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COUNTERING CHINA: ENSURING AMERICA REMAINS THE WORLD LEADER IN ADVANCED TECHNOLOGIES AND INNOVATION

HEARING

BEFORE THE

SUBCOMMITTEE ON
INFORMATION TECHNOLOGY

OF THE

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AND GOVERNMENT REFORM
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COUNTERING CHINA: ENSURING AMERICA REMAINS THE WORLD LEADER IN ADVANCED TECHNOLOGIES AND INNOVATION

Wednesday, September 26, 2018

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON INFORMATION TECHNOLOGY,
COMMITTEE ON OVERSIGHT AND GOVERNMENT REFORM,
Washington, D.C.

The subcommittee met, pursuant to call, at 10:05 a.m., in Room 2247, Rayburn House Office Building, Hon. Will Hurd [chairman of the subcommittee] presiding.

Present: Representatives Hurd, Issa, Cloud, Kelly, and Krishnamoorthi.

[Audio malfunction in hearing room.]

Mr. HURD. Welcome, everyone. We do not have an echo, so let's try that again.

The Subcommittee on Information Technology will come to order, and without objection, the chair is authorized to declare a recess at any time.

Good morning. For more than 40 years, the U.S. has encouraged China to develop its own economy and take its place alongside the U.S. as a central and responsible player on the world stage, but China does not want to join us. They want to replace us. More importantly, China has not been playing fair. They coerce American companies into entering into joint ventures with Chinese companies with close links to the Communist Chinese Government as the price for market access.

The United States Trade Representative, which led a seven-month investigation into China's intellectual property theft, recently found that Chinese theft of American IP currently costs between $225 billion and $600 billion annually.

The Chinese have not been secretive about their ambitions and their goals. Chinese President Xi made it clear upon taking office that his dream for China is, and I quote, "the great rejuvenation of the Chinese nation." Critical to Xi's vision of a rejuvenated China's dominance is manufacturing, modern advanced technology.

In 2015, China's State Council introduced the Made in China 2025 initiative with the aim to modernize the Chinese economy and become the world leader in manufacturing. Made in China 2025 focuses on promoting breakthroughs in critical sectors of the Chinese economy, and of the sectors this hearing will focus primarily on next-generation IT, a topic that this subcommittee has been exploring for three and a half years. A next-generation IT includes the

hardware that make up today's technology and the networks that support communications. Examples include 5G networks, semiconductors, cloud computing, artificial intelligence, blockchain, and quantum computing.

As we explore these issues, we cannot lose sight of the many abuses the oppressive Chinese Government perpetuates on its citizens. In China today Uighur Muslims are sentenced to years in prison for praying. Mothers and fathers are shipped to reeducation camps for practicing Falun Gong and never heard from again. The communist Chinese Government oversees one of the strictest online censorship regimes in the world, and the Human Rights Watch recently stated the broad and sustained offensive on human rights that started after President Xi Jinping took power five years ago shows no sign of abating. The U.N. estimates as many as 1 million Chinese citizens are currently quarantined in concentration camps.

The Communist Party that runs the Chinese Government is an oppressive regime with an abysmal human rights record. As Americans, we believe everyone has a right to life, liberty, and the pursuit of happiness. The millions of men, women, and children living under the oppressive Chinese regime in China deserve better from their government. Our nation faces a great challenge rising from the East, but we have met greater challenges before, and I am confident we can meet this one.

And I am also looking to explore how we do other things than tariffs. How do we put a regime in place that deals with the practices that we know China is doing? They are stealing our technology. They are forcing intellectual transfer. Alibaba is treated like a U.S. company in the U.S., but are American companies treated like Chinese companies in China? No. We know China prevents investment in key future sectors, but we allow Chinese investment in those sectors here in the U.S.

I think there are other tactics we can be taking other than tariffs in order to deal with and ensure America and American companies specifically stay the leaders in innovation, and I am looking forward to exploring these issues today. And as always, I am excited to explore these issues with the one and only, my friend and colleague, Robin Kelly from the great State of Illinois.

I thank our witnesses for being here today and look forward to hearing from them innovative solutions to ensure that America remains the world leader in advanced technologies and innovation.

Mr. HURD. And now, it is my pleasure to recognize the ranking member of the subcommittee, Ms. Kelly, for her opening statement.

Ms. KELLY. Thank you, Mr. Chairman, and thank you for calling today's important hearing. And I too want to welcome the witnesses.

China is mounting a serious challenge to the United States for global leadership in technology and innovation. China's success so far is attributed to two policies: China uses pressure tactics on American companies requiring them to transfer technology to Chinese firms as a condition of doing business in the Chinese market; and China's making world-leading investments in research and development. In fact, for the first time Chinese investment in R&D will surpass U.S. investment next year. Together, these policies

have transformed China into America's chief global competitor in advanced technology.

Unfortunately, this administration's response has been to start a trade war with China with few results to show for it. Tariffs will not stop China from making huge investments in research and development, but tariffs are hurting Americans. Farmers are already feeling the effects. Soybean farmers in my home State of Illinois, which we are number one in soybean, are losing out on contracts in China, and workers have been laid off as a result.

American shoppers will soon feel the effects. A recent study by the National Retail Federation estimates that the most recent round of tariffs will cost U.S. consumers $6 billion in higher costs for products like furniture and luggage. The Consumer Technology Association estimates that tariffs on technology products will cost Americans another $3 billion for devices such as modems.

On top of the counterproductive tariffs, the Trump Administration's immigration policies are damaging our own ability to compete for the talent we need to remain a lead in technology innovation. The Administration recently announced that it was rescinding employment authorization for technology workers' spouses under the H–4 visa program. That sends a clear message that highly skilled immigrants who come to work for American technology companies are not welcome.

And President Trump has not led the major increases in R&D investment and education funding that are necessary to stay ahead of China's commitments. Over the past three years, China has outspent the United States by approximately $24 billion on investments in telecommunications infrastructure. China is planning to invest an additional $400 billion over the next five years to win the race to deploy 5G wireless technology for cell phones. The United States is falling behind. China has already deployed 350,000 cell sites for 5G, while the U.S. has only deployed 30,000. Overall, while the U.S. remains a leader in spending on research and development, China is expected to surpass the U.S. in total research spending by the end of this year.

China is also catching up to the United States in education. According to the National Science Foundation, China now awards nearly as many doctorates in science and engineering as the United States. Expanding STEM education is key for America to remain a leader in innovation in the global economy. To that end, I have introduced today's American DREAM Act to incentivize college graduates with degrees in a STEM field to teach for five years. This legislation would help the United States build the pipeline necessary to educate the next generation of innovators in science and technology.

President Trump has gotten the U.S. into a trade war with China, which is harming American farmers and businesses. This trade war lacks a clear strategy with no end in sight. The United States should be investing in research and in education to preserve America's global leadership in technology and attract the best talents from around the world.

Again, thank you, Mr. Chairman, for the opportunity to discuss this extremely important topic with our panel. Thank you.

Mr. HURD. Thank you, Ranking Member. And I agree; education, immigration, two ways we can solve this problem.

And now, it is a pleasure to introduce our witnesses. Our first, Mr. John Neuffer, president and CEO of the Semiconductor Industry Association. Thank you for being here. Mr. Dean Cheng, senior research fellow, Asian Studies Center, Davis Institute for National Security and Foreign Policy at The Heritage Foundation. Say that three times fast. Ms. Sarah Cook, senior research analyst for East Asia at Freedom House; and Rob Atkinson, president of the Information Technology and Innovation Foundation.

And welcome to you all. And pursuant to committee rules, all witnesses will be sworn in before you testify, so please stand and raise your right hand.

[Witnesses sworn.]

Mr. HURD. Thank you. Please let the record reflect that all witnesses answered in the affirmative.

In order to allow time for discussion, please limit your testimony to five minutes. The entire written statement has been made part of the record. And thank you for your submissions. A reminder, the clock in front of you shows remaining time. When it is yellow, you have 30 seconds. When it is red, your five minutes are up. Please remember to press the button to turn your microphone on before speaking.

And now, it is a pleasure to recognize Mr. Neuffer for your opening remarks.

WITNESS STATEMENTS

STATEMENT OF JOHN NEUFFER

Mr. NEUFFER. Thank you. I work for a tech association, and I'm glad to see we're not the only ones with—that have technical difficulties with our equipment.

Good morning, Chairman Hurd, Ranking Member Kelly, and members of this subcommittee. I'm John Neuffer, and I'm testifying on the behalf of Semiconductor Industry Association. Thanks for the opportunity to testify before this committee regarding one of the most pressing challenges facing the U.S. semiconductor industry today: How to maintain U.S. semiconductor technology leadership in light of the full-throated effort by China to compete with the U.S. in advanced technologies, especially in regard to those Chinese Government policies and practices that threaten our intellectual property and distort markets.

Invented right here in America, semiconductors are the building blocks upon which U.S. technological leadership rests. They power virtually all modern electronics from communications to transportation to health care to energy to military systems. U.S. ship makers lead the world. We account for close to half of the $412 billion global semiconductor market. We are the Nation's fourth-largest exporter after aircraft, refined oil, and automobiles. We have a global trade surplus of over $6 billion, and a bilateral trade surplus with China of over $2 billion. Importantly, nearly half of our manufacturing operations are right here in America, spread across 19 States, not just in Silicon Valley. And the industry employs close to 25,000 workers in the U.S. with well-paying jobs.

So China is a critical market for our industry, to be sure. At the center of the world's electronics supply chain, China is, unsurprisingly, the leading destination for U.S. semiconductor exports. We are especially concerned with Chinese actions, policies, and practices that force the transfer or allow the outright theft of our technology. This includes the forced transfer of our technology as a condition of market access, which you've addressed this morning, the plethora of formal and informal requirements that force the disclosure of intellectual property, and persistent economic espionage to steal viable IP.

In 2014, China is—set in motion a massive effort to indigenize its semiconductor ecosystem with the goal of becoming the global leader in all major segments of the industry by 2030. Core to this effort are substantial government subsidies. Altogether an estimated $90-$100 billion in government financial support has been earmarked to support the sweeping undertaking. Similarly, Chinese industrial policies in sectors such as solar, wind, and LEDs have led to major distortions in the marketplace and left lots of wreckage, so we know what that picture show looks like.

To maintain U.S. leadership in the semiconductor industry, the U.S. Government must develop a comprehensive and adequately resourced competitiveness and innovation agenda. Other steps need to be taken. First, let's eliminate tariffs, the recently imposed tariffs on semiconductors. Slapping tariffs on our products only hurts U.S. semiconductor companies, while failing to address the real problems we're having with China. Chinese semiconductor companies don't even send their products to the U.S., so Chinese enterprises are not hurt by tariffs.

Second, strengthen multilateral actions with U.S. allies. Multilateral pressure is one of the few tactics that has historically prompted China to change course in a positive direction.

Third, strengthen protection of IP. Press harder on China to adopt policies and engage in stronger IP enforcement to prohibit and penalize state or state-owned enterprises from misappropriating trade secrets or proprietary technologies generally and especially through activities related to the hiring of overseas talent.

Finally, help the U.S. run faster with increased Federal investment in research. While the U.S. has long been the leader in semiconductor R&D, Federal investment in this area is simply not keeping pace with nation-state competitors.

The United States is at a critical juncture. It's facing intense global competition from China in multiple high-tech sectors, including semiconductors. While our nation continues to dominate leading technologies from semiconductors to aerospace, we must not be complacent. There are real near-term and long-term challenges that require closer collaboration between industry and government to ensure we retain our technological leadership in key technology arenas.

Thank you.

[Prepared statement of Mr. Neuffer follows:]

SEMICONDUCTOR INDUSTRY ASSOCIATION

Written Testimony from the
Semiconductor Industry Association
Regarding
"Countering China: Ensuring America Remains the World Leader in Advanced Technologies and Innovation"

Hearing by the House of Representatives Committee on Oversight and Government Reform,
Subcommittee on Information Technology
September 26, 2018

The Semiconductor Industry Association (SIA) appreciates the opportunity to testify before this Committee regarding one of the most pressing challenges facing our nation today: how to maintain America's leadership position in advanced technologies in light of strengthened international competition, particularly from China. China is the largest market for the U.S. semiconductor industry. At the same time, SIA and many other industry groups have concerns with China's policies and practices that threaten IP and distort market access.

