains of science and technology in which the United States may not possess or be able to maintain traditional advantages, thereby allowing China to progress toward "overtaking around a corner" (*wan dao chaoche*).[5] Indeed, innovation has come to be seen as an integral element of today's great-power rivalries.

INNOVATION IN CHINA'S NATIONAL REJUVENATION

Innovation has emerged as a priority within China's national strategy and Xi Jinping's ideology. Starting during the 13th Five-Year Plan, a paradigm of "innovation-driven" development has been at the center of China's agendas for economic growth and military modernization. In May 2016, China's State

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1 These objectives were raised during the Fifth Plenum and rearticulated with the 14th Five-Year Plan. See "Zhonggong zhongyang guanyu zhiding guomin jingji he shehui fazhan di shisi ge wu nian guihua he er ling sanwu nian yuanjing mubiao di jianyi" [Proposal of the CCP Central Committee on Formulating the 14th Five-Year Plan for National Economic and Social Development and the Long-Term Goals for 2035], Xinhua, November 3, 2020 ❧ http://www.gov.cn/zhengce/2020-11/03/content_5556991.htm.

2 For a more extensive assessment of this concept, see M. Taylor Fravel, "Testimony before the U.S.-China Economic and Security Review Commission Hearing on U.S.-China Relations at the Chinese Communist Party's Centennial," January 28, 2021 ❧ https://www.uscc.gov/sites/default/files/2021-01/M_Taylor_Fravel_Testimony.pdf.

3 For another commentary on this topic, see Chen Xiangyang, "Bainian wei you zhi da bianju, 'bian' zai na?" [What Is the "Change" in Profound Changes Unseen in a Century?], *People's Daily*, August 23, 2019 ❧ http://www.qstheory.cn/international/2019-08/23/c_1124913320.htm.

4 For a relevant commentary on these themes, see, for instance, Yang Xiaowei, "Kan qing 'bainian wei you zhi da bianju' zhong de keji bianliang" [See Clearly the Technological Variables in the "Big Change Unseen in a Century"], *Guangming Daily*, June 24, 2020 ❧ http://theory.people.com.cn/n1/2020/0624/c40531-31757983.html.

5 "Woguo jichu yanjiu bujin yao 'wan dao chaoche' geng yao 'lingpiqijing'" [My Country's Basic Research Not Only Must "Overtake on a Curve" but Also Must "Open a New Path"], Xinhua, March 5, 2018 ❧ http://www.xinhuanet.com/tech/2018-03/05/c_1122486166.htm.

Council and Politburo jointly released the Strategic Guideline for National Innovation-Driven Development (Guojia chuangxin qudong fazhan zhanlue gangyao), an initiative that linked innovation with China's prospects to become a great power. It states the following:

> The drive for innovation influences the fate of the nation. The core support for national power is the capability to innovate in science and technology. Those nations that are powerful in innovation can flourish, while those that are weak in innovation are imperiled. The primary reason for our nation's modern backwardness and suffering of beatings is that China just missed the previous scientific and technological revolution, resulting in technological weaknesses and shortcomings in our national strength.[6]

In this view, China's historical weakness was the outcome of a failure to keep pace with the technologies of the times. Thus, Beijing seeks to mitigate the risks of technology surprise, fearing the prospect of a "generation gap" relative to competitors, especially in dual-use and military technologies.[7] In particular, "science and technology have never before so profoundly influenced the future and fate of nations, and have never before so profoundly influenced the lives and welfare of the people, as they do today," as Xi declared in a 2018 speech.[8] China's rejuvenation requires urgent action at this critical crossroads to become the "high ground of innovation."[9] Success in science and technology can also be touted in propaganda as an indicator of China's overall success, thereby contributing to the CCP's legitimacy.

China's pursuit of innovation has been complex, involving a multitude of plans and programs carried out across decades and generations of leadership. These myriad initiatives directed by the state have been inconsistent in their outcomes, corresponding with rapid progress, including that enabled in certain instances by the absorption of foreign technology, yet also falling short of targets and expectations.[10] The science and technology plans in effect

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[6] "Zhonggong zhongyang guowuyuan yinfa 'guojia chuangxin qudong fazhan zhanlue gangyao'" [The CCP Central Commission and State Council Release the "Outline of the National Innovation-Driven Development Strategy"], Xinhua, May 19, 2016 ∽ http://news.xinhuanet.com/politics/2016-05/19/c_1118898033.htm.

[7] State Council Information Office (PRC), Xin shidai de Zhongguo guofang [China's National Defense in the New Era] (Beijing, July 24, 2019), available at http://www.xinhuanet.com/politics/2019-07/24/c_1124792450.htm.

[8] "Become the World's Primary Center for Science and High Ground for Innovation," trans. Ben Murphy et al., DigiChina, March 18, 2021 ∽ https://digichina.stanford.edu/news/xi-jinping-strive-become-worlds-primary-center-science-and-high-ground-innovation.

[9] Ibid.

[10] See Tai Ming Cheung et al., "Planning for Innovation: Understanding China's Plans for Technological, Energy, Industrial, and Defense Development," a report prepared for the U.S.-China Economic and Security Review Commission, July 28, 2016 ∽ https://www.uscc.gov/research/planning-innovation-understanding-chinas-plans-technological-energy-industrial-and-defense.

today continue a tradition that dates back to early national "megaprojects" that were launched to advance strategic priorities, starting with "two bombs, one satellite," the initiative through which China developed its first atomic bomb, intercontinental ballistic missile, and satellite in 1956.[11] This effort established a distinct paradigm of "big science"[12] that has continued across consecutive five-year plans. This approach also shaped the National Medium- and Long-Term Plan for Science and Technology Development (2006–20), which will be followed by a successor program for the next fifteen years (2021–35).[13] These plans have promoted a range of major programs and megaprojects that have achieved traction in priority domains and emerging industries. For instance, aero-engines, brain science, robotics, and quantum computing and communications were prioritized in 2015 for breakthroughs by 2030, and artificial intelligence (AI) was later added to that lineup.[14]

However, whether the party-state system can be effective in transitioning the country from being a fast follower to being a true leader in strategic technologies remains to be seen. Beyond catching up, the current aspiration that motivates today's initiatives is to pursue more truly original innovation, which has necessitated increased investments in basic research and reforms to science and technology management. In addition to these central priorities, China's party-state has also looked to pursue market investment by leveraging the role of private capital and enterprises in commercializing innovation. While the quantity of China's output in patents and publications has increased significantly over time, the quality has in some cases lagged.[15] In fact, the transition to "high-quality development" that CCP leaders have prioritized has occurred unevenly, and at times haltingly, across various industries.[16] Even though China has surpassed the United States in the total volume of scientific publications across several disciplines, a big gap continues to exist between

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[11] For context and historical perspective, see Evan A. Feigenbaum, *China's Techno-Warriors: National Security and Strategic Competition from the Nuclear to the Information Age* (Stanford: Stanford University Press, 2003).

[12] Hao Xin and Gong Yidong, "China Bets Big on Big Science," *Science* 311, no. 5767 (2006): 1548–49.

[13] Sylvia Schwaag Serger and Magnus Breidne, "China's Fifteen-Year Plan for Science and Technology: An Assessment," *Asia Policy* 4 (2007): 135–64.

[14] State Council Information Office (PRC), "Guowuyuan guanyu yinfa 'shisanwu' guojia keji chuangxin guihua de tongzhi" [The State Council's Notice Regarding the Publication of the 13th Five-Year National Science and Technology Innovation Plan], August 8, 2016 ～ http://www.gov.cn/zhengce/content/2016-08/08/content_5098072.htm.

[15] Marius Zaharia, "Trade War or Not, China Is Closing the Gap on U.S. in Technology IP Race," Reuters, April 13, 2018 ～ https://www.reuters.com/article/us-usa-trade-china-intellectualproperty/trade-war-or-not-china-is-closing-the-gap-on-u-s-in-technology-ip-race-idUSKBN1HK187.

[16] "China to Promote High-Quality Development in a New Era, Officials Say," CGTN, December 13, 2019 ～ https://news.cgtn.com/news/2019-12-13/China-to-promote-high-quality-development-in-a-new-era-says-officials-MnV1ali9AA/index.html.

the two countries in basic and original research.[17] China's contributions have been undoubtedly significant to the growth of the global economy, and that impact is expected to only increase in the years to come.[18] Nonetheless, up until now, China might still have been considered a "dark horse," as described by Xue Lan, director of the China Institute for Science and Technology Policy at Tsinghua University.[19] Yet, despite the disparities that persist between aspiration and actualization, truly "made in China" innovation has also started to deliver tangible benefits, including in moments of crisis.

INNOVATION IN AN AGE OF PANDEMICS

China's capacity to leverage science and technology during the Covid-19 pandemic and in stimulating national recovery may have major impacts for the future balance of technological power. Yuan Peng of the China Institutes of Contemporary International Relations noted:

> The pandemic once again revealed the power of science and technology. One of the reasons that China was able to stabilize and control the situation relatively quickly was that she drew on innovations and developments in science and technology over recent years, including Big Data, health codes, express delivery practices, various tracing technologies, electronic payment systems, grid management, etc.[20]

Indeed, at the height of the pandemic, drones and driverless vehicles were utilized for disinfection and in supporting the delivery of food and medical supplies.[21] The country's large-scale surveillance capabilities, enabled by AI, contributed to identifying infected individuals, while advances in big data analytics helped forecast the spread of the virus.[22] Chinese technology companies have taken on

17 "State of U.S. Science Enterprise Report Shows U.S. Leads in S&E as China Rapidly Advances," National Science Foundation, January 18, 2018 ∼ https://www.nsf.gov/news/news_summ. jsp?cntn_id=244271.

18 Qingnan Xie and Richard B. Freeman, "Bigger Than You Thought: China's Contribution to Scientific Publications and Its Impact on the Global Economy," *China and World Economy* 27, no. 1 (2019): 1–27.

19 "Xue Lan: 'Shisiwu' shiqi Zhongguo de keji chuangxin" [Xue Lan: China's Scientific and Technological Innovation during the "14th Five-Year Plan" Period], *Science and Technology Daily*, January 29, 2021 ∼ http://www.stdaily.com/shipin/ktbj/2021-01/29/content_1077144.shtml.

