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Assessment of the Chinese Communist Party's Economic Ambitions,
Plans, and Metrics of Future Success"**

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The Information Technology and Innovation Foundation (ITIF) appreciates the United States-China Economic and Security Review Commission's invitation to provide a written submission regarding its panel on China's cloud computing sector as part its hearing on "A Net Assessment of the CCP's Economic Ambitions, Plans, and Metrics of Future Success." The following written testimony builds on previous testimony before the U.S. Senate, the U.S. International Trade Commission, and other ITIF reporting about Chinese digital protectionism and industrial policy.¹

OVERVIEW

It is vital that the United States prioritize getting greater access to China's cloud services market. The U.S. cloud service sector leads the world as it is the most innovative, investing tens of billions of dollars in research and development (R&D) annually, which leads to thousands of new patents. However, the U.S. cloud sector's leading position depends upon fair market access to global markets to earn the revenues to drive further R&D.

While it is not possible to calculate an exact figure, ITIF conservatively estimates (based on market-share comparisons) that Amazon and Microsoft's cloud services (delivered as Infrastructure as a Service or IaaS, which is restricted in China) lost a combined \$1.6 billion in forgone revenue over the two-year period from 2017 to 2018. As the China market continues to rapidly grow, these losses will only grow. This estimate is based on these firms having full and fair market access. These (and other U.S. cloud firms) currently face significant restrictions in China, which forces them to set up joint ventures (JV) and licensing arrangements that involve transferring knowledge and know-how to local partners alongside other market restrictions that hold them back from directly competing with their Chinese competitors, such as Alibaba Cloud and Tencent Cloud. There is a stark lack of reciprocity in that Chinese cloud firms face no such restrictions in the United States. Frankly, this is an unacceptable and unsustainable situation.

My testimony focuses on three core issues: 1) How China's cloud market restrictions forced U.S. cloud firms to help build local competitors, while also protecting and allowing Alibaba Cloud, Tencent Cloud, and other local champions to seize market share and become more competitive in China, and increasingly, in markets around the world; 2) How U.S. cloud firms retain a competitive advantage over Chinese firms in terms of R&D and global operations, but that China and Chinese firms are investing growing amounts of money and efforts to improve their capabilities, competitive position, and global operations; and 3) that the United States needs to prioritize cloud sector issues given U.S. leadership in the sector and ensure that related trade, economic, and cyber and national security policies support—not undermine—the sector's ability to innovate and compete around the world.

The United States need to take a more targeted and strategic approach as China and its firms are gunning for the U.S.'s position as a leader of the digital economy. China considers cloud computing services as strategic and central to its economic development and national security. For example, in September 2020, China released the "Guiding Opinions on Expanding Investment in Strategic Emerging Industries and Cultivating Strengthened New Growth Points and Growth Poles," which laid out China's priorities for the development of strategic emerging industries, including cloud.² China's 14th Five Year Plan (14FYP), which covers China's development from 2021 to 2025, focused extensively on science, technology, and innovation. The 14FYP stated that China promises to make "technological self-reliance and self-strengthening a strategic pillar of national development."³ Cloud computing services are foundational for many of the technologies the plan

identified as strategic and central to technological self-reliance and national security, such as artificial intelligence (AI), quantum computing, genetics and biotechnology, and advanced clinical medicine.⁴

China's digital protectionism and focus on local cloud computing firms becomes even more problematic given the country's ability to guide huge amounts of financing (via direct financing and public procurement contracts) to local firms. For example, China's recent stimulus plan allocates \$1.4 trillion over five years for many areas that involve cloud services, including digital infrastructure like 5G, smart cities, and Internet of Things applications for manufacturing.⁵ On January 31, 2021, China's State Council issued an "Action Plan for Constructing a High-Standard Market System" (Action Plan), which directs authorities to expand investment in new infrastructure construction such as artificial intelligence, cloud computing, blockchain, and other new technology infrastructure as well as data centers, smart computing centers, and other computing power infrastructure.⁶

The United States is the world leader in cloud computing services. China's market restrictions divert significant sales revenues that supports innovation and job creation in the United States. The impact has been especially damaging given that many U.S. companies' market access has been denied during a critical, formative period of economic growth in China. The impact of China's market restrictions go beyond China. Chinese tech firms are taking advantage of open markets in other nations to expand globally. For example, Alibaba Cloud has set up data centers globally, including Australia, Germany, India, Indonesia, Japan, Malaysia, Singapore, the United Arab Emirates, the United Kingdom, the United States (in Virginia and Silicon Valley). Likewise, Tencent Cloud's global operations are growing rapidly.⁷ U.S. cloud firms also stand to lose market share as other countries view the "China model" of digital protectionism as a success and one they want to replicate (such as in Europe and India), in part, because it has used restrictions to support local champions.

Getting China to provide greater cloud market access will not be easy. China sees digital economy restrictions as essential to achieving its most important goal—regime stability.⁸ For the longest time, cloud market access was essentially deemed "off limits" from negotiations. This is why, thus far, the United States and other countries that support an open and rules-based global digital economy have been unsuccessful in negotiations with China to get it to open up its cloud market and its broader digital economy to more U.S. digital firms and their digital goods and services. However, there are some recent signs and opportunities for the United States to (again) seek greater cloud market access in China.

China has shown some potential signs that it might be willing to provide greater market access to U.S. cloud providers. My testimony makes three recommendations.

1. The United States should prioritize clear and comprehensive market access in cloud and associated digital services in each forum involving China. China's large and growing cloud market and digital economy makes it important that U.S. firms have fair market access in the future given global competition is only going to get fiercer with Tencent Cloud, Alibaba Cloud, and others expanding around the world. Even if China doesn't ultimately come to the table, the United States should remain committed to pursuing clear and meaningful market access as part of multilateral negotiations at the World Trade Organization (WTO) given the benefits this broader market access will provide the sector.

2. The United States should not pursue misguided and self-sabotaging national and cyber security orders that punish U.S. cloud providers for China's unwillingness to address China-based cyber threats and unwillingness to cooperate with U.S. law enforcement. U.S. cloud firms have no control over the actions of nation states and state-sponsored cyber threats, so should not be made responsible for the latter's response to U.S. government's requests for actions and cooperation. The United States should instead pursue updated Mutual Legal Assistance Treaties and CLOUD Act agreements with countries around the world and use other cybersecurity and cybercrime forums to pressure China to take greater action.
3. Congress and the Biden administration should embrace reciprocity. If China does not adequately open up its cloud services market to U.S. firms, the United States should limit their access to the U.S. market. The United States should also encourage allies to do the same as part of broader efforts to confront Chinese innovation mercantilism.⁹ If China doesn't provide reciprocity digital economy market access, this would at least limit Alibaba Cloud and other's ability to use global markets to become more competitive.
4. Finally, the United States should put China's cloud market restrictions into the proper broader context in developing a "Grand Strategy for the Global Digital Economy." The U.S. lacks a coherent and comprehensive strategy to deal with the many international data and digital issues it faces. Its current approach is to address each issue individually and in an ad hoc way. The United States needs a broader strategy if it hopes to address the many interrelated trade, economic, human rights, and political issues raised by global digital issues and conflicts over them.

CHINA'S MARKET ACCESS RESTRICTIONS

Despite U.S. firms being world leaders in cloud services, China's discriminatory and restrictive market access and licensing regime means that there are very few U.S. cloud providers in China. For most U.S. cloud service firms, it's essentially closed. Given U.S. cloud firms can't provide these services on a cross-border basis (largely due to restrictive Chinese policies), the only option to access the Chinese market is to establish a contractual partnership with a Chinese partner (in order to get the necessary licenses), which includes handing over valuable technology, intellectual property, know-how, and branding.¹⁰ U.S. cloud providers have no direct relationship with customers in China and no ability to independently develop their business, or those of their partners. Companies' efforts to build business thus inevitably builds up the Chinese partner, who may well become a future global competitor. This section analyzes the nature of China's cloud market restrictions.

This is exactly China's goal. As U.S. cloud firms have told USTR as part of its Special 301 investigations, China uses a restrictive, yet ambiguous, licensing process to benefit Chinese cloud computing businesses and pressure technology transfer. China first tacitly permits foreign investors to partner with licensed Chinese cloud service providers to gain market access, and then, once key technology and know-how had been injected into these partnerships, China resolved the regulatory ambiguities that had necessitated these arrangements in favor of the Chinese partner, resulting in the transfer of technology to the Chinese partner.¹¹ These are just some of the reasons why U.S. firms want greater, clearer market access (and not through JVs).

In major markets, including China, cloud computing services are typically offered through commercial presence in one of two ways. They are offered as an integrated service in which the owner and operator of a telecommunications network which offers cloud services over the network. However, U.S. firms are excluded from competing in China's basic telecommunications market, which is dominated by three state-owned

enterprises (SOEs, see figure 1). Licenses are essentially impossible to get. The second approach is that firms offer cloud services as a stand-alone (valued added) computer service, with connectivity to the computing service site provided separately by telecommunications firms. Although China's WTO General Agreement on Trade in Services (GATS) commitments include services relevant to both approaches, neither one is currently open to foreign-invested companies.¹²

U.S. firms are most interested in the value-added telecommunication services (VATS) market, which includes cloud computing. However, this is where China uses restrictive and discriminatory licensing and JV requirements to control foreign competition and to force them to help local competitors. China blocks U.S. cloud service firms from directly participating in the three most common forms of cloud computing services: (IaaS); computer platform as a service (PaaS); and software as a service (SaaS).¹³ A JV is a prerequisite for U.S. firms to even apply for a license to operate in the cloud service market. Ultimately, of the thousands of VATS licenses given out, only a small handful have gone to U.S. and foreign firms.

China's cloud market has become more restricted over time. In 2015, China released regulations for several services it considers VATS (see figure 1). By categorizing Internet-based services (e.g., cloud computing, big data, and other information services) as telecommunication services, and not as "computer and related services," it has much greater freedom to restrict market access to foreign tech firms. This is because China made commitments as part of its accession to the WTO in 2001 to provide nondiscriminatory treatment and market access to foreign firms in "computer and related services."¹⁴ This category of Internet-based computer services includes email, voicemail, online information and database retrieval, electronic data interchange, enhanced facsimile services, code and protocol conversion, and online information and/or data processing.¹⁵ Essentially, China's approach is a technical work-around to avoid its commitment to open its market for Internet-based computer services to foreign competition.

Figure 1: Classification catalogue of telecommunication services in China.

Basic Telecom (A1/A2)		Value-Added Telecommunication Services (B1/B2)	
Service	Key Requirements and General Foreign Market Access	Service	Key requirements & General Market Access
A1 Fixed-line telecommunications Cellular telecommunications Satellite services 1 Telecom data 1 IP calls	Strict licensing requirement & less than 49 percent foreign equity. In reality, its effectively closed to foreign firms.	B1 Internet data centers and services such as PaaS and IaaS. Content delivery networks (CDNs) Domestic IP-Virtual Private Network Services Internet service providers (ISPs)	Largely closed. Less than 50 percent foreign investment joint ventures can apply for a license. However, foreign firms have generally only received 5 percent of licenses. SaaS is completely off limits.
A2 Trunk communication Wireless paging Satellite services 2 Telecom data 2 Network access infrastructure services Domestic telecommunication infrastructure services Internet hosting	Strict licensing requirement & less than 49 percent foreign equity. In reality, its effectively closed to foreign firms.	B2 Online data transaction and processing, including e-commerce. Domestic multi-party communication Storage and transfer Call center services Information services	Relatively open. Foreign firms can own 100 percent if providing e-commerce, domestic multi-party communication, storage and transfer, and call center services. Otherwise, same as above.

China then introduced a requirement for telecom and Internet Service Providers (ISPs) to apply for licenses for each subcategory of VATS services, raising the potential for government agencies to discriminate against foreign firms.¹⁶ For example, China’s new subcategory, “Internet-based resources collaboration services,” means that providers of cloud computing application services including IaaS and PaaS have to apply for multiple licenses, given some firms and services cross over into multiple categories. As SaaS is considered too

close to information services, which China is extremely sensitive to for censorship reasons, it is essentially closed and considered separately as part of its service and licensing requirements.

In 2016, China made another set of significant changes to its licensing and regulatory regime that further discriminated and restricted U.S. technology firms involved in cloud computing, big data, and other information services. In October 2016, the Ministry of Industry and Information Technology released the “Notice on Regulating Business Behaviors in the Cloud Service Market,” which outlined how foreign cloud companies are forbidden from working via local partnerships in any capacity beyond “technical assistance.” It is not specified what is allowed under “technical assistance,” but based on current practice, it means that U.S. firms are only allowed to license their goods (software and hardware) to their (forced) local partners and show them how to use them. The notice further specifies several activities that cloud service providers cannot perform, such as sign contracts directly with end users. In March 2017, 50 U.S. lawmakers complained about these new rules in a letter to China’s ambassador to the United States, stating that the change would force U.S. companies to essentially transfer ownership and operations of their cloud systems to Chinese partners (which is essentially what it did).¹⁷ USTR’s 2018 broad-ranging investigation into China’s acts, policies, and practices related to technology transfers, intellectual property, and innovation noted, “According to numerous submissions in this investigation, an important example of how ambiguity in China’s administrative licensing process is used to pressure technology transfer arises in the field of cloud computing.”¹⁸

This mercantilist approach to cloud computing is consistent with China’s ongoing efforts to develop a local cloud-computing sector that uses indigenously developed technology. China’s ambitions in the sector started as part of the country’s *National Medium and Long-Term Plan (MLP) for Science and Technology Development (2006-2020)*. Building on this in 2010, China identified cloud computing as one of 11 strategic emerging industries that would receive special attention and funding, all in pursuit of the goal of expanding access to cloud resources in China, developing indigenous cloud-computing technology, and creating an internationally competitive Chinese cloud-computing sector. The Ministry of Science and Technology’s *12th Five-Year Plan (2011-2015)* paid particular attention to cloud computing, where the aim became to develop a cloud-computing standard based on indigenously developed technology.¹⁹ And as noted the sector was highlighted again in the most-recent *14th Five-Year Plan*. These policies, taken together, show China’s efforts to use mercantilist policies at home to support the development of “local champions,” who, ideally for China, will eventually become more innovative and competitive and able to compete in overseas markets—against the very tech firms that are unable to compete in China.

U.S. FIRMS IN CHINA: TRYING TO MAKE THE MOST OF ITS RESTRICTIVE MARKET

China’s discriminatory licensing process and restrictive JV requirements keep many leading U.S. cloud firms out, and of those few it lets in, it strictly controls how they operate. As of 2009, although there were over 20,000 local companies licensed to provide VATS in China, only 30 or so licenses were issued to foreign companies, including five U.S. companies.²⁰ More recent industry estimates state that only around 5 percent of VATS licenses go to foreign firms. As USTR notes, although not explicitly stated in rule or policy, China appears to apply an economic needs test to new entrants in this sector to avoid “unhealthy competition.”²¹ By that, they mean fair competition. This section analyzes the role of China’s growing cloud market in the global market and the operations of some of the few U.S. cloud service providers in China.

The global nature of cloud computing and China's large and growing digital economy means that forgoing China's market is simply not a commercially viable option for U.S. cloud firms. Furthermore, many of their multinational customers demand globally available services. This is why a few large U.S. firms have run the gauntlet and setup operations in China, all within the confines of its strict conditions. For example, Microsoft has partnered with 21Vianet (in 2014), SAP with China Telecom, and IBM with a group of local companies.²²

China's market restrictions have forced U.S. cloud service firms to use a few different models to enter and compete in China, each with their own advantages and disadvantages (in terms of capital intensity, compliance burden, and the range of services they're able to offer). Furthermore, of the few U.S. firms that do operate in China, they essentially have to develop separate local services and infrastructure to their global operations. U.S. firms operate their China data center services (such as IaaS and PaaS) separately from their global cloud services.²³ Either way, U.S. firms are severely restricted in what they can do, often being constrained to arrangements whereby they license their products to their local partners, who set up and run the data centers and cloud services and manage relations with end users.

China has broad data localization requirements that make it illegal, or uncertain and very difficult, for U.S. cloud firms to transfer data out of China.²⁴ It also prohibits them from providing many cross-border cloud services. It also creates technical and operational issues for U.S. cloud firms, such as being able to seamlessly transfer data in and out as part of software updates, debugging, technical upgrades, and other cross-border services. China would need to provide broad digital market access to make it meaningful for U.S. cloud firms given the critical role of value-added services that U.S. firms deploy alongside their cloud services, whether this is consumer-facing services (such as email) or enterprise-facing (such as virtual private networks and data analytic services).

Generally, China's market is broken down into three components for U.S. firms to target: domestic firms, multinational companies, and Chinese firms expanding into overseas markets. Basically, U.S. cloud firms are competing to accelerate the globalization of Chinese firms, while empowering foreign multinationals in terms of their cloud needs in China. U.S. firms are more competitive in these two categories given they have larger global operations for these firms to use, but Chinese firms are rapidly expanding global operations (so this advantage will shrink).

In 2014, Microsoft launched its Azure cloud services in a partnership with 21Vianet, which was the first international public cloud service to become generally available in China. Microsoft plans to expand its partnership, effectively doubling its cloud computing capacity in China.²⁵ Microsoft Azure's partnership is not a JV, but a licensing agreement, with Shanghai Blue Cloud Technology Co., Ltd., which is wholly owned by 21Vianet. This licensing model is reportedly what the Chinese government prefers, as it gives the local partner even greater control over data center operations. For Microsoft, it provides a local partner to then sell and service a broad range of software (especially its Office 365 portfolio) and to compete in the otherwise excluded SaaS market. In 2018, Microsoft's Office 365 (which is a type of SaaS) became a leader in China's SaaS market.²⁶ Whereas Microsoft Azure is IaaS. However, even with this model, Microsoft is limited in what it can do. 21Vianet independently operates, provides, and manages the delivery of Microsoft cloud services. It also provides subscription and billing services, as well as support.²⁷ However, indicative of China's huge market potential, even with these restrictions, Microsoft has reported growth of over 100 percent in some

quarters. Also indicative of the critical role that cloud market access plays in allowing firms to offer a broader range of services, Microsoft has over 17,000 local IT system integrators that use its services.

Amazon Web Services (AWS) has had a tortured experience in China. For example, in April 2019, Amazon shut its Chinese e-commerce marketplace.²⁸ In January 2021, a Beijing court ruled that AWS cannot use its AWS logo in China as it belonged to a Chinese company.²⁹ Furthermore, China forced Amazon to sell part of its China operations to its local partner to comply with new laws (below).