SIA is the voice of the U.S. semiconductor industry, one of America's top export industries and a key driver of America's economic strength, national security, and global competitiveness. Invented right here in America, semiconductors are the building blocks upon which U.S. technological leadership rests, powering virtually all modern electronics used in communications, computing, transportation, health care, energy, and military systems, along with many other sectors at the forefront of U.S. competitiveness.

- U.S. chipmakers lead the world with close to half of the $412 billion global semiconductor market.
- Semiconductors are the nation's fourth largest export, after aircraft, refined oil, and automobiles.
- The U.S. has a global semiconductor trade surplus of over $6 billion and a semiconductor trade surplus with China of $2 billion in 2017.[1]
- Nearly half of the manufacturing operations of major U.S. semiconductor firms are located here in the United States, across 19 states, directly employing close to 250,000 workers with well-paying jobs and supporting over one million additional indirect jobs throughout our economy.
- The U.S. semiconductor industry is one of the most research-intensive industries, investing 18.7 percent of revenue annually in research and development (R&D) -- the second-highest rate of any U.S. industry in 2017.

As the world's largest exporter of electronic goods powered by semiconductors, China is a critical market for many U.S. semiconductor companies. In 2017 alone, China exported $600

[1] Official U.S. government trade data, U.S. Department of Commerce, obtained from the U.S. International Trade Commission, Dataweb: https://dataweb.usitc.gov/.

billion in electronic goods powered by semiconductors, representing nearly one third of all Chinese exports.[2] This includes over $140 billion in personal computers and nearly $220 billion in smartphones produced in China in 2017.[3] Correspondingly, China is the fastest growing and single-largest market for semiconductors, accounting for about one third of global semiconductor sales in 2017. Unsurprisingly, it is also a leading destination for U.S. semiconductor exports. Today, the U.S. semiconductor industry is the leader in the China market, capturing a little over half of China market sales in 2017, totaling $66.4 billion. This is the largest market share the U.S. industry enjoys in any region.[4] Thus it is critical that U.S. semiconductor companies are able to access the China market and continue to do business there. At the same time, SIA companies face a growing number of Chinese government policies and practices that threaten IP, market access, and the competitiveness of U.S. semiconductor companies.

I. Chinese Government Forced Technology Transfer, IP Theft & Import Substitution Practices

The U.S. semiconductor industry invests nearly $36 billion in research and development annually. So protecting the fruits of this research is critical to our competitiveness. In particular, we are concerned with Chinese actions, policies, and practices that force the transfer or outright theft of U.S. semiconductor technology.[5] Numerous official policy pronouncements and statements by senior Chinese government officials reveal an intent to use government measures to force the transfer of IP and technology and engage in import substitution (replace imports of foreign products with domestic technology).

1) The Chinese government, in conjunction with state-owned or state-influenced electronics companies, applies informal pressure on foreign technology suppliers to transfer technology as condition of access to the large and growing Chinese market.
2) Chinese cybersecurity rules and measures either require the direct disclosure of intellectual property, and/or put tremendous pressure on foreign tech firms to find local partners to help them comply with these rules.
3) Some in the industry face challenges due to economic espionage. Indeed, a report by the U.S. intelligence community noted that "China has expansive efforts in place to acquire U.S. technology to include sensitive trade secrets and proprietary information."[6] Unfortunately, a small number of Chinese government or state-owned institutions, and/or individuals acting on their direction, may choose to steal or misappropriate the targeted technology from foreign firms as a short-cut to developing the technology.

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[2] General Administration of Customs, People's Republic of China, found at: http://www.gov.cn/xinwen/2018-01/12/content_5255987.htm#1.

[3] Ministry of Industry and Information Technology of the People's Republic of China, found at: http://www.miit.gov.cn/n1146312/n1146904/n1648373/c6048688/content.html.

[4] U.S. total exports of semiconductors in 2017 were $44 billion, of which $5.9 billion go to China directly. Due to global supply chains and the prominence of the fabless-foundry business model, most U.S. semiconductors are not sold or shipped directly to China.

[5] For a more detailed assessment of semiconductor industry challenges in China, please refer to SIA's "Written Comments to USTR Regarding the Initiation of a Section 301 Investigation into China's Acts, Policies and Practices Related to Technology Transfer, Intellectual Property, and Innovation." October 5, 2017. https://www.regulations.gov/document?D=USTR-2017-0016-0057

[6] https://www.dni.gov/files/NCSC/documents/news/20180724-economic-espionage-pub.pdf

II. China's Semiconductor Industrial Policy & Subsidies

These policies should be understood within the broader context of Chinese industrial policy for the semiconductor industry. Today, Chinese domestic semiconductor sales only account for five percent of the worldwide market as Chinese firms struggle to compete in any of the advanced semiconductor technology segments. Due to this perceived strategic vulnerability, the government in Beijing set a formidable initiative in motion to build and enhance its own homegrown semiconductor industry.[7] In June 2014, China released the "Promotion of a National IC Industry Development Guidelines," which call for the development of an entire semiconductor industry ecosystem within China, with the goal of becoming the global leader in all major segments of the industry by 2030.[8] One of the explicit objectives of China's IC industry promotion effort is to increase its semiconductor industry's share of the domestic market from the current level of under 20 percent to a minimum of 70 percent by 2025. These Guidelines are consistent with efforts underway in China to indigenize the broader ICT sector and establish so-called "secure and controllable" technologies.

Core to China's IC promotion efforts are substantial central and local government and/or state-directed subsidies in the form of investment funds, credit lines, or grants designed to build or acquire a leading semiconductor industry. Of course, this kind of government intervention can have serious market-distorting effects. As of September 2018, the central government IC Fund has committed 138 billion RMB ($21 B USD) to 55 projects. Altogether, an estimated $90-100 billion in government financial support has been earmarked to support China's domestic industry. These funds alone demonstrate the Chinese government's commitment towards boosting its self-sufficiency in semiconductor technology and capturing a greater share of the global market.

III. How to Maintain American Technological Preeminence

To maintain U.S. leadership in the semiconductor industry (and for that matter in other tech industries), the U.S. government needs to develop a comprehensive and appropriately resourced competitiveness and innovation agenda. SIA recommends the following approaches to help make the U.S. a more competitive environment for manufacturing, innovation, exporting our products, and job growth and thereby contribute to maintaining and growing semiconductor technology leadership.

A. Eliminate Tariffs on Semiconductors

SIA supports the administration's goal to address discriminatory and burdensome trade practices of the Chinese government. As stated in our multiple public submissions related to the Section 301 investigation, however, imposing tariffs on semiconductors and semiconductor-related products not only fails to address the problematic Chinese forced tech transfer policies and IP

[7] China's Next Target, U.S. Microchip Hegemony. Wall Street Journal, July 27, 2017. Online, Available at: https://www.wsj.com/articles/chinas-next-target-u-s-microchip-hegemony-1501168303
[8] China Daily: China Announces Measures to Boost IC Industry. June 26, 2014. Online, available at: http://usa.chinadaily.com.cn/business/2014-06/25/content_17613997.htm

theft that is the subject of the investigation, but it undermines U.S. industry and technology leadership. [9]

At present, Chinese companies export almost no semiconductors to the U.S. market. In reality, the vast majority of U.S. semiconductor imports from China are semiconductors designed and/or manufactured in the United States and shipped to China for the final stage of semiconductor fabrication known as assembly, test and packaging. These are low-value processes that add only about 10 percent of the value to the chips. U.S. tariffs on semiconductors misdirect penalties toward the U.S. semiconductor industry, while failing to curtail Chinese discriminatory trade and unlawful IP practices.[10]

We instead call on the Administration to explore more effective approaches and targeted policies, as discussed below.

B. Strengthen Multilateral Action with U.S. Allies

In order to maintain U.S. leadership in the semiconductor industry, the administration and Congress need to work together with allies to adopt and promote a stronger rules-based trading system. Multilateral pressure is one of the few tactics that has historically prompted China to change course. For example, in 2004, China proposed an international standard for wireless security, "Wireless Authentication and Privacy Infrastructure (WAPI)." China subsequently tried to make this standard mandatory for wireless LAN equipment imported for use in China. The U.S. government partnered with the European Commission and Japanese government to compel the Chinese government to stand down, rightly pointing out that its requirements were discriminatory and served as a market access barrier to foreign ICT. Another example of successful multilateral pressure is China's suspension of its 2009 requirement that all computers sold in China be installed with "Green Dam-Youth Escort" screening software. This Chinese-developed software had clear "censor-ware" capabilities with intrusive surveillance potential. The international business community, rights groups, and NGOs, as well as governments of the United States, Japan, and EU applied intense pressure on numerous fronts. And, the Chinese government suspended the program, which not seen the light day again since then. We encourage the U.S. government to work with its allies in multilateral fora, including the

[9] 1. SIA's "Written Comments to USTR Regarding the Initiation of a Section 301 Investigation into China's Acts, Policies and Practices Related to Technology Transfer, Intellectual Property, and Innovation." October 5, 2017. https://www.regulations.gov/document?D=USTR-2017-0016-0057
2. SIA Submission on the Proposed Determination of Action Pursuant to Section 301: China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation. Docket Number USTR-2018-0005. May 14, 2018. https://www.regulations.gov/document?D=USTR-2018-0005-2555
3. SIA Submission on the Proposed Determination of Action Pursuant to Section 301: China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation. Docket Number USTR-2018-0018. July 20, 2018. https://www.regulations.gov/document?D=USTR-2018-0018-0538
4.. SIA Submission on the Proposed Determination of Action Pursuant to Section 301: China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation. Docket Number USTR-2018-0026. September 6, 2018. https://www.regulations.gov/document?D=USTR-2018-0026-6032

[10] See SIA Submission on the Proposed Determination of Action Pursuant to Section 301: China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation. Docket Number USTR-2018-0018. July 20, 2018.

Government Authorities Meeting on Semiconductors (GAMS) to press China to changes its unfair practices related to IP theft and forced technology transfer, and increase transparency.

C. Enforce China's International Commitments

While SIA supports efforts to strengthen WTO rules, the GATT and WTO disciplines remain reasonably effective, but not sufficiently enforced. There is a widespread lack of compliance by China on the subsidies front with the transparency, notification, and surveillance obligations in Part VII of the WTO Subsidies Agreement, and an accompanying lack of enforcement by the Subsidies and Countervailing Measures Committee and their respective domestic trade authorities. SIA, through the U.S. Information Technology Office in China (USITO) has provided more details on China's IC subsidies to USTR in response to the Federal Register on China's Compliance with its Accession Commitments to the WTO.

D. Strengthen Protection of IP

The U.S. government should press China to adopt policies and engage in stronger IP enforcement to prohibit and penalize state or state-owned enterprises (SOEs) from misappropriating trade secrets or proprietary technologies through activities related to the hiring of overseas talent. This should include initiation of a public and transparent national audit by China's IPR enforcement agencies into current hiring practices within China's state-owned semiconductor firms, with a commitment to prosecute any and all identified illegal activity and verified execution of that commitment. Patent and trade secrets disputes should be adjudicated by Chinese courts in a fair and impartial process that does not favor domestic companies over foreign companies. To help drive toward these objectives, the U.S. and China should create an annual review mechanism to ensure third-party review of any disputes that allege discriminatory rulings.