20 Yuan Peng, "The Coronavirus Pandemic and a Once-in-a-Century Change," trans. by David Ownby, Reading the China Dream, June 17, 2020 ∼ https://www.readingthechinadream.com/yuan-peng-coronavirus-pandemic.html.

21 "Driverless Delivery Van Startup Sees Demand Surge amid Outbreak," Bloomberg, March 8, 2020 ∼ https://www.bloomberg.com/news/articles/2020-03-08/they-won-t-catch-the-virus-so-chinese-robovan-maker-s-sales-jump.

22 "Asian Cities Harness Big Data and AI for Contact Tracing," *Nikkei Asia*, June 6, 2020 ∼ https://asia.nikkei.com/Business/Technology/Asian-cities-harness-big-data-and-AI-for-contact-tracing.

especially prominent positions in such endeavors. For instance, Baidu provided an algorithm, known as LinerFold, for free use by epidemic control centers and research institutions to contribute to identifying the secondary structure of the virus's RNA.[23] Within several Chinese hospitals, AI systems were introduced to assist with diagnosis or provide guidance on treatments.[24]

Science and technology also have been at the center of China's agenda for recovery from the pandemic. Chinese leaders sought to be the "first to control the epidemic," the "first to resume work and production," and the "first to achieve economic growth from negative to positive," as initially highlighted during the Central Economic Work Conference in December 2020.[25] These "three firsts" have been critical prerequisites to the restoration of normal economic activities. The pursuit of positive growth also motivated the introduction of a $1.4 trillion initiative for "new-type infrastructure" focusing on building up indigenous capabilities in AI, 5G, big data, and the Internet of Things, among other priorities.[26] This emphasis on infrastructure may play to the strengths of China's system, such as the capacity to concentrate efforts on major tasks, integrate and optimize resource allocation, and overcome the disadvantages of fragmentation and duplication.[27] In the aftermath of the pandemic, which is seen as having tested but ultimately proved the institutional superiority of their system of governance, CCP leaders believe China remains in "a period of important strategic opportunities,"[28] whereas the United States, by contrast, is believed to be in decline.[29]

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[23] Liang Huang et al., "LinearFold: Linear-Time Approximate RNA Folding by 5'-to-3' Dynamic Programming and Beam Search," *Bioinformatics* 35, no. 14 (2019): i295-i304.

[24] "Yiqing shiqi de AI: Zhihui yiliao shidai jichi er lai" [AI during the Epidemic Period: The Era of Smart Medical Care Is Coming], Yicai, July 4, 2020 ⌇ https://www.yicai.com/news/100687646.html.

[25] "Kaiju 'shisiwu' kaiqi xin zhengcheng—cong 2020 nian zhongyang jingji gongzuo huiyi kan yi XiJinping tongzhi wei hexin de dang zhongyang mouhua 'shisiwu' kaiju qibu" [Beginning the "14th Five-Year Plan" and Starting a New Journey—From the 2020 Central Economic Work Conference, the Party Central Committee with Comrade Xi Jinping at the Core Is Planning the Beginning of the "14th Five-Year Plan"], Xinhua, December 20, 2020 ⌇ http://politics.people.com.cn/n1/2020/1220/c1001-31972695.html.

[26] Liza Lin, "China's Trillion-Dollar Campaign Fuels a Tech Race with the U.S.," *Wall Street Journal*, June 11, 2020 ⌇ https://www.wsj.com/articles/chinas-trillion-dollar-campaign-fuels-a-tech-race-with-the-u-s-11591892854.

[27] Ibid.

[28] "Xi Jinping: Guanyu 'zhonggong zhongyang guanyu zhiding guomin jingji he shehui fazhan di shisi ge wu nian guihua he er ling sanwu nian yuanjing mubiao di jianyi' de shuoming" [Xi Jinping: Explanation of the "Proposals of the CCP Central Committee on Formulating the 14th Five-Year Plan for National Economic and Social Development and Long-Term Goals for 2035"], Xinhua, November 3, 2020 ⌇ https://web.archive.org/web/20201212142251/http://www.xinhuanet.com/politics/leaders/2020-11/03/c_1126693341.htm.

[29] Zhang Yuyan, "Lijie bainian wei you zhi da bianju" [Understand the Profound Changes Unseen in a Century], *International Economic Review*, September 18, 2019 ⌇ http://www.qstheory.cn/defense/2019-09/18/c_1125010363.htm.

China's efforts to expand its digital economy and several emerging industries could create strategic implications if the rapid growth of these critical sectors enables its economy to surpass that of the United States. China's digital economy increased in scale from 11.0 trillion yuan ($1.6 trillion) to 35.8 trillion yuan (over $5 trillion) between 2012 and 2019.[30] As of 2019, the digital economy accounted for 36.2% of China's GDP, and this share of the economy continued to grow in the wake of the Covid-19 pandemic.[31] The added value of China's emerging industries was estimated to account for 11.5% of GDP, an increase of 3.9 percentage points from 2014.[32] Seeking to sustain growth despite the turbulence, the policy document "Guiding Opinions on Expanding Investment in Strategic Emerging Industries and Cultivating Strengthened New Growth Points and Growth Poles," introduced in the fall of 2020, elevated and reaffirmed development priorities with the National Development and Reform Commission as the lead.[33] Among industries highlighted in the document were 5G networks, biotechnology, new materials, new energy technologies, green technologies, smart and new energy vehicles, and creative digital businesses.[34] Evidently, the party-state is betting on these new sources of growth to overcome potential countervailing trends.

The pandemic also reinforced China's concerns with biosecurity and biotechnology innovation, while revealing potential shortcomings in the country's current capabilities. Chinese institutions were among the first to create viable vaccines, which quickly progressed from testing to trials in priority populations, including the military. The five vaccines developed in China in the first year of the pandemic have been simpler in design than those produced by U.S. companies Pfizer and Moderna, and use an inactivated version of the virus—an approach that has advantages in ease of storage and

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[30] Ouyang Shijia, "Digital Economy to Inject Impetus," *China Daily*, September 7, 2020 ∾ https://www.chinadaily.com.cn/a/202009/07/WS5f557848a310675eafc57cf9.html.

[31] Ibid.

[32] "Fazhan gaige wei jiu 'guanyu kuoda zhanlue xing xinxing chanye touzi peiyu zhuangda xin zengzhang dian zengzhang ji de zhidao yijian' da jizhe wen" [The National Development and Reform Commission Answers Reporters' Questions on the "Guiding Opinions on Expanding Investment in Strategic Emerging Industries and Cultivating Strengthened New Growth Points and Growth Poles"], National Development and Reform Commission (PRC), September 24, 2020 ∾ http://www.gov.cn/zhengce/2020-09/24/content_5546618.htm.

[33] See "New Chinese Ambitions for 'Strategic Emerging Industries,' Translated," trans. Elsa Kania et al., New America, September 29, 2020 ∾ https://www.newamerica.org/cybersecurity-initiative/digichina/blog/new-chinese-ambitions-strategic-emerging-industries-translated.

[34] National Development and Reform Commission (PRC), "Guanyu kuoda zhanlue xing xinxing chanye touzi peiyu zhuangda xin zengzhang dian zengzhang ji de zhidao yijian" [Guiding Opinions on Expanding Investment in Strategic Emerging Industries and Cultivating Strengthened New Growth Points and Growth Poles], Document no. 1409, 2020.

transport, which facilitates international distribution at scale.[35] By contrast, the Pfizer and Moderna vaccines, based on mRNA technology, have proved far more effective but require exquisite conditions to be transported, and Chinese research is only just starting to leverage this technique.[36] The success of China's efforts in vaccine development, including the capacity to scale up production, has allowed Beijing to conduct "vaccine diplomacy," raising some concerns about global influence and potential leverage in such a moment of crisis.[37]

However, the lack of transparency, as well as questions of ethics and informed consent that have arisen in the process, have undercut confidence in these offerings. China's failure to release the data and results from clinical trials provoked concerns about the reliability of its vaccines in distribution across a growing number of countries, as have oblique admissions of potential limitations. "We will solve the issue that current vaccines don't have very high protection rates," declared Gao Fu, director of the Chinese Center for Disease Control and Prevention, in April 2021, adding, "It's now under consideration whether we should use different vaccines from different technical lines for the immunization process."[38] Such a setback, given the urgency of the challenge and potential consequences of failing to check the pandemic, will likely motivate a redoubling of efforts in vaccine technology and production techniques, especially in an era in which pandemic threats and biosecurity challenges may only mount.

THE NEW ERA OF SELF-RELIANCE AND AUTONOMY

The aftermath of the pandemic with its fraught geopolitics has also revealed the imperative of autonomy to China's future economic and national security. In April 2020, Xi Jinping in remarks to the Politburo urged the country to advance "independent, controllable, safe, and reliable" supply chains in

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35 "China's Vaccine Front-Runner Aims to Beat Covid the Old-Fashioned Way," Bloomberg, August 24, 2020 ∾ https://www.bloomberg.com/news/articles/2020-08-24/coronavirus-vaccine-china-s-covid-front-runner-uses-brute-force-approach.

36 Zhuang Pinghui, "Coronavirus: Is China Ready for the mRNA Vaccine Revolution?" *South China Morning Post*, January 21, 2021 ∾ https://www.scmp.com/news/china/science/article/3118535/coronavirus-china-ready-mrna-vaccine-revolution.