However, despite very restrictive access, AWS remains engaged and is expanding services to seize as much market share as it can. AWS has data centers in Ningxia, Beijing, and Hong Kong. China is the only country outside of the United States with three AWS regions. AWS partners with Beijing Sinnet Technology Co. to operate the AWS China cloud-computing service in the Beijing region. In November 2017, AWS sold the hardware for its cloud computing operation to Sinnet for \$300 million, reportedly to meet Chinese regulations which forbid foreign companies from owning or operating certain technology for the provision of cloud services.³⁰ Amazon made the sale in advance of Ministry of Industry and Information Technology (MIIT) plans to force firms to apply for a new operating license by the end of 2017. Since 2017, AWS has also partnered with Ningxia Western Cloud Data Technology Co (NWCD) to operate data centers in Ningxia.³¹ Similar to Microsoft, AWS provides technology, guidance, and expertise to NWCD and Sinnet, while NWCD and Sinnet operate and provide AWS Cloud services to local customers.³²

What this means is that AWS China operates apart from AWS's global regions. AWS China uses local management console and account systems for billing and support charges, which use their own authentication for access to AWS services in China. AWS customers need to access AWS services in mainland China and Hong Kong using respective portals, which are not the same as those they'd use to access AWS services elsewhere around the world. Furthermore, globally, AWS has more than 175 fully functional services for its customers to use; however, many are not available in the China region.³³ Even within China, some service offerings differ. While AWS services are generally available in both the Beijing and Ningxia regions, some services are only available in one of the two regions. For example, AWS IoT Analytics is limited to businesses in the Beijing region.

AWS's operations in China continues to expand and evolve to grow market share. In 2019, AWS added a new Asia-Pacific region in Hong Kong. In March 2021, AWS announced that it is expanding its partnership with NWCD to provide 130 percent more cloud capacity and that it'll open a third cloud zone as part of its Beijing-based operations.³⁴ AWS is also aiming to close the gap in service offerings and in offering new services. For example, it launched AWS Marketplace China in 2020, with more than 200 third-party software offerings, which is another critical part of the competition, in terms of who else is using AWS services. Similarly, AWS is expanding its Partner Program (who are specialist third parties that use AWS to build solutions and services for customers) through strategic partnerships with well-known domestic and foreign IT providers, such as KPMG, Capgemini, Deloitte, Digital China, Ultrapower Software, and Futong. It has also designated 43 local partners as AWS Competent, which shows they are especially adept at using AWS services.

Like other U.S. cloud firms in China, AWS is targeting Chinese firms expanding into overseas markets, such as CIMC, Globalegrow, Cheetah Mobile, Midea, OnePlus, and Huya. For example, it only took AWS five days to complete the global deployment and migration of all of OnePlus's overseas shopping sites onto a

global system to support its overseas businesses.³⁵ As another example, AWS only recently announced that it will provide global cloud services for Chinese tech firm Huawei (a wearable computing device vendor with operations in 70 countries and regions).

In 2015, Oracle (the largest enterprise software company in the world) partnered with Tencent to provide its SaaS, PaaS, and IaaS services.³⁶ Oracle provides the technology that powers its data centers, while Tencent Cloud provides service for consumers. Oracle has operated in China for about two decades, owns 14 branches, five R&D centers, and has nearly 5,000 employees in the country. Oracle's Asia Pacific arm accounts for about 16 percent of the company's total revenues. In 2019, Oracle closed its R&D center in China.³⁷

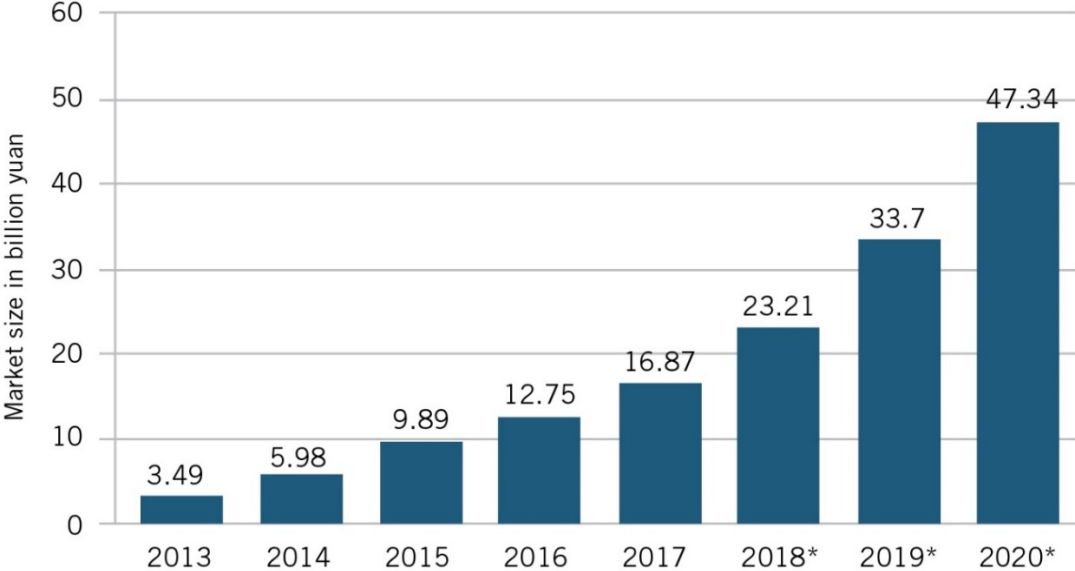
Google Cloud does not operate in mainland China. In mid-2020, Google reportedly considered a new initiative (called "isolated regions") that would have allowed it to try and re-enter China. Google considered allowing third parties to control and manage its cloud services, such as via a locally owned company or a government agency (which it does not currently do).³⁸ Google considered the change in operations in no small part due to China's market restrictions (as well as those in Europe). This follows reported talks between Google and a Chinese firm in 2017 about the potential to setup a partnership to provide cloud services in China.

CHINA'S CLOUD VS. THE GLOBAL CLOUD

China is the world's second-largest cloud services market. COVID-19 only accelerated its rapid growth as China directed economic stimulus spending into supporting digital adoption. This section analyzes the growth of China's cloud market and competition between Chinese and U.S. cloud firms in China and globally for market share.

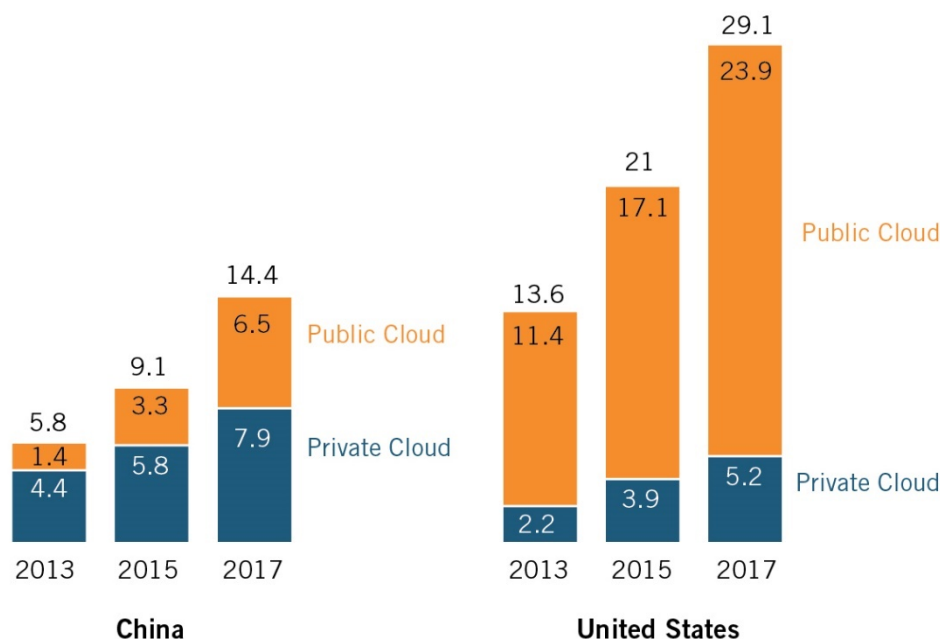
China's cloud services market is worth tens of billions of dollars and is growing rapidly.³⁹ For example, China's SaaS market alone grew 13-fold from an estimated 3.5 billion yuan in 2013 (nearly \$500 million) to 47.3 billion yuan (nearly \$6.7 billion) in 2020 (see figure 2).⁴⁰ Total cloud spending was worth an estimated \$5 billion in just the third quarter of 2020.⁴¹ As figure 2 shows, China's cloud market is growing rapidly. In the first quarter of 2020, China's cloud infrastructure spending increased 67 percent year on year to \$3.9 billion, maintaining its No. 2 position behind the United States, according to data from Canalys.⁴² China's spending accounted for 12.5 percent of the world's total (\$34.6 billion) investment on cloud infrastructure in the first quarter of 2020 compared to 10 percent in the same quarter in 2019.⁴³ In the same time period, International Data Corporation (another commercial market analysis firm) reported that China's SaaS market segment grew 57.6 percent year-over-year, while the PaaS segment expanded 64.6 percent. The sum of these two markets increased by 58.7 percent year-over-year.⁴⁴

Figure 2: China’s software-as-a-service (SaaS) cloud market (billion yuan, 2013-2017).⁴⁵



China’s cloud market retains enormous growth opportunities. Chinese firms spent around 14 percent of their total IT budget on cloud services in 2017—more than double the amount spent in 2013. However, even with this growth, China still lags behind global peers in terms of cloud expenditure. In the United States, for instance, cloud spending accounted for around 29 percent of the total IT budget in 2017, up from around 14 percent in 2013 (figure 3). This is indicative of the enormous growth potential that remains.

Figure 3: China vs. U.S. cloud expenditures (percent of total IT budget)⁴⁶



The absence of U.S. firms has allowed local Chinese firms to grow and seize the majority of China’s domestic cloud market. China’s cloud market is dominated by local providers, such as Alibaba Cloud, Tencent, JD Cloud, Huawei, and Baidu, as well as niche players like ChinaC, ChinaCache, ChinaNetCenter, Kingsoft Cloud, Qingcloud, Qihoo 360 Technology, Qiniu and UCloud, among others. In China, in the first half of 2020, Alibaba Cloud, Tencent Cloud, Huawei Cloud, and China Telecom together held around 44, 14, and 14 percent market share, respectively, according to Canalys. Amazon was the fifth-biggest cloud provider with around 7 percent, which alongside other foreign firms, make up around 20 percent of the market.⁴⁷

Indicative of the importance of the cloud sector to Chinese tech firms, Alibaba’s revenue from cloud operations grew 50 percent during the quarter ended December 2020 to \$2.47 billion, making up around 7 percent of the company’s quarterly revenue. Indicative of the market opportunity, Chinese firms (often supported by government policy) are investing huge amounts in new data centers. For example, in May 2020, Tencent Cloud stated it plans to invest \$70 billion in digital infrastructure to expand its cloud computing, AI, blockchain and cybersecurity capabilities over the next five years. Similarly, in April 2020, Alibaba Cloud stated it planned to invest around \$29 billion over the next three years on cloud infrastructure.⁴⁸

The main saving grace for U.S. cloud firms is that the U.S. IaaS and PaaS market remains significantly larger than China’s and it is also growing quickly (20+ percent a year).⁴⁹ The global public cloud services market grew 6.3 percent in 2020 to \$257.9 billion, up from \$242.7 billion in 2019 (figure 4).⁵⁰ SaaS remains the largest market segment and is forecast to grow to \$104.7 billion in 2020 due to more firms shifting from on-premises license software to subscription-based SaaS models, in conjunction with the increased need for new software collaboration tools during COVID-19. The second-largest market segment is cloud infrastructure as a service (IaaS), which is forecast to grow 13.4 percent to \$50.4 billion in 2020.⁵¹ Indicative of the pace of growth, between 2018 and 2019, global public IaaS and PaaS markets doubled in size (see figure 4).⁵² But

whereas U.S. firms can obviously compete for growing demand for cloud services at home and most other countries around the world, it can't in China, which represents a large part of the global market.

Figure 4: Worldwide public cloud service revenue and forecast (millions of U.S. dollars)⁵³

	2019	2020	2021	2022
Cloud Application Infrastructure Services (PaaS)	37,512	43,498	57,337	72,022
Cloud Application Services (SaaS)	102,064	104,672	120,990	140,629
Cloud System Infrastructure Services (IaaS)	44,457	50,393	64,294	80,980

On a global basis, Amazon’s worldwide market share of the public cloud has held relatively steady at around 38-40 percent, while Microsoft, Google, and Alibaba have all steadily gained market share (see figure 5).⁵⁴ These four leading providers generally account for around 70 percent of the worldwide market for IaaS and PaaS. These leading firms are followed by Salesforce, IBM, Oracle, Tencent, and a large group of companies with minor market shares (see figure 6). The rest of the market is comprised of hosted and managed private cloud services, where IBM is the market leader alongside companies like Rackspace and OVH.⁵⁵ (See the next section for a competitive analysis of Alibaba Cloud and Tencent Cloud).

Figure 5: Global public cloud services—market share trends (Public IaaS and PaaS).⁵⁶

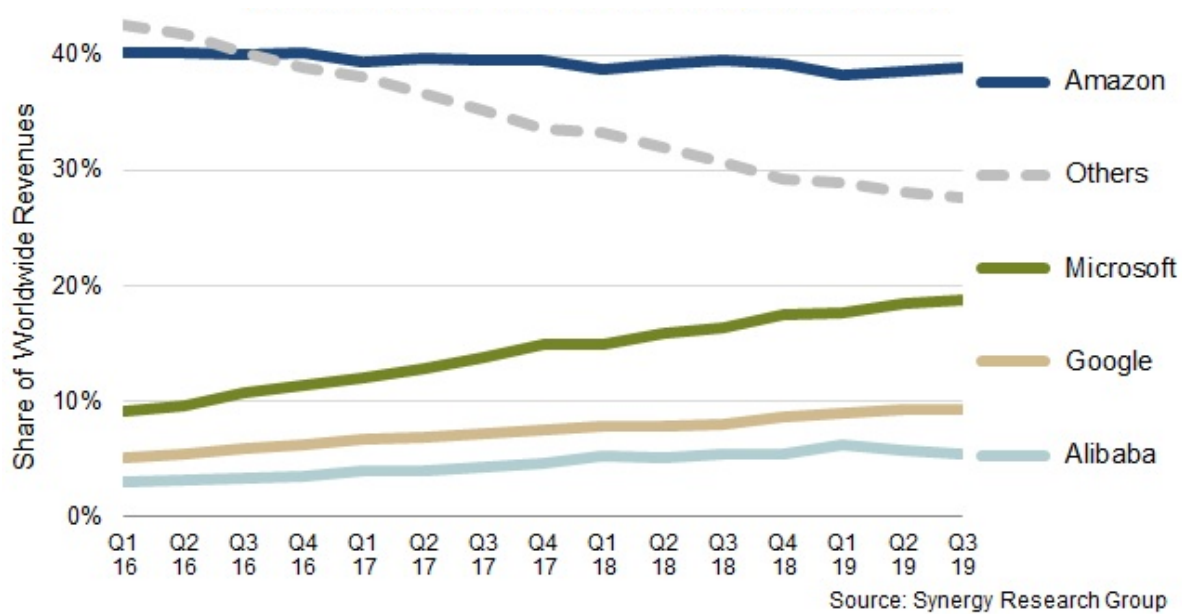
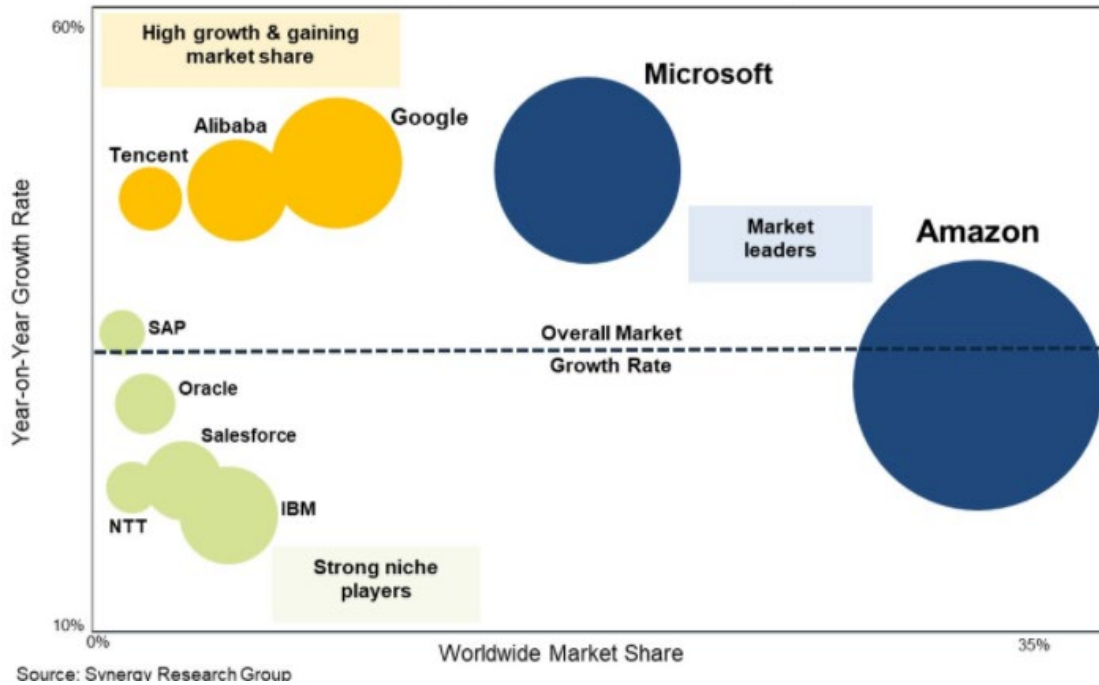


Figure 6: Global cloud provider's competitive positioning (IaaS, PaaS, hosted private cloud, third quarter, 2020)⁵⁷



COMPARING CAPABILITIES AND GLOBAL COVERAGE: ALIBABA AND TENCENT LAG BEHIND U.S. FIRMS, BUT A PROTECTED HOME MARKET HELPS THEM CATCH UP

Alibaba Cloud and Tencent Cloud lag behind AWS, Microsoft, and Google in size, capabilities, and global coverage, but they are taking advantage of open global markets to rapidly expand (see figure 6 above). The lack of reciprocal market access in China is brought into stark contrast as these firms continue to expand in the United States and elsewhere around the world.