E. Ensure a More Competitive Policy Environment in the U.S.

Our global competitors are investing and working actively to grow their own semiconductor industry, and the U.S. needs to adopt policies that will enable U.S.-based companies to run faster and compete more effectively. Three ways the U.S. can increase domestic competitiveness include:

- ***Increase Federal Investment in Research*** – Federal investment in research has played a critical role in supporting America's technology leadership and our national security. The semiconductor industry is unique in its sustained partnership with civilian and defense research agencies over decades to invent and develop enabling technologies that help address critical national security needs and have led to ubiquitous commercial products and systems that underpin our nation's growth and productivity. Federal investment in basic research is supplemented by the semiconductor industry's huge investment in applied R&D, amounting to nearly $36 billion (approximately one-fifth of revenue, among the highest of any industry). This investment depends on precompetitive university research to provide the fundamental advances. While the U.S. has long been the leader in semiconductor R&D, federal

investment in this area is not keeping pace with nation-state competitors who are poised to challenge U.S. leadership in the coming years. The U.S. should significantly increase its investments in research in semiconductor-related fields, conducted at American universities and national labs and in collaboration with the semiconductor industry. Funding basic research at America's colleges, universities, and national labs plays a critical and equally important role in supporting the "pipeline" of talent for the next generation of semiconductor innovators, thereby strengthening America's technology workforce.

- ***Strengthen America's Semiconductor Workforce*** – The success of the U.S. semiconductor industry is due to the talent and skills of our workforce. America's technology leadership is dependent on our country's ability to develop and attract the best technologists and engineers in the world. SIA calls on the administration to take action to ensure the U.S. workforce remains the best in the world, including: (a) incentivizing qualified STEM graduates to work in the U.S. semiconductor industry by, for example, forgiving tuition loans for such graduates; (b) increasing long-term funding for STEM education in primary and secondary schools as a means of building the American technology workforce of the future; and (c) enacting immigration reforms that expand the number of "green cards" for STEM graduates educated at U.S. colleges and universities, thereby enabling the semiconductor industry to attract and retain the best and brightest from around the world.

- ***Implement Appropriate and Balanced Export Controls*** – SIA strongly believes U.S. national security and economic competitiveness interests are most effectively advanced by an export control system that focuses on national security and foreign policy as the exclusive bases for U.S. dual-use controls. In order to avoid unduly controlling non-sensitive, commercial semiconductor technology, SIA encourages the regular review of U.S. export controls to ensure that regulations remain up-to-date, reflect the current state of semiconductor technology, and are properly tailored to national security objectives. SIA also encourages the U.S. government to advance multilateral export controls adopted by all major semiconductor-producing nations, rather than unilateral controls only applied to U.S. companies that generally fail to restrict the transfer of emerging and foundational technology developed outside the United States. Multilateral controls are also necessary to avoid putting U.S. technology companies at a competitive disadvantage.

IV. Conclusion

The United States is at critical juncture. It is facing intense global competition from China in multiple high-tech sectors, including semiconductors. While our nation continues to dominate leading technologies from semiconductors to aerospace, and the gap with China remains significant, we cannot be complacent with our current leadership. There are real near- and long-term challenges that require closer collaboration between industry and government to ensure we retain our technological leadership in key areas. We need to address China's unfair practices in a targeted, productive way, and at the same time double down on our own technological advantages through increased government investments and other means.

Mr. HURD. Thank you, sir.

Mr. Cheng, you are now recognized for your opening remarks.

STATEMENT OF DEAN CHENG

Mr. CHENG. Good morning, Chairman Hurd, Ranking Member Kelly, members of the subcommittee and committee. My name is Dean Cheng. I'm the senior research fellow for Chinese political and security affairs at The Heritage Foundation. My comments this morning are my own.

My comments this morning are intended to provide some context for better understanding the Chinese approach to information and information technology. Three key aspects underlie the Chinese view of the world and in particular their approach to information and communications technology: comprehensive national power, the period of strategic opportunity, and the impact of living in the information age.

Comprehensive national power is how the Chinese compare the world's various nations, how do they rack-and-stack Bolivia, Botswana, Brazil, the United States. It includes all aspects of national power, military capability, economic capacity, political unity, diplomatic respect, even cultural security.

Science and technology writ large, but especially information technology, contributes to and affects all three aspects—all of these aspects of comprehensive national power. It improves the economy, enhances military effectiveness, and can even elevate cultural security and strengthen political unity. It's also important to recognize that in the Chinese context, scientists and the scientific community often have an outsized political impact, and I would point to the example of the Chinese scientist Qian Xuesen, who was a combination of J. Robert Oppenheimer, Albert Einstein, and Robert Goddard in the Chinese context and had an enormous political influence.

The period of strategic opportunity is from the Chinese perspective the first two decades of the 21st century. It is a period marked by low probability of war and therefore an important moment for China to focus on national development, to elevate GDP, GDP per capita, level of national infrastructure, and, again, level of science and technology capacity. Exploiting the period of strategic opportunity is central because it will allow China to catch up with the rest of the world and will include both internal domestic efforts, as well as exploiting ties to the outside world.

And here the fact that we live in the information age becomes central because the rise of the information age facilitates China's access to the rest of the world's R&D capacity but also provides a focus for China's internal development. The rise of the information age means that future power is going to be measured not simply in an industrial capacity, how many gigawatts of power do you produce, how many millions of tons of bauxite do you refine, but in terms of the ability to generate, to gather, to analyze, to exploit, and to transmit information more rapidly and more accurately both within China but around the world. And so within this context information and communications technology, ICT, plays an especially outsized role, given its impact as the basic metric for future power.

It is—should therefore not be surprising then that China is focused on developing information, not just ICT as we tend to think of it, whether it's semiconductors or 5G, but ancillary and related aspects, software, social media, even space. Space is seen as a vital part of information technology because it is a central means of both transmitting and gathering information.

Again, it should not be a surprise that for the Chinese of particular emphasis is so-called ABC: artificial intelligence, big data, and cloud computing. In each of these areas the Chinese are pushing their state champions. It should be noted these are not necessarily state-owned enterprises, but all Chinese companies at the end of the day are state-influenced, and therefore, may not be directly working for China but are certainly not going to say no the way Google has over Project Maven.

The Chinese do see all of this information revolution as fundamentally altering the state of play among nations, much like HMS Dreadnought instantly made all warships around the world obsolete. The Chinese believe that ICT is providing an opportunity to in a sense reset the global balance of power.

In this context, however, I do want to emphasize to the members of the committee that the Chinese are not simply stealing. This is not of course to say that they don't steal but that they have spent an enormous amount of effort and energy to promote indigenous innovation, and therefore, it would be a horrible mistake for us to believe that if we simply could curtail theft, that China will inevitably fall behind. You cannot look at the amount of sustained effort and investment and believe that China is going to allow itself to fall behind.

Let me conclude then with just a couple of quick thoughts on solutions, one of which is that if the issue is about stolen technology, then we should perhaps treat Chinese companies as dealing in stolen goods. And we have an extensive legal array of measures to deal with that. If it is about information, however, then for China it is as much about information access as it is about the information goodness itself.

Thank you very much.

[Prepared statement of Mr. Cheng follows:]

The Heritage Foundation

CONGRESSIONAL TESTIMONY

"China's High Technology Challenge to the United States"

Testimony before
Committee of Oversight and Government Reform

United States House of Representatives

September 26, 2018

Dean Cheng
Senior Research Fellow
The Heritage Foundation

My name is Dean Cheng. I am a Senior Research Fellow at The Heritage Foundation. The views I express in this testimony are my own and should not be construed as representing any official position of The Heritage Foundation.

Over the past three decades, the American view of the People's Republic of China (PRC) as a potential competitor in various areas of high technology has steadily evolved. In the 1980s, a decade after Deng Xiaoping began his policy of "Reform and Opening," China was still seen as primarily a source of cheap goods of limited sophistication. China's economic growth, however, saw not only an expanding array of goods, but a steady increase in their sophistication.

Today, China is seen as a near-peer competitor in terms of its scientific and technological prowess. Chinese supercomputers are among the world's fastest, while China is now their leading manufacturer. The world's largest radio telescope is located in China. A Chinese lunar probe will make an unprecedented landing on the far side of the Moon. American policymakers have worried about the effects of a Chinese lead in quantum computing and artificial intelligence development.[1]

At the same time, the Chinese Communist Party (CCP), the ruling element within the PRC, sees itself as both competing with the United States and in a period of "strategic opportunity."[2] The implication is that the current competition is most likely to remain peaceful, focused on the non-military aspects of "comprehensive national power," and affording the PRC a historic opportunity to catch up with the more developed countries of the West, including the United States, Europe, and Japan.

"Comprehensive National Power" in the "Period of Strategic Opportunity"

[1] Ben Guarino, Emily Rauhala, and William Wan, "China Increasingly Challenges American Dominance of Science," *Washington Post*, June 3, 2018, https://www.washingtonpost.com/national/health-science/china-challenges-american-dominance-of-science/2018/06/03/c1e0cfe4-48d5-11e8-827e-190efaf1f1ee_story.html?noredirect=on&utm_term=.79778c5f5aae (accessed September 18, 2018).

[2] Chen Erhou, Liu Zhen, et. al., "Seize the Strategic Opportunity and Concentrate Progressive Energy," *Xinhua*, March 4, 2018, http://www.xinhuanet.com/politics/2018lh/2018-03/04/c_1122483315.htm (accessed September 23, 2018), and Li Junru, "Fully Recognize Our Nation's Vital Strategic Opportunity Period for National Development," *Study Times*, February 21, 2011, http://theory.people.com.cn/GB/13967607.html (accessed September 23, 2018)

Central to understanding how the PRC views science and technology (S&T) is the idea of "comprehensive national power" (*zonghe guojia liliang*; 综合国家力量). According to the China Institute of Contemporary International Relations (CICIR), a Chinese think-tank associated with the Ministry of State Security, comprehensive national power (CNP) is the "total of the powers or strengths of a country in economics, military affairs, science and technology, education, resources, and influence."[3]

One of the central lessons from the collapse of the Soviet Union was Moscow's over-emphasis on the military, while neglecting other elements of national power. For China, given that it is starting from an even lower level of national development, the focus has been on improving all the elements of CNP.
This, in turn, means advancing the various strands of national power that define a nation and, as important, how it compares with other states. CNP includes both hard and soft power. It involves not only military capability and economic strength, but also diplomatic respect, political cohesion, and levels of scientific and technical attainment.

In this context of lifting China's CNP, science and technology plays an increasingly pivotal role since it affects multiple strands of power, including the economy and the military. Lack of scientific and technological progress condemns a nation to second-class status, forever reacting to developments elsewhere. Advances, on the other hand, allow a nation to set the terms of economic and military engagement.

The role of science and technology has accelerated in the past several decades. According to Chinese assessments, the world has shifted from the Industrial Age to the Information Age. National economic power is no longer a function of just industrial output (e.g., tons of bauxite smelted or steel produced). Instead, it is increasingly affected by the ability to gather, transmit, and generate accurate information rapidly. The developments in the area of information and communications technology (ICT) has led to a revolution in the measure of national power, which in turn has widespread political, social, and military ramifications.

ICT, however, is itself the product of a number of disciplines, including software engineering, microchip design, batteries and energy storage, and also is related to aerospace technologies (e.g., communications satellites), electromagnetic spectrum management, and even maritime technology (in the laying of undersea cables). If the PRC is to compete in the Information Age, then it must develop capabilities in many if not all of these sub-disciplines and associated fields.

The interest in improving China's level of science and technology has redoubled during this "period of strategic opportunity." The Chinese assess the first decades of this century as a period of relative quiescence, with few direct threats to Chinese security. Consequently, now is the opportunity for China to improve its economic and technological competitiveness, elevate its international standing, and make the leap to a mid-level power (in the Chinese conception).[4] As Xi Jinping declared at the 19th Party Congress in 2017, China will use the current period to improve its standing. By the middle of the 21st century, according to Xi, China will have become "a global leader in terms of comprehensive national power and international influence."[5]

In the Chinese view, demonstrating prowess in various fields of scientific endeavor enhances China's reputation in terms of both soft and hard power. With the former, it makes China a more desirable partner in

[3] China Institute of Contemporary International Relations, *Global Strategic Pattern—International Environment of China in the New Century* (Beijing: Shishi Press, 2000), cited in Hu Angang and Men Honghua, "The Rising of Modern China Comprehensive National Power and Grand Strategy."