37 Peter J. Hotez, "Vaccine Diplomacy," *Foreign Policy*, May–June 2001, 68.

38 Joe McDonald and Huizhong Wu, "Top Chinese Official Admits Vaccines Have Low Effectiveness," Associated Press, April 10, 2021 ∾ https://apnews.com/article/china-gao-fu-vaccines-offer-low-protection-coronavirus-675bcb6b5710c7329823148ffbff6ef9.

fields related to national security.[39] As the 14th Five-Year Plan was prepared, "being oriented toward global science frontiers" was framed as a core priority due to concerns about "fierce international competition, unilateralism and protectionism," implicitly resulting from U.S. policy choices.[40] Under these conditions, the 14th Five-Year Plan (2021–25) reflects as much continuity as change in focusing on innovation as critical to rejuvenation. The quest for "new engines" for development,[41] including through the promotion of "high-end, intelligent, and green" production, will continue in this next round of plans and programs.[42] In particular, the 14th Five-Year Plan stated that China must "adhere to the core status of innovation in the overall situation of China's modernization construction, take technological self-reliance and self-strengthening as the strategic support of national development, face the frontiers of world science and technology, [and] face the main economic battlefield."[43]

The party believes that China's rise and national strength require greater autonomy from the United States in economic development and technological capabilities. Potentially reflecting ongoing debates about appropriate responses in China's political economy, the concept of "technological self-reliance," in particular, can come into tension with and appear to contradict the calls for open innovation.[44] According to Wang Zhigang, China's minister of science and technology, "technological innovation is the foundation for a country to become prosperous and strong, and it is the way to win in international competition…. Self-reliance in science and technology is a strategic choice that we take the initiative to

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[39] "Xi Jinping: Guojia zhong chang qi jingji shehui fazhan zhanlue ruogan zhongda wenti" [Xi Jinping: Several Major Issues in the National Medium and Long-Term Economic and Social Development Strategy], Seeking Truth, October 31, 2020 ∾ http://www.ccdi.gov.cn/ldhd/gcsy/202011/t20201103_229231.html.

[40] "Xi Jinping zhuchi zhaokai kexuejia zuotan hui bing fabiao zhongyao jianghua" [Xi Jinping Presided Over a Symposium of Scientists and Delivered an Important Speech], Xinhua, September 1, 2020 ∾ http://www.xinhuanet.com/politics/leaders/2020-09/11/c_1126483955.htm.

[41] "Keji bu: Zheng zuzhi bianzhi mianxiang weilai 15 nian de keji fazhan guihua" [Ministry of Science and Technology: Currently Organizing the Preparation of the Scientific and Technology Development Plans for the Next 15 Years], *People's Daily*, May 19, 2020 ∾ http://news.sciencenet.cn/htmlnews/2020/5/440026.shtm.

[42] "Zhonggong zhongyang guanyu zhiding guomin jingji he shehui fazhan di shisi ge wu nian guihua he er ling sanwu nian yuanjing mubiao di jianyi."

[43] This echoes and is consistent with calls for "self-reliance" also raised in November 2020. "Dazao juyou hexin jingzheng li de 'shisiwu' keji chuangxin gaodi" [Create a Technological Innovation Highland with Core Competitiveness during the "14th Five-Year Plan"], People's Forum, November 18, 2020 ∾ http://www.ccpph.com.cn/sxllrdyd/5ZQH1017/5ZQH1017_3/202011/t20201118_276051.htm.

[44] For an account of this dynamic from a Chinese scholar, see Li Wei, "Towards Economic Decoupling? Mapping Chinese Discourse on the China–U.S. Trade War," *Chinese Journal of International Politics* 12, no. 4 (2019): 519–56.

recognize changes and adapt to changes in response to the times."[45] China's model has distinctive "institutional advantages" and through reforms can introduce new "kinetic energy" in his view.[46]

There has been a degree of consistency in the iterations of China's priorities over time, but the latest articulation of megaprojects centers upon AI, quantum information, integrated 'circuits, life sciences and healthcare, aerospace, and deep seas technology.[47] The significant investments in these frontiers associated with such megaprojects could prove to have an impact. As of spring 2021, 102 "major projects" focusing on national priorities such as energy, transportation, and new-type infrastructure are being prepared to launch and drive significant investments across cities and provinces, pursuant to the blueprint that the 14th Five-Year Plan provides.[48]

In parallel, the government has been promoting an approach of "dual circulation" that is intended to create synergies and reorient toward domestic demands as a driver of growth, thereby providing a means of hedging against external shocks.[49] This approach aims to reduce reliance on overseas markets and promote supply chain indigenization. The pursuit of dual circulation reflects a reaction against U.S. policies viewed as promoting a "decoupling" that threatened to deprive China of the capacity to import critical components on which its economy depends.[50] A strategy of dual circulation and dedication to greater "autonomy" in innovation contrasts with and may contradict recognition by Chinese leaders that the current science and technology revolution and industrial transformation involve unique "intersection, integration, penetration, and diffusion," differing from such revolutions of the past, as Wang Zhigang has argued.[51] While China's attempts to leapfrog other countries and leverage innovation to advance its development, seemingly a

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[45] Wang Zhigang, "Wanshan keji chuangxin tizhi jizhi" [Improve the Science and Technology Innovation System and Mechanism], *People's Daily*, December 14, 2020 ∾ http://opinion.people. com.cn/n1/2020/1214/c1003-31964780.html.

[46] Ibid.

[47] "Zhonggong zhongyang guanyu zhiding guomin jingji he shehui fazhan di shisi ge wu nian guihua he er ling sanwu nian yuanjing mubiao di jianyi."

[48] "102 xiang zhongda gongcheng xu shi dai fa jingzhun kuoda youxiao touzi" [102 Major Projects Are Ready to Be Launched, Precise Expansion of Effective Investment], Economic Information Daily, March 19, 2021 ∾ http://www.xinhuanet.com/fortune/2021-03/18/c_1127223856.htm.

[49] For commentary on the concept, see "China's 'Dual-Circulation' Strategy Means Relying Less on Foreigners," *Economist*, November 7, 2020 ∾ https://www.economist.com/china/2020/11/05/ chinas-dual-circulation-strategy-means-relying-less-on-foreigners.

[50] For a thoughtful American perspective on the topic, see Ali Wyne, "How to Think about Potentially Decoupling from China," *Washington Quarterly* 43, no. 1 (2020): 41–64.

[51] Wang, "Wanshan keji chuangxin tizhi jizhi."

continuation of the advantages of backwardness, have gained traction by most metrics, several shortcomings remain that present serious challenges.

One such area is basic R&D. China's party-state system has demonstrated the capacity to mobilize and dedicate significant resources to achieve national priorities. While funding for R&D has still lagged behind that of the United States, the gap is starting to close. In 2019, R&D expenditure increased by over 10% to 2.21 trillion yuan ($322 billion), according to an estimate from China's National Bureau of Statistics,[52] and then reached 2.44 trillion yuan ($378 billion) by 2020.[53] However, funding for basic research has often constituted a smaller (but increasing) proportion of that allocation, totaling 6.16% in 2020. In his 2021 work report, Premier Li Keqiang called for over 7% annual growth in R&D spending, and within that allocation, to raise spending on basic research by 10.6% in 2021.[54] By 2025, China's central government spending on R&D is expected to reach 3.758 trillion yuan ($580 billion), and spending on basic research is intended to increase to 8% of the overall expenditure.[55] Beyond funding, reforms also intend to promote more open competition for funding and projects, aiming to address systemic factors.

The front that may prove most challenging in the drive for self-reliance has been the painful strangleholds in semiconductors that the Chinese government has sought to overcome. Continued challenges in the indigenous development of semiconductors has proved a point of weakness that U.S. policies have exploited by denying certain Chinese companies access to U.S. semiconductors, most infamously Huawei. China still imports the largest volume of semiconductors, and continued reliance on high-tech imports is regarded as a potential security threat. For instance, China imported over $300 billion in semiconductors in 2018, greatly exceeding the amount it spent on crude oil that year ($238 billion).[56] As several companies like Huawei began stockpiling supplies of computer chips due to concerns about U.S. sanctions,

[52] Dennis Normile, "China Again Boosts R&D Spending by More than 10%," *Science*, August 28, 2020 ∽ https://www.sciencemag.org/news/2020/08/china-again-boosts-rd-spending-more-10.

[53] "China's R&D Spending Rises to Record 2.4% of GDP in 2020," CGTN, March 1, 2021 ∽ https://news.cgtn.com/news/2021-03-01/China-s-R-D-spending-rises-to-record-2-4-of-GDP-in-2020-YhqaulWMx2/index.html.

[54] "China's Beefed Up R&D Spending to Narrow Tech Gap with U.S., Ease 'Stranglehold Problems,'" *Global Times*, March 5, 2021 ∽ https://www.globaltimes.cn/page/202103/1217469.shtml.

[55] "China's R&D Expenditure Expected to Reach 3.758 Trillion Yuan in 2025," CGTN, March 8, 2021 ∽ https://www.ecns.cn/news/sci-tech/2021-03-08/detail-ihaihrwe3352341.shtml.

[56] Ma Si, "Chipmakers Bank on 'White Knights' to Move Up the Ladder," *China Daily*, July 30, 2019 ∽ https://www.chinadaily.com.cn/a/201907/30/WS5d3fa161a310d83056401b4f.html.

Chinese imports of computer chips climbed to almost $380 billion in 2020.[57] That same year, Chinese companies also purchased almost $32 billion of semiconductor manufacturing equipment, mainly from Japan, South Korea, and Taiwan, a 20% jump from 2019.[58]

To date, China's drive to mobilize massive investments to enable advances in semiconductors has achieved only limited success, revealing the limitations of a model that relies on brute-force mobilization. The quest to catch up and advance to a leadership position is especially difficult for complex technologies in which talent, tacit knowledge, and engineering expertise are especially significant. Efforts to this end by the Semiconductor Manufacturing International Corporation (SMIC) as a de facto national champion, as well as by new entrants working on specialized semiconductors, have started to gain traction, but there is a long road still ahead.[59]

THE COMPLEX DIALECTICS OF "MADE IN CHINA" INNOVATION

China's aspirations to become a powerful country in and through science and technology will continue to confront certain incongruities. Although the CCP has prioritized the promotion of innovation, the ultimate imperative to retain party control also undermines the conditions for innovation—an environment that is conducive to risk-taking and creativity. While the prominent impacts of innovation within China belie the claim that there is an inherent contradiction between innovation and authoritarian governance, the CCP's concern with control and co-option, including of scientists and successful technology companies, may chill the climate. Recent measures to assert control over technology companies, including prospects of a new state-backed joint venture that could manage or oversee their data, reflect the tension between these platforms as important elements of a new digital economy and concern over the security implications of their data and their reach.[60] The demand that leading enterprises must play for the national

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[57] "China Stockpiles Chips, Chip-Making Machines to Resist U.S.," Bloomberg, February 2, 2021 ∽ https://www.bloomberg.com/news/articles/2021-02-02/china-stockpiles-chips-and-chip-making-machines-to-resist-u-s.