For global cloud service firms, it is not enough to provide basic services at home. The basis for competition is global and around providing a comprehensive, integrated, and cutting-edge suite of artificial intelligence, cybersecurity, and other value-added services. Gartner's (a global research and advisory firm) evaluation of cloud providers (covering PaaS, functions as a service (FaaS), database PaaS (dbPaaS), and application developer PaaS (adPaaS)) provides a comprehensive assessment of competitive position in the global cloud market (figure 7). It shows that AWS leads the world, followed by Microsoft, Google, and Alibaba Cloud.⁵⁸

Figure 7: “Magic quadrants” for cloud infrastructure and platform services: leaders, challengers, and niche players⁵⁹



AWS has a commanding lead across many of the IaaS and PaaS market’s critical dimensions, including total market share and service capabilities (as shown in figure 6 and 7). AWS has a growing portfolio of products and services with sought-after features. Its offerings are also backed by a well-established partner program.⁶⁰ AWS also has the expertise and resources to vertically integrate and deliver a comprehensive set of services to customers on a global basis. AWS also provides many Chinese firms expanding overseas with services. Similarly, Microsoft Azure offers a complete end-to-end set of solutions related to a broad range of workloads and applications, such as via partnerships with Oracle, SAP, and VMware, plus the ability to integrate use of its Office software. Google’s big data and data science capabilities and open-source contributions, such as Kubernetes and TensorFlow, differentiate it.⁶¹

Alibaba is the world’s fourth-biggest cloud computing service.⁶² However, Alibaba remains a mostly China-focused cloud provider, but this is changing as it has been rapidly growing its operations around the world, especially in the Asia-Pacific and North America. At home, Alibaba Cloud leverages its parent company’s dominance in e-commerce operations to get more firms to use the full suite of Alibaba services.

Alibaba Cloud’s international business is headquartered in Singapore. Alibaba Cloud’s operations are in the United States, Germany, Australia, Indonesia, Japan, India, Malaysia, Singapore, the United Arab Emirates, and the United Kingdom.⁶³ Part of its competitive advantage is that Alibaba Cloud leverages its ability to allow customers to use Alibaba Cloud to also access Alibaba’s e-commerce operations in China. However, indicative of the gap between China and the global market, Alibaba Cloud’s international offering does not have the full capabilities of it offers in China, nor do they offer the full range of features that its major global competitors offer.⁶⁴ However, Alibaba Cloud’s expansion faces some geopolitical headwinds given concerns

about Chinese technology firms and alleged Chinese government access to data, such as those raised in India.⁶⁵

Tencent Cloud has advantages in cloud gaming and live streaming, as well as its strong ecosystem transformation capabilities offered by its WeChat and applets (mini programs that allow users to enjoy basic functions of some apps on the WeChat interface). However, it is mainly focused on China and serving multinationals in China and Chinese multinationals expanding overseas. However, even this is enough to make it a major player globally. Tencent Cloud now has larger IaaS market share on a worldwide basis than IBM and Oracle, and it has the technical acumen to be a formidable challenger to Alibaba Cloud.

Tencent Cloud data centers are located in Australia, Brazil, Canada, China, India, Japan, the Netherlands, Russia, Singapore, South Korea, Thailand, and the United States.⁶⁶ Tencent Cloud has strong synergies between its digital service ecosystem and its cloud services, in terms of integrated gaming, social networking, and digital e-commerce services for foreign and Chinese firms. However, Tencent Cloud has a nascent presence among international enterprises, with most of its overseas cloud resources consumed by gaming customers. Indicative of this, outside of China, Tencent Cloud has no managed service providers ecosystem (data center administration), no support for Oracle, limited migration tooling or services, and no marketplace of third party-certified applications.⁶⁷

The broader lack of reciprocal digital and e-commerce market access between China and the rest of the world provides Alibaba, Tencent, and other Chinese tech firms with a broader competitive advantage over their U.S. competitors than that which they derive from cloud-specific restrictions. Their e-commerce, payments, communication, and other services can expand globally (largely unimpeded), often in parallel with, or in some cases ahead of, their cloud operations. China's broader digital protectionism means that these firms can develop their own leading services at home in a protected digital market and use this home base to expand globally.

For example, while most famous for its messaging app, WeChat, Tencent is the world's largest video gaming company. It is leveraging its own cloud services as part of this business. Tencent earned nearly \$74 billion in 2020, with gaming representing about one-third. It has 140 games and gaming assets across mobile, PC, consoles, e-sports, and live streaming. This is significant as China's gaming market was worth nearly \$40 billion in 2020, which was even larger than the U.S. market (worth around \$37 billion).⁶⁸ Yet the vast majority of U.S. video gaming companies, titles, and associated firms (like Amazon's video streaming service Twitch) are blocked from, or only have limited access to, China's video game and digital content markets.⁶⁹ Meanwhile, Tencent is free to setup a live-streaming service (called Trovo Live) to compete with Twitch in the United States.⁷⁰

Where U.S. and Chinese Cloud Firms Go Head-to-Head in Asia (ex-China), Chinese Firms Differentiate Themselves in Key Ways

Thus far, the most intense U.S.-China rivalry in cloud markets is in India and South East Asia. Alibaba Cloud and others are going head-to-head with U.S. firms in a way that they obviously do not at home.⁷¹ As part of this direct competition for customers and contracts in new and emerging markets, China's cloud providers are seeking competitive advantage by differentiating themselves on key cloud market policies that are opposed by U.S. cloud firms. U.S. and Chinese firms are also taking different approaches in their competition across

digital services (e-commerce, social media, search, payments, and others).⁷² This section analyzes key differences in how they are competing in cloud services.

First, Chinese cloud firms are not opposing data localization and expansive government access to data frameworks. Rather, Alibaba Cloud and others see their willingness to abide by these requirements as a competitive advantage, as U.S. and other foreign cloud firms often actively oppose such measures. For example, Alex Li (general manager, Alibaba Cloud India) said the company, which has set up data centers in India, sees a big opportunity in the Indian government's push toward data localization.⁷³ Simon Hu (President, Alibaba Cloud) made similar comments, stating "We need to respect laws on data security and privacy. It is the most fundamental one. We insist on localization of data. Indian data should be stored in India. That is our principal."⁷⁴

Many government officials and agencies in the region (especially law enforcement and national security agencies) prioritize control over data, so Alibaba Cloud and other's sale strategy of giving local governments what they want, in terms of local storage and control, can be very effective. In their head-to-head competition in South East Asia, some U.S. cloud firms state that they are not generally losing contracts to Chinese firms on price or services, but their willingness to abide by government requests for data can be a critical differentiator, especially if the contract is for cloud services to manage public or government data and services.

In contrast, U.S. firms oppose data localization as it creates duplicative costs and undermines global service capabilities, such as cybersecurity protections and data analytics.⁷⁵ U.S. cloud firms also tend to have sophisticated legal compliance and IT operations to ensure that they follow local data protection laws and data access laws, but only those strictly within the law and those that do not infringe upon other countries' laws and sovereignty. Many U.S. cloud firms also publish transparency reports about government requests for data to show how they manage these requests and protect user data.⁷⁶ Chinese cloud firms do not provide similar transparency reports. Chinese cloud firms face growing scrutiny over their data management practices and accusations that they provide data to the Chinese government.⁷⁷

Second, part of Chinese cloud firms' value proposition to customers is that they provide access to China as part of a seamless service between many countries in Asia and China, whereas (due to restrictions) many of their U.S. competitors cannot do the same. While Alibaba Cloud and others do not have the same global capabilities as their U.S. competitors, they have better access and services in China, which is where many business customers are focused.

Third, Chinese cloud companies also benefit from China's broader diplomatic, trade, and economic engagement with countries in the region, such as via the ASEAN-China strategic partnership, the Belt and Road Initiative, and the Digital Silk Road (DSR).⁷⁸ As to the latter, for years, DSR has been less an identifiable set of projects as much as it was a brand for virtually any telecommunications or data-related business operations or product sales by China-based tech firms around the world.⁷⁹ DSR is all-encompassing term applied by China's public and private sector leaders to telecommunications and other data and connectivity projects in countries that are nominally part of the BRI. Projects self-brand as part of the DSR to score political—and perhaps financial—support from Beijing, while the state is not too involved in day-to-day operations, although it can and does intervene to advance its strategic objectives. However, it seems clear that in the future Beijing will invest resources to help its domestic tech giants pursue commercial business opportunities and be involved at all levels of the digital infrastructure build along the DSR, including cloud

services.⁸⁰ It is important to note that Chinese cloud firms would be expanding globally anyhow, but that they will self-brand as DSR or formally join DSR initiatives if it suits their interests.⁸¹

CHINA'S RESTRICTIVE CLOUD MARKET UNDERMINES U.S. INNOVATION AND COMPETITIVENESS

What is at stake in pushing for fair cloud market access in China is U.S. cloud sector's ability to earn the revenue that drives ever-greater R&D and business operations in the United States, and globally. Not only are U.S. firms losing out on market access and revenue due to China's protectionism, but they are also losing market share and revenue in third-country markets as Chinese firms use their protected home market to expand globally and other countries or regions (such as Europe) seek to emulate China's approach. U.S. cloud firms are in an ongoing race for innovation advantage as their Chinese competitors also commit ever-growing amounts of money and effort to fund the R&D that will define their respective competitive positions in the future.

U.S. policymakers need to support U.S. cloud firms as their innovative capabilities help drive America's long-term economic growth. For instance, at least half of America's economic growth can be attributed to scientific and technological innovation.⁸² However, such innovation does not fall like manna from heaven. Rather, innovation is a product of complex national innovation systems, supported by a thoughtful and comprehensive set of innovation-enabling public policies that collectively impact the capacity and ability of both private and public actors to effectively innovate.

The U.S. cloud sector can be characterized as an innovative industry, which exhibits a few specific characteristics. First, the rapid and regular development of new processes, products, or services—many of them disruptive in nature—is critical to their competitive advantage. Their success depends not on making a particular good or service cheaper, but on creating the next-generation product. Second, the marginal cost of selling the next product or service is significantly below the average cost of producing it in innovation-based industries. The digital content and services industry is perhaps the most extreme example of this. In some cases, the first version of a service costs hundreds of millions of dollars to create, while additional digital copies are produced at virtually no cost. Finally, innovation industries depend more on intellectual property—particularly on science- and technology-based IP—than other industries. For example, software depends on source codes.

Chinese digital protectionism undermines the three key factors needed to maximize innovation in the U.S. cloud sector:

1. Ensuring the largest possible markets: For innovation industries with high fixed costs in design and development, but lower marginal costs of production, large markets are critical because they enable firms to cover those fixed costs—so unit costs can be lower and revenues for reinvestment in the next generation of innovation higher. This is why firms in most innovation industries, like cloud services, are global.

2. Limiting nonmarket-based competition: Large markets enable firms to sell more. But if larger markets come with larger numbers of competitors, total sales per firm can remain the same, or even fall. Conventional wisdom holds that this competition is good for innovation. However, many studies have demonstrated that innovation and competition can be modeled according to an inverted “U” relationship, with both too much and too little competition producing less innovation.⁸³ Chinese industrial policy has allowed less competitive firms to enter and grow thanks to protectionism. Not only this, but China supports their global expansion.
3. Ensuring strong intellectual property protections: Firms in innovation-based industries depend on intangible capital, much of it intellectual property. Strong intellectual property protections are needed to enable inventors to realize economic gains from their inventions— further giving them the ability to reinvest those profits into the next generation of innovative activities. However, if competitors are able to enter into or remain in a market because they obtain an innovator’s intellectual property for less than the fair market price (through either theft or coerced transfer), they are able to siphon off sales that would otherwise go to innovators.

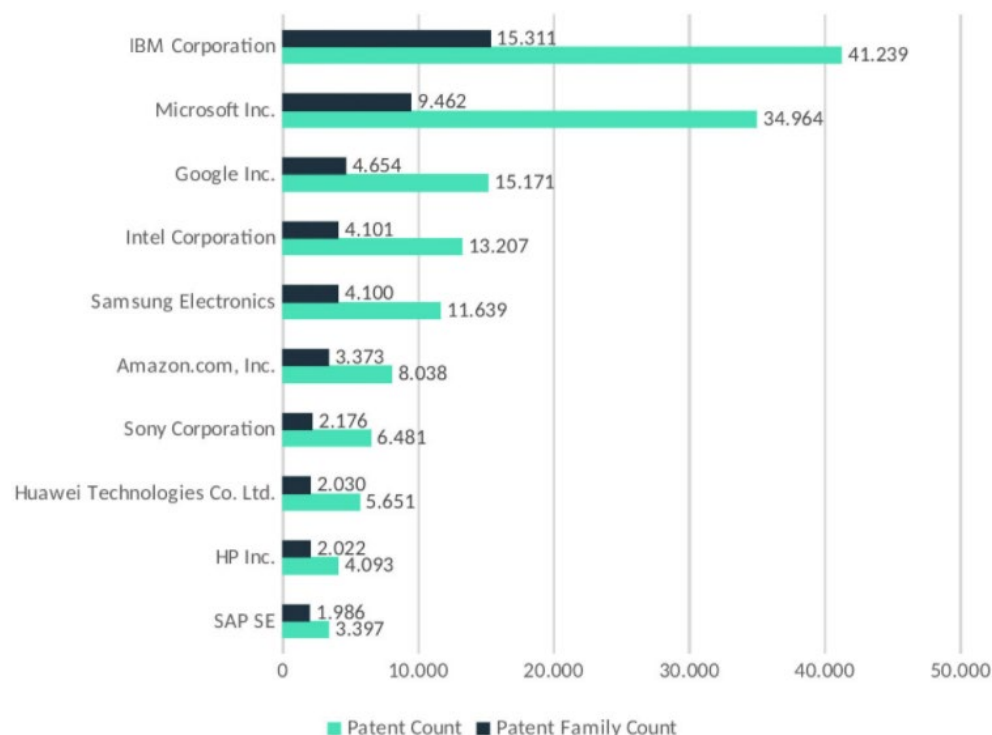
U.S. cloud firms deserve attention as they are among the most innovative in the world. Google, Amazon, Microsoft, and others invest more in R&D than nearly all other firms. In 2020, Amazon invested \$40.4 billion, Alphabet (Google's parent company) invested \$27.3 billion, Microsoft invested \$19.3 billion, Apple invested \$18.8 billion, IBM invested \$6.3 billion, and Oracle invested \$6 billion.⁸⁴ It is not only the total amounts of R&D that’s important to consider, but also where they were directing it, in targeting cybersecurity, cloud computing, AI, analytics, 5G and 6G, and mobility.

For example, Google just announced plans to invest over \$7 billion in new operations and data centers across the United States. and create at least 10,000 new full-time (Google) jobs in America in 2021.⁸⁵ Google will expand data centers in Nebraska, South Carolina, Virginia, Nevada, and Texas. Google will it establish its newest Cloud engineering site in Durham, North Carolina. Google’s 2020 U.S. Economic Impact Report outlines how its services (such as Google Search, Google Play, YouTube, and Google advertising tools) helped provide \$426 billion of economic activity for more than 2 million American businesses, nonprofits, publishers, creators, and developers.⁸⁶

But Chinese cloud firms are spending more on R&D to close the technological gap with U.S. competitors. In 2020, Huawei invested \$20 billion in R&D, while Alibaba invested \$7.4 billion.⁸⁷ China's top 100 Internet companies have increased their R&D investments by \$21.9 billion in 2019, which is a 45 percent increase in R&D spending compared to 2017.⁸⁸ Huawei boosted its R&D expenditures from \$12 billion in 2018 to \$20 billion in 2020. Huawei’s R&D investments now account for approximately 20 percent of the telecommunications giant's overall revenue.⁸⁹

The U.S. cloud sector’s world-leading innovation is also clear in terms of intellectual property (figure 8).⁹⁰ Alphabet, IBM, Intel, Microsoft, and Apple are among the world’s leading developers of valuable patents.⁹¹ For example, in 2018, IBM led U.S. companies in patents, with engineers, researchers, scientists, and designers racking up a record 9,100 patents (the 26th year in a row that it led U.S. firms). Of those, more than 2,000 were related to cloud computing. Other areas of patenting activity include AI, blockchain, quantum computing, and security.⁹²

Figure 8: Top owners of cloud computing patents (2010-2018, global, IPlytics analysis)⁹³



U.S. cloud firms’ global operations and research network support all this R&D spending and patenting. Market access is one driver of where U.S. firms setup AI R&D labs, but it’s far from the only one. For example, in 2019, AWS established an IoT labs in Shenzhen (and Taiwan). It also operates an AI R&D lab in Shanghai. However, research shows that U.S. tech firm’s global research operations still greatly benefit R&D in the United States. A Center for Security and Emerging Technology (CSET) report shows that Amazon, Apple, Facebook, Google, IBM, and Microsoft have AI R&D labs and staff around the world.⁹⁴ For the four companies where CSET could find information on labs—Facebook, Google, IBM, and Microsoft—they found 62 labs conducting AI R&D. While most of these labs (68 percent) were located outside of the United States (with 10 percent in China, with six labs), 68 percent of AI staff at these companies are in the United States.⁹⁵

Global R&D networks are also necessary to access local talent. A Microsoft Research representative told CSET, “some of the people we are hiring today in China and India are the exact same people we would normally be hiring in Redmond, Boston, or NYC, but today they are not able to get visas to immigrate to the U.S.”⁹⁶ This is indicative of the need for the U.S. immigration system to make it easy for high-skilled workers to migrate and work in the United States.⁹⁷ But it also shows how global research and market operations benefit R&D in the United States.

ESTIMATING THE (SIGNIFICANT) COST OF CHINA’S CLOUD MARKET RESTRICTIONS

China’s cloud market restrictions cost U.S. cloud firms hundreds of millions of dollars of lost revenues each year that they could otherwise reinvest in staff, R&D, and expanding their U.S. and global operations.

There have been few attempts to quantify the trade impact of China’s digital protectionism, in part because any estimate is fraught with difficulties and assumptions. For example, China’s digital ecosystem—with key “super apps” providing a single portal for a range of integrated services—has evolved in a way that is very different to that of the United States. This evolution has largely taken place since some cloud firms are completely blocked in China (such as Google), while others have been heavily constrained (such as AWS and Microsoft). So, it’s impossible to know how market share would be divided if Google, AWS, and other U.S. cloud firms could enter and compete on fair terms. In many regards, China is one of the most competitive places for consumer services and technology. So, the factors that affect a U.S. firm’s market share are beyond the impact that protectionism has on U.S. firms’ market access and operations.