[4] State Council Information Office, *China's Military Strategy* (Beijing, PRC: State Council Information Office, 2015), https://jamestown.org/wp-content/uploads/2016/07/China%E2%80%99s-Military-Strategy-2015.pdf (accessed September 18, 2018), and Ian Rinehart, "The Chinese Military: Overview and Issues for Congress," Congressional Research Service, 2016, p. 9, https://fas.org/sgp/crs/row/R44196.pdf (accessed September 18, 2018).

[5] Bonnie Glaser and Matthew Funaiole, "Xi Jinping's 19th Party Congress Speech Heralds Greater Assertiveness in Chinese Foreign Policy," *The Lowy Interpreter*, October 26, 2017, https://www.lowyinstitute.org/the-interpreter/19th-party-congress-more-assertive-chinese-foreign-policy (accessed September 18, 2018).

both economic and scientific projects. At the same time, an advanced scientific and technological base can have a deterrent effect on potential adversaries, since it implies that China can field sophisticated military systems.

To this end, improving China's scientific and technological capabilities is a clear priority.

A Long-standing Interest in S&T

It is not a ***new*** priority, however. When Deng Xiaoping came to power in 1978, the PRC was an economic disaster. The policies of Mao Zedong from 1949 to 1978, emphasizing central planning, forced draft industrialization and economic isolation. Deng's policies, which reformed all of these aspects, laid the foundation for the subsequent forty years of growth. China's annual gross domestic product (GDP) growth from 1979 to 2016 has averaged 9.6 percent. "This has meant that on average China has been able to more than double the size of its economy in real terms every eight years."[6]

One of the key reasons for this growth was Deng's reassessment of the "tenor of the times." Under Mao Zedong, the Chinese leadership operated under the belief that a major war between the capitalist and socialist camps was likely. Moreover, after the Sino-Soviet split of 1960, there was also the likelihood of a Chinese war with the Soviet Union.

Consequently, the PRC had to prepare for "major war, early war, nuclear war." Chinese economic efforts were focused on supporting a protracted conflict that would likely include nuclear strikes on Chinese soil, and a potential invasion by the Soviet Union. Not only was major investment focused on supporting military industries, but many factories were inefficiently distributed across China, to help sustain an extended resistance by guerrilla forces.

Deng, however, concluded that the current era was not marked by the likelihood of war, but was one of "Peace and Development." Far from facing the prospect of imminent war, according to Deng, there was only a limited likelihood of great power conflict. China could therefore safely adjust its priorities, and focus on improving its economy. Deng therefore slashed the size of the People's Liberation Army (PLA), and also redirected resources towards building commercial industries. Military industries were given the stark choice of going out of business or shifting their products to commercial goods for the civilian market. Deng's efforts are described by the Chinese as "Reform and Opening" (*gaige yu kaifang*; 改革与开放).

Even in the early days of Chinese reform, however, there was a recognition that Chinese long-term competitiveness required investments in high technology. Chinese scientists approached Deng Xiaoping in 1986, proposing a national effort to foster certain high-technology sectors. Deng personally approved the National High-Tech R&D Program, "Plan 863," which fosters Chinese high-technology development in key technical fields deemed to be of particular strategic value. These include:

- Information technology,
- Bio-technology and advanced agricultural technology,
- Advanced materials technology,
- Advanced manufacturing and automation technology,
- Energy technology, and
- Resource and environment technology.[7]

Aerospace technology was also an early focus for Plan 863. In the mid-1990s, the Chinese added marine technology to the list. Research areas included in Plan 863 enjoy additional funding and priority access to top research facilities.

Other Chinese technology development efforts include Plan 973, the National Basic Research Program, which supports research in "cutting edge" technology areas; the Key Technologies R&D Program, which apparently supports applied technology areas that aid manufacturing; the Spark Program, focused on technology benefiting rural

[6]Wayne M. Morrison, "China's Economic Rise: History, Trends, Challenges, and Implications for the United States," RL 33534, Congressional Research Service, February 2018, p. 5, https://fas.org/sgp/crs/row/RL33534.pdf (accessed September 18, 2018).

[7]PRC Ministry of Science and Technology, "National High-Tech R&D Program (863 Program)," http://www.most.gov.cn/eng/programmes1/ (accessed September 18, 2018).

areas; and the Torch Program, which supports commercialization of high technology.[8]

In February 2016, the Chinese press reported that several major technology programs, including Plan 863 and 973, had been merged into a single new program, in order to improve efficiency. These reports indicate that the new program, operating under the PRC Ministry of Science and Technology, would support an initial group of 59 projects, and would "focus on key fields such as

- Biotechnology
- Space
- Information
- Automation
- Energy
- New Materials
- Telecommunications
- Marine Technology."[9]

Within all of these areas, the expectation is that Chinese scientists will be leaders, not simply followers. That is, the Chinese are pushing for "indigenous innovation" (*zizhu chuangxin*; 自主 创), and not simply copying (or stealing) foreign technology.

Indeed, alongside the various funding programs intended to foster certain specific research areas has been a broader effort to push Chinese innovation, i.e., the application of S&T. In 2006, the PRC promulgated the "National Medium and Long-Term Program for Scientific and Technological Development," providing guidelines for areas of emphasis and funding through 2020. This plan marked the formal incorporation of "indigenous innovation" into Chinese strategic economic planning. It identified some 39 key areas, frontier technologies, and scientific and engineering megaprojects.[10]

The purpose of this program is to promote innovation within China, by Chinese scientists and research establishments, for the benefit of China. Elements include:

- A substantial increase in research and development (R&D) funding, to reach 2.5 percent of GDP by 2020;
- Tax policies to promote investment in research by Chinese businesses; and
- A reduction in the reliance on foreign technologies.[11]

In association with the Medium and Long-Term Program, especially the effort to reduce reliance on foreign technologies, Chinese policymakers subsequently also created a system for accrediting products based on the level of national indigenous innovation. This system, announced in 2009, would initially be applied in six product areas, including computers and software, telecommunications products, and energy equipment. The assessed level of indigenous innovation would then be used to "guide" national, provincial, and local government procurement.[12]

Not surprisingly, this effort to limit foreign access to Chinese markets led to a major international outcry. Even though the PRC eventually stepped back from this effort, however, the extent to which Chinese policymakers would go to promote indigenous

[8]Joel R. Campbell, "Becoming a Techno-Industrial Power: Chinese Science and Technology Policy," Brookings Institution *Issues in Technology Innovation* No. 23, April 2013, https://www.brookings.edu/wp-content/uploads/2016/06/29-science-technology-policy-china-campbell.pdf (accessed September 18, 2018).

[9]Chinese Academy of Sciences, "China Inaugurates National R&D Plan," Xinhua, February 17, 2016, http://english.cas.cn/newsroom/china_research/201602/t20160217_159669.shtml (accessed September 18, 2018).

[10]National Research Council of the National Academies, *The New Global Ecosystem in Advanced Computing* (Washington, DC: National Academies Press, 2012), p. 99, https://www.nap.edu/read/13472/chapter/16 (accessed September 18, 2018).

[11]Josef Bichler and Christian Schmidkonz, "The Chinese Indigenous Innovation System and Its Impact on Foreign Enterprises," Munich Business School *Working Paper* 2012-1 (Munich, Germany; Munich Business School, 2012), p. 3, https://www.munich-business-school.de/fileadmin/mbs_daten/datejen/working_papers/mbs-wp-2012-01.pdf (accessed September 18, 2018).

[12]Jingxia Shi, "China's Indigenous Innovation and Government Procurement," *Bridges*, Vol. 14, No. 3 (September 16, 2010), https://www.ictsd.org/bridges-news/bridges/news/china%E2%80%99s-indigenous-innovation-and-government-procurement (accessed September 18, 2018).

innovation was made clear. As important, it demonstrates how China can promote its own industries and encourage its S&T through the establishment and manipulation of technical and industrial standards. This approach is arguably more difficult to counter than outright theft of intellectual property, since it ostensibly employs market tools and legal measures.

Additional Means of Accessing Advanced Technology

The employment of accreditation also highlights the evolving set of tools available to Chinese decision makers in developing and acquiring advanced technologies. Not only does the Chinese government control access to a potentially enormous market, but the economic growth of the past four decades has given Beijing financial resources that allow it to purchase technologies and companies outright.

Foreign companies that seek access to the Chinese market, especially those in key high-technology industries or sectors, are often only able to do so if they establish a local footprint. This may be in the form of an equity joint venture or a contractual joint venture. The former entails the creation of legal entities that have partial foreign ownership and partial Chinese ownership. The latter is the creation of a specific, contractually based entity, rather than a new organization.[13] While recent Chinese legal reforms have loosened which types of joint ventures are necessary for particular industries, and in some cases expanded the permissibility of wholly foreign investment, high-technology areas typically remain constrained.

As important, the Chinese system often encourages foreign companies to establish R&D facilities in the PRC, whether as part of a joint venture or not. As one observer of pharmaceuticals noted, "In principle, companies with local operations are eligible for fast-track approval of new products." As a result, a number of foreign pharmaceutical companies have established research campuses in China.[14]

China has also increasingly tried to purchase foreign high-technology companies. Chinese efforts in the United States have at times been stymied by the Committee on Foreign Investment in the United States (CFIUS), which can block foreign acquisitions of American companies if it is seen as posing a potential national security challenge. As a result, China has increasingly targeted European companies.

Chinese investments in Germany, for example, have risen substantially since 2015. China has acquired German plastics, biotechnology, and engineering firms.[15] The Chinese purchase of the German robot manufacturer Kuka for 4.4 billion euros (approximately $5.1 billion) in 2016 set off alarms, and has led to discussion of the establishment of a German equivalent of CFIUS to review foreign acquisitions of German companies.[16]

Earlier in 2018, Chinese investors acquired the French chip manufacturer Linxens. The company's products are mainly used in security and identity applications. "The group's products are used in areas ranging from smartphones, transport cards, identity cards and passports to contact and contactless transactions and biometrics."[17]

Ongoing Chinese Concerns

[13]Paul Edelberg, "Is China Really Opening Its Doors to Foreign Investment?" *China Business Review*, November 8, 2017, https://www.chinabusinessreview.com/is-china-really-opening-its-doors-to-foreign-investment/ (accessed September 18. 2018).

[14]Matthew Nitkoski, "The Heat Is on for the Chinese Pharmaceutical Industry," CKGSB Knowledge, November 14, 2016, http://www.knowledge.ckgsb.edu.cn/2016/11/14/.../heat-chinese-pharmaceutical-industry/ (accessed September 18, 2018).

[15]"Factbox: Chinese Investments in German Companies," Reuters, February 26, 2018, https://www.reuters.com/article/us-daimler-geely-factbox/factbox-chinese-investments-in-german-companies-idUSKCN1GA1RO (accessed September 18, 2018).

[16]Benjamin Bathke, "China's Unsatisfied Hunger for German Companies," Deutsche Welle, July 12, 2017, https://www.dw.com/en/chinas-unsatisfied-hunger-for-german-companies/a-39658363 (accessed September 18, 2018).

[17]Don Weinland, Harriet Agnew, and Javier Espinoza, "China's Unigroup Buys French Chipmaker Linxens for $2.6 Billion," *Financial Times*, July 25, 2018, https://www.ft.com/content/f919b032-8fe5-11e8-b639-7680cedcc421 (accessed September 18, 2018).

Despite these efforts, however, Chinese leaders remain concerned about the state of China's high-technology capabilities. In key technology areas, China remains heavily dependent on foreign sources. A World Bank study in 2012 concluded that China had a $10 billion intellectual property deficit; that is, China imported some $10 billion more than it exported. [18] Despite Chinese investments in high technology in the intervening six years, it is not clear how much the situation has changed.

In 2018, for example, the United States announced that it would impose a seven-year ban on sales of microprocessors and other components to Chinese telecommunications company ZTE. It soon emerged that such a ban would effectively kill China's second largest telecommunications company. Nor is ZTE unique; many other major Chinese companies, including key state-owned enterprises such as Petro China, depend on Western high technologies for their operations.[19]

China's "Made in 2025" program, where the Chinese hope to be able to become largely autonomous in key manufacturing areas by 2025, should therefore be seen as part of the larger effort to promote Chinese science and technology, not only in terms of innovation and R&D, but sustaining China's industry by localizing the entire technology development, commercialization, and production process.