[58] Ibid.

[59] Zeyi Yang, "Chinese Companies Are Making Their Own Semiconductors," Protocol, March 13, 2021 ∽ https://www.protocol.com/china/chinese-companies-make-own-semiconductors.

[60] Lulu Yilun Chen, "China Considers Creating State-Backed Company to Oversee Tech Data," Bloomberg, March 24, 2021 ∽ https://www.bloomberg.com/news/articles/2021-03-24/china-is-said-to-mull-state-backed-company-to-oversee-tech-data.

team inherently undercuts the credibility of their efforts to go global and be trusted in other markets, thereby constraining their growth opportunities.

Likewise, when Xi Jinping has reaffirmed a desire to continue to promote global cooperation in science and technology, such rhetoric collides with the drive for self-reliance. With dual circulation, the odds of these attempts' success in reorienting toward the domestic economy while continuing to benefit from global markets and international engagement remain to be seen. The turn toward the indigenization of supply chains and autonomy in technological capabilities may also disrupt the connectivity that is critical to global growth and progress. Moreover, in Xi's new era, the frequent assertion that science—and scientists—must serve the party-state risks creating distortions in incentives and practices, as do security concerns around research or incidents of potential sensitivity. For example, the Chinese government has imposed restrictions on the sharing of data and the publication of research in certain instances, including for research on Covid-19.[61] Such practices risk cutting off Chinese science and scientists from the international scientific community and the rigorous review processes that set the global standard. Although China aspires to be a new world leader in science and technology, the capacity of Chinese science to go global may be limited and undermined by the deficit of trust and transparency that results from CCP purview. And of course, despite CCP claims that the superiority of China's system was demonstrated by a successful pandemic response, the failure to warn the global community and suppression of information in the early stages of the crisis (and even to this day), in a deviation from "standard practice," undercut the country's credibility and worsened public perceptions.[62]

POLICY IMPLICATIONS

Going forward, a key challenge for governments will be balancing the realities of competition with the desire to sustain openness in the global scientific ecosystem that is critical to its progress. In a world that is complex, globalized, and interdependent, the diffusion of knowledge and technology is inherently difficult to constrain, so any ambitions to establish uncontested

[61] Andrew Silver and David Cyranoski, "China Is Tightening Its Grip on Coronavirus Research," *Nature* 580, no. 7804 (2020): 439–40.

[62] "Covid-19 Pandemic: China 'Refused to Give Data' to WHO Team," BBC, February 14, 2021 ≈ https://www.bbc.com/news/world-asia-china-56054468.

leadership or dominance may prove to be in vain. So too China's rise in science and technology is significant but still uncertain in its future trajectory. Whereas once the United States tended to dismiss China's capacity for innovation, current anxieties about threats to U.S. leadership can provoke exaggerated assessments of the competitive challenge, which risk provoking countermeasures that are damaging or disproportionate. For instance, bans or unduly harsh scrutiny or restrictions on Chinese students coming to the United States could be counterproductive.[63]
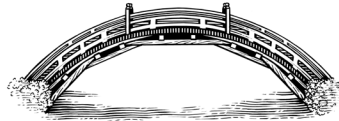
As a means of mitigating the risks of surprise, there are compelling reasons to focus on improving methodologies for forecasting and evaluating technological progress across relevant domains, including through increased investments in open source intelligence. In a world where science and technology are open and remain globalized to a certain extent, scientific and diplomatic engagement can provide a means of risk mitigation. Ultimately, the core challenge for any nation in a world of science and technological transformation will continue to be creating favorable conditions for innovation domestically, including through investments, while leveraging the advantages and mitigating the risks of interdependence. ◈

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63 Elsa B. Kania and Lindsay Gorman, "The United States Can't Afford to Turn Away Chinese Talent," *Foreign Policy*, May 13, 2020 ∼ https://www.cnas.org/publications/commentary/the-united-states-cant-afford-to-turn-away-chinese-talent.

China's Growing Influence over the Rules of the Digital Road

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EXECUTIVE SUMMARY

This essay examines the growing role of China in international standards-setting organizations as a window into its efforts to influence global digital governance institutions and highlights areas where the U.S. can preserve its interests in cyberspace.

MAIN ARGUMENT

In recent years China's international influence in shaping the digital rules of the road has increased. Evidence of the country's growing role in digital standards-setting organizations comes from increased numbers of submissions to key international technical standards bodies as well as enhanced Chinese representation in leadership positions in these bodies. This trend is evident in emerging technologies, such as artificial intelligence, which provide opportunities for China to lead in the formulation of new systems of standards. At the same time, it is important to avoid overstating the country's role in global digital governance. China's standards-setting influence is qualified by the caliber of its submissions and by comparison with other leading countries.

POLICY IMPLICATIONS

- The U.S. must recognize that China is becoming a more important player in setting international standards for digital technologies, and that this trend comes with both risks and benefits.

- To bolster U.S. industry participation in international standards-setting, the U.S. can provide more support for hosting international standards gatherings and for U.S. subject matter experts to participate in standards-setting forums.

- International standards-setting organizations can also take steps to check undue Chinese government influence, such as by strengthening anonymous voting procedures.

A mong those who analyze international standards-setting, it has become fashionable to note that the importance of technical standards often goes underappreciated, as flashier forms of technological governance and competition garner more attention. However, it now feels disingenuous to make this case, given the heightened awareness of the geopolitics of technical standards, in particular relating to China's growing role in global standards-setting. The "China Standards 2035" initiative, for example, has stoked much concern and fear about China reshaping the technological landscape in its favor.[1]

There is no question that China's influence in global standards-setting organizations has increased in recent years, especially in emerging digital technologies, but the full extent and implications of China's growing role are much less clear. This essay provides a grounded assessment of China's influence in this domain. Drawing on both case studies of specific technological domains and statistics for leadership positions and submissions, the first section presents evidence of China's increasing presence in digital standards-setting organizations and highlights some of the associated risks. The second section then qualifies some of the trends related to China's influence. Specifically, comparisons to other standards-setting leaders and a deeper examination of the quality of submissions help depict a more nuanced picture of the country's role. While China's increased involvement in these institutions brings risks, it also comes with benefits. The essay concludes by considering policy options for both the U.S. government and international standards-setting organizations.

CHINA'S GROWING PRESENCE IN STANDARDS-SETTING

China is undoubtedly playing an increased role in international standards-setting organizations. One indicator for China's growing activity in digital standards-setting is the number of submissions to leading international technical standards bodies, such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). The ISO and IEC are the leading organizations for standards-setting in digital technologies and have produced around 85% of all known international

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1 Naomi Wilson, "China Standards 2035 and the Plan for World Domination—Don't Believe China's Hype," Council on Foreign Relations, June 3, 2020 ~ https://www.cfr.org/blog/china-standards-2035-and-plan-world-domination-dont-believe-chinas-hype.

standards.[2] In recent years, the number of submissions by Chinese institutions and firms to the ISO and IEC has grown annually by 20%.[3]

This trend is particularly noticeable in telecommunications. It is well-documented that Huawei, a Chinese firm, is a leader in 5G technical standards. According to the Cyber Creative Institute, a Japanese research firm that has long tracked "standard essential patents" in 5G, Huawei holds the third-highest number of such patents.[4] Additionally, in 2019, Chinese organizations submitted 830 technical documents related to wired communication specifications to the International Telecommunications Union (ITU), ranking highest in the world and surpassing the combined total submissions of South Korea, the United States, and Japan.[5]

China's growing influence in digital standards-setting organizations can also be measured by the number of representatives holding leadership positions in these bodies. Over the past decade, the number of secretariat positions in technical committees and subcommittees at the ISO and IEC occupied by Chinese representatives increased by approximately 70%.[6] Such positions are especially important because these committees are where technical standards are drafted.[7] In October 2018, Yinbiao Shu was elected as the first Chinese president of the IEC.[8]

Chinese policymakers view emerging digital technologies as an opportunity for China to lead in the formulation of new systems of standards. Specifically, Chinese standards-setting organizations have consistently expressed ambitions to enhance their "right to speak" or "discursive power" in setting international standards for artificial intelligence (AI). China's national AI development plan, for instance, mentions the Chinese word for standards

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[2] Tim Büthe and Walter Mattli, *The New Global Rulers: The Privatization of Regulation in the World Economy* (Princeton: Princeton University Press, 2013), 137.

[3] Jeffrey Ding, "China Standards 2035—Coming Soon," ChinAI Newsletter, no. 124 ∾ https://chinai. substack.com/p/chinai-124-china-standards-2035-coming.

[4] The two companies that rank ahead of Huawei are Samsung and Qualcomm. See Cyber Creative Institute, "Essentiality Evaluation of SEP Declared 5G Patents," Press Release, October 12, 2020 ∾ https://www.cybersoken.com/file/press_5G_Patents,5G-SEP_en.pdf.

[5] "China Leads the Way on Global Standards for 5G and Beyond," *Financial Times*, August 4, 2020 ∾ https://www.ft.com/content/858d81bd-c42c-404d-b30d-0be32a097f1c.

[6] U.S.-China Business Council, "China in International Standards Setting—USCBC Recommendations for Constructive Participation," February 2020, 3 ∾ https://www.uschina.org/sites/default/files/ china_in_international_standards_setting.pdf.

[7] Björn Fägersten and Tim Rühlig, "China's Standard Power and Its Geopolitical Implications for Europe," Swedish Institute of International Affairs, February 2019 ∾ https://www.ui.se/ globalassets/ui.se-eng/publications/ui-publications/2019/ui-brief-no.-2-2019.pdf.

[8] Claire Marchand, "Council Elects Future IEC President," International Electrotechnical Commission, e-Tech, June 15, 2018 ∾ https://etech.iec.ch/issue/2018-06/council-elects-future-iec-president.