To develop an estimate of the economic impact of China’s digital protectionism on U.S. cloud firms, ITIF chose the Asia Pacific region as a comparator for estimating revenues and market share for two cloud service providers, Amazon and Microsoft. (See appendix A for data). We focused on Infrastructure as a Service and used the Asia Pacific region as the comparator. It’s easier to do a direct comparison for IaaS as it is a neutral service platform and is not affected by different cultural and design preferences. As noted, IaaS is a form of cloud computing that provides virtualized computing resources over the Internet. IaaS is highly scalable and allows businesses to purchase resources on-demand and as-needed instead of having to buy hardware outright. AWS, Cisco Metacloud, DigitalOcean, Google Cloud, Microsoft Azure, and Rackspace are popular IaaS providers around the world.

Just using a simple direct estimation, if Amazon and Microsoft had the market share in China for IaaS that they do in the Asia Pacific region overall, they would have made \$516 million and \$140 million more, respectively, in 2017 and 2018 (appendix A).⁹⁸ Of course, China makes up half of the region’s spending on IaaS, so just using its market shares in the rest of Asia Pacific, suggests that these two firms they would have earned \$1.03 billion and \$571 million more, respectively.⁹⁹

U.S. CAPITAL SUPPORTS CHINA’S DIGITAL INDUSTRIAL POLICY

Just as Chinese firms are benefiting from U.S. know-how and licensing through forced joint ventures and licensing arrangements, many are benefiting from unfettered access to U.S. capital markets and venture capital. Chinese cloud service firms are using international and U.S. capital to fund their domestic and global expansion. In this way, U.S. investors are seeking direct exposure to the Chinese cloud market when they otherwise might do so through investments in AWS, Microsoft, Google, and others.

For example:

- In December 2019, GDS (a leading developer and operator of data centers in China) raised approximately \$277 from a public offering via American depositary shares (ADS, which are shares of a non-U.S. company that is held by a U.S. depositary bank and is available for purchase by U.S. investors).¹⁰⁰
- In August 2020, 21Vianet raised \$391 million via an ADS offering. Blackstone Investment also bought \$150 million in shares via a private placement in June 2020.
- In September 2020, ChinaData (another hyperscale data center operator in China and elsewhere around the world) listed on the NASDAQ exchange, raising \$540 million.¹⁰¹ ChinaData was actually formed via various acquisitions and mergers by Bain Capital.¹⁰²

- In May 2020, GLP (via Prologis, a San Francisco-based real estate investment fund) invested \$230 million in a hyperscale data center in Zhangjiakou, Hebei Province.

U.S. investment funds are funding Chinese data centers and cloud companies to gain exposure to China’s large and fast ground digital economy. Their underlying rationale is the same as U.S. cloud firms that want to—but can’t—enter and compete on fair and level terms in China. In an alternative scenario of fair market access, U.S. cloud firms would be raising or deploying their own capital to expand their operations in China and U.S. investors would be able to gain exposure through them. But with market restrictions, U.S. investors are basically providing the capital to support China’s efforts to build the capacity and capabilities of local cloud firms who ultimately end up competing with U.S. firms there (and increasingly abroad).

CLOUD SERVICES IN CHINA: RECENT INTERNATIONAL AND DOMESTIC DEVELOPMENTS

Recent U.S.-China, EU-China, and WTO trade negotiations show how various countries are trying (but thus far failing) to gain greater cloud market access in China. China is also considering domestic reforms that may impact U.S. cloud market access. This section analyzes recent developments before summing up the possibility as to whether China is willing to consider meaningful concession on cloud market access.

Trade Negotiations

Phase 1 U.S.-China Trade Deal: In Play, But Cloud Market Access Did Not Make the Final Cut

China engaged in serious and detailed negotiations about cloud market access in U.S. China “Phase 1” negotiations, where it was reportedly willing to make some serious concessions. Ultimately, the final deal included some interesting, but ultimately limited, commitments on cloud market services. Phase 2 was supposed to address cloud market and other cyber and digital market issues, but such negotiations seem unlikely.

For a while, cloud computing, data handling, and other technology issues were at the forefront of negotiations. USTR was pushing for outcomes on cloud market access and China was reportedly willing to make serious concessions. For example, in March 2019, Chinese Premier Li Keqiang reportedly proposed a trial liberalization project, saying that foreign cloud companies could operate without a domestic partner in free-trade zones.¹⁰³ China also offered to issue more licenses for U.S. firms to operate data centers and to lift the 50 percent equity cap for foreign-owned cloud-service providers.¹⁰⁴ China saw this as a sweetened offer after U.S. negotiators rejected an earlier proposal as inadequate. However, U.S. negotiators, technology companies, and industry groups panned this proposal, viewing it as weak and unrealistic.¹⁰⁵ Ultimately, China did not make any further substantive cloud and digital economy market access offers or commitments as part of Phase 1 negotiations. It’s hard to know whether this was due to internal opposition (by the Ministry of Public Security and others) to commitments China’s trade officials made or whether it didn’t stack up alongside other negotiated outcomes.

Interestingly, China agreed to purchase U.S. cloud services as part of the deal’s broader purchase targets. Cloud services were one of four services sectors that China agreed to purchase additional service exports worth \$12.8 billion in year 1, \$25.1 billion in year 2, and \$37.9 billion in year 3. However, the deal did not break down these additional purchases into the four categories (so we do not know what the specific target for cloud was supposed to be if there was one). The deal notes that these purchases included both the cross-border supply of cloud services (known in trade law as mode 1) and the supply of services through a commercial

presence (known as mode 3).¹⁰⁶ Furthermore, the Phase 1 deal further breaks down the sub-categories of cloud services (using U.S. government classification schedules) in specifying that the purchases involve data hosting, processing, and related services, telecommunication services, computer services, and information services.¹⁰⁷ It's also unclear how China would reach these purchase targets, such as directing government agencies or state-owned firms to use U.S. cloud services.

U.S. cloud firms also benefited from other parts of the Phase 1 agreement (if these are implemented fully and consistently), such as prohibiting forced technology transfers and on basic intellectual property protections for software. As to the former, China agreed that “Neither Party shall require or pressure persons of the other Party to transfer technology to its persons in relation to acquisitions, joint ventures, or other investment transactions.”¹⁰⁸ On administrative and licensing requirements and processes, China agreed that “Neither Party shall adopt or maintain administrative and licensing requirements and processes that require or pressure technology transfer from persons of the other Party to its persons.”¹⁰⁹

U.S. firms, and traditionally the U.S. government, are averse to managed trade and specified trade purchase targets. U.S. cloud firms are reluctant to push China to fulfil its purchase commitments (or to ask the U.S. government to apply pressure on China) as this outcome does not provide the long-term and meaningful market access they need to compete on fair and level terms in China. Short-term government-mandated purchases do not change the fundamental competitive disadvantages that U.S. firms face in China.

U.S.-China trade talks are always going to be complicated and involve many issues and stakeholders competing for attention. But given the U.S. cloud sector's leading position in the global market and position as one of the country's most innovative, it seems amiss not to prioritize cloud and digital issues, especially given China's large and fast-growing digital economy. The opportunity cost of being kept out only grows. Should another opportunity arise, the United States should prioritize cloud and digital market access.

The EU-China Comprehensive Agreement on Investment: Locking in Existing Cloud Market Access

The cloud-related provisions in the China-EU Comprehensive Agreement on Investment (CAI) largely locks the same restrictive market access arrangements faced by U.S. firms.¹¹⁰ Various EU officials have portrayed it as new and meaningful, but while it may mean some changes for specific EU firms, it doesn't ultimately change China's restrictive JV and licensing arrangements for foreign cloud firms.¹¹¹ Even if the EU did manage to negotiate new market access, as per WTO rules, any expanded market access offered by China to the EU in services sectors must be made available to other countries on a most-favored nation (MFN) basis.

After seven years of negotiations, the European Commission concluded CAI talks in December 2020.¹¹² CAI is pending ratification in the European Parliament and it's far from certain that it'll approve the deal given concerns about China's human rights record and other issues. Even if approved, it's unlikely to come into effect for several years. However, it's still useful for U.S. policymakers to consider CAI as it happened recently, it makes China's restrictions clear and binding, and it takes into consideration China's approach to using free and special trade zones.

Some European government and industry officials compare CAI's cloud commitments to those provided in China's trade agreements with Hong Kong and Macau and in the still nascent plans for special/digital free trade zones (see the section below on China's domestic digital economy deliberations). However, these special

zones are still in development and it is far from clear what market access and operations they will allow for cloud services. It is hard to judge whether some of the analysis and public announcements on CAI are simply standard public relations efforts to (over)sell a new trade and investment agreement, reflect the fact that some people misunderstand cloud market access requirements and developments in China, or that China was (informally) banning EU cloud firms from even trying to set up cloud service JVs on the mainland.

Value-added telecommunications services like cloud services are somewhat more open (but still very restricted) in Hong Kong and Macau under China's Closer Economic Partnership Arrangements with these territories (CEPA). Under CEPA, China allows less than 50 percent foreign ownership for domestic IP-VPN services, 100 percent foreign ownership of certain Internet access services, and firms to own less than 50 percent of cloud service firms (in the Internet data center service category) and content distribution networks. Licenses are also somewhat easy to get. Some European and Japanese firms reportedly setup subsidiaries in these areas to get B1/B2 value-added telecommunication service licenses (which are otherwise hard or near impossible to get on the mainland, see figure 1), which use to build up their business with Chinese customers, thus indirectly accessing the mainland China market. For example, BT (British Telecoms) was reportedly able to get a B1 and B2 license for value-added telecommunication services in CEPA. China apparently did not like this as it was only supposed to be for firms from Hong Kong and Macau. Some European government and industry officials view these more liberal market access arrangements as China's way to evaluate new settings in considering whether to extend these nationally or internationally, which they think China did in CAI.

CAI allows EU investors to own 50 percent cloud service JVs, which apparently covers IaaS and PaaS.¹¹³ SaaS remains completely off limits. China also explicitly caps foreign ownership in a range of other computer services at 50 percent. Essentially, China agreed to (again) bind market access to its computer services market at existing levels (thus making current market access legally enforceable via CAI). Some EU analysis seems to interpret China's commitment in CAI to reaffirm its WTO General Agreement on Trade in Services (GATS) commitments on computer services as meaningful (when they should have been providing this all along) and that somehow EU firms will not need a license in certain computer service sub sectors (unless they are expecting China to revise requirements for foreign firms in some sectors as part of legal scrubbing).¹¹⁴ Otherwise, CAI still has the same foreign equity caps and does nothing to stop them from using discriminatory and restrictive licensing where they see fit.¹¹⁵

Overall, this establishes parity with market access currently available to U.S. cloud firms. CAI essentially extends the CEPA level of market opening nationally and means that EU cloud firms will not have to go through subsidiaries in Hong Kong and Macau. But EU firms will still need to go through the discriminatory and selective licensing process on the mainland (which CAI did not change).

China did include a "technology neutrality" clause, which ensures that equity caps imposed on value-added telecom services will not be applied to other services, such as financial, logistic, and medical services, if these are offered online. Basically, this commitment ensures that China does not (again) use a discriminatory interpretation of service trade categorizations to allow it to discriminate against foreign tech firms and their digital products.

Overall, CAI falls well short of anything that looks like reciprocal market access or even new and meaningful market access. Chinese negotiators (reportedly) did consider the possibility of allowing firms to own greater

than 50 percent of cloud JVs, but ultimately settled on market access equivalent to CEPA and what it provides U.S. firms. If it comes into effect, it may provide some greater certainty for EU firms (if this was uncertain before) and an easier tool for enforcement. While it does show that China is willing to negotiate on cloud market issues, it does not represent an ambitious outcome given it essentially clarifies the status quo and the commitments China made when it joined the WTO some two decades ago.

WTO E-commerce Negotiations: A Critical Forum to Push for Broad Cloud Market Access

The United States should push for cloud and digital market access, and rules to prohibit data localization and protect the free flow of data flow, as part of ambitious e-commerce negotiations at the WTO.

In 2018, 70-odd WTO members-initiated negotiations on e-commerce as part of a much-needed effort to modernize the WTO's woefully outdated trade rules.¹¹⁶ Negotiations do not involve the full WTO membership, only a sub-set of countries that are interested in being part of this e-commerce agreement. This includes the United States and many other supporters of digital free trade, such as Australia, Canada, Chile, Japan, New Zealand, Singapore, and the United Kingdom. But it also includes digital protectionists like China (and Russia).

It was surprising that China even joined negotiations. Thus far, China has not made substantive or enforceable commitments on e-commerce or digital trade as part of its trade agreements. Only in the recent Regional Comprehensive Economic Partnership (RCEP) did it agree to provisions relating to data flows for the first time in a trade agreement, but even then, these provisions are not binding so are only of symbolic (not economic) value.¹¹⁷ China tends to see e-commerce through the lens of traditional trade, where e-commerce platforms sell physical goods that need facilitation through customs, while the United States and many other nations see it much more broadly, encompassing both purely digital products and the digitally enabled delivery of goods and services.

China has reportedly shown some (tentative) signs that it may be willing to change its position and make commitments on data flows and cloud market access as part of ongoing negotiations. A (2016) joint non-paper by China-Pakistan on the WTO's e-commerce initiative is indicative of its traditional approach, in that it does not mention cloud services and data flows and states that "discussions at this stage should not lead to new market access commitments including tariff reductions."¹¹⁸ So the baseline for improvement is pretty low given China often frames its position as one where it refuses to negotiate on digital issues as they're central to its conceptualization of national sovereignty and are thus off limits.

China has reportedly engaged in a generally productive and constructive manner through the various small group and associated negotiating groups. China is watching, learning about other countries' proposals, and then selectively engaging (which was also its approach on e-commerce and data-related issues in RCEP negotiations). Where China has put forward proposals, they are reportedly still far from ambitious and far from what the United States and others would accept.

China's proposals represent a noticeable, even if subtle shift in policy (even if it may not be clear as its proposal is framed and drafted in a way that is very different to what the United States uses in its trade agreements). This shift is encouraging to see. However, an ambitious final agreement that includes China is far from a given. It is a matter of seeing if China is willing to join a genuinely ambitious agreement that is

much closer to U.S. digital trade objectives, which includes binding and commercially significant commitments on data flows, cloud market access, and associated digital services and activities.

The United States needs to ensure cloud market access is part of the end agreement given cloud's critical role in supporting global digital free trade. This is one of the points made in a joint statement by a global coalition of business and tech associations.¹¹⁹ As part of negotiations, the United States reportedly asked for market access commitments in digital service sectors (including on cloud services), that countries update service trade classifications so that they apply to modern (digital) trade, and that countries allow for the cross-border supply of digital services. This is in addition to proposals prohibiting data localization and forced technology transfers and supporting the cross-border transfer of data. Many other countries also want to pursue similar market access and classification outcomes, as seen in a joint (2017) non-paper at the WTO by Canada, Chile, Colombia, Côte d'Ivoire, the European Union, the Republic of Korea, Mexico, the Republic of Moldova, Montenegro, Paraguay, Singapore, and Turkey.¹²⁰

Many countries support the United States' efforts to use WTO e-commerce negotiations to build an open, rules-based global digital economy. Like the United States, many other countries have enacted new, binding rules on digital trade. China's involvement provides some hope that perhaps, finally, it is willing to work with its trading partners on new digital trade rules. As negotiations continue and China gets a clearer sense of what the final agreement looks like and what it means for it, it may decide to engage more directly in negotiations. This would be a win-win-win for the United States, China, and the global digital economy if China were to join an ambitious new e-commerce agreement.

While it would be great for China to be involved in a new global e-commerce agreement, its involvement should absolutely not come at the cost of an ambitious outcome. U.S. negotiators should not accept any final agreement that does not include commitments on cloud market access, alongside other critical provisions prohibiting data localization and allowing the cross-border flow of data.¹²¹ Any e-commerce agreement that does not protect data flows and provide cloud services market access is one that ultimately fails to support e-commerce.

Domestic Digital Economy Reforms

China Debates Domestic Reforms: Control and Protectionism vs. Greater Competition, Digital Trade, and Connectivity to Support the Global Expansion of Local Champions

U.S. trade negotiations will not force China to make policy changes it was not already prepared to make. U.S. success in achieving greater cloud, and broader digital economy, market access in China depends in large part upon China's willingness to open up on its own accord. This leads to a central question for U.S. policymakers: do recent domestic debates and trade negotiations mean that China (in the right context) is genuinely willing to not only allow greater cloud market access, but also to address broader digital market barriers (such as on data localization and data flows), that together amount to new and meaningful market access for U.S. firms? This section analyzes recent domestic policy changes around data governance, digital trade, and data flows to help potentially answer this question.

Some Chinese officials recognize that they need to create a digital economy that is (somewhat) more open to foreign firms, data, and digital services. These officials recognize that their local tech champions need to be able to connect local and global digital operations for them to be more competitive against AWS, Google, and

others. Alibaba, Tencent, and others support their efforts as they clearly recognize the benefits. These officials also recognize that for China to retain its central role in many global production networks, that modern multinationals in China need digital connectivity (and if they want these firms to stop encouraging their home governments from targeting China). However, these officials and firms face off against powerful opponents within China's government that support ongoing protectionism and who prioritize local control over data and digital services for political and social purposes.

China's debate about domestic data governance, industrial policy, and greater integration and engagement in global digital trade is opaque and hard to follow. U.S. firms are involved in some discussions and are provided some opportunities to provide feedback on draft laws and regulations, but their access and influence remains relatively limited. Chinese multinationals are involved in many data and digital policy debates, alongside trade, commerce, and data privacy and protection officials of the Cyberspace Administration of China (CAC)—and powerful Ministry of Public Security (MPS) officials.

However, MPS's overriding concerns about retaining control over data and digital services for political purposes and CAC's interest in censoring and blocking sensitive content makes it hard for other officials and firms to push for changes that would allow greater U.S. digital market access and better connections between China's Internet and the global one. This debate has played out during efforts to reform and implement China's Cybersecurity Law and its draft Data Security Law (which are both very restrictive in requiring extensive restrictions on data and foreign digital services) and the draft Personal Information Protection Law (which could potentially allow U.S. firms to transfer Chinese personal data, see below).¹²²

Given the generally restrictive nature of China's Cybersecurity law, its Draft Data Security Law, and others, those Chinese government officials, agencies, and firms that support protectionism and control seem to have the upper hand. However, the fact that many of these laws have not been fully implemented years after they were introduced, that the draft PIPL provides a potential framework for data transfers, and that China is experimenting with more liberal digital free trade zones indicates that the debate is not over. There's still a chance for those Chinese officials, agencies, and firms that want a more open and competitive digital economy to have a significant and lasting impact on how China governs its digital economy.