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[18]UNESCO, "China: Taking Stock of Progress Toward Becoming an Innovation-Driven Nation," *Science, Technology and Innovation Policy*, December 2, 2016, http://www.unesco.org/new/en/natural-sciences/science-technology/single-view-sc-policy/news/china_taking_stock_of_progress_towards_becoming_an_innovati/ (accessed September 18, 2018).

[19]Jean Baptiste Su, "Analysis: ZTE's Collapse Reveals China's Huge Dependence on U.S. Technologies," *Forbes*, April 22, 2018, https://www.forbes.com/sites/jeanbaptiste/2018/04/22/analysis-ztes-collapse-reveals-chinas-huge-dependence-on-u-s-technologies/#6237918b7326 (accessed September 18, 2018).

Mr. HURD. Ms. Cook, you are now recognized for your opening remarks.

STATEMENT OF SARAH COOK

Ms. COOK. Chairman Hurd, Ranking Member Kelly, and members of the subcommittee, thank you. It is an honor to testify.

Last fall, the Chinese Communist Party declared its aspirations for China to become a, quote, "cyber superpower." A September 2017 article in a top party journal lays out China's strategy for achieving this status and is surprisingly candid about the party's ambitions and motives, including, one, increasing domestic Chinese internet controls to ensure authoritarian longevity so that, quote, "The party's ideas always become the strongest voice in cyberspace," end quote; two, using the technology sector as a foundation to secure China's economic health, including by enhancing the global influence of Chinese tech giants; and three, expanding information controls beyond China's borders in order to, quote, "push China's proposition of internet governance toward becoming an international consensus," end quote.

Prioritization and effective implementation of such strategies has emerged as a hallmark of Xi Jinping's leadership of the Chinese Communist Party. Xi has a sophisticated understanding of how the internet and social media applications function, and he's proven himself adept at closing previously existing loopholes in internet controls. Indeed, over the past year alone China has taken new strides in technological advancement, censorship, surveillance, and international expansion.

The Communist Party's cyber ambitions directly and negatively impact U.S. companies. China is home to over 800 million internet users, but many of the world's top technology and social media firms are banned or extremely constrained in their ability to provide services to them, including Facebook, Twitter, and Google. A 2016 survey by the American Chamber of Commerce found that 79 percent of U.S. companies reported that Chinese Government internet's restrictions hurt their businesses.

Chinese technology firms have been at the forefront of the party's censorship and surveillance efforts, but American and international firms are increasingly implicated. The Chinese Government is adept at using the combination of its ability to block online services and allure of its enormous domestic market to extract concessions from foreign firms, including assistance with its censorship and surveillance system. Under China's new cybersecurity law, foreign companies operating in China are also increasingly at risk of becoming complicit in politicized arrests.

As Chinese and foreign companies take more steps to appease the regime, the human toll will continue to mount. Censorship and surveillance on sensitive topics like Taiwan, Tibet, Xinjiang, and Falun Gong either whitewash or actually exacerbate large-scale human rights violations, including mass detentions, torture, and extrajudicial killings. Ironically, the complicit companies are also victims of the government's repression. They suffer from the arbitrary nature of Chinese regulatory decisions, reduced profit margins, and distrust abroad due to close Chinese Government ties.

China and the Communist Party's cyberspace policies and strategies are complex and multilayered. They require an equally sophisticated response. I would urge the committee to consider the following recommendations: One, the United States should be proactive in developing its own capabilities and upholding international free speech and privacy standards. This should include developing a comprehensive 5- to 10-year national strategy on artificial intelligence.

Two, the United States Government should encourage the business community to take a principled stance vis-?-vis Chinese Government internet controls. This should include reintroducing and passing the Global Online Freedom Act, which would designate internet-restricting companies and impose certain requirements on companies doing business in those places.

And three, the United States should be proactive in challenging the very clear authoritarian foundations of the Communist Party's cyberspace strategy. A central pillar of this effort should be increasing both the scale and effectiveness of funding for countering censorship efforts specifically related to China. The Chinese Government is spending billions of dollars a year not only to keep Chinese people from freely accessing the internet but also to keep U.S. companies from offering services to the largest internet market in the world. Some of the first websites Chinese users visits after jumping the so-called Great Firewall are actually sites like Google, Facebook, and Twitter. Supporting Chinese internet users' ability to access these websites not only enhances internet freedom but also U.S. economic competitiveness.

In this context, I urge the committee to investigate and report on whether current U.S. Government funding for internet freedom in China is being deployed in the most effective manner to address today's challenges. This would involve seeking information from the Broadcasting Board of Governors and the State Department on questions such as how much internet freedom funding has been allocated to China? How many users in China have benefited? Does this appropriately match the needs and demands of users, as well as U.S. interests in policy goals vis-?-vis China?

Funding efforts to date have undoubtedly done much good, but there is reason to believe that an even greater impact could be achieved with a more efficient strategy, possibly without the need to even increase funding. American and international firms are caught between a rock and a hard place. The Chinese Communist Party has laid out its own plans and ambitions, and it shows every sign of implementing them to the fullest. The question is whether the United States, other democracies, and tech entrepreneurs will assert their own principles, including freedom of expression, with equal determination.

Thank you.

[Prepared statement of Ms. Cook follows:]

Freedom House
75 Years Championing Democracy

China's Cyber Superpower Strategy: Implementation, Internet Freedom Implications, and U.S. Responses

Written Testimony by Sarah Cook
Senior Research Analyst for East Asia and China Media Bulletin Director

House Committee on Oversight and Government Reform, Subcommittee on Information Technology

Countering China: Ensuring America Remains the World Leader in Advanced Technologies and Innovation

September 26, 2018

Chairman Hurd, Ranking Member Kelly, and members of the subcommittee, it is an honor to testify before you today. I have divided my comments into four parts:

I. A brief overview of the Chinese Communist Party's strategy for becoming a "Cyber Superpower"
II. Examples of how this is being implemented, often with the assistance of Chinese and foreign technology companies
III. Analysis of the costs these dynamics impose on human rights, internet freedom, and tech companies themselves
IV. Recommendations for steps the U.S. government can take in response to these trends
V. Concluding thoughts based on Freedom House experience

China's "cyber superpower" strategy

Last fall, the Chinese Communist Party (CCP) declared its aspirations for China to become a "cyber superpower," the desired outcome of developing improved capabilities and influence in areas ranging from domestic censorship to high-tech innovation to global internet governance.

During his October 2017 speech to the 19th Party Congress, Chinese president and CCP head Xi Jinping emphasized the importance of innovation as China emerges as a world power.[1] The speech was preceded by a detailed article published in the vanguard Party journal *Qiushi*

[1] Freedom House, China Media Bulletin, No. 126, November 4, 2017, https://freedomhouse.org/china-media/china-media-bulletin-party-congress-media-vision-surveillance-updates-africa-impact-issue-no-123

the month before outlining the full details of Xi and the CCP's vision for achieving "cyber superpower" 网络强国 (*wǎngluò qiángguó)* status.[2] The piece—authored by officials at the Cyberadministration of China (CAC), the country's top internet regulator—is at times surprisingly candid about the Party's ambitions and motives in several areas relevant to today's discussion:

- **Increasing domestic Chinese internet controls to ensure authoritarian longevity**: The authors note that the goal of strengthening "positive energy" online and making innovations in propaganda and content controls is "so that the Party's ideas always become the strongest voice in cyberspace." The article acknowledges that controlling the internet is key to the party's own political survival, stating that "If our party cannot traverse the hurdle represented by the Internet, it cannot traverse the hurdle of remaining in power for the long term." A central element of strengthening party leadership in the cybersecurity and information technology field includes safeguarding "Comrade Xi Jinping as the core of Party Central Committee authority."

- **Using the technology sector as a foundation to secure China's economic health at a time of reduced GDP growth rates**: A central part of the strategy laid out is to "accelerate indigenous innovation of core technologies in the information field," "obtain breakthroughs,' and "narrow the gap with developed countries" in areas like artificial intelligence, cloud computing, and 5G mobile networks. Other aspects of the CCP's strategy in this regard include developing the digital economy and continuing to enhance the "global influence of internet companies like Alibaba, Tencent, Baidu, [and] Huawei," as well as supporting the international adoption of Beidou satellite navigation as an example of military-civilian integration.

- **Expanding information controls beyond China's borders:** The article's authors note that online propaganda should also target international audiences with the goal of "expanding online international communication to 200 countries ... and more than 1 billion overseas users." They also state that the purpose of strengthening international exchanges and cooperation in the field of information technology and cybersecurity—including with the United States—is "to push China's proposition of Internet governance toward becoming an international consensus."

Prioritization and effective implementation of such CCP strategies related to cyberspace has emerged as a hallmark of Xi Jinping's leadership of the Communist Party since 2012. Compared to his predecessor Hu Jintao, Xi is more sophisticated in his understanding of how the internet and social media applications function, as well as how free expression in the

[2] Elsa Kania, Samm Sacks, Paul Triolo, and Graham Webster, "China's Strategic Thinking on Building Power in Cyberspace," *New America*, September 25, 2017, https://www.newamerica.org/cybersecurity-initiative/blog/chinas-strategic-thinking-building-power-cyberspace/

online sphere could pose an existential political threat to the CCP. He has also proved himself to be adept at closing previously existing loopholes in internet controls that enabled tens of millions of Chinese netizens to share breaking news, expose corruption and rights abuses, debate government policies, and have an occasional laugh at the expense of CCP leaders. This track record of Xi's within China—as well as the full scale and impact of the domestic internet control apparatus—are worth keeping in mind when considering the CCP's commitment to implementing the dimensions of his vision with international implications. Even before the above article's publication outlining this strategy, China's authoritarian regime had begun taking steps to achieve its stated goals, adopting and implementing a new Cybersecurity Law and declaring its Made in China 2025 policy. But over the past year, China has taken new strides in technological advancement and international expansion.

Technological innovation in China, for better or for worse

Some aspects of the Chinese government's innovation drive have clear public benefits. The number of internet users in China has grown exponentially over the past 15 years, reaching an estimated 802 million people as of June, more than double the entire population of the United States. The vast majority of these Chinese users access the internet via their mobile phones.[3] That access is set to get a new boost. In August, state-owned China Unicom successfully launched and tested its first 5G experimental network in Beijing, the next generation of high-speed mobile web access, which it plans to have rolled out across the city by next summer.[4]

But other advances are more problematic. Although widespread mobile web connectivity engenders many benefits, it also personalizes censorship and surveillance practices to an unprecedented degree. This is especially the case when, alongside increased access to internet services, China's ruling Communist Party has developed the world's most multi-layered and sophisticated internet control apparatus. For the past three years, China has been the worst abuser of internet freedom among 65 countries assessed in Freedom House's annual *Freedom on the Net* report.[5]

Yet even with that robust baseline, the past year has seen new waves of tightening in areas of free expression or dissemination channels that were previously tolerated. Since a new Cybersecurity Law came into effect in June 2017, online censorship and surveillance have expanded dramatically alongside increasing arrests of Chinese citizens, particularly for content shared on the popular instant messaging platform WeChat.

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[3] China Internet Network Information Center. (2018). *Statistical Report on Internet Development in China*. Retrieved from https://cnnic.com.cn/IDR/ReportDownloads/201807/P020180711391069195909.pdf

[4] Sina, "Beijing enters 5G network era with China Unicom's experimental sites," August 14, 2018, http://english.sina.com/buz/b/2018-08-14/detail-ihhtfwqq8823911.shtml

[5] Freedom House, *Freedom on the Net 2017*, November 2017, https://freedomhouse.org/report/freedom-net/freedom-net-2017.