(*biaozhun*) 24 times.[9] In August 2020 the Standardization Administration of China and five other departments jointly issued the "Guide to the Building of a National Standard Framework for New Generation Artificial Intelligence." This follows from the agency's *White Paper on Artificial Intelligence Standardization*, published two years earlier in March 2018.[10]

China's growing influence in setting digital rules presents a number of risks to U.S. interests. First, since political values can be embedded in technical standards, there is a concern that China-backed standards could support centralizing authoritarian control of the internet. Some researchers have warned that Chinese firms' efforts to standardize technologies that merge the data link and network layers of internet architecture could give more control to network operators and infrastructure providers, which could enable more fine-grained surveillance operations.[11] A *Financial Times* article warned that China aims to create "an alternative form of the internet, to replace the technological architecture that has underpinned the web for half a century."[12]

Another concern is that China is shaping international technical standards to favor the export of Chinese technologies. Acceptance of its industrial standards sometimes comes attached as a condition for Chinese infrastructure investments. Alibaba's involvement in the construction of digital infrastructure in Malaysia, as Barry Naughton has detailed, demonstrates the "powerful complementarities created by dynamic private Chinese businesses, the large Chinese market, and the availability of finance for China-supported infrastructure programs."[13] The underlying factor behind these concerns is

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9 As I wrote with two co-authors in another article, "the drive to shape international standards (part of the 'right to speak') reflects long-standing concerns that Chinese representatives were not at the table to help set the rules of the game for the global Internet. The Chinese government wants to make sure that this does not happen in other ICT spheres, now that China has become a technology power with a sizeable market and leading technology companies, including in AI." Jeffery Ding, Paul Triolo, and Samm Sacks, "Chinese Interests Take a Big Seat at the AI Governance Table," New America, June 20, 2018 ⌇ https://www.newamerica.org/cybersecurity-initiative/digichina/blog/chinese-interests-take-big-seat-ai-governance-table.

10 "Translation: Excerpts from China's 'White Paper on Artificial Intelligence Standardization,'" trans. by Jeffrey Ding, New America, June 20, 2018 ⌇ https://www.newamerica.org/cybersecurity-initiative/digichina/blog/translation-excerpts-chinas-white-paper-artificial-intelligence-standardization.

11 Stacie Hoffmann, Dominique Lazanski, and Emily Taylor, "Standardising the Splinternet: How China's Technical Standards Could Fragment the Internet," *Journal of Cyber Policy* 5, no. 2 (2020): 239–64 ⌇ https://doi.org/10.1080/23738871.2020.1805482.

12 Madhumita Murgia and Anna Gross, "Inside China's Controversial Mission to Reinvent the Internet," *Financial Times*, March 27, 2020 ⌇ https://www.ft.com/content/ba94c2bc-6e27-11ea-9bca-bf503995cd6f?shareType=nongift.

13 Barry Naughton, "Chinese Industrial Policy and the Digital Silk Road: The Case of Alibaba in Malaysia," *Asia Policy* 15, no. 1 (2020): 23–39. See also Yuan Yang, Madhumita Murgia, and Anna Gross, "Chinese Tech Groups Shaping UN Facial Recognition Standards," *Financial Times*, December 1, 2019 ⌇ https://www.ft.com/content/c3555a3c-0d3e-11ea-b2d6-9bf4d1957a67.

a "techno-nationalist" bent in Beijing's approach to standardization that promotes Chinese standards in opposition to international standards.[14]

The tensions sparked by China's efforts to shape international standards-setting reflect long-standing conflicts over how the internet should be governed. For example, in September 2020, China announced the Global Data Security Initiative, which aims to ensure that data gathered locally is stored locally. Some analysts claim that the initiative "incorporates principles reminiscent of the government's earlier emphasis on 'cyber sovereignty'"—the belief that states should control their own model of domestic internet governance.[15] Toward that end, China has pushed for multilateral venues for internet governance, including the United Nations and regional groupings like the Shanghai Cooperation Organisation. This contrasts with the vision of internet governance promoted by the United States and its allies, which advocate for a free and open platform governed by civil society and the private sector, such as organizations like the Internet Corporation for Assigned Names and Numbers and the Internet Engineering Task Force. Indeed, as Adam Segal has argued, China's efforts to develop discursive power in standards-setting echo a central driver of cyber sovereignty: "Beijing's desire...to assert the predominance of states in processes traditionally driven by the private sector."[16]

QUALIFICATIONS

Standards-setting is a technically complicated process involving technological changes on an ever-moving frontier. It thus should not be surprising that there is more than meets the eye when it comes to assessing China's influence in standards-setting. To more fully understand the country's growing role in standards-setting organizations, it is important to further investigate and qualify some of the indicators presented above.

First, more Chinese nationals in leadership positions does not necessarily translate into agenda-setting power for the country. There is no systematic evidence that working groups led by Chinese representatives are more receptive

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14 Richard P. Suttmeier, "A New Technonationalism? China and the Development of Technical Standards," *Communications of the ACM* 48, no. 4 (2005): 35 ∽ https://doi.org/10.1145/1053291.1053313.

15 Graham Webster and Paul Triolo, "Translation: China Proposes 'Global Data Security Initiative,'" New America, September 7, 2020 ∽ https://www.newamerica.org/cybersecurity-initiative/digichina/blog/translation-chinese-proposes-global-data-security-initiative.

16 Adam Segal, "China's Vision for Cyber Sovereignty and the Global Governance of Cyberspace," in "An Emerging China-Centric Order: China's Vision for a New World Order in Practice," ed. Nadège Rolland, National Bureau of Asian Research (NBR), Special Report, no. 87, August 2020, 98.

to adopting submissions from Chinese firms. Chinese representatives may also have significantly different approaches to exercising their influence. Some working group chairs, for example, may strive to keep the standards-setting process apolitical, while others may exhibit more favoritism.[17]

Second, the quality of standards submissions must be considered alongside their quantity. A high proportion of Chinese submissions to standards bodies are low quality and are rejected before they make it to later stages of drafting.[18] This is partly due to the subsidy policies of many Chinese provinces and municipalities that reward Chinese companies for the number of proposals they submit, which inflates submission counts. In some cases, Chinese participants will split up one proposal into several segmented proposals to boost national statistics.[19] This is a smart strategy for meeting work quotas but not necessarily a smart way to measure influence. One can see parallels to issues with assessing Chinese technological capabilities using total patent counts or publication counts, which suffer from similar incentive and quality issues.[20]

Putting China's growing role in the ISO and IEC in comparative context also shows that the country is far from being the leader in digital standards-setting. According to data from the Japanese Industrial Standards Committee, when measured by national representatives at the chair or vice-chair positions on the ISO and IEC technical committees, China's influence has greatly increased but remains below that of other countries such as the United States and Germany.[21] This finding also extends to emerging domains such as AI, where countries like China are more likely to reshape the rules of the road. One analysis, for example, finds that China has "moderate levels" of representation in ISO and IEC groups on AI standardization, and that there have been "exaggerated perceptions by U.S., EU and Australian governments of Chinese influence on AI standards."[22]

It is also important to note that China's growing influence in international standards-setting organizations is not necessarily bad for U.S. interests.

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[17] Francis Devlin, "What Is the Level of Chinese Influence on International AI (Artificial Intelligence) Standards?" (master's thesis, Peking University, 2020), 13.

[18] Fägersten and Rühlig, "China's Standard Power and Its Geopolitical Implications for Europe."

[19] U.S.-China Business Council, "China in International Standards Setting," 3.

[20] Jeffrey Ding, "China's Current Capabilities, Policies, and Industrial Ecosystem in AI," testimony before the U.S.-China Economic and Security Review Commission, June 7, 2019 ∾ https://www.uscc.gov/sites/default/files/June%207%20Hearing_Panel%201_Jeffrey%20Ding_China%27s%20Current%20Capabilities%2C%20Policies%2C%20and%20Industrial%20Ecosystem%20in%20AI.pdf.

[21] Ding, "China Standards 2035—Coming Soon."

[22] Devlin, "What is the Level of Chinese Influence on International AI (Artificial Intelligence) Standards?"

To be sure, the country's increased involvement in these institutions brings risks, but it could also bring significant benefits. In theory, China's increased participation will result in better harmonization between international and Chinese standards, which could make it easier for international companies to sell to China's sizable market.[23] These are not insignificant sums. China's payments for the use of U.S. intellectual property grew from $755 million in 1999 to $8.3 billion in 2017, according to a 2019 report from the Federal Reserve Bank of St. Louis.[24]

Additionally, Chinese and U.S. interests are not always in conflict in the standards-setting context. In one high-profile case that came to light in May 2018, the Chinese firm Lenovo voted for a 5G technology standard led by the U.S. firm Qualcomm when an alternative standard by Chinese firm Huawei was also available.[25] This case was not an exception: as early as 2004, Xiangkui Yao and Richard Suttmeier found that Chinese firms may back standards set by foreign technology leaders rather than those pushed by the state and other national firms, resulting in a politics of standards defined by "increasingly complex and cross-cutting cleavages."[26] Even as think tank analysts from the United States, Germany, and Japan advocate for a "tech alliance" among democratic countries as a check against China's leverage in standards-setting, firms from all three countries will likely continue to deepen standards-setting alliances with their Chinese counterparts.[27]

POLICY OPTIONS

Recognizing this messy reality of complex and cross-cutting cleavages is the first step for a principled strategy for the United States to realize its interests in global standards-setting organizations. China is certainly

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[23] U.S.-China Business Council, "China in International Standards Setting," 3

[24] Ana Maria Santacreu and Makenzie Peake, "A Closer Look at China's Supposed Misappropriation of U.S. Intellectual Property," Federal Reserve Bank of St. Louis, Economic Synopses, no. 5, February 8, 2019 ∾ https://research.stlouisfed.org/publications/economic-synopses/2019/02/08/a-closer-look-at-chinas-supposed-misappropriation-of-u-s-intellectual-property.

[25] Frank Hersey, "Lenovo Founder in Public Backlash for 'Unpatriotic 5G Standards Vote,'" TechNode, May 16, 2018 ∾ https://technode.com/2018/05/16/lenovo-huawei-5g.