China's recent draft Personal Information Protection Law (PIPL) provides some hope that those Chinese officials and firms that support greater data flows and digital engagement are having an impact. It signals that China (maybe) willing to shift (somewhat) away from the forced data localization principles outlined in the sweeping cybersecurity law enacted in 2017 (which mandates a broad local storage requirement for personal data and important data).¹²³ For the first time, PIPL lays specific ground rules for the outbound flow of personal data. It would allow personal data transfers out of China when sufficient levels of protection guaranteed by contracts or certified by designated agencies are present.

China's Digital- and Cloud-Friendly Free Trade Zones: Signal of Meaningful Reform or Insignificant Pilot Project?

China is creating new digital friendly free trade zones (FTZs) that would provide better market access and operating conditions for U.S. cloud firms. In September 2020, President Xi Jinping delivered a speech about the global digitalization of services trade, during which he announced the creation of a new FTZ in Beijing, which will focus on science and technology services.¹²⁴ In 2020, China started enacting regulatory changes to bring digital FTZs to life. In 2020, China's State Council (the highest executive and administrative body in

China's government) approved the plan to "Comprehensively Deepen the Pilot Program of Innovative Development of Trade in Services" and China's Ministry of Commerce (MOFCOM) released the "General Plan for Comprehensively Deepening the Pilot Program of Innovative Development of Trade in Services."¹²⁵ Similarly, on November 11, 2020, Liu Liehong, Vice Minister of China's Ministry of Industry and Information Technology (MIIT), said in a speech that MIIT will open China's value-added telecommunications services (VATS) market, including data centers, cloud services and other services, and the first step will be pilot open VATS in the Shanghai and Hainan free trade zones.

MOFCOM's implementation plan calls for streamlined administration and greater service market access (including in emerging service industries) in these FTZs in Beijing, Tianjin, Shanghai, Chongqing, and elsewhere.¹²⁶ MOFCOM has also stated that it will eventually eliminate the equity cap on foreign investments in VATS (and other service sectors). The MOFCOM notice (below) liberalizes some of China's service trade catalogue and potentially opens the door to somewhat easier data flows, but all under the careful supervision of Chinese government agencies (see figure 9).¹²⁷ Chinese authorities are reportedly still considering how companies would be able to transfer data outside of FTZs. They have noted that regulations would likely require "self-review" for compliance, which would be based on the Cybersecurity Law. The notice states it's a three-year trial, however, there are no reports that these FTZs have been implemented.

Figure 9: China's Ministry of Commerce: Data-related service sector liberalizations for free trade zones [translated]¹²⁸

75	In pilot areas where conditions permit, a dedicated Internet data channel will be opened.	MIIT formulates policy guarantee measures; qualified pilot regions are responsible for promotion.
76	Explore the classified supervision model of cross-border data flows, and launch a pilot program for the safe management of cross-border data transmissions.	The Cyberspace Administration of China guides and formulates policy guarantee measures; pilot areas such as Beijing, Shanghai, Hainan, and Xiong'an New District are responsible for the promotion
77	Exploring and optimizing the services for scientific research institutions to access international academic frontier websites (natural sciences) in eligible pilot areas.	The Cyberspace Administration of China and other support and guidance, the Ministry of Science and Technology, etc. formulate policy guarantee measures; pilot areas such as Beijing, Shanghai, Hainan, and Xiong'an New District are responsible for the promotion
78	Actively carry out research on issues related to the digital business environment, and establish a dynamic tracking mechanism for the digital business environment at home and abroad.	The Cyberspace Administration of China, the Ministry of Finance, the Ministry of Commerce, and other relevant departments proceed according to the division of responsibilities
79	Support the creation of the Guangdong-Hong Kong-Macao Greater Bay Area, Beijing-Tianjin-Hebei, and Yangtze River Delta Big Data Technology National Engineering Laboratory, and promote the construction of big data center projects. Explore the establishment of a data flow mechanism for Guangdong, Hong Kong, Macao, Beijing-Tianjin-Hebei, and the Yangtze River Delta.	Support and guidance from the Development and Reform Commission, Cyberspace Administration of China, Ministry of Industry and Information Technology, Hong Kong and Macao Affairs Office; pilot areas such as Beijing, Tianjin, Shanghai, Hainan, Shenzhen, Shijiazhuang, Nanjing, Hangzhou, Hefei, Guangzhou, Suzhou, and Xiong'an New District Responsible for promotion

Details from specific new FTZs build on these overarching plans:

- Beijing: The official work plan for the Beijing FTZ includes commitments about establishing an open digital economy and services market access, the “orderly flow of data,” and the ability for firms to engage in digital trade.¹²⁹
- Lingang: The Lingang New Area pilot FTZ (near Shanghai) will focus on information and communication technologies, which will target firms involved in cloud computing, 5G networks, edge computing, cross-border e-commerce, and pilot cases of offshore data centers and data service outsourcing. The Lingang New Area will explore international Internet access supervision models, such as building a cross-border data security assessment system and creating a whitelist authentication scheme for firms to directly access the (presumable global) Internet. Overall, it aims to “promote the cross-border flow of data under the premise of safety/security.”¹³⁰
- Hainan: On June 1, 2020, China released its plan for the new Hainan FTZ. Similar to other zones, the Hainan FTZ will open basic telecommunications service and VATS, gradually remove restrictions on foreign equity caps, carry out international Internet data exchange pilot projects, build international submarine optical cables and landing points, and set up international communication gateways.¹³¹
- Shenzhen: In October 2020, China’s implementation plan for Shenzhen’s new FTZ included safe and orderly opening of basic telecommunication services and VATS services, removing the equity cap on foreign investments, and granting Shenzhen the authority to approve foreign-invested telecommunications enterprises.¹³²

Digital FTZs may represent a genuine, good-faith attempt by Chinese officials to pilot and test arrangements for a more open digital economy and easier data transfers. Historically, special trade zones have played an important role in economic reforms in China as it uses them to test and understand new policies before releasing nationally. China may want to use these digital friendly FTZs to see if they can build a digital framework that allows local and foreign firms to benefit from greater data transfers and digital trade, while providing MPS and others with some ability to maintain (restrained) oversight and control over data and digital activity.

Digital friendly FTZ may represent an incremental move towards greater digital economy market access, however, they fall far short of what U.S. negotiators should demand. While FTZs may have been useful and attractive to foreign firms (who largely wanted access to cheap labor for manufacturing) twenty years ago, having small geographic enclaves for U.S. cloud and digital service providers may not be attractive, nor operationally feasible. These firms need to operate across cloud and digital service sectors and be able to access customers wherever they are in China and elsewhere around the world and transfer their and other non-personal data seamlessly (and not have to get prior approval or be under continuous observation for data transfers). Also, China has a poor track-record of not following through on commitments to open markets and allow freer trade in its FTZs.

Summary: China May Be Willing to Make Concessions, But Would it Provide Substantive Market Access? And at What Cost?

Foreign trade officials and industry representatives disagree as to whether China is genuinely willing to provide meaningful market access to U.S. and foreign cloud providers in bilateral and multilateral negotiations. Some see its approach to negotiations with the United States, Europe, and at the WTO as a ploy, simply for public posturing so that they are seen as a constructive negotiating and trade partner. That's much like Chinese President Xi's hollow remarks about free trade and protectionism at the World Economic Forum in 2017.¹³³ Or that it is simply a way for China to try and get what they want elsewhere in negotiations (all of which is normal for trade negotiations). Either way, the United States should prioritize and push for clear, meaningful, binding, and enforceable cloud market access in China.

Even if China is willing to make concessions in Phase 2 or other talks, these may come at the cost of concessions that the United States and others are unwilling to make. For example, China could use cloud market access as a bargaining chip with the United States (and Europe) for the removal of restrictions on Huawei. It would also be hard, if not impossible, for the United States and others to make these types of tradeoffs within the context of WTO talks. Furthermore, meaningful market access for U.S. cloud firms would be difficult to achieve given it would require China to provide broader digital market access, such as removing data localization requirements and allowing easy data flows, among other issues.

China's digital FTZs are still a long way from U.S. demands for reciprocal cloud market access. One of the few ways China would use digital FTZs was as part of a negotiated transition arrangement with the United States, whereby China commits to provide clear, broad digital market access within a set period, but that it can use these FTZs and a specific period of time to test and determine how it will adapt its regulatory framework. But that the end goal is never in doubt and it can't use the interim transition period to delay the final outcome or use it to find other ways to deny market access to U.S. cloud providers.

However, the pessimistic alternative is that China will try and make the case to the United States and others that digital FTZs are a substantive change (they are not) and that they are moving in the right direction and to give them time. However, it has been 20 years since China joined the WTO and U.S. firms have missed out on a long period of major growth in China's digital economy. In the meantime, Chinese firms enjoy open digital markets around the world. Reciprocity should be the central benchmark to judge China's proposals, not whether their proposal represents increment change from China's baseline of digital protectionism.

RECOMMENDATIONS

The United States would be ill-served to simply wait and hope China realizes the futility of its approach to digital protectionism or accept proposals for some form of digital FTZs. The United States should prioritize and push for ambitious and meaningful digital market access as the cost of being kept out only grows as its digital economy continues to grow.

There are several key recommendations that the United States-China Economic and Security Review Commission can make in calling for action in Congress and the Biden administration. As part of its broader review of U.S.-China policy, the Biden administration has an opportunity to not only prioritize and develop a clear ask as to what meaningful cloud and digital market access looks like in China and how to ensure U.S. cloud providers are not inadvertently caught up in new supply chain and cybersecurity restrictions. It also has

a chance to change the status quo in closing access to the U.S. (and potentially other markets) in an effort to create reciprocity and leverage for negotiations. But more importantly, the Biden administration has an opportunity to develop a grand digital strategy to ensure the United States has a clear, comprehensive, and whole-of-government plan to address digital trade, misinformation, cyberattacks, data privacy, and other data and digital issues around the world.

In addition to the below, ITIF has called for a broader range of institutional and policy changes to better respond to Chinese innovation mercantilism, such as in the reports *Constructive, Alliance-Backed Confrontation: How the Trump Administration Can Stop Chinese Innovation Mercantilism* and *Why and How to Mount a Strong, Trilateral Response to China's Innovation Mercantilism*.¹³⁴ Of course, it would be ideal if the Biden administration's response to China's cloud market access restrictions fit neatly into the administration's broader China trade, economic, and national security strategy, which hopefully will evince a commitment to dramatically rolling back China's unrepentant and extensive embrace of innovation mercantilist policies.

Ensure Cloud Market Access is Prioritized and Meaningful in Bilateral and WTO Negotiations

The U.S. cloud sector's global leadership, and role as one of the U.S.'s most-innovative sectors, depends upon access to global markets, talent, and data. Chinese digital protectionism has a global impact on U.S. trade and innovation. U.S.-China and EU-China trade negotiations show that China is somewhat willing to discuss cloud service market access, which for the longest time, had been viewed as off-limits from negotiations.¹³⁵ In both bilateral and WTO-related negotiations, the United States should prioritize cloud and digital market access and push China to provide meaningful access to its cloud market and digital economy.

The goal: China should provide U.S. cloud service providers with full and nondiscriminatory market access and grant necessary approvals for U.S. companies to provide cloud services in China, without the need to enter a JV or local partnership to seek a license.

Specific U.S. asks/outcomes should include:

- Remove foreign equity caps for foreign cloud service providers, so U.S. providers could operate as wholly foreign owned entities. This would involve China revising relevant measures, including MIIT's Telecommunications Catalogue.
- Allow foreign cloud service providers to enter and setup operations in China—not just special or free trade zones.
 - For example, during U.S.-China trade talks, China proposed allowing operations for foreign cloud-service providers in a free-trade zone, possibly in the southern city of Guiyang, which is a center for big data. It'd require U.S. firms to shift existing operations (which is expensive and duplicative) and a “trial” does not provide the certainty that the type of investment required to setup a data center would be worth it.
- Provide U.S. firms with clear and ready access to all necessary licenses in China including those relevant to cloud-related operations, hardware, software, facilities, and infrastructure. Access to licenses would be for all cloud services, including SaaS, IaaS, and PaaS, and related computer services. China should provide prompt written decisions on all applications for licenses, including reasons that an application has been denied and a right to appeal the denial.

- Commit to provide transparent, objective, and non-discriminatory auditing and certification processes for cloud and other Internet service providers as it relates to cybersecurity and other cloud-related regulations. U.S. firms are fearful of how they can fall afoul of onerous, but vague, audits, such as those under China’s multi-level protection scheme.¹³⁶
- Ensure U.S. cloud service providers can use U.S. company brand names and trademarks when providing services in China.
- Provide the U.S. government and U.S. cloud service providers with early and continuing guidance as to ongoing implementation of China’s Cybersecurity Law and other major data-related legislations and the development of new data-related laws and regulations (such as its evolving cryptography regulatory framework and development and use of local standards and technical requirements).
- Require China to allow cross-border transfers of data for business purposes on a transparent and non-discriminatory basis, including the movement, processing, transfer, and storage of personal data. Cross-border data flows are a central part of global cloud services. Forced data localization is a discriminatory measure that favors Chinese cloud providers.
 - This would require China to revise data localization and overly strict requirements for cross-border data flows in the Cross-border Data Transfer Measures and Critical Information Infrastructure regulation, the draft Personal Information Protection Law (PIPL), and the Cybersecurity Law.

U.S. Cloud Firms in China Should Not Be Sacrificed in a Misguided Effort to Respond to China-based Cyberthreats

International cyberattacks taking advantage of scofflaw countries that don’t want to, or can’t, address this illegal activity is a real and growing problem for the United States. However, it is misguided and counterproductive to punish U.S. cloud firms and force them out of China if China-based cyberthreats happen to use their services in China or in other countries. U.S. cloud firms have no control over the actions of nation states and state-sponsored cyber threats, so should not be made responsible for their response to U.S. government’s requests for actions and cooperation on cyberthreats. Forcing U.S. cloud firms out of China would only help China in ceding market share to local firms and would not change China’s approach to cross-border law enforcement cooperation. U.S. cloud firms also stand to lose business elsewhere around the world as customers seek to avoid the specter of U.S. government surveillance of them and their activities and the potential for the U.S. government to suddenly interrupt their supply chains by suddenly stopping their ability to use Chinese and U.S. cloud service providers.

In December 2020, former U.S. President Trump signed a last-minute executive order that would let the government restrict the international operations of U.S. cloud computing companies in an effort to protect against foreign cyberattacks. The executive order provides the U.S. government 120 days to consult on how to increase information sharing among cloud providers themselves, as well as with the government, to “deter the abuse of US IaaS products.” After 240 days, a report and recommendations will be presented to the U.S. president. The executive order allows the U.S. Department of Commerce to prohibit U.S. cloud providers from partnering with foreign cloud companies that supposedly offer safe haven to hackers and give the Commerce secretary the ability to ban those foreign providers from operating in the United States. Although

the executive order uses the infrastructure as a service (IaaS) term, the order explains the definition also includes other cloud services.¹³⁷ The draft order is reportedly designed to deter malicious foreign actors from using cloud service providers to quickly and anonymously conduct cyberattacks.¹³⁸ Similar to other executive orders targeting Chinese firms WeChat and TikTok, the Department of Commerce would bar U.S. firms from conducting business transactions with certain foreigners using their cloud services. It would also require U.S. cloud firms to verify the identity of people using their services and to retain certain customer and use details every time their services are used, such as names, physical and email addresses, national identification numbers, means and sources of payment, phone numbers, and IP addresses.¹³⁹ Media reports quoted an anonymous official stating that “it’s [the executive order] there also as a leverage point in bilateral relations.” “To know that that is there when you’re dealing with a country and trying to get them to participate in a mutual legal assistance treaty or law enforcement efforts or information-sharing efforts, it’s a useful tool to have there.” The individual continued by noting that “getting China to take seriously and follow up, investigate, and prosecute their own cybercrime in their own borders is a continuously challenging issue.”¹⁴⁰

U.S. cloud providers should not be used as a bargaining chip in trying to get China to address international cyberthreats. The United States needs to take a far more nuanced and targeted approach to restrictions on the Chinese government and Chinese companies involved in cross-border cyber-attacks. The U.S. government’s frustration with China and outdated mechanisms for managing cross-border law enforcement requests for data (such as mutual legal assistance agreements) is understandable, but targeting U.S. cloud firms for inaction by their host countries isn’t going to change that.

To improve the international exchanges of data for law enforcement purposes, the United States should instead expand its pursuit of CLOUD Act agreements and efforts in the G7 and OECD to build new principles and frameworks to account for legitimate concerns about government requests for data.¹⁴¹ China is unlikely to join these efforts, but it may reconsider in the long term as building a new global framework will put China’s unwillingness to cooperate with international law enforcement activities into stark contrast. But, in general, U.S. policymakers need to be focused on contesting the unreasonable mandates the Chinese government imposes on U.S. firms operating in China, not on the actions U.S. firms are compelled to undertake, when they would otherwise not, thanks to the dictates of a Communist regime.

From a trade and competition perspective, the executive order is misguided, as forcing U.S. cloud firms to exit China because of cybersecurity threats would simply support China’s digital industrial goals in ceding more market share to Chinese cloud companies. There should be no doubt that it is in America’s long-term economic and security interests for U.S. companies to sell as many goods and services to China as possible. Every dollar’s worth of digital and physical exports from the United States to China is a dollar that Chinese firms do not make—and it is a dollar American firms can use to reinvest in R&D and support employment in the United States. America should be encouraging, rather than berating, U.S. firms to engage in the Chinese market (not including, obviously, selling directly to the Chinese military), for America is locked in a critical competition for global technology leadership with China. Walking away from the China market only gives China a leg up in that competition. Chinese firms would use those revenues to continue innovating and expanding into markets all around the world, ultimately taking market share and jobs from American technology companies.

The executive order is already having an impact on U.S. cloud providers outside of China. The lack of debate, transparency, and details around the executive order creates uncertainty for U.S. cloud providers and their customers. As per other executive orders targeting China and the U.S. ICT supply chain, customers don't want to face the situation where the U.S. government interrupts their supply chains by suddenly, and arbitrarily, stopping their ability to use Chinese and U.S. cloud service providers. Also, the need to verify customers and retain data about them and their use of U.S. cloud services is enough to spook U.S. cloud services customers around the world who are already sensitive to concerns about U.S. government surveillance following the Snowden revelations. Ironically, these customers may turn to Alibaba Cloud and Tencent (and to European providers) to ensure they can avoid this risk.