Technical and regulatory innovation and experimentation is constantly underway. Additions to the censorship and surveillance toolbox from the past year include: large-scale shuttering of social media accounts rather than just deleting posts and particularly influential accounts, forcing the removal of hundreds of mobile phone apps that enable users to reach blocked websites, and the mass purchasing by security agencies of devices for extracting and scanning the contents of smartphones.[6]

Chinese technology firms at the forefront

Chinese technology companies have been central to censorship advancements. For example, some firms are developing the ability to automatically scan images for subversive text rather than relying solely on human censors. An August 14 report by the Toronto-based Citizen Lab revealed two forms of image censorship being deployed by Tencent's mobile application WeChat[7]: One tool filters images containing sensitive text, and the other snags those that are visually similar to images already on a blacklist. Social media users have long posted images to circumvent censorship of simple text, and these new capabilities could close that loophole. Tencent has taken a number of other steps since May to meet the government's censorship demands. It has barred users from linking to external videos in chat groups,[8] deleted large numbers of audio and video clips (including those deemed to "distort history"),[9] and banned users from making changes to their profile pictures or user names—a common form of commentary—during the June summit of the Shanghai Cooperation Organization, the regional security bloc led by China.[10]

In the realm of surveillance, the western region of Xinjiang has become a laboratory for testing big-data, facial-recognition, and smartphone-scanner technologies that can eventually be deployed across China and beyond. Several firms have emerged at the cutting edge of this effort, including CloudWalk, Hikvision, Dahua, SenseTime, and Yitu.[11] Although

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[6] Freedom House, *China Media Bulletin*, No. 121, September 11, 2017, https://freedomhouse.org/china-media/china-media-bulletin-party-congress-censorship-vpn-crackdown-surveillance-upgrades-no-121; Freedom House, *China Media Bulletin*, No. 127, March 23, 2018, https://freedomhouse.org/china-media/china-media-bulletin-risks-of-xis-power-grab-npc-censorship-xinjiang-reprisals-issue-no-127. Cate Cadell, "From laboratory in far west, China's surveillance state spreads quietly," *Reuters*, August 14, 2018, https://www.reuters.com/article/us-china-monitoring-insight/from-laboratory-in-far-west-chinas-surveillance-state-spreads-quietly-idUSKBN1KZ0R3

[7] Jeffrey Knockel, Lotus Ruan, Masashi Crete-Nishihata, and Ron Deibert, "(Can't) Picture This," *The Citizen Lab*, August 14, 2018, https://citizenlab.ca/2018/08/cant-picture-this-an-analysis-of-image-filtering-on-wechat-moments/

[8] https://www.rfa.org/mandarin/yataibaodao/meiti/ql2-05212018101620.html

[9] Xinhua, "Chinese video websites delete 1.5 mln illegal clips," May 10, 2018, http://www.xinhuanet.com/english/2018-05/10/c_137170187.htm

[10] China Digital Times, "Minitrue: WeChat Group Controls for Qingdao Summit," June 5, 2018, https://chinadigitaltimes.net/2018/06/minitrue-wechat-group-controls-for-qingdao-sco-summit/

[11] Charles Rollet, "In China's Far West, Companies Cashin on Surveillance Program that Targets Muslims," *Foreign Policy*, June 13, 2018, https://foreignpolicy.com/2018/06/13/in-chinas-far-west-companies-cash-in-on-surveillance-program-that-targets-muslims/

the work entails complicity in the oppression of Xinjiang's Uighur Muslim population, it could give the companies a competitive edge on the international market, partly because access to large amounts of data can help train artificial-intelligence algorithms. For example, data and images of ethnic Chinese, Turkic Uighurs, and—under a new deal with Zimbabwe's government—sub-Saharan Africans could collectively enable developers to correct common race-related errors in facial-recognition software and gain market share in other parts of the world.[12] Chinese firms are already expected to control 44 percent of the global market for such technology by 2023.[13]

Chinese firms seek to expand in a wide range of other areas. A report published by Hong Kong–based *Abacus* in July shows how Baidu, Alibaba, and Tencent have been investing in or acquiring dozens of companies within China and abroad, from e-commerce and ride-sharing apps to blockchain developers and makers of self-driving cars.[14] These tech giants are private enterprises, and they may have their own reasons for making such investments, but they also remain beholden to the government and its strategic goals. As the report notes: "Success or failure in China's internet landscape is contingent upon government authority." Evidence of this reality has been abundant in recent months. In May, after a brief suspension by regulators, Toutiao overhauled the content and messaging of its popular personalized news app, altering its mission statement to include spreading "correct public opinion orientation."[15] Also that month, industry leaders joined in the creation of a new China Federation of Internet Societies (CFIS), directed by the Cyberspace Administration of China (CAC).[16] Individuals like Tencent chairman Pony Ma, Alibaba founder Jack Ma, and Baidu chairman Robin Li were appointed as vice presidents. One of the CFIS's inaugural commitments was to "conscientiously study and implement the spirit of Xi Jinping's Strategic Thought on Building a Cyber Superpower."

Foreign tech firms in China

Chinese tech firms are not the only ones eager to please the leadership in Beijing. Many of the world's top technology and social media companies are banned or extremely constrained in their ability to provide services to Chinese internet users. Notably, the websites of

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[12] Lynsey Chutel, "China is exporting facial recognition software to Africa, expanding its vast database," *Quartz Africa*, May 25, 2018, https://qz.com/africa/1287675/china-is-exporting-facial-recognition-to-africa-ensuring-ai-dominance-through-diversity/

[13] Eudora Wang, "China To Take Nearly Half Of Global Face Recognition Device Market By 2023," *China Money Network*, August 23, 2018, https://www.chinamoneynetwork.com/2018/08/23/china-to-take-nearly-half-of-global-face-recognition-device-market-by-2023

[14] Abacus News. (2018). *China Internet Report 2018 [Short Version]*. Retrieved from https://www.slideshare.net/EdithYeung/china-internet-report-2018-short-version

[15] Yimian Wu, "China's Toutiao Has A New Mission: To Shape Correct Public Opinion," *China Money Network*, May 17, 2018, https://www.chinamoneynetwork.com/2018/05/17/chinas-toutiao-has-a-new-mission-to-shape-correct-public-opinion

[16] David Bandurski, "Building the Party's Internet," *China Media Project*, May 11, 2018, http://chinamediaproject.org/2018/05/11/building-the-partys-internet/

Facebook and Twitter are blocked, while restrictions on Google have expanded from its search engine to its email client, translation services and more. Such restrictions place real costs on these companies and U.S. businesses operating in China generally. A 2016 survey by the American Chamber of Commerce found that 79 percent of U.S. companies reported that Chinese government internet restrictions hurt their business.[17]

The Chinese government is adept at using the combination of its ability to block online services from reaching potential customers and the lure of its enormous domestic market to extract concessions from foreign firms, including assistance with its censorship and surveillance system. The recent controversy surrounding Google's plans to develop a censored search engine for the Chinese market is only the latest among many examples of such cooperation. LinkedIn restricts users in China from accessing profiles or posts by people based outside the country that are deemed to contain politically sensitive information.[18] Earlier this year, Apple removed more than 600 applications from its mobile store that facilitated Chinese users' ability to access blocked websites.[19]

Foreign companies operating in China also increasingly risk accusations of complicity in politicized arrests or violations of user privacy. Last year's Cybersecurity Law stipulates that foreign companies must store Chinese users' cloud data on servers located in China. To meet this requirement, Apple announced in January that iCloud data would be transferred to servers run by Guizhou on the Cloud Big Data (GCBD), which is owned by the provincial government.[20] Apple and GCBD now both have access to iCloud data, including photos and other content. In February, the U.S.-based note-taking app company Evernote similarly announced that Chinese users' data would be transferred to Tencent Cloud by mid-2018 to comply with data localization rules in the Cybersecurity Law.[21] Airbnb alerted its hosts that starting on March 30, "Airbnb China may disclose your information to Chinese government agencies without further notice to you."[22] And one of the biggest investors in the artificial

[17] Erik Crouch, "79% of American companies say China's internet restrictions are hurting them," *Tech in Asia*, January 20, 2016, https://www.techinasia.com/china-amcham-restrictions-internet-survey
[18] Paul Mozur and Vindu Goel, "To Reach China, LinkedIn Plays by Local Rules,' *New York Times,* October 5, 2014, https://www.nytimes.com/2014/10/06/technology/to-reach-china-linkedin-plays-by-local-rules.html.
[19] Letter from Cynthia C. Hogan, Apple Vice President for Public Policy in the Americas to Senators Patrick Leahy and Ted Cruz, November 21, 2017, https://www.leahy.senate.gov/imo/media/doc/Apple%2011212017.pdf.
[20] BBC, "Apple: Chinese firm to operate China iCloud accounts," January 10, 2018, http://www.bbc.com/news/business-42631386.
[21] Freedom House, *China Media Bulletin,* No. 126, February 27, 2018, https://freedomhouse.org/china-media/china-media-bulletin-resisting-beijings-influence-new-year-gala-metoo-in-china-issue-no-126#a4.
[22] Twitter post by Bill Bishop with screenshot of AirBnb notice, March 28, 2018, https://twitter.com/niubi/status/978945772971614209.

intelligence (AI) firm SenseTime, which provides facial recognition technologies to some local police and at least one prison in China, is U.S. chipmaker Qualcomm.[23]

But in a new and disturbing development, the Chinese government has used market leverage—and in some cases arbitrary blocking and other regulatory actions—to spur censorship of information available to people outside China. In a spate of incidents over the spring and summer, hotel, airline, and automobile companies changed their presentation of content on topics like Tibet or Taiwan to fit Beijing's political positions. A piece of code in Apple's iPhone operating system that was meant to prevent Chinese users from displaying the Taiwan flag emoji recently caused phones with China location settings to crash, even if the device was being used in San Francisco.[24] Apple is now weighing the inclusion of China's Beidou navigation system on the next generation of iPhones; one can already imagine how its maps will handle Beijing's territorial claims.[25]

The costs of compliance

As Chinese and foreign companies take more steps to appease the regime, the human toll will continue to mount. The space for ordinary Chinese to obtain and share information on a wide range of both political and apolitical topics has noticeably shrunk in recent years, while the risks of punishment for even facetious comments deemed unacceptable to the authorities have risen. These shifts have affected hundreds of millions of users in China. Although not all may be aware of the full set of changes, many have been forced to alter their online habits due to increasing censorship and real-name registration requirements.

For target populations like activists, religious believers, or members of ethnic minorities, the consequences have been dire. Censorship and surveillance on sensitive topics like Taiwan, Tibet, Xinjiang, Falun Gong, and the 1989 Tiananmen massacre either whitewash or exacerbate large-scale human rights violations—including mass detentions, torture, and extrajudicial killings.

Beyond that, on a daily basis, vital information is kept from the Chinese public. Annual Freedom House analysis of leaked censorship directives has repeatedly shown that a broad range of breaking news topics are targeted for control, including critical information about public health and safety.[26] Meanwhile, Chinese people's ability to discuss the current and

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[23] Reuters, "Qualcomm invests in Chinese AI facial recognition startup SenseTime," November 14, 2017, https://www.reuters.com/article/us-sensetime-fundraising-qualcomm/qualcomm-invests-in-chinese-ai-facial-recognition-startup-sensetime-idUSKBN1DF0HE.
[24] Andy Greenberg, "Apple's China-friendly Censorship Caused An IPhone-crashing Bug," *Wired*, July 10, 2018, https://www.wired.com/story/apple-china-censorship-bug-iphone-crash-emoji/
[25] Asia Times, "Apple may build China's BeiDou navigation into future iPhones," August 22, 2018, http://www.atimes.com/article/apple-may-build-chinas-beidou-navigation-into-future-iphones/
[26] Freedom House, *China Media Bulletin*, No. 125, January 27, 2018, https://freedomhouse.org/china-media/china-media-bulletin-2017-year-in-review-issue-no-125

future direction of their country has been severely constrained. This was especially evident in the run-up to the 19th Party Congress last October and constitutional changes earlier this year. As the country underwent some of the most significant political events in its recent history, deletion of social media posts and accounts spiked. The vast majority of Chinese citizens were not only shut out of the conversation, but also risked severe punishment should they even try to take part from afar.

But ironically, the complicit companies themselves are also important victims of the government's repressive measures, enduring a number direct and indirect costs as a result of state abuses.