[26] Xiangkui Yao and Richard P. Suttmeier, "China's Post-WTO Technology Policy Standards: Software, and the Changing Nature of Techno-Nationalism," NBR, Special Report, no. 7, May 1, 2004 ∾ https://www.nbr.org/publication/chinas-post-wto-technology-policy-standards-software-and-the-changing-nature-of-techno-nationalism.

[27] For an account of growing cooperation between China and Germany on high-tech standardization, see Daniel Fuchs and Sarah Eaton, "How China and Germany Became Partners on Technical Standardization," *Washington Post*, Monkey Cage, November 16, 2020 ∾ https://www.washingtonpost.com/politics/2020/11/16/how-china-germany-became-partners-technical-standardization.

becoming a more significant player in setting international standards for digital technologies. At the same time, it is important to avoid overstating China's influence in global digital governance, and there is a need to develop a more nuanced picture of Chinese activities and how they translate into actual influence. U.S. policymakers should also realize that this trend comes with both risks and benefits.

While avoiding the downsides of China's centrally led standardization drive, the U.S. government can play a more active role in supporting U.S. industry participation in standards-setting forums. The solution is not to mimic China's top-down, government-directed standardization. In setting standards for emerging technologies, such as AI and big data, governments are "blind giants."[28] When they can have the most influence on a technology's trajectory is also when they have the least technical experience. The risk is that too much government intervention could lock in standards that are inferior to those generated by bottom-up, market-driven efforts.

Instead, incremental reforms are more promising. For instance, the United States should support government experts to participate in the full cycle of the standards-setting process and provide funding to host major international standards meetings.[29] The U.S. government can also encourage international standards organizations to adopt policies that curb undue Chinese government influence, such as by strengthening anonymous voting and implementing more stringent eligibility qualifications to ensure that the best technology wins out.[30] All these steps permit U.S. technology companies to continue forming strategic alliances with firms from other countries, including China.[31]

Finally, U.S. policymakers should keep in mind the fundamental purpose of international standards-setting: achieving global consensus on technology that works for everyone. This simple premise is important to hold on to, especially as discussions about technical standards become

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[28] Paul A. David, "Some New Standards for the Economics of Standardization in the Information Age," in *Economic Policy and Technological Performance*, ed. Partha Dasgupta and Paul Stoneman (Cambridge: Cambridge University Press, 1987), 206–39.

[29] U.S.-China Business Council, "China in International Standards Setting,"

[30] Ibid.

[31] For an example of how U.S. firms were disadvantaged in standards-setting because they stopped developing interoperability protocols with Huawei on 5G, see Karen Prentice and Chris Freifeld, "Exclusive: U.S. Drafts Rule to Allow Huawei and U.S. Firms to Work Together on 5G Standards—Sources," Reuters, May 8, 2020 ∽ https://www.reuters.com/article/us-usa-china-huawei-tech-exclusive-idUSKBN22I1ZY.

increasingly framed around great-power competition between the United States and China.[32]

While competitive dynamics will inevitably affect the process, the promise of international standards to effectively regulate new technologies can be captured in the diffusion of cybersecurity practices to almost 160 countries, environmental sustainability standards, and safety standards used in industries such as nuclear energy.[33] Similarly, international standards could ensure more sustainable and safe development of digital technologies for all, such as through requirements for audit trails in safety-critical applications of AI systems.[34] Balancing the risks and benefits of China's growing influence in digital standards-setting is necessary for ensuring safe and sustainable technological development. ◈

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[32] Jeffrey Ding, "Balancing Standards: U.S. and Chinese Strategies for Developing Technical Standards in AI," NBR, Commentary, July 1, 2020 ∽ https://www.nbr.org/publication/balancing-standards-u-s-and-chinese-strategies-for-developing-technical-standards-in-ai.

[33] Peter Cihon, "Standards for AI Governance: International Standards to Enable Global Coordination in AI Research & Development," Future of Humanity Institute, University of Oxford, April 2019.

[34] Miles Brundage et al., "Toward Trustworthy AI Development: Mechanisms for Supporting Verifiable Claims," April 2020, available at https://arxiv.org/pdf/2004.07213.pdf.

The Triadic Conflict That Lies Ahead in the U.S.-China Tech Confrontation

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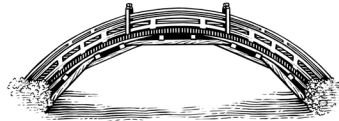
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EXECUTIVE SUMMARY

This essay examines how the triadic conflict between the U.S., China, and technology companies is shaping the governance of cyberspace.

MAIN ARGUMENT

With the increasing influence of global technology companies, a trilateral competition is emerging between the U.S., China, and these companies over supremacy in cyberspace. As common values are a prerequisite for cyberspace governance, each actor is advocating values that favor its position. The U.S. and other democracies argue that cyberspace must continue to be democratic, whereas China and other authoritarian states argue that state sovereignty is the highest guiding principle. The tech companies, on the other hand, want to ensure that cyberspace remains global. Sovereignty, globalization, and democratic governance thus constitute a trilemma between positions that are partly incompatible with each other.

POLICY IMPLICATIONS

- With nations and tech companies on a collision course, the U.S. and Japanese governments should not confront two competitors at the same time. Instead, to push back against authoritarian regimes on cyberspace governance, democratic countries need to cooperate with tech companies.

- Confronted with the trilemma between democracy, sovereignty, and globalization, policymakers can advance up to two of these values. However, advancing all three is not a viable option because of incompatibilities between these values in practice.

- The triadic conflict in cyberspace can also be seen as a competition for access to data. As the U.S., China, and technology companies drive data into their own jurisdictions, difficult times lie ahead for other actors, such as developing countries, international organizations, regional security organizations, civil society, and standardization bodies.

The notion that cyberspace is a global arena free from any nation's interference has been repeated by politicians, bureaucrats, scholars, and technologists since the emergence of this domain. Many countries regard outer space, the high seas, and cyberspace as global commons and did not insist on setting boundaries. However, today states are fragmenting the internet, setting their own rules, and localizing their citizens' data within their territories.

This essay revisits the question of who will dominate cyberspace. It is widely believed that the United States and China will compete for supremacy in this domain,[1] and judging by the current friction between these two powers, there can be little doubt this theory possesses some validity. Yet this view underestimates the influence of a third group: global technology companies. These companies have economic activities worldwide and are competitive in information and communication technology (ICT). The future of cyberspace may not be based on U.S.-China conflict but rather on a triadic structure comprising the United States, China, and global technology companies.

This essay is organized as follows. The first section surveys the historical role of the internet and cyberspace in the U.S.-China rivalry. It identifies 2010–13 as a pivotal period when the international community lost confidence in the United States and China emerged more fully as a tech power. Next, the essay explains the growing influence of global tech companies and considers the tension between U.S. global tech companies and the U.S. government as well as between Chinese global tech companies and the Chinese government. The final section summarizes these discussions and examines the options available to Japan and its allies.

THE U.S.-CHINA CONFLICT AND THE ROLE OF CYBERSPACE

The internet was born in the United States, and the country still has various technological and institutional advantages. This supremacy, which some call U.S. cyber hegemony, was supported by the United States' technical development capabilities and vision of a democratic, free, and global cyberspace. U.S. supremacy in cyberspace has been criticized by

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[1] Paul Triolo et al., "The Digital Silk Road: Expanding China's Digital Footprint," Eurasia Group, April 8, 2020.

authoritarian states, including China and Russia,[2] while being supported by many democracies, including Japan and European countries.

The turning point occurred between 2010 and 2013. First, in 2010, U.S. Cyber Command was officially established as a U.S. combatant command. Around the same time, the so-called Stuxnet incident, in which the United States conducted a cyberattack on Iran's nuclear facilities, became public. In June 2013, Edward Snowden, a former government contractor, revealed that the U.S. National Security Agency (NSA) and other intelligence agencies had surreptitiously collected information from U.S. allies such as Germany, France, and Japan. Through a series of events in this period, it became clear that the United States would not hesitate to exercise what former CIA director Michael Hayden termed its "home field advantage."[3] In 2013, *Forbes* estimated that distrust of U.S. products and services in the cloud-computing industry would lead to a decline in sales of $35–$180 billion by 2016.[4] Some argue that communication from Asia, Africa, and Latin America through the United States has decreased since Snowden's revelations.[5] John Chambers, CEO of Cisco, has expressed concern that the NSA's practices "undermine the ability of technology companies to deliver products globally."[6] Since then, cyberspace has been suffering from a "trust deficit disorder."[7]

The expansion of China's influence in cyberspace is tightly linked to the development of the Chinese economy, and economic development in turn has a stabilizing influence on governance power of the Chinese Communist Party. China's GDP was growing by more than 6% annually before the Covid-19 pandemic, and China was the only major economy with positive growth in 2020. Digital businesses support economic growth. The digital economy's contribution to China's GDP jumped from roughly 26.6% in 2015 to 32.3%

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2 Julien Nocetti, "Contest and Conquest: Russia and Global Internet Governance," *International Affairs* 91, no. 1 (2015): 128–29.

3 Michael V. Hayden, testimony to the United States Senate Committee on the Judiciary, July 26, 2006 ∾ https://fas.org/irp/congress/2006_hr/072606hayden.html.

4 James Staten, "The Cost of PRISM Will Be Larger Than ITIF Projects." *Forbes*, August 15, 2013 ∾ https://www.forbes.com/sites/forrester/2013/08/15/the-cost-of-prism-will-be-larger-than-itif-projects/#2e699df5795f.

5 Ronald J. Deibert, *Black Code: Surveillance, Privacy, and the Dark Side of the Internet* (Toronto: Signal, 2013).

6 Ashley Lau, "Cisco Chief Urges Obama to Curb NSA Surveillance Activity," Reuters, May 18, 2014 ∾ https://www.reuters.com/article/us-cisco-systems-nsa/cisco-chief-urges-obama-to-curb-nsa-surveillance-activity-idUSBREA4H0C720140518.

7 António Guterres (address to the UN General Assembly, New York, September 25, 2018) ∾ https://www.un.org/sg/en/content/sg/speeches/2018-09-25/address-73rd-general-assembly.

in 2017.[8] In recent years, China has strongly promoted domestic production of semiconductor components and other ICT products to increase its technological self-sufficiency. It has also been actively subsidizing new technology fields such as those related to 5G, artificial intelligence (AI), and quantum computing.