Focus on Reciprocity: Block Access to the United States' (and Hopefully Trading Partner's) Cloud Markets

The Biden administration should insist upon reciprocity: restrict Chinese cloud firm's access to the United States market unless China takes steps to open its market within a specified time frame. The United States should also encourage its likeminded trading partners to block access as part of their broader, collective response to China's innovation mercantilism. It would create negotiating leverage and would limit the extent to which Chinese cloud firms could use open global markets to improve their ability to compete with their U.S. and foreign cloud service providers.

The continuing lack of reciprocity in U.S-China cloud markets is unacceptable. Allowing China and its leading cloud firms to have it all their own way—not only do Chinese local champions have a protected home market, but U.S. firms are forced to help local ones, while Chinese firms are free to access the U.S. market (and other global markets) unimpeded—is grossly unfair. More to the point, it's fundamentally inconsistent with the commitments China has made to its international trading partners as a member of the World Trade Organization.¹⁴² Reciprocity, national treatment, and non-discrimination are the most essential and fundamental obligations of WTO membership, yet China continues to unrepentantly flaunt these responsibilities. China's failure to meet the standard for reciprocity is one of a number of failures to meet its WTO obligations that would justify the United States bringing a non-violation nullification and impairment case against China. As ITIF (and others, such as Jennifer Hillman) have written, the non-violation clause (Article XXIII of GATT) “provides a legal cause of action against measures that do not violate the treaty but that nevertheless upset the reasonable expectations of the parties and can be aimed at policies that might otherwise be beyond the reach of the GATT/WTO agreements.”¹⁴³ In the case of cloud computing services, it's clear that U.S. firms are being denied the benefits of reasonably expected market access. Moreover, as Hillman notes, “there are some commitments that could form the basis for a violation claim [against China], including a lack of reciprocity.”¹⁴⁴ In short, the United States would certainly be justified in bringing a WTO case against China for its cloud market access restrictions.

However, more broadly, as ITIF has written, it's time for U.S. economic and trade policy with China to move toward a results-oriented approach that holds China to specific goals, such as significantly reducing its global current account surplus, reducing its forced technology transfer and IP theft, and opening up its digital markets.¹⁴⁵ If China is not going to let U.S. cloud firms compete equitably in the Chinese market, then the Biden administration and Congress need to start blocking access to Chinese cloud firms competing in the U.S. market (and the same for another markets, digital or otherwise.) For instance, this is the intent of recent

legislation S. 2826, “The Global Economic Security Strategy Act of 2019” introduced by U.S. Senators Marco Rubio (R-FL), Todd Young (R-IN), Jeff Merkley (D-OR), and Chris Coons (D-DE).¹⁴⁶

Especially in today’s digital economy, where cloud services lie at the heart of competition across sectors and at the heart of research into current and emerging digital technologies. This unfair situation will continue to erode the U.S.’s (hard fought) leading position in the sector, especially as China’s digital economy makes up a growing portion of the global one.

It was disappointing, but not surprising, to see that the Biden administration’s recently released Trade Agenda and 2020 Annual Report does not mention China’s cloud market restrictions, given they are still in the early days of figuring out how to grapple with a broad and complex bilateral relationship. The Biden administration deserves time to develop its own China strategy. Thankfully, it already has all the evidence it needs. The United States’ (2018) Special 301 investigation into China’s technology transfer, intellectual property, and innovation policies was comprehensive and showed that China’s cloud market access restrictions are unreasonable and discriminate against U.S. firms and their services.¹⁴⁷ Biden’s Trade Agenda does refer to USTR’s 2018 Special 301 investigation and USTR’s 2020 National Trade Estimate report (and its fact sheet on digital trade), which detail China’s cloud market restrictions.¹⁴⁸ However, none of these reports outline a course of action. More evidence and ideas from this hearing and others like it will hopefully highlight the importance of the issue and generate ideas to address it (alongside the many other pressing issues in the U.S.-China relationship).

The United States needs to create leverage if it wants to change the status quo in the coming years. Current WTO trade rules are largely redundant. USTR has not been confident that it would stand a good chance of success in a WTO dispute case given how China enacted its restrictions and the outdated nature of WTO trade rules (negotiated and enacted in the pre-Internet era of the 1980s and 1990s). Indicative of this, is the fact that the WTO dispute that USTR launched against China following the Special 301 investigation targeted China’s restrictive licensing regime and its forced tech transfers, but not those in the cloud sector.¹⁴⁹ Potential future trade rules at WTO e-commerce talks may be useful, but such a scenario is hypothetical. China may not even be party to the final agreement.

The Biden administration should take up the case of cloud market access and look at ways to create reciprocity by blocking market access at home (and other markets) to limit the extent to which Chinese cloud firms can use open global markets to help them catch up to U.S. (and foreign) cloud providers. It will not be as easy as raising tariffs given it is a non-tariff related issue and given U.S. trade obligations. The Biden administration’s Trade Agenda states that strong trade enforcement is essential to its trade strategy and that it will bring trade cases against trade partners for unfair trade practices. It states that it will shy away from unilateral action, but that it may be necessary in some instances.¹⁵⁰ In the case of China’s cloud market restrictions, it is most definitely necessary.

The United States needs to lead the charge, but it needs to work with likeminded allies to create a substantial incentive for China to open its digital markets. Or if China does not open up, it at least limits the damage from unfair competition from Chinese cloud and tech firms. Overall, working with allies is clearly the right strategy to address Chinese innovation mercantilism.¹⁵¹ As home to the world’s leading cloud sector, no other country is more significantly impacted than the United States. However, while Alibaba Cloud and Tencent Cloud have datacenters in the United States, they do not have significant market share, so blocking them does

not make up for the significant market share that U.S. and other foreign firms would have in an open Chinese market. However, if the United States and its allies all block access to Chinese companies in sectors where there is clearly a lack of reciprocal market access, it increases the costs of China's lack of market openness. It limits Tencent Cloud and Alibaba Cloud's ability to seize market share, thus slowing their ability to (unfairly) leverage the lack of reciprocity to become more competitive in the global cloud market.

The United States Should Develop a Grand Strategy for the Global Digital Economy

China is ahead of the United States and many others in terms of grand strategy in terms of advocating for its digital and ICT firms and associated projects as part of its BRI and the Digital Silk Road initiatives. China's targeting of U.S. cloud providers is merely one part of its broader digital protectionism strategy. The United States needs to put this issue alongside the many others it needs to address both specifically, but also holistically, as part of a grand strategy for the global digital economy. A worthwhile next step would be for the U.S. Congress and the United States-China Economic and Security Review Commission to hold hearings about the need for a U.S. grand strategy for the global digital economy and what it should entail.

The rise of the digital economy over the last two decades has further deepened and widened global integration as the Internet and related technologies have allowed firms to more easily attain global reach, while at the same time linking the world more closely in a web of information. But there is also a large countervailing force: an autocratic, non-democratic country—China—that is threatening to wrest global leadership in these technologies, with attendant social, political, economic, and security implications.¹⁵² Against this backdrop, the key question today is how a world, extremely diverse in income levels, cultures, and types of government, will deal with global technologies and global firms. This is a particularly important question now. However, the digital world is rife with strife: There is conflict over cyberattacks, Internet blocking, and cross-border data flows; over attitudes and policies toward leading information technology and Internet firms; and over technology leadership and competitiveness.

In this world, the United States—as the global IT and digital leader—has struggled to articulate and advocate for a coherent and strategic response. All too often, U.S. thinking about privacy, tech platforms, national security, and Internet and artificial intelligence (AI) governance is siloed and bifurcated. During the Clinton and second Bush administrations, U.S. policymakers believed that the rest of the world would emulate what was obviously the superior U.S. digital policy system, and they worked toward that end. But China's success in IT and digital industries, coupled with a questioning of the desirability of a U.S.-style light-touch digital regulation and the rise of U.S. “big tech” companies, has meant that the United States can no longer rely principally on persuasion to convince others of the economic and innovation advantages of its approach.

For example, USTR's recently released *2020 Trade Policy Agenda and 2019 Annual Report* details individual digital provisions that relate to digital trade, but without a broader context or strategy to address them as part of the growing trend toward “digital sovereignty” in China, Europe, India, and elsewhere around the world.¹⁵³ USTR and other U.S. government agencies (such as the Department of Commerce) need to ensure that U.S. trade policy addresses the individual elements as part of a holistic and broader global digital economy agenda.

For the past decade or so, a major part of the U.S. challenge in discussing, advocating, and negotiating internationally in this area is that U.S. officials do not have an easy-to-translate model of digital governance and associated set of talking points. What does the United States want (besides everything), and what are its

major priorities—open markets, human rights, the freedom to innovate, privacy, national security, jobs, a more economically integrated world, a more peaceful world? For many years, U.S. officials believed in and advocated for open markets, international trade, less regulation, greater economic integration, and the rule of law because they thought those would benefit both the United States and the world. That basic framing may have worked before China became a systemic competitor/adversary, Russia and several other states became systemic bad actors, and the EU and many developing states embraced digital protectionism.

The United States needs to move away from an idealistic view of digital international relations to a new doctrine of “digital realpolitik.” The new doctrine needs to move away from the idealist’s dream of a harmonized, values-based global Internet, as this is clearly not going to happen. It also needs to move away from principally unilateral action. The priority should be advancing U.S. interests by spreading the U.S. digital innovation policy system and constraining digital adversaries, especially China. This will entail working with allies when possible—and pressuring them when necessary. This means that shaping the global IT and digital economy in ways that are in U.S. interests is one of the most important challenges facing U.S. foreign and economic policy going forward. As such, going forward, the United States needs a revised and clear set of principles that together articulate a new doctrine of digital realpolitik to orient its global digital policy, such as those outlined in ITIF’s report “A U.S. Grand Strategy for the Global Digital Economy.”¹⁵⁴

APPENDIX A: ESTIMATING THE COST OF RESTRICTIONS ON U.S. CLOUD SERVICES

This table summarizes the results estimating the revenues of U.S. cloud companies in China in different scenarios and provide estimates of cumulative losses.¹⁵⁵ It is drawn from recent U.S. senate testimony on “censorship as a non-tariff barrier,” which also considered search services.¹⁵⁶ The high and low assumptions for each are different. For the cloud scenario, the estimate assumes cloud companies receive the market share equivalent to the average in the Asia Pacific region including China, and then receiving the market share equivalent to the regional average excluding China.

Estimates of Google Ad Revenue in China (\$B)				Estimates of Cloud Revenue in China (\$B)			Lost Cloud and Search Revenue in China (\$B)			
	Real Market Share	Static 2010 Market Share	South Korean Market Share		Real Market Share	Asia Pacific Market Share	Rest of Asia Pacific Market Share	Company	Low Estimate	High Estimate
2013	\$0.53	\$2.07	\$3.41	Amazon				Google (2013-19)	\$32.49	\$61.33
2014	\$0.53	\$3.14	\$4.56	2017	\$0.14	\$0.30	\$0.46	Amazon (2017-18)	\$0.52	\$1.03
2015	\$0.22	\$4.23	\$6.49	2018	\$0.61	\$0.97	\$1.33	Microsoft (2017-18)	\$0.43	\$0.86
2016	\$0.29	\$4.55	\$8.24	Microsoft						
2017	\$0.27	\$5.89	\$10.46	2017	\$0.13	\$0.19	\$0.24			
2018	\$0.35	\$7.12	\$13.20	2018	\$0.33	\$0.70	\$1.08			
2019	\$0.61	\$8.29	\$17.77							

For cloud services: Amazon’s and Microsoft’s Infrastructure as a Service (IaaS) market shares in China are compared to their market shares in the overall Asia Pacific region, estimating the revenues each company would earn if they held their regional market share within China. Additionally, the Chinese market is subtracted from the Asia Pacific region to estimate the market share each company holds in the rest of the region, which are once again substituted for the Chinese market shares.

Asia Pacific IaaS Market Share			China IaaS Revenue		Est. Revenue		Asia Pacific Share Revenue	
	Amazon	Microsoft	(\$B)		Amazon	Microsoft	Amazon	Microsoft
2017	11.2%	7.0%	2017	2.68	0.14	0.13	0.30	0.19
2018	11.0%	8.0%	2018	8.78	0.61	0.33	0.97	0.70
					Total	0.75	0.46	1.27
China IaaS Market Share					2017 and 2018 Difference			
	Amazon	Microsoft			Amazon	Microsoft		
2017	5.4%	5.0%			0.52			
2018 H1	6.9%	3.7%			0.14			
					Total	0.66		
Non CN Asia Pacific Market Share			Est. Revenue		Asia Pacific Share Revenue			
	Amazon	Microsoft	Amazon	Microsoft	Amazon	Microsoft		
2017	17.0%	9.0%	0.14	0.13	0.46	0.24		
2018	15.1%	12.3%	0.61	0.33	1.33	1.08		
			Total	0.75	0.46	1.78	1.32	
			2017 and 2018 Difference					
					Amazon	1.03		
					Microsoft	0.57		
					Total	1.60		

ENDNOTES

1. Nigel Cory, “Testimony to the U.S. Senate Subcommittee on Trade Regarding Censorship as a Non-Tariff Barrier to Trade” (ITIF, June 30, 2020), <https://itif.org/publications/2020/06/30/testimony-us-senate-subcommittee-trade-regarding-censorship-non-tariff>; Nigel Cory, “Comments to the U.S. International Trade Commission on the Critical Role of Data in the Global Economy” (ITIF, April 21, 2017), <https://itif.org/publications/2017/04/21/comments-us-international-trade-commission-critical-role-data-global-economy>; Nigel Cory, “Surveying the Damage: Why We Must Accurately Measure Cross-Border Data Flows and Digital Trade Barriers” (ITIF, January 27, 2020), <https://itif.org/publications/2020/01/27/surveying-damage-why-we-must-accurately-measure-cross-border-data-flows-and>; Nigel Cory, “The Ten Worst Digital Protectionism and Innovation Mercantilist Policies of 2018” (ITIF, January, 2019), http://www2.itif.org/2019-worst-mercantilist-policies.pdf?_ga=2.171925856.1180134359.1617056243-1235678492.1612995001; Nigel Cory, “The Worst Innovation Mercantilist Policies of 2016” (ITIF, January, 2017), <http://www2.itif.org/2017-worst-innovation-mercantilist-policies.pdf>.
2. “Translation: New Chinese Ambitions for ‘Strategic Emerging Industries, (Center for Security and Emerging Technologies and DigiChina, September 29, 2020), <https://cset.georgetown.edu/research/new-chinese-ambitions-for-strategic-emerging-industries-translated/>.
3. “Beijing updates ‘Made in China 2025’ for leaner, meaner times,” *South Asian Monitor*, March 23, 2021, <https://southasianmonitor.net/en/world-news/beijing-updates-made-in-china-2025-for-leaner-meaner-times>.
4. Ibid.
5. Karen M. Sutter and Michael D. Sutherland, “China’s 14th Five-Year Plan: A First Look” (U.S. Congressional Research Service, January 5, 2021), <https://crsreports.congress.gov/product/pdf/IF/IF11684>.
6. Alan Price, Timothy Brightbill, and Adam Teslik, “China Action Plan Targets Enhancement of Digital Economy,” Wiley law firm blog post, February 3, 2021, <https://www.wiley.law/alert-China-Action-Plan-Targets-Enhancement-of-Digital-Economy>; [translation] “The General Office of the Central Committee of the Communist Party of China and the General Office of the State Council issued the ‘Action Plan for Building a High Standard Market System,’” Chinese government website, January 31, 2021, http://www.gov.cn/zhengce/2021-01/31/content_5583936.htm.
7. “Regions and Availability Zones,” Tencent Cloud website, <https://intl.cloud.tencent.com/global-infrastructure>.
8. For example: Chinese President Xi Jinping’s speech to the National Propaganda and Ideology Work Conference, August 2013, “Western anti-China forces have constantly and vainly tried to exploit the Internet to ‘topple China’... Whether we can stand our ground and win this battle over the Internet has a direct bearing on our country’s ideological and political security.” Quote taken from: James Griffiths, *The Great Firewall of China: How to Build and Control an Alternative Version of the Internet* (London: Zed Books, 2019).
9. Nigel Cory and Robert D. Atkinson, “Why and How to Mount a Strong, Trilateral Response to China’s Innovation Mercantilism” (ITIF, January 13, 2020), <https://itif.org/publications/2020/01/13/why-and-how-mount-strong-trilateral-response-chinas-innovation-mercantilism>.
10. For example, in 2017, China’s regulator issued a circular, entitled “On Cleaning up and Regulating Internet Access Services Market”, which prohibits Chinese telecommunication operators from offering consumers leased lines or virtual private network (VPN) connections reaching overseas data centers, which could restrict a key access mechanism companies use to connect to foreign cloud computing service suppliers and related resources.
11. United States Trade Representative (USTR), *China’s Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation under Section 301 of the Trade Act of 1974* (Washington, DC: USTR, March 22, 2018), <https://ustr.gov/sites/default/files/Section%20301%20FINAL.PDF>
12. Ibid.
13. Industry discussions; Ibid.