First, the arbitrary nature of Chinese regulatory decisions can wreak havoc on the best-laid business plans and nascent successes. In July, it seemed briefly that Facebook had gained government approval to open a subsidiary and innovation hub in Zhejiang Province, no doubt after long and arduous negotiations.[27] But within hours, the registration announcement disappeared and was censored in Chinese media, apparently because the CAC vetoed the local government's decision. The same arbitrariness affects the Chinese tech sector as well. In April, several extremely popular applications providing news or enabling the sharing of humorous content to tens of millions of users were abruptly suspended or shut down for failing to "rectify" their content sufficiently.

Second, the Chinese government's ever-increasing censorship and surveillance demands reduce profit margins. Actions like moving data service centers from overseas to China and partnering with local companies—as required under the new Cybersecurity Law and implemented by companies like Apple and Evernote—are not inexpensive endeavors. Neither is rapid expansion of censorship staff, as Toutiao announced following its suspension in April; the company increased the number of editorial monitors from 6,000 to 10,000 and established a special committee to manage a politicized content overhaul.[28]

Third, while close government ties are a necessity in China, they provoke scrutiny, distrust, and skepticism abroad. More foreign governments and civil society groups now object when Chinese firms seek to build critical infrastructure or provide important technology and services. Last month, Australia blocked Huawei and ZTE from building the country's 5G network, citing security risks.[29] The Fiscal Year 19 National Defense Authorization Act signed into law on August 13 banned federal agencies from purchasing equipment made by

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[27] Paul Mozur, "China Said to Quickly Withdraw Approval for New Facebook Venture," *New York Times*, July 25, 2018, "https://www.nytimes.com/2018/07/25/business/facebook-china.html

[28] Yimian Wu, "Toutiao CEO Issues Apology As Chinese Media Regulator Shuts Joke App Permanently," China Money Network, April 11, 2018, https://www.chinamoneynetwork.com/2018/04/11/toutiao-ceo-issues-apology-as-chinese-media-regulator-shuts-joke-app-permanently.

[29] Hong Kong Free Press, "Australia blocks China's Huawei, ZTE from 5G network citing security risks," August 23, 2018, https://www.hongkongfp.com/2018/08/23/australia-blocks-chinas-huawei-zte-5g-network-citing-security-risks/

Hikvision, Dahua, Huawei, or ZTE.[30] And on September 18, broadcasters in Ghana raised concerns about the government's talks with a Chinese company on a contract to build the country's digital television infrastructure. [31] Meanwhile, Google's reputation has taken a hit from the revelations about its Chinese search engine project,[32] with some top employees resigning in protest.[33]

Recommendations

China and the CCP's cyberspace policies and strategies are complex and multi-layered. Some aspects have clear public benefits. Some are legitimate government actions to support Chinese companies in a competitive market or restrict circulation of content deemed problematic by international standards. But at least as many aspects of the Chinese regime's actions involve unfair practices, corporate espionage, and rights violating censorship and surveillance. This reality requires an equally sophisticated and multi-layered response, not only to uphold U.S. economic competitiveness, but also internet freedom for people within China, the United States, and elsewhere around the world.

The U.S. government and international community should be ready to respond to recent events and future trends. The following are a few select recommendations to the U.S. government

I. **The United States should be proactive in developing its own capabilities and upholding international free speech and privacy standards**. This can be done by:

- **Developing a comprehensive national strategy on artificial intelligence**. This should cover a five to ten year time frame and include outlining the state of current research and applications, threats and opportunities presented by artificial intelligence, current gaps, and how to move forward.

- **Dedicating diplomatic resources to upholding internet freedom at international forums and holding China to its World Trade Organization commitments**. This should include proactively tracking and countering

[30] United States. Cong. House. *John S. McCain National Defense Authorization Act for Fiscal Year 2019*. 115th Cong. H.R. 5515. https://www.congress.gov/bill/115th-congress/house-bill/5515/text
[31] Ghana Web, "Don't hand digital migration contract to StarTimes – GIBA warns government," September 18, 2018, https://www.ghanaweb.com/GhanaHomePage/NewsArchive/Don-t-hand-digital-migration-contract-to-StarTimes-GIBA-warns-government-685952
[32] Ryan Gallagher, "Google China Prototype Links Searches to Phone Numbers," *The Intercept, September 14, 2018*, https://theintercept.com/2018/09/14/google-china-prototype-links-searches-to-phone-numbers/
[33] Ryan Gallagher, "Senior Google Scientist Resigns Over 'Forfeiture of Our Values' in China," *The Intercept*, September 13, 2018, https://theintercept.com/2018/09/13/google-china-search-engine-employee-resigns/

Chinese, Russian and other authoritarian countries' efforts to weaken international standards and protections for human rights online.

- **Exercising caution regarding Chinese investments in the United States.** In addition to investigating potential national security risks and economic impacts, reviews would do well to take into consideration whether there is evidence or reason to believe that Chinese companies have been involved in human rights abuses in China.

II. **The United States should be proactive in challenging the authoritarian foundations of the Communist Party's cyberspace strategy.** This can be done by:

- **Promoting internet freedom within China in bilateral engagement.** U.S. officials should consistently raise the issues of internet freedom in China publicly and in private meetings with Chinese counterparts, including at the highest levels. They should urge the release of imprisoned journalists and free expression activists (see here for sample list) and highlight the harm done to Chinese citizens when reporting on topics of public concern—like health, safety, and corruption—is constrained. Additional recommendations on how to support and advance free expression in China are available on Freedom House's website as part of the resource section of our *China Media Bulletin* project. But, restrictions on the internet in China don't just hurt Chinese, citizens, they hurt U.S. businesses, as well.

- **Funding counter censorship efforts specific to China.** Studies and anecdotal evidence have shown that some of the first websites that Chinese internet users visit after "jumping" the so-called Great Firewall are internet services provided by top U.S. technology companies such as Google's search engine, Facebook, YouTube, and Twitter. Supporting Chinese internet users' ability to access these websites enhances both U.S. economic competitiveness and internet freedom. Actions to be taken might include:

    - Review how much U.S. funding to date for internet freedom has assisted users from China, including by seeking information from the BBG and State Department, and whether this appropriately matches demand.
    - Support groups that develop and disseminate tools to enable Chinese users on a large scale to access blocked websites and expand funding for applications that enhance access to uncensored information and digital security on mobile phone devices.
    - Create an emergency fund that can be activated quickly during moments of crisis or political turmoil to rapidly enhance the server

capacity of circumvention tools facing increased demand from China as periodically happens when the number of Chinese people seeking uncensored information spikes. The Senate Fiscal Year 19 State and Foreign Operations Appropriations bill contains an additional $2.5 million in internet freedom funding for this purpose, and we would urge its inclusion in final legislation that is worked out in December.

- Support efforts to monitor, preserve, and recirculate censored content within China, including news articles and social media posts that have been deleted by censors. This should also include support for developing new tools to create images more likely to evade artificial-intelligence driven censorship on applications like WeChat.

- **Support projects that raise awareness of internet controls**: Support research and outreach initiatives that inform Chinese audiences about the censorship and surveillance apparatus, imprisoned journalists and online activists, the regime's human rights record overall, and how democratic institutions function. Existing studies and surveys have shown that netizen awareness of censorship often yields a greater desire to access uncensored information, assist a jailed activist, or take steps to protect personal communications.

III. **The United States government should encourage the business community to take a principled stance vis-à-vis Chinese government internet controls.** This could be done by:

- **Pressing companies doing business in China to do no harm,** whether it be turning private citizen data over to the Chinese government or providing surveillance or law enforcement equipment used by Chinese authorities to violate user rights.

- **Reintroducing and passing the Global Online Freedom Act:** The Global Online Freedom Act, introduced in every Congress from 2006-2014, contains provisions that are relevant to today's challenges. Congress should reintroduce and pass these provisions, including directing the Secretary of State to designate internet-restricting countries; prohibiting the export to those countries of any items that could be used to carry out censorship, surveillance, or internet freedom restrictions; and requiring internet communication service companies operating in internet-restricting countries to disclose as part of their annual reporting what they are doing to protect human rights and freedom of information.

Conclusion

American and international firms are caught between a rock and a hard place. As they compete for profits and market share, they must navigate between the legal regimes and political demands emanating from Beijing on the one hand and democratic societies on the other. The Chinese Communist Party has laid out its own plans and ambitions, and it shows every sign of implementing them to the fullest. The question is whether the United States, other democracies, tech entrepreneurs, and investors will assert their own principles—including freedom of expression, free enterprise, and the rule of law—with equal determination.

At times, it can appear that internet freedom may be at odds with innovation or robust competition with China, but a race to the lowest common denominator of internet repression is precisely what Beijing would be happy to see take place. Some measures that would uphold principles of internet freedom and fair competition in the long term might seem to impose a cost on U.S. businesses in the short term, but as outlined above, currying favor with the Chinese government's repressive demands carries its own costs. Developing more resilient business models will benefit companies in the long run and garner support of many people in China as well.

As part of the *China Media Bulletin* project, Freedom House has been working with partners who run circumvention tools like GreatFire's FreeBrowser or overseas Chinese outlets who gain traffic via tools like FreeGate and Ultrasurf. These channels garner millions of impressions each month and bring tens of thousands of readers from inside China to the bulletin, many of whom stay on the page for long periods to read the content or subscribe to the newsletter directly. This is just one example of the eagerness with which a notable contingent of Chinese people are actively seeking out uncensored, credible information about their country and the media controls in place.

Earlier this year, we conducted a survey among Chinese readers of the bulletin. The impact on their own behavior of gaining a better understanding of censorship and surveillance in China was palpable. Significantly, 55 percent of Chinese respondents reported being more careful when using Chinese social media applications after reading the bulletin and over 45 percent reported making a greater effort to seek out uncensored information. In addition, 18 percent of Chinese readers reported deciding to take some action to support free expression or an individual activist.

As they learn about the reality of Chinese technology companies collaboration with the Chinese government, individuals like these are likely to seek out more secure international—and often American—alternatives, so long as those companies are not also compromising their services by conceding to Chinese government demands.

I would like to conclude with a quotation from one of those readers as a testament to the importance of international support for free expression and access to information in China.

> *I am a lower class worker in Chinese society and I don't speak English. An independent Chinese media like you, that does in-depth reports about the situation in China, gives me a better understanding of China's current situation and future development. And it also helped my personal life and work. On a macro scale, China is the largest authoritarian country in the world, the Chinese Communist Party oppresses its citizens, blocks information flows, and also threatens the existing world order. I think the flow of information and freedom of speech are very important to China's future development. Birds in cages long to fly, even if we can't fly out now, hearing the chirping of birds outside can still give us hope and faith!*

Mr. HURD. Mr. Atkinson, you are now recognized for five minutes.

STATEMENT OF ROBERT ATKINSON

Mr. ATKINSON. Thank you, Chairman Hurd and Ranking Member Kelly, members of the subcommittee. It's a pleasure to be here today.

ITIF is a technology policy thinktank. We've long focused on the question of what we've termed innovation mercantilism from China. I won't go into the details of what that is. I put that in my written testimony. And let me say what should we be doing.

Clearly, the avenue now is tariffs. I'm not going to say whether they're overall good or bad, but I think if we're going to use tariffs, we should use them strategically. Mr. Neuffer alluded to the fact that tariffs on semiconductors only hurt us, they don't help—they don't hurt the Chinese. We put tariffs on certain types of products or inputs where the American firm is competing against, say, a firm from Japan or a firm from Indonesia. They come into the country tariff-free. Our companies don't. If we're going to use tariffs, let's be strategic about it. Let's put some thought behind it and not just use it as a blunt instrument.

I think more importantly, though, we need to think about how do we orient trade policy towards China in a results-oriented way. This is something people argued about with regard to Japan in the 1980s. One of the results we want from China—I say that by the way because I don't think a process-oriented process works with China. They're just too sophisticated, and any time we say don't do a particular process, they will figure out a new way to do it. I think we want a number of clear easily measured results: one, an end to coerced and forced tech transfer. We can measure that. We can say just no more.