China's ambitions for leadership in cyberspace became clear when Xi Jinping became president in 2013. Xi called for cooperation to "jointly build a community of shared future in cyberspace."[9] He has also been active in promoting international cooperation, such as the provision of technology to developing countries. China's policy of expanding its sphere of influence through ICT is an essential component of its broader Belt and Road Initiative that is known as the Digital Silk Road.[10] This is a state-sponsored effort to help IT companies (e.g., Alibaba, Tencent, Baidu, and Huawei) and telecom operators (e.g., China Mobile, China Telecom, and China Unicom) succeed in the markets of the countries targeted by the Belt and Road Initiative.[11] The government's support has brought submarine cables, terrestrial cables, 5G communication infrastructure, and data centers to many countries. For example, Huawei won 28 of the 5G contracts in Europe and a few contracts for data center construction in Pakistan and Kenya. Huawei Marine, a cable-laying joint venture, is working with Papua New Guinea and the Solomon Islands to install optic cables.

In general, Chinese products are inexpensive and can be procured quickly. They are also superior in terms of information control because they use technologies that Western companies do not employ due to privacy concerns, which makes them attractive to authoritarian states. The major remaining concern is the potential for backdoor programs to be embedded in the products and exfiltrate data to a third party. However, the adoption of Chinese products is not likely to stop. Despite frequent claims of information leaks due to the use of Chinese products, only a small number of these accusations have been proved. When asked about the risk, for example, Malaysian prime minister Mahathir bin Mohamad downplayed the espionage

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8 Dang-chen Sui and Yihan Guan, "Research on 'Combination of Medical Treatment and Endowment' from the Perspective of Digital Economy," in *2nd International Conference on Education Innovation and Social Science* (ICEISS 2018), ed. Jiwen Jiao (Beijing: Atlantis Press, 2018), 252.

9 Xi Jinping, "Remarks by H.E. Xi Jinping President of the People's Republic of China at the Opening Ceremony of the Second World Internet Conference," Ministry of Foreign Affairs of the People's Republic of China (PRC), December 16, 2015 ∽ https://www.fmprc.gov.cn/mfa_eng/wjdt_665385/zyjh_665391/t1327570.shtml.

10 Ashley Dutta et al. "China's Digital Silk Road: Economic and Technological Implications," *Asia Policy* 15, no. 1 (2020): 1–81.

11 Triolo et al., "The Digital Silk Road," 1.

risks relative to the benefit of using Huawei's technology: "We are too small to have any effect on a huge company like Huawei, whose research is far bigger than the whole of Malaysia's research capability….So we try to make use of their technology as much as possible…what is there to spy in Malaysia?"[12]

In parallel with its efforts to catch up with the United States in technological development, the Chinese government has reiterated its vision of a "multilateral, democratic and transparent global cyberspace governance system."[13] China believes that effective U.S. dominance in cyberspace has already been established. As a redress, it proposes an expanded role for the United Nations. This proposal includes, for example, the establishment of a forum discussing international rules and norms of state behavior on an equal footing.[14] China, being a permanent member of the Security Council, will undoubtedly see its influence strengthened further to the detriment of Japanese and Western interests.

It is difficult to predict how far the conflict between the United States and China will escalate. The degree of economic interdependence between the United States and China is high. In particular, China holds more than $3 trillion in foreign currency reserves, about three times as much as Japan holds—"China's relationship with Bretton Woods is complex."[15] The stability of the dollar-reserve currency system is in China's interest too. The worst-case scenario envisioned by some international political scientists of a war between the two countries would be highly disadvantageous for both sides.[16] The view that U.S.-China confrontation is likely does not seem to consider the possibility that the two states may reach an agreement that is mutually favorable.

Another issue that emerged around 2013 is that cyberspace began to be discussed in the context of security studies, using keywords that evoke major-power competition, such as the "digital Cold War" and the "Internet

[12] Kelly Olson, "Malaysia's Mahathir: We Try to Use Huawei Technology 'as Much as Possible,'" CNBC, May 30, 2019 ∼ https://www.cnbc.com/2019/05/30/mahathir-we-try-to-use-huawei-technology-as-much-as-possible.html.

[13] Ministry of Foreign Affairs (PRC), "International Strategy of Cooperation on Cyberspace," March 1, 2017 ∼ https://www.fmprc.gov.cn/mfa_eng/wjb_663304/zzjg_663340/jks_665232/kjlc_665236/qtwt_665250/t1442390.shtml.

[14] Cai Cuihong, "China and Global Cyber Governance: Main Principles and Debates," *Asian Perspective* 42, no. 4 (2018): 647–62.

[15] Priyanka Pandit, "Bretton Woods and the China Challenge," East Asia Forum, August 31, 2019 ∼ https://www.eastasiaforum.org/2019/08/31/bretton-woods-and-the-china-challenge.

[16] See, for example, Graham Allison, *Destined for War: Can America and China Escape Thucydides's Trap?* (Boston: Houghton Mifflin Harcourt, 2017).

Yalta regime."[17] It is often said that cyberspace is the "fifth space" alongside land, sea, air, and outer space. It is natural to look back and apply the same logic that has governed existing spaces. Researchers see states as key actors in the struggle between nations for the fifth space as they "bear primary responsibility for international security and stability…they are the legitimate agents for the use of force, the ultimate source of international power."[18] Increasingly, militaries are equipped with offensive cyber capabilities, and intelligence and law-enforcement agencies are developing their cyber-surveillance capabilities.

However, cyberspace has fewer physical and geographic constraints than traditional spaces do, and the role of states and governments has been quite limited.[19] Milton Mueller, a U.S. researcher on internet governance, sharply criticized the attitude of analyzing only the competition among nations in this domain: "If all we can see in the struggles over Internet governance is the question of which state comes out more powerful than its rivals, then our mentality has advanced little from seventeenth-century mercantilism."[20] The next section will focus on how a third group of actors—global tech companies—is becoming increasingly influential in cyberspace.

THE CYBERSECURITY TRILEMMA

Global Tech Companies

In September 2015, Microsoft founder Bill Gates and CEO Satya Nadella hosted a large delegation from Beijing led by Xi Jinping at the company's headquarters. Xi, who was visiting the United States for the U.S.-China summit with then president Barack Obama, met with executives from eight high-tech companies.[21] Why is China trying to make direct contact with Microsoft and other U.S. tech companies? To address this question, this

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17 Wolfgang Kleinwachter, "Internet Governance Outlook 2013: 'Cold Internet War' or 'Peaceful Internet Coexistence'?" CircleID, January 3, 2013 ∾ https://www.circleid.com/posts/20130103_internet_governance_outlook_2013; and Alexander Klimburg, "The Internet Yalta," Center for a New American Security, August 5, 2013 ∾ https://www.cnas.org/publications/commentary/the-internet-yalta.

18 James Andrew Lewis, "State Practice and Precedent in Cybersecurity Negotiations," Center for Strategic and International Studies, 2018, 9 ∾ https://www.csis.org/analysis/state-practice-and-precedent-cybersecurity-negotiations.

19 Tim Maurer, "Contested Governance: Internet Governance and Cybersecurity," in "Innovations in Global Governance—Peace-Building, Human Rights, Internet Governance and Cybersecurity, and Climate Change," Council on Foreign Relations, September 11, 2017, 29–32.

20 Milton Mueller, *Will the Internet Fragment? Sovereignty, Globalization and Cyberspace* (Cambridge: Polity, 2017), 19.

21 Brad Smith and Carol Ann Browne, *Tools and Weapons: The Promise and the Evil of the Digital Age* (London: Hodder and Stoughton, 2019), 252.

section takes a closer look at the importance of global tech companies for the competition in cyberspace.

Cyberspace, it is worth noting, is a space generally owned and managed by private companies. We can use the internet only because there are undersea cables, data centers, and so forth. It is an oversimplification to view these private companies as entities that pass data from right to left to benefit the unspecified consumer and provide services equally according to the price. In fact, private companies in cyberspace play a variety of coordinating roles, and the guiding principle behind their actions cannot be assumed to be economic rationality.

Among the private sector, global tech companies play a crucial role. Key companies in this field include U.S. firms Google (Alphabet), Apple, Facebook, Amazon, and Microsoft, commonly known collectively as GAFAM, and Chinese firms Baidu, Alibaba, Tencent, and Huawei, commonly known together as BATH.

The economic power of global tech companies in the market is overwhelming. First of all, GAFAM's total revenue was said to be $802 billion in 2018.[22] This is more than the 60 trillion yen that Japan, the world's third-largest economy, collected in tax revenue in 2019.[23] China's Alibaba aspires to become the world's fifth-largest economic entity by 2036 after the United States, China, Europe, and Japan.[24] In FY2020, Alibaba's revenue was about $70 billion, and the company had a market value in September 2020 of $730 billion, making it the sixth-most valuable tech firm in the world, just behind the GAFAM companies.[25]

Global tech companies are different from traditional manufacturing industries such as steel, automobiles, and semiconductors. Most of their profits are returned to shareholders in higher stock prices and dividend payments without creating jobs in the local market. Tax authorities are also increasingly frustrated with these companies' various tax-avoidance methods. According to an estimate by the United Nations University, tax evasion by

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[22] Yihan Ma, "Alibaba's annual revenue FY 2010-FY 2020," Statista, May 22, 2020 ∼ https://www. statista.com/statistics/225614/net-revenue-of-alibaba.

[23] Takeshi Kikuchi, "Boutyou GAFA kokka ga gyakusyuu (bundan no saki ni)—Tomi no ryusyutsu hadome he kazei ya kisei no ugoki" [Expanding GAFA Nation Strikes Back (Beyond Fragmentation)—Taxation and Regulation Move to Curb Wealth Outflow], *Nihon Keizai Shimbun*, March 10, 2019.

[24] Li Tao, "A Company as an Economy? Alibaba Says It Can Be World's Fifth-Largest by 2036," *South China Morning Post*, June 9, 2017 ∼ https://www.scmp.com/business/companies/article/2097691/ alibaba-aims-become-fifth-largest-economy-2036.