-
14. World Trade Organization Council for Trade in Services, “Computer and Related Services Background Note by the Secretariat S/C/W/45” (Geneva: World Trade Organization, July 14, 1998), https://www.wto.org/english/tratop_e/serv_e/w45.doc.
 15. Stephen J. Ezell and Robert D. Atkinson, “False Promises: The Yawning Gap between China’s WTO Commitments and Practices” (Information Technology and Innovation Foundation, September 2015), <http://www2.itif.org/2015-false-promises-china.pdf>.
 16. For example: Telecommunications Regulations of the People’s Republic of China, art. 7 and the Telecommunications Services Catalogue, attached as the Annex (State Council Order No. 291, issued Sept. 25, 2000 and amended on July 29, 2014 and Feb. 6, 2016), which lists IDC under the VATS operator license.
 17. William Mauldin, “U.S. Lawmakers Complain About China’s Cloud Computing Restrictions,” *Wall Street Journal*, March 23, 2017, <https://www.wsj.com/articles/BL-WB-67850>.
 18. USTR, *China’s Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation under Section 301 of the Trade Act of 1974*.
 19. Leigh Ann Ragland et al., “Red Cloud Rising: Cloud Computing in China” (Washington, DC: U.S. Economic and Security Commission, September 5, 2013), http://origin.www.uscc.gov/sites/default/files/Research/DGI_Red%20Cloud%20Rising_2014.pdf; United States Information Technology Office (USITO), “USITO Brief: Ministry of Science and Technology 12th Five Year Plan” (Washington, DC: USITO, August 5, 2011), <http://www.semiconductors.org/clientuploads/directory/DocumentSIA/USITO%20Brief%20Ministry%20of%20Science%20and%20Technology%2012th%20Five%20Year%20Plan.pdf>.
 20. United States Trade Representative, *2013 National Trade Estimate China* (Washington, DC: United States Trade Representative, 2014), <https://ustr.gov/sites/default/files/2013%20NTE%20China%20Final.pdf>; Hogan Lovells, “Third Party Payment Licenses in China - Are They Within the Grasp of Foreign Investors?” (London: Hogan Lovells, June 2014), http://www.hoganlovells.com/files/Uploads/Documents/14.06_Corporate_China_Alert_-_Third_Party_Payment_Licences_in_China_-_Are_They_within_The_Grasp_of_Foreign_Investors_SHALIB01_1093411.pdf.
 21. USTR, *China’s Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation under Section 301 of the Trade Act of 1974*.
 22. IBM, “Made in IBM Labs: IBM to Build First Cloud Computing Center in China,” news release, February 1, 2008, <http://www-03.ibm.com/press/us/en/pressrelease/23426.wss>; Rebecca Blumenstein, “Microsoft’s Partner Strategy in China,” *The Wall Street Journal*, June 8, 2016, <http://www.wsj.com/articles/microsofts-partner-strategy-in-china-1465421401>; SAP, “SAP and China Telecom Expand Strategic Partnership to Provide SAP Cloud Portfolio in China,” news release, November 20, 2013, <http://news.sap.com/sap-and-china-telecom-expand-strategic-partnership-to-provide-sap-cloud-portfolio-in-china/>; “Azure China Data Centers,” Microsoft website, July 20, 2020, <https://docs.microsoft.com/en-us/azure/china/overview-datacenter>.
 23. “Cross-border connectivity and interoperability,” Microsoft website, July 20, 2020, <https://docs.microsoft.com/en-us/azure/china/overview-connectivity-and-interoperability>.
 24. Nigel Cory, “Why China Should Be Disqualified From Participating in WTO Negotiations on Digital Trade Rules” (ITIF, May 9, 2019), <https://itif.org/publications/2019/05/09/why-china-should-be-disqualified-participating-wto-negotiations-digital>; Nigel Cory, “Cross-Border Data Flows: Where Are the Barriers, and What Do They Cost?” (ITIF, May 1, 2017), <https://itif.org/publications/2017/05/01/cross-border-data-flows-where-are-barriers-and-what-do-they-cost>.
 25. Omar Khan, “New Azure region coming to China in 2022,” Microsoft blog post, March 4, 2021, <https://azure.microsoft.com/en-us/blog/new-azure-region-coming-to-china-in-2022/>.
 26. “Microsoft and 21Vianet reinforce long-term cooperation on cloud services in China,” Microsoft blog post, March 14, 2018, <https://azure.microsoft.com/en-au/blog/microsoft-and-21vianet-reinforce-long-term-cooperation-on-cloud-services-in-china/>.

-
27. “Apply to sell in Microsoft national clouds as part of the CSP program,” Microsoft website, May 5, 2020, <https://docs.microsoft.com/en-us/partner-center/csp-national-clouds-overview>.
 28. “Amazon to close Chinese domestic marketplace business in major e-commerce setback,” *South China Morning Post*, April 18, 2019, <https://www.scmp.com/news/world/united-states-canada/article/3006643/amazon-close-chinese-online-store-major-e-commerce>.
 29. Yang Jie, “Amazon Banned From Using AWS Logo in China Trademark Ruling,” *Wall Street Journal*, January 5, 2021, <https://www.wsj.com/articles/amazon-banned-from-using-aws-logo-in-china-trademark-ruling-11609841232>.
 30. Yang Jie and Liza Lin, “Amazon Sells Hardware to Cloud Partner in China,” *Wall Street Journal*, November 14, 2017, https://www.wsj.com/articles/amazon-to-sell-its-china-cloud-computing-business-1510628802?mod=article_inline.
 31. Indicative of the restrictive licensing requirements, AWS’s website of its partnership with NWCD states that it is a cloud service provider with the Internet Data Center Services license (a B1 category service in figure 1) and the Internet Resource Collaboration Services license. “Ningxia Western Cloud Data Technology Co.Ltd.,” AWS website, <https://partners.amazonaws.com/partners/0010L00001rCaF1QAK/Ningxia%20Western%20Cloud%20Data%20Technology%20Co.Ltd>.
 32. “Amazon Web Services (AWS) and Ningxia Western Cloud Data Technology Co. Ltd (NWCD) Announce a Second AWS Region in China, Now Available to Customers,” press release, December 11, 2017, <https://www.businesswire.com/news/home/20171211006337/en/Amazon-Web-Services-AWS-and-Ningxia-Western-Cloud-Data-Technology-Co.-Ltd-NWCD-Announce-a-Second-AWS-Region-in-China-Now-Available-to-Customers>.
 33. Agatha Poon, “AWS China hopes to benefit from China’s ‘dual circulation’ strategy” (industry report, 451 Research, February 26, 2021), https://d1.awsstatic.com/analyst-reports/451-AWS-China-dual-circulation-strategy.pdf?trk=ar_card.
 34. Zhu Shenshen, “Amazon expanding cloud services in China to meet booming demand,” *Shanghai Daily*, march 26, 2021, <https://www.shine.cn/biz/company/2103266544/>.
 35. Poon, “AWS China hopes to benefit from China’s ‘dual circulation’ strategy.”
 36. John Foley, “Oracle, Tencent Reach Agreement To Advance Cloud Services In China,” *Forbes*, November 13, 2015, <https://www.forbes.com/sites/oracle/2015/11/13/oracle-tencent-reach-agreement-to-advance-cloud-services-in-china/?sh=26513f2e138c>.
 37. Cyrus Lee, “Oracle closes China’s R&D centre and axes nearly 1,000 employees: Report,” *ZDNet*, May 8, 2019, <https://www.zdnet.com/article/oracle-said-to-close-chinas-r-d-center-axing-nearly-1000-employees/>.
 38. “Google scraps cloud initiative in China and other ‘sensitive markets’,” *South China Morning Post*, July 9, 2020, <https://www.scmp.com/news/world/united-states-canada/article/3092416/google-scraps-cloud-initiative-china-and-other>.
 39. Yoko Kubota and Lingling Wei, “China Sweetens Its Cloud-Computing Offer in U.S. Trade Talks,” *Wall Street Journal*, April 11, 2019, https://www.wsj.com/articles/china-sweetens-its-cloud-offer-in-u-s-trade-talks-11554976562?mod=article_inline.
 40. “Market size of software-as-a-service (SaaS) cloud market in China from 2013 to 2020,” Statista, <https://www.statista.com/statistics/1029285/china-software-as-a-service-market-size/>.
 41. Celia Chen, “AWS made cloud computing services mainstream, but it still hasn’t cracked China,” *South China Morning Post*, February 3, 2021, <https://sg.news.yahoo.com/aws-made-cloud-computing-services-123818013.html>.

-
42. Minghe Hu, "Cloud computing adoption accelerates in China as economy recovers from coronavirus pandemic," *South China Morning Post*, June 16, 2020, <https://www.scmp.com/tech/big-tech/article/3089225/cloud-computing-adoption-accelerates-china-economy-recovers>.
 43. Ibid.
 44. "IDC: China's Public Cloud Service Market Tops USD 3.92 Billion," press release, July 24, 2020, <https://equalocean.com/briefing/20200724230002731>.
 45. "Market size of software-as-a-service (SaaS) cloud market in China from 2013 to 2020," Statista, <https://www.statista.com/statistics/1029285/china-software-as-a-service-market-size/>
 46. Cloud computing budget spending divided by overall enterprise software, service, and IT infrastructure spending. Hari Kannan and Christopher Thomas, "Public cloud in China: Big challenges, big upside" (McKinsey & Company report, July 6, 2018), <https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/public-cloud-in-china-big-challenges-big-upside>.
 47. Yang Jie, "Amazon Banned From Using AWS Logo in China Trademark Ruling," *Wall Street Journal*, January 5, 2021, <https://www.wsj.com/articles/amazon-banned-from-using-aws-logo-in-china-trademark-ruling-11609841232>; Karen Chiu, "Huawei looks to cloud services in 2021 as US sanctions strangle smartphone business," *South China Morning Post*, January 3, 2021, <https://www.scmp.com/tech/tech-leaders-and-founders/article/3116243/huawei-looks-cloud-services-2021-us-sanctions>; Celia Chen, "AWS made cloud computing services mainstream, but it still hasn't cracked China," *South China Morning Post*, February 3, 2021, <https://sg.news.yahoo.com/aws-made-cloud-computing-services-123818013.html>.
 48. Minghe Hu, "Cloud computing adoption accelerates in China as economy recovers from coronavirus pandemic," *South China Morning Post*, June 16, 2020, <https://www.scmp.com/tech/big-tech/article/3089225/cloud-computing-adoption-accelerates-china-economy-recovers>.
 49. Jeff Zhang, "Alibaba Cloud Intelligence - Strong Growth Driven by Digital Transformation and Core Technologies" (presentation, 2020 investor day), https://alibabagroup.com/en/ir/presentations/Investor_Day_2020_AlibabaCloud.pdf.
 50. "Gartner Forecasts Worldwide Public Cloud Revenue to Grow 6.3% in 2020," press release, July 23, 2020, <https://www.gartner.com/en/newsroom/press-releases/2020-07-23-gartner-forecasts-worldwide-public-cloud-revenue-to-grow-6point3-percent-in-2020>.
 51. Ibid.
 52. "Amazon, Microsoft, Google and Alibaba Strengthen their Grip on the Public Cloud Market" (Synergy Research Group Report, October 29, 2019), <https://www.srgresearch.com/articles/amazon-microsoft-google-and-alibaba-strengthen-their-grip-public-cloud-market>.
 53. "Gartner Forecasts Worldwide Public Cloud Revenue to Grow 6.3% in 2020."
 54. "Amazon, Microsoft, Google and Alibaba Strengthen their Grip on the Public Cloud Market."
 55. Ibid.
 56. Ibid.
 57. "Cloud Market Growth Rate Nudges Up as Amazon and Microsoft Solidify Leadership" (Synergy Research Group Report, October 29, 2019), <https://www.srgresearch.com/articles/cloud-market-growth-rate-nudges-amazon-and-microsoft-solidify-leadership>.
 58. Raj Bala, Bob Gill, Dennis Smith, David Wright, and Kevin Ji, "Magic Quadrant for Cloud Infrastructure and Platform Services" (Gartner report, September 1, 2020), <https://www.gartner.com/doc/reprints?id=1-242R58F3&ct=200902&st=sb>.
 59. Ibid.
 60. Poon, "AWS China hopes to benefit from China's 'dual circulation' strategy."

-
61. Bala et al, "Magic Quadrant for Cloud Infrastructure and Platform Services."
 62. In the quarter ended September. Jane Zhang and Minghe Hu, "Alibaba says its cloud computing business holds tremendous potential as China picks up pace on digitalisation drive," *South China Morning Post*, February 3, 2021, <https://www.scmp.com/tech/big-tech/article/3120289/alibaba-says-its-cloud-computing-business-holds-tremendous-potential>.
 63. "Alibaba Cloud's Global Infrastructure," Alibaba website, <https://www.alibabacloud.com/global-locations>.
 64. Bala et al, "Magic Quadrant for Cloud Infrastructure and Platform Services."
 65. Larry Dignan, "Alibaba Cloud nears profitability as customers move from IaaS into AI, data analytics workloads," *ZDNet*, October 1, 2020, <https://www.zdnet.com/article/alibaba-cloud-nears-profitability-as-customers-move-from-iaas-into-ai-data-analytics-workloads/>.
 66. "Tencent Cloud Global Infrastructure," Tencent Cloud website, <https://intl.cloud.tencent.com/global-infrastructure>.
 67. Bala et al, "Magic Quadrant for Cloud Infrastructure and Platform Services."
 68. Hannah Reale, "Tencent's Game," *The Wire China*, March 28, 2021, <https://www.thewirechina.com/2021/03/28/tencents-game/>.
 69. Nigel Cory, "Testimony to the U.S. Senate Subcommittee on Trade Regarding Censorship as a Non-Tariff Barrier to Trade" (ITIF, June 30, 2020), <https://itif.org/publications/2020/06/30/testimony-us-senate-subcommittee-trade-regarding-censorship-non-tariff>; James Griffith, "China just blocked Amazon's streaming service Twitch," *CNN Business*, September 21, 2018, <https://money.cnn.com/2018/09/21/technology/twitch-china-blocked-amazon/index.html#:~:text=The%20world's%20most%20popular%20service,iOS%20App%20Store%20in%20China>.
 70. Zheping Huang and Vlad Savov, "Tencent's Twitch Streaming Rival Is Hiding in Plain Sight," *Bloomberg*, June 26, 2020, <https://www.bloomberg.com/news/articles/2020-06-26/tencent-tests-livestreaming-rival-to-amazon-s-twitch-in-the-u-s>.
 71. Sharmila Ganapathy-Wallace, "Alibaba Cloud trains its sights on Southeast Asia," *Digital News Asia*, September 28, 2017, <https://www.digitalnewsasia.com/digital-economy/alibaba-cloud-trains-its-sights-southeast-asia>.
 72. For further details on the depth and breadth of this competition, see: "Chinese and US tech giants go at it in emerging markets," *The Economist*, July 7, 2018, <https://www.economist.com/business/2018/07/07/chinese-and-us-tech-giants-go-at-it-in-emerging-markets>; Aradhana Aravindan, "Singapore slings? Taking on Alibaba, Amazon launches Prime Now in the city state," *Reuters*, July 27, 2017, <https://www.reuters.com/article/us-amazon-singapore-idUSKBN1AC03K>; Resty Woro Yuniar, "Can China's Alipay, WeChat cash in as Indonesia embraces QR codes?," *South China Morning Post*, December 31, 2018, <https://www.scmp.com/week-asia/economics/article/2179906/can-chinas-alipay-wechat-cash-indonesia-embraces-qr-codes>; "Here's How Chinese Tech Giants Including Tencent And Ant Financial Are Plowing Into Southeast Asia" (CB Insights Research Brief, August 16, 2017), <https://www.cbinsights.com/research/alibaba-tencent-ant-southeast-asia/>.
 73. Surabhi Agarwal, "Alibaba cloud sees a bright lining in data localization," *The Economic Times*, November 1, 2018, <https://economictimes.indiatimes.com/tech/internet/alibaba-cloud-sees-a-bright-lining-in-data-localisation/articleshow/66454149.cms?from=mdr>.
 74. R. Dinakaran, "Alibaba ready to comply with Govt policy on data localization," *Business Line*, September 19, 2018, <https://www.thehindubusinessline.com/info-tech/alibaba-ready-to-comply-with-govt-policy-on-data-localisation/article24987381.ece>; Mugdha Variyar, "Alibaba backs data localisation in India; looks to grow its cloud presence," *The Economic Times*, September 19, 2018, <https://economictimes.indiatimes.com/internet/alibaba-backs-data-localisation-in-india/articleshow/65869783.cms>.

-
75. Nigel Cory, “Cross-Border Data Flows: Where Are the Barriers, and What Do They Cost?” (ITIF, May 1, 2017), <https://itif.org/publications/2017/05/01/cross-border-data-flows-where-are-barriers-and-what-do-they-cost>; Nigel Cory and Ellyse Dick, “How to Build Back Better the Transatlantic Data Relationship” (ITIF, March 25, 2021), <https://itif.org/publications/2021/03/25/how-build-back-better-transatlantic-data-relationship>.
 76. Isedua Oribhabor and Peter Micek, “The what, why, and who of transparency reporting,” Access Now blog post, April 2, 2020, <https://www.accessnow.org/the-what-why-and-who-of-transparency-reporting/>.
 77. “Alibaba Cloud denies report on data theft of Indian users,” *ETCIO.com*, September 18, 2020, <https://cio.economicstimes.indiatimes.com/news/digital-security/alibaba-cloud-denies-report-on-data-theft-of-indian-users/78183045>.
 78. “Zhang Gaoli Attends and Addresses the Opening Ceremony of China-ASEAN Expo,” Ministry of Foreign Affairs of the People’s Republic of China, September, 13, 2017, https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1493010.shtml.
 79. Robert Greene and Paul Triolo, “Will China Control the Global Internet Via its Digital Silk Road?” (Carnegie Endowment for International Peace, May 8, 2020), <https://carnegieendowment.org/2020/05/08/will-china-control-global-internet-via-its-digital-silk-road-pub-81857>; “The Digital Silk Road: Expanding China’s Digital Footprint” (Eurasia Group report, April 8, 2020), <https://www.eurasiagroup.net/files/upload/Digital-Silk-Road-Expanding-China-Digital-Footprint-1.pdf>.
 80. Greene and Triolo, “Will China Control the Global Internet Via its Digital Silk Road?”
 81. Ibid.
 82. Executive Office of the President National Science and Technology Council Advanced Manufacturing National Program Office, “National Network for Manufacturing Innovation Program: Annual Report” (Executive Office of the President, February 2016), <https://www.manufacturing.gov/files/2016/02/2015- NNMI-Annual-Report.pdf>.
 83. For a review of studies, see Michelle A. Wein and Stephen J. Ezell, “How to Craft an Innovation Maximizing T-TIP Agreement” (ITIF, October 2013), <http://www2.itif.org/2013-innovation-maximizing-ttip-agreement.pdf>.
 84. Laura DiDio, “The Critical Role of High-Tech R&D in the COVID-19 Era,” *Tech News World*, January 12, 2021, <https://www.technewsworld.com/story/86977.html>.
 85. Sundar Pichai, “Investing in America in 2021,” Google blog post, March 18, 2021, <https://blog.google/inside-google/company-announcements/investing-america-2021/>.
 86. “Google Economic Impact,” <https://economicimpact.google.com/>.
 87. DiDio, “The Critical Role of High-Tech R&D in the COVID-19 Era.”
 88. “China issues 2020 list of top 500 enterprises,” *China Daily*, September 28, 2020, <https://www.chinadaily.com.cn/a/202009/28/WS5f71991ea31024ad0ba7c659.html>.
 89. DiDio, “The Critical Role of High-Tech R&D in the COVID-19 Era.”
 90. “Recent patent trends in cloud computing,” IPlytics blog post, November 22, 2018, <https://www.iplytics.com/general/recent-patent-trends-cloud-computing/>.
 91. Louis Columbus, “The Most Innovative Tech Companies Based On Patent Analytics,” Blog post, A Passion for Research, December 22, 2019, <https://softwarestrategiesblog.com/2019/12/22/the-most-innovative-tech-companies-based-on-patent-analytics/>.
 92. Matthew Wilson, “Cloud computing patents a major part of another record-breaking year for IBM,” IBM, blog post, January 8, 2019, <https://www.ibm.com/blogs/cloud-computing/2019/01/08/cloud-patents-ibm-2018/>.
 93. “Recent patent trends in cloud computing,” IPlytics blog post.
 94. Roxanne Heston and Remco Zwetsloot, “Mapping U.S. Multinationals’ Global AI R&D Activity” (CSET, December, 2020), <https://cset.georgetown.edu/research/mapping-u-s-multinationals-global-ai-rd-activity/>.