Secondly, a vast reduction of industrial subsidies as, again, Mr. Neuffer alluded to. They're not just in the semiconductors. They're in a vast array of technology industries way, way beyond what the OECD subsidy guidelines would allow; a reduction in IP theft and cyber theft, and much better U.S. market access.

So how do we do that? I think it's clear that our best chance of doing that is a deep, deep coalition with our allies. We had meetings with the Japanese, with the European officials, with Korean officials. They all ask for one thing, for us to take the lead, but they all want to be part of that. And I think right now we're not doing that.

We've seen that that process works back in—I'm going to guess 2012 or so. There was a Chinese policy called indigenous innovation product catalogs, very onerous, restrictive process. You couldn't sell to the Chinese if you were a European or American firm unless you gave them your technology. That's essentially it. And the Europeans, their Chamber of Commerce, our Chamber of Commerce, our government, their government, all banded together, and that pressure was enough to force the Chinese Government to back off and eliminate the indigenous innovation product catalog. So we've seen that that way of organizing pressure works.

If we don't do that, though, what do we need to do? I think a big part of this is going to basically be making their ability to catch

up more difficult. We're just going to have to throw roadblocks in the way while at the same time speeding up our catchup. And part of that has to be limiting their global market share and expanding our global market share. Technology industries is probably one of the most important things you can do because global market share means more revenues to then invest in R&D.

And in that regard I would say that having a company like Google go into China is completely in the American interest even if they comply with Chinese law. We want to take market share away from Baidu. We want to give our companies more market share.

What else can we do? I think we need a better and more comprehensive ability to understand what's going on. That's why we've supported the Senate Bill S. 2757, the National Economic Security Strategy Act, which would call for an economic strategy aligned with national security for the first time in our history. We would encourage the House to adopt something similar.

We certainly would encourage the administration to take a hard line on Chinese investment. FIRRMA certainly helps on that. But you see this now. For example, there are Chinese-backed technology accelerators. There's one in University of Maryland, for example. These aren't out of the goodness of the heart of the Chinese Government. These are designed for one and one—only one purpose, to support new firms, new high-tech startup firms, and to take their technology across the ocean back to China.

We need to have USTR bring a case before the WTO on subsidy disclosure, which they have not done. This is in—actually an area where the WTO might be able to actually act against Chinese interests as opposed to some other areas where it's much more difficult.

I would work hard to ban Chinese access to our final—Chinese firm access to our banking system, our securities system. They don't give us that.

We need to rethink antitrust. For example, right now, we have a regulation that our Justice Department exempts mergers at state-owned enterprises in China. There's no reason to do that. We should be holding them accountable for antitrust the way they have used their process against us.

And finally, even with all the efforts we need to be taking to slow them down and put roadblocks in front of them for their unfair actions, we need to take stronger actions at home, increase R&D, EXIM Bank funding, better STEM talent, better R&D tax credit, and the like. Thank you very much.

[Prepared statement of Mr. Atkinson follows:]

ITIF | INFORMATION TECHNOLOGY & INNOVATION FOUNDATION

Testimony of

Robert D. Atkinson
President
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Before the
House Committee on Oversight and Government Reform
Subcommittee on Information Technology

Hearing on Countering China: Ensuring America Remains the World Leader in Technology and Innovation

September 26, 2018

Washington, DC

Good afternoon Chairman Hurd, Ranking Member Kelly and members of the Committee; thank you for inviting me to share the views of the Information Technology and Innovation Foundation (ITIF) on the issue of unfair Chinese trade and technology policies and practices and what the U.S. government should do in response.

The Information Technology and Innovation Foundation is a non-partisan think tank whose mission is to formulate and promote public policies to advance technological innovation and productivity internationally, in Washington, and in the states. Recognizing the vital role of technology in ensuring prosperity, ITIF focuses on innovation, productivity, and digital economy issues. ITF has long focused on the issue of how unfair foreign policies and practices, particularly Chinese, negatively impact the U.S. economy. I very much appreciate the opportunity to comment on these issues today.

The Technology Threat From Unfair Chinese Technology and Trade Policies

Ever since the first industrial revolution advanced countries have worried about technology transfer to foreign nations. For example, it was against the law to transfer technology designs outside of Britain; something that Samuel Slater did when he memorized the plans for textile machines before immigrating to the United States and establishing the first U.S. textile mill in Rhode Island.

Today the United States leads in the so-called fifth industrial revolution (information technology) and hopes to lead in the 6th (artificial intelligence, robotics, etc.), but a major threat to our leadership is from China's unfair and harmful trade and technology policies. China is seeking global technology dominance in an array of advanced technology industries, including in information technology, through an unprecedented array of predatory economic and trade policies and practices, including theft of U.S. technology and coerced transfer thereof. The world has never seen a country like China before, with its organized and strategic system of authoritarian state capitalism. It is not a market economy where firms largely dictate their own strategy and behavior. It is not a country governed by the rule of law. It is not a country constrained by global norms of acceptable economic and trade behavior. It is a country where the government is concerned with one and only one economic goal: winning in advanced technology industries by any means possible.

As ITIF has documented across a series of reports—including "False Promises: The Yawning Gap Between China's WTO Commitments and Practices," "Enough is Enough: Confronting Chinese Innovation Mercantilism," and "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation "—China has deployed a vast panoply of innovation mercantilist practices that seek to unfairly advantage Chinese advanced-industry producers over foreign competitors.[1] These practices have included forced technology transfer and forced local production as a condition of market access; theft of foreign intellectual property (IP); curtailment and even outright denial of access to Chinese markets in certain sectors; manipulation of technology standards; special benefits for state-owned enterprises; capricious cases to force foreign companies to license technology at a discount; government subsidies of Chinse companies, and government-subsidized acquisitions of foreign enterprises. U.S. and foreign enterprises across virtually every advanced technology sector—from aerospace and biotechnology to information and communications technology (ICT) products, Internet, clean energy, and digital media—have been harmed by China's

aggressive use of these types of innovation mercantilist policies and will continue to be harmed if China cannot be pressured to roll back its egregious predatory practices.

In the last few years, though, the focus of China's efforts has shifted. In 2015, Chinese President Xi Jinping unabashedly trumpeted a goal of making China the "master of its own technologies."[2] China's arrival at that point resulted from the evolution of Chinese economic policy over the past two decades. Up to the mid-2000s, China's economic development strategy sought principally to induce foreign multinationals to shift relatively low- and moderate-value production to China.[3] It used an array of unfair tactics, including currency manipulation, massive subsidies, and limits on imports. That strategy changed in 2006 as China moved to a "China Inc." development model of indigenous innovation which focused on helping Chinese firms, especially those in advanced, innovation-based industries, often at the expense of foreign firms. Marking the shift was a seminal document called the "National Medium- and Long-term Program for Science and Technology Development (2006-2020)," the so-called "MLP," which called on China to master 402 core technologies, everything from intelligent automobiles to integrated circuits and high-performance computers.

The MLP announced that modern Chinese economic strategy sought absolute advantage across virtually all advanced technology industries. It rejected the notion of comparative advantage: which holds that nations should specialize in the production of products or services at which they are the most efficient and trade for the rest. Instead, China now wishes to dominate in the production of a wide array of advanced technology products and services including jet airplanes, semiconductors, computers, machine tools, robots, electric vehicles, artificial intelligence software, cloud computing and pharmaceuticals. Essentially, Chinese policymakers wish to autarkically supply Chinese markets for advanced technology products with their own production while still benefitting from unfettered access to global markets for their technology exports and foreign direct investment.

In recent years President Xi has doubled down on this approach, through new promulgations such as the "Made in China 2025 Strategy," the "13th Five-Year Plan for Science and Technology," the "13th Five-Year Plan for National Informatization," and "The National Cybersecurity Strategy," among other policies. The "Made in China 2025 Strategy," for instance, calls for 70 percent local content in manufacturing components in China, while policies enumerated in documents such as the "13th Five-Year Plan for National Informatization" and "The National Cybersecurity Strategy" effectively deny access to U.S. enterprises seeking to compete in emerging ICT industries such as cloud computing in China. The "National Cybersecurity Strategy" further outlines a goal for China to become a strong cyber power by 2020, and that includes mastering core technologies, many of which the United States is currently the international leader in, such as operating systems, integrated circuits, big data, cloud computing, large-scale software services, the Internet of Things, 5G wireless systems, etc., as the country increasingly pursues a strategy of shutting out foreign competitors in the interest of advantaging domestic enterprises and industries. As the Mercator Institute for China Studies in Germany writes, "Made in China 2025 in its current form [means that] China's leadership systematically intervenes in domestic markets so as to benefit and facilitate the economic dominance of Chinese enterprises and to disadvantage foreign competitors."[4] For instance, with regard to ICT-enabled manufacturing (i.e., "smart manufacturing") the strategy calls for 80 percent domestic market share of high-end computer numeric controlled machines by 2025; 70 percent for robots and robot core

components; 60 percent for big data; 60 percent for IT for smart manufacturing; and 50 percent for industrial software.[5]

Foreign Technology Acquisition Underpins "Made in China 2025"

At the heart of China's strategy is foreign technology acquisition. The Chinese leadership knows that if it just relies on market forces few if any foreign technology leaders will provide them with the technology Chinese firms need. And domestic Chinese firms, while making progress, lag behind the global technology leaders. As a result, China has deployed a panoply of tools to unfairly obtain needed foreign technology.

Intellectual Property Theft:

Intellectual property theft is one important tool in the Chinese arsenal. China has deployed industrial spies to obtain foreign secrets. As the *New York Times* documented, a leading Chinese computer chip maker allegedly paid employees of a Taiwanese chip company working with the U.S. company Micron to steal valuable chip designs.[6]

Another vector is cyber theft. Seven percent of U.S. firms operating in China listed cyber theft as a problem, a number that presumably would be higher if every firm that had faced an intrusion was aware of it.[7] The *IP Commission Report on the Theft of U.S. Intellectual Property* found that China accounted for nearly 80 percent of all IP thefts from U.S.-headquartered organizations in 2013, amounting to an estimated $300 billion in lost business annually.[8] An updated 2017 Commission report put the figure at $600 billion.[9] Then NSA Director Keith Alexander has called Chinese IP theft, "the greatest transfer of wealth in history."[10] Even though President Xi made "commitments" to end Chinese cyber-theft, there is little evidence that the Chinese have followed through on this promise. As the China the National Counterintelligence and Security Center stated in its "2018 Foreign Economic Espionage in Cyberspace" report:

> China has expansive efforts in place to acquire U.S. technology to include sensitive trade secrets and proprietary information. It continues to use cyber espionage to support its strategic development goals—science and technology advancement, military modernization, and economic policy objectives. China's cyberspace operations are part of a complex, multipronged technology development strategy that uses licit and illicit methods to achieve its goals.[11]

Meanwhile, China still has one of the highest rates of unlicensed software usage in the world, with 74 percent of the software in use unlicensed and the market value of unlicensed software usage exceeding $8.7 billion in 2013.[12] Then-Microsoft CEO Steve Ballmer once estimated that as much as 95 percent of the copies of Microsoft's Office software and 80 percent of its Windows operating systems in China were pirated.[13] 240,000 Internet cafés in China rely on illegal copies of entertainment software.[14] Chinese firms even sell technology to allow users to circumvent encryption protection so they can pirate video games. In fact, China has factories that produce and sell video game circumvention devices around the world.

Another vector for purloined intellectual property is to trick companies in the United States into thinking that a Chinese firm wants to invest in them. A seemingly independent Chinese investment fund will approach a small to mid-sized U.S. technology company and indicate a willingness to invest needed capital in the

company. But before the Chinese company can do this, they must do due diligence and they send in employees, who turn out to work for a state-owned Chinese company, to obtain key information about the company, including trade secrets. The firm never hears back from the investment company again.

Another path is through exchange visits and student enrollments in U.S. universities. At least at one time, it was common for Chinese exchange visitors to the United States to use opportunities to visit factories and other facilities to engage in industrial espionage, including measuring equipment