[25] John Divine, "The 10 Most Valuable Tech Companies in the World," *U.S. News and World Report*, September 17, 2020 ∼ https://money.usnews.com/investing/stock-market-news/slideshows/ most-valuable-tech-companies-in-the-world.

global corporations as a whole amounts to $500 billion a year. New tax collection mechanisms are being considered, such as taxing firms based on the location of their activities (i.e., the location of their users) rather than the location of their workers.[26]

In addition, the internet and cyberspace are moving toward concentration rather than diffusion. Everything is more efficient when a central body manages it. A good service attracts more users; more users create more data; and more data leads to even better services. This cycle results in a small number of global tech companies having control over large volumes of data. Kai-Fu Lee, a Taiwan-born venture capitalist active in both the United States and China, predicts that "other countries will be left to pick up the scraps, while these AI superpowers will boost productivity at home and harvest profits from markets around the globe."[27]

Nations and Global Tech Companies on a Collision Course

The interests of the U.S.-based global tech companies and the U.S. government are not always aligned. These firms understand that their growth is heavily dependent on non-U.S. markets. As of 2017, 60% of U.S. tech company revenue came from outside the United States.[28] There have also been direct standoffs between the government and U.S. tech companies. For example, the NSA notified Yahoo in 2007 that it would be fined $250,000 per day if it did not cooperate with the NSA surveillance program PRSIM.[29] Almost all the major U.S. tech firms at the time, including AOL, Apple, Google, and Microsoft, were PRISM participants, while other NSA programs collected telecommunications data.[30] RSA Security, a company that develops and sells cryptographic software, was asked and paid to weaken its cryptographic

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[26] Klaus Schwab, "Globalization 4.0: A New Architecture for the Fourth Industrial Revolution," *Foreign Affairs*, January 16, 2019 ∽ https://www.foreignaffairs.com/articles/world/2019-01-16/globalization-40.

[27] Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order* (Boston: Houghton Mifflin Harcourt, 2018).

[28] Adam Segal, "Chinese Cyber Diplomacy in a New Era of Uncertainty," Hoover Institution, Aegis Paper Series, no. 1703, June 2, 2017, 68.

[29] Dominic Rushe, "Yahoo $250,000 Daily Fine over NSA Data Refusal Was Set to Double 'Every Week,'" *Guardian*, September 12, 2014 ∽ https://www.theguardian.com/world/2014/sep/11/yahoo-nsa-lawsuit-documents-fine-user-data-refusal.

[30] See for example, ibid.; and Glen Greenwald, "NSA Collecting Phone Records of Millions of Verizon Customers Daily," *Guardian*, June 6, 2013 ∽ https://www.theguardian.com/world/2013/jun/06/nsa-phone-records-verizon-court-order.

libraries so that authorities could crack encryption if necessary.[31] Global tech companies are using more sophisticated encryption as a countermeasure against intrusions, and even the FBI is struggling to decrypt the encrypted information contained in seized electronic devices.[32] As a result, the U.S. government is placating, threatening, and paying off global tech companies to cooperate.

U.S. tech companies also have complicated relationships with foreign governments. Recent decisions by Apple, the most successful U.S. company in the Chinese market, are noteworthy in this regard. China enacted its Cybersecurity Law in 2016, which mandated that user data be stored within Chinese territory, and tech companies have taken steps to comply with the legislation. Apple set up a dedicated data center for Chinese users of its cloud services in Guizhou Province in 2018, and Google's development of a specific search engine for use in China took place around the same time. Xi Jinping's visit to Microsoft may have been part of an effort to bridge the gap between the Chinese government and U.S. global tech companies.

What about the global tech companies headquartered in China? To what extent can Huawei, Alibaba, and Tencent be trusted? As a recent study argues, "it's clear these companies are not purely commercial actors."[33] Compared to the tensions between the government and tech companies in the United States, the conflicts between the Chinese government and Chinese tech companies are less apparent. This does not mean that there is no conflict; however, it may mean that these companies are under the strong influence of the Chinese Communist Party. For instance, as of this writing, Jack Ma, founder of Alibaba, did not make a public appearance for more than three months in late 2020 and early 2021. Ma had publicly criticized Chinese financial regulators for slowing down innovation before he went silent. Also, the corporate governance of many large Chinese tech companies remains opaque; for example, it is unclear who owns Huawei.[34]

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[31] Joseph Menn, "Exclusive: NSA Infiltrated RSA Security More Deeply Than Thought—Study," Reuters, March 31, 2014 ∼ https://www.reuters.com/article/us-usa-security-nsa-rsa/exclusive-nsa-infiltrated-rsa-security-more-deeply-than-thought-study-idUSBREA2U0TY20140331.

[32] In May 2017, then FBI director James Comey provided the following testimony: "In just the first half of this fiscal year, the FBI was unable to access the content of more than 3,000 mobile devices using appropriate and available technical tools, even though there was legal authority to do so. This figure represents nearly half of all the mobile devices the FBI attempted to access in that timeframe." James Comey, testimony before the Senate Judiciary Committee, Washington, D.C., May 3, 2017, 3 ∼ https://www.judiciary.senate.gov/imo/media/doc/05-03-17%20Comey%20Testimony.pdf.

[33] Danielle Cave et al., "Mapping China's Technology Giants," Australian Strategic Policy Institute, Issues Paper, no. 15, April 2019, 3 ∼ https://www.aspi.org.au/report/mapping-chinas-tech-giants.

[34] Christopher Balding and Donald Clarke, "Who Owns Huawei?" SSRN, April 17, 2019 ∼ https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3372669.

While China is a huge market, it is still a finite one. Soon, China's global tech companies will no longer be able to expand their business domestically and will have to focus more on developing overseas markets. As China's global tech companies increase their international visibility, their global public shareholdings, and the percentage of their revenue that comes from overseas, the Chinese government's voice will become less significant.

The Triad of Cyberspace

The preceding discussion unpacked the composition of the U.S.-China conflict over cyberspace and confirmed the power of global tech companies in this area. This subsection argues that a triadic confrontation between the United States, China, and global tech companies is emerging.

The triadic conflict in cyberspace can be seen as a competition for access to data, which is the strategic resource of this era.[35] Power in cyberspace, or cyberpower, is the ability to access data and influence the behavior of others. Whether Facebook attempts to acquire new users abroad, the Chinese government attempts to obtain individuals' purchasing histories, or EU member states ban the storage of data outside Europe, these are all tactics to access data. Whoever controls cyberspace is the one who has access to more data.

To establish a system of governance in cyberspace, common values are a prerequisite for order. These three actors—the United States, China, and global tech companies—are advocating values in cyberspace that favor their positions. The United States and other democracies argue that cyberspace must continue to be democratic, whereas China and other authoritarian states argue that a state's sovereignty is the highest guiding principle. The tech companies, on the other hand, want to ensure that cyberspace remains global. The competition between these three actors is also a tension of three values: democracy, state sovereignty, and globalization. If the three values could coexist, then we could split cyberspace and manage each part of it. However, as Dani Rodrik has argued, sovereignty, globalization, and democratic governance constitute a trilemma between positions that are partly incompatible with each other.[36]

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[35] Farid Gueham argues that data is a new political and economic commodity. Farid Gueham, "Digital Sovereignty: Steps towards a New System of Internet Governance," Fondation Pour l'innovation Politique, January 1, 2017 ∿ https://euagenda.eu/publications/digital-sovereignty-steps-towards-a-new-system-of-internet-governance.

[36] Dani Rodrik, *The Globalization Paradox: Why Global Markets, States, and Democracy Can't Coexist* (Oxford: Oxford University Press, 2011)

There are also other players in this competition that we have not brought into the analysis. These include developing countries, international organizations, regional security organizations, civil society, standardization bodies, and expert networks such as computer security incident response teams. In the trilemma described above, these actors will lose their influence as they are not the gatekeepers of data. They will each align themselves more closely with one of the triangle's three points.[37]

If a global, democratically operated cyberspace with strong national sovereignty is not possible, two of these three values might simultaneously shape the governance of cyberspace. Western countries that have been cooperating with the G-7 and Organisation for Economic Co-operation and Development (OECD) will continue to pursue democratic control of cyberspace. However, the positions of the countries involved in this effort are not entirely the same. From the discussions of the UN Open-ended Working Groups, the Global Commission on the Stability of Cyberspace, and various multilateral forums, it is becoming clear that the United Kingdom and the United States are seeking a democratic cyberspace with states' sovereign rights secured, whereas countries such as Japan, the Netherlands, and Singapore are aiming for a democratic cyberspace with global interoperability.

In the tripolar competition described, Japan aligns closely with the United States. The two countries share common values and possess many existing security and economic agreements. A major difference, however, is that Japan believes more strongly that cyberspace should remain a global space, and the Japanese government has consistently called for the free flow of information. This is one of the most liberal positions today. Many countries have accepted the fragmentation of the internet and are trying to secure national sovereignty in cyberspace and localizing data. Realizing the Japanese government's vision of a "free flow of data with trust" is as difficult a task as reviving a liberal international order that is losing momentum.

CONCLUSION

To answer the question of who will dominate cyberspace, this essay surveyed the background of the U.S.-China confrontation in cyberspace and examined the changing balance of power in this domain. It then argued

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[37] For example, the global incident response expert network was a transnational technical expert community in the 1990s. Computer security incident response teams were later "nationalized" and "politicized." Robert Morgus et al., "National CSIRTs and Their Role in Computer Security Incident Response," Global Public Policy Institute and New America, November 2015.

that the influence of global tech companies is expanding and proposed that a trilateral competition is emerging between the United States, China, and global tech companies. The result is a trilemma between the values of democratic governance, state sovereignty, and globalization.

If cybersecurity is viewed only as a bilateral confrontation between the United States and China, then the debate is over which of these two powers to align with. The proposed triadic structure introduces a key third actor, the tech sector, and initiates a discussion of what kind of cyberspace is hoped for: one based on democracy, which the United States stands for; one based on the strengthening of national sovereignty, which China stands for; or one premised on globalization, which global tech companies try to maintain. ◈