-
95. Ibid.
 96. Ibid.
 97. Robert D. Atkinson, "Limiting L-1 Visas: How to Harm America's Business Climate and Kill Jobs," Innovation Files blog post, June 18, 2020, <https://itif.org/publications/2020/06/18/limiting-l-1-visas-how-harm-americas-business-climate-and-kill-jobs>; Adams Nager, "Worried About Foreign H-1B Hirers? Award More Visas!," Innovation Files blog post, March 31, 2016, <https://itif.org/publications/2016/03/31/worried-about-foreign-h-1b-hirers-award-more-visas>.
 98. For cloud services: Amazon's and Microsoft's Infrastructure as a Service (IaaS) market shares in China are compared to their market shares in the overall Asia Pacific region, estimating the revenues each company would earn if they held their regional market share within China. Additionally, the Chinese market is subtracted from the Asia Pacific region to estimate the market share each company holds in the rest of the region, which are once again substituted for the Chinese market shares; China Internet Watch, "Alibaba Cloud owns 43% China's public cloud market in 2018," February 12, 2019, <https://www.chinainternetwatch.com/28150/public-cloud-h1-2018/>; China Internet Watch, "China public cloud (IaaS) to reach US\$6.21 bn in 2018; Amazon fastest growth," October 10, 2018, <https://www.chinainternetwatch.com/26900/public-cloud-iaas-2018/>; Business Wire, "Alibaba Cloud Ranked First in Asia Pacific(*) by Gartner Market Share: IT Services in IaaS and IUS," April 24, 2019, <https://www.businesswire.com/news/home/20190424005371/en/>; IDC, "New IDC Forecast Reveals Asia/Pacific* Spending on Public Cloud Services to Reach USD 76.1 Billion by 2023," August 7, 2019, <https://www.idc.com/getdoc.jsp?containerId=prAP45431219>.
 99. The tables in the appendix summarize the results estimating the revenues of U.S. cloud companies in China in different scenarios and provide estimates of cumulative losses. The high and low assumptions for each are different. For cloud, we assume cloud companies receive the market share equivalent to the average in the Asia Pacific region including China, and then receiving the market share equivalent to the regional average excluding China.
 100. Industry source; "GDS American Depository Shares notice," <https://investors.gds-services.com/node/8261/html>.
 101. Peter Judge, "ChinData IPO raises \$540m, values company at \$4.9bn," *Data Center Dynamics*, October 1, 2020, <https://www.datacenterdynamics.com/en/news/chindata-ipo-raises-540m-values-company-49bn/>.
 102. Bain Capital acquired Xiamen Qinhuai Technology and merged it with their existing company Bridge Data Centres to form ChinData.
 103. Yoko Kubota and Lingling Wei, "China Sweetens Its Cloud-Computing Offer in U.S. Trade Talks," *Wall Street Journal*, April 11, 2019, https://www.wsj.com/articles/china-sweetens-its-cloud-offer-in-u-s-trade-talks-11554976562?mod=article_inline.
 104. Ibid.
 105. Ibid.
 106. See page 6-3. "Economic and Trade Agreement Between the Government of the United States of America and the Government of the People's Republic of China," USTR website, https://ustr.gov/sites/default/files/files/agreements/phase%20one%20agreement/Economic_And_Trade_Agreement_Between_The_United_States_And_China_Text.pdf.
 107. Ibid. See page 6-23. Each of these categories are taken from the U.S. Department of Commerce's Bureau of Economic Analysis (BEA) table 2.3 on "U.S. trade in services, by country of affiliation and by type of service, with one exception. The BEA category for data hosting, processing, and related services is from BEA table 4.1 on "U.S. services supplied to foreign persons by U.S. multinational enterprises through their majority-owned foreign affiliates, by industry of affiliate and by country of affiliate."
 108. Ibid.
 109. Ibid.

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110. “EU-China Comprehensive Agreement on Investment,” presentation, European Commission, Directorate General for Trade, January 21, 2021, https://trade.ec.europa.eu/doclib/docs/2021/march/tradoc_159480.pdf; “EU-China Comprehensive Agreement on Investment: Negotiations: Schedule of China,” https://trade.ec.europa.eu/doclib/docs/2021/march/tradoc_159483.pdf.
 111. Mainly, that China committing to allowing 50 percent equity caps is new (it isn’t). This is what foreign cloud providers are already subject to. Furthermore, the deal does nothing about the use of restrictive and selective licensing arrangements.
 112. “Key elements of the EU-China Comprehensive Agreement on Investment,” press release, December 30, 2020, https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2542.
 113. For specific language, see Annex I, Entry 12(3). 2. In the case of an EU investor investing in internet data center service (including content delivery network service), the shareholding percentage of foreign investors may not exceed 50%. 3. In the case of an EU investor investing in international communication facility service, satellite communication service, cluster communication service, network access facilities service, network trusteeship service, domestic communication facilities service, fixed communication service, cellular mobile communication service, data communication service or IP telephone service, the shareholding percentage of foreign investors may not exceed 49% (the foregoing services may be provided on the basis of facilities). In the case of an EU investor investing in online data processing and transaction processing services (E-commerce not included), domestic internet virtual private network services and code and protocol conversion services, the shareholding percentage of foreign investors may not exceed. “EU-China Comprehensive Agreement on Investment: Negotiations: Schedule of China,” https://trade.ec.europa.eu/doclib/docs/2021/march/tradoc_159483.pdf.
 114. Ibid. China’s committed to update its special measures for market access of foreign investments (its negative list). Negotiators’ Note: Before signature of the Agreement and during the legal scrubbing China will update the reference to Special Administrative Measures for Market Access of Foreign Investment (Negative List) (2019 Edition) in this Schedule in the light of its latest edition.
 115. “EU-China Comprehensive Agreement on Investment: Negotiations: Schedule of China,” https://trade.ec.europa.eu/doclib/docs/2021/march/tradoc_159483.pdf.
 116. “(WT/MIN(17)/60) Joint Statement on E-commerce,” World Trade Organization, December 13, 2017, <https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/WT/MIN17/60.pdf&Open=True>.
 117. [Twitter thread] “@nigelcory: RCEP is China's first argmt with data flow rules, but it's largely symbolic & meaningless. Less than GATS - not enforceable. Must be read with China's restrictive, control-focused approach to data gov & natsec. Thread on EU/WTO/ASEAN/CPTPP/USMCA/DEPA 1/9,” November 17, 2020, <https://twitter.com/nigelcory/status/1328357984573984768>.
 118. Communication from the People's Republic of China and Pakistan, “(JOB/GC/110/Rev.1, JOB/CTG/2/Rev.1) Work Programme on Electronic Commerce Aiming at the 11th Ministerial Conference,” November 16, 2016.
 119. “Business and Tech Groups Release Priorities for WTO E-Commerce Meetings,” press release, IT Industry Council, July 16, 2018, <https://www.itic.org/news-events/news-releases/business-and-tech-groups-release-priorities-for-wto-e-commerce-meetings>.
 120. Communication from Canada, Chile, Colombia, Côte d'Ivoire, the European Union, the Republic of Korea, Mexico, the Republic of Moldova, Montenegro, Paraguay, Singapore and Turkey, “Work Programme on Electronic Commerce: Trade Policy, the WTO, and the Digital Economy,” World Trade Organization, August 1, 2016, https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S009-DP.aspx?language=E&CatalogueIdList=236954,236782,233802&CurrentCatalogueIdIndex=1&FullTextHash=371857150&HasEnglishRecord=True&HasFrenchRecord=True&HasSpanishRecord=True.
 121. Cory, “Why China Should Be Disqualified From Participating in WTO Negotiations on Digital Trade Rules.”
 122. Samm Sacks, Mingli Shi, and Graham Webster, “The Evolution of China's Data Governance Regime: A Timeline,” DigiChina blog post, February 8, 2019, <https://www.newamerica.org/cybersecurity-initiative/digichina/blog/china-data-governance-regime-timeline/>; Samm Sacks, Qiheng Chen, and Graham

-
- Webster, “Five Important Takeaways From China's Draft Data Security Law,” DigiChina blog post, July 9, 2020, <https://www.newamerica.org/cybersecurity-initiative/digichina/blog/five-important-take-aways-chinas-draft-data-security-law/>; Mingli Shi, “China’s Draft Privacy Law Both Builds On and Complicates Its Data Governance,” DigiChina, December 14, 2020, <https://www.newamerica.org/cybersecurity-initiative/digichina/blog/chinas-draft-privacy-law-both-builds-on-and-complicates-its-data-governance/>.
123. The cybersecurity law targets critical information infrastructure (CII) operators. The lack of a clear definition for CII operators means that it has been interpreted as a broad data localization requirement.
 124. “Xi Jinping delivers a speech at the 2020 China International Trade in Services Fair Global Service Trade Summit,” Xinhua, September 4, 2020, http://www.xinhuanet.com/politics/leaders/2020-09/04/c_1126454690.htm.
 125. Translated.
 126. [translated] China’s Ministry of Commerce, “General Plan for Comprehensively Deepening the Pilot Program of Innovative Development of Trade in Services,” December 31, 2020, <http://images.mofcom.gov.cn/fms/202008/20200814092010526.pdf>.
 127. [Translated] China’s Ministry of Commerce, “Comprehensively deepen pilot projects, specific measures, and division of responsibilities for the innovative development of trade in services,” August 20, 2020, <http://images.mofcom.gov.cn/fms/202008/20200814092010665.pdf>.
 128. Ibid.
 129. [Translated] “State Council on Deepening the New Round of Service Industries in Beijing, expand opening up, comprehensive pilot projects, building national service industry, expand opening up the comprehensive demonstration zone work plan,” September 7, 2020, http://www.gov.cn/zhengce/content/2020-09/07/content_5541291.htm.
 130. [Translated] Zhu Kai, “Shanghai port to accelerate the creation of a new generation of information and communication hub,” *Securities Times*, April 21, 2020, <https://m.hexun.com/economy/2020-04-21/201091874.html>.
 131. [Translated] “The Central Committee of the Communist Party of China and the State Council issued the “Overall Plan for the Construction of Hainan Free Trade Port,”” China’s Ministry of Justice, June 1, 2020, http://www.moj.gov.cn/news/content/2020-06/01/xxxt_3249859.html.
 132. [Translated]: “The General Office of the Central Committee of the Communist Party of China and the General Office of the State Council issued the “Implementation Plan for the Pilot Comprehensive Reform of Building a Pilot Demonstration Zone of Socialism with Chinese Characteristics in Shenzhen (2020-2025),” October 11, 2020, http://www.gov.cn/zhengce/2020-10/11/content_5550408.htm.
 133. “Full Text: Xi Jinping’s keynote speech at the World Economic Forum,” April 6, 2017, http://www.china.org.cn/node_7247529/content_40569136.htm.
 134. Cory and Atkinson, “Why and How to Mount a Strong, Trilateral Response to China’s Innovation Mercantilism”; Nigel Cory, Robert D. Atkinson, and Stephen Ezell, “Stopping China’s Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation” (The Information Technology and Innovation Foundation, March, 2017), <http://www2.itif.org/2017-stopping-china-mercantilism.pdf>.
 135. Lingling Wei and Bob Davis, “U.S. Trade Negotiators Take Aim at China’s Cybersecurity Law,” *Wall Street Journal*, March 29, 2019, https://www.wsj.com/articles/u-s-trade-negotiators-take-aim-at-chinas-cybersecurity-law-11553867916?mod=article_inline.
 136. The multi-level protection scheme (MLPS) is a security certification regime that the Chinese government established in 2007. In 2018, China’s Ministry of Public Security (MPS) released a draft of a new version (referred to as MLPS 2.0). The draft regulation updates the original MLPS regime based on the new principles set out in the 2017 Cybersecurity Law. MLPS ranks from 1 to 5 all information and communications technology systems based on their importance to national security, with Level 5 deemed the most sensitive.

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137. "The term [IaaS] means any product or service offered to a consumer, including complimentary or 'trial' offerings, that provides processing, storage, networks, or other fundamental computing resources, and with which the consumer is able to deploy and run software that is not predefined, including operating systems and applications," Chris Duckett, "Trump decrees American cloud providers need to maintain records on foreign clients," *ZDNet*, January 20, 2021, <https://www.zdnet.com/article/trump-decrees-american-cloud-providers-need-to-maintain-records-on-foreign-clients/>.
 138. Steve Overly and Eric Geller, "White House drafts executive order that could restrict global cloud computing companies," *Politico*, December 4, 2020, <https://www.scmp.com/news/world/united-states-canada/article/3112722/white-house-drafts-executive-order-could-restrict>.
 139. Richi Jennings, "Trump Hates Cloud, Because China Cyber?" Security Boulevard blog post, January 21, 2021, <https://securityboulevard.com/2021/01/trump-hates-cloud-because-china-cyber/>; Duckett, "Trump decrees American cloud providers need to maintain records on foreign clients."
 140. Overly and Geller, "White House drafts executive order that could restrict global cloud computing companies."
 141. See: Nigel Cory, Robert D. Atkinson, and Daniel Castro, "Principles and Policies for "Data Free Flow With Trust" (ITIF, May 27, 2019), <https://itif.org/publications/2019/05/27/principles-and-policies-data-free-flow-trust>.
 142. Ralph Ossa, "A New Trade Theory of GATT/WTO Negotiations," WTO Working Paper, February 2, 2009, https://www.wto.org/english/res_e/reser_e/ersd200908_e.pdf.
 143. Stephen J. Ezell, "Tariffs Won't Stop China's Mercantilism. Here Are 10 Alternatives," *Real Clear Policy*, April 23, 2018, https://www.realclearpolicy.com/articles/2018/04/23/tariffs_wont_stop_chinas_mercantilism_here_are_10_alternatives_110605.html; Jennifer Hillman, "Testimony Before the U.S.-China Economic and Review Security Commission: Hearing on U.S. Tools to Address Chinese Market Distortions," June 8, 2018, 10, https://www.uscc.gov/sites/default/files/Hillman%20Testimony%20US%20China%20Comm%20w%20Appendix%20A.pdf?mod=article_inline.
 144. Hillman, "Hearing on U.S. Tools to Address Chinese Market Distortions," 6.
 145. Atkinson, Cory, and Ezell, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation," 4.
 146. Senator Marco Rubio, "Rubio, Young, Merkley, Coons Legislation Calls for Global Economic Security Strategy," news release, November 12, 2019, <https://www.rubio.senate.gov/public/index.cfm/2019/11/rubio-young-merkley-coons-legislation-calls-for-global-economic-security-strategy>; Congress.gov, "S. 2826: The Global Economic Security Strategy of 2019 Act," <https://www.congress.gov/116/bills/s2826/BILLS-116s2826is.pdf>.
 147. United States Trade Representative (USTR), *Section 301 Report into China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation* (Washington, D.C: USTR, March 22, 2018), <https://ustr.gov/sites/default/files/Section%20301%20FINAL.PDF>.
 148. United States Trade Representative (USTR), *2021 Trade Policy Agenda and 2020 Annual Report of the President of the United States* (Washington, D.C: USTR, March, 2021), <https://ustr.gov/sites/default/files/files/reports/2021/2021%20Trade%20Agenda/Online%20PDF%202021%20Trade%20Policy%20Agenda%20and%202020%20Annual%20Report.pdf>; United States Trade Representative, Fact Sheet on the 2020 National Trade Estimate: Strong, Binding Rules to Advance Digital Trade," March 2020, <https://ustr.gov/about-us/policy-offices/press-office/fact-sheets/2020/march/fact-sheet-2020-national-trade-estimate-strong-binding-rules-advance-digital-trade>.
 149. USTR's WTO dispute about China's restrictive licensing regime and its forced tech transfers did not target China's use of licenses in the cloud sector. In 2018 USTR initiated a WTO dispute settlement in regards to some of China's restrictive licensing regime, but not those used in the cloud sector, but ultimately it decided to suspend it in June 2019. China—Certain Measures Concerning the Protection of Intellectual Property Rights (DS542), https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds542_e.htm.

-
150. United States Trade Representative, *2021 Trade Policy Agenda and 2020 Annual Report of the President of the United States* (Washington, D.C: USTR, March, 2021), <https://ustr.gov/sites/default/files/files/reports/2021/2021%20Trade%20Agenda/Online%20PDF%202021%20Trade%20Policy%20Agenda%20and%202020%20Annual%20Report.pdf>.
 151. Cory and Robert D. Atkinson, "Why and How to Mount a Strong, Trilateral Response to China's Innovation Mercantilism."
 152. See Albert Hirschman, *National Power and the Structure of Foreign Trade* (Los Angeles, CA: University of California Press, 1945).
 153. United States Trade Representative (USTR), *2020 Trade Policy Agenda and 2019 Annual Report* (Washington, D.C: USTR, February 28, 2020), https://ustr.gov/sites/default/files/2020_Trade_Policy_Agenda_and_2019_Annual_Report.pdf.
 154. Robert Atkinson, "A U.S. Grand Strategy for the Global Digital Economy" (ITIF, January 19, 2021), <https://itif.org/publications/2021/01/19/us-grand-strategy-global-digital-economy>.
 155. China Internet Watch, "Alibaba Cloud owns 43% China's public cloud market in 2018," February 12, 2019, <https://www.chinainternetwatch.com/28150/public-cloud-h1-2018/>; China Internet Watch, "China public cloud (IaaS) to reach US\$6.21 bn in 2018; Amazon fastest growth," October 10, 2018, <https://www.chinainternetwatch.com/26900/public-cloud-iaas-2018/>; Business Wire, "Alibaba Cloud Ranked First in Asia Pacific(*) by Gartner Market Share: IT Services in IaaS and IUS," April 24, 2019, <https://www.businesswire.com/news/home/20190424005371/en/>; IDC, "New IDC Forecast Reveals Asia/Pacific* Spending on Public Cloud Services to Reach USD 76.1 Billion by 2023," August 7, 2019, <https://www.idc.com/getdoc.jsp?containerId=prAP45431219>.
 156. Nigel Cory, "Testimony to the U.S. Senate Subcommittee on Trade Regarding Censorship as a Non-Tariff Barrier to Trade" (ITIF, June 30, 2020), <https://itif.org/publications/2020/06/30/testimony-us-senate-subcommittee-trade-regarding-censorship-non-tariff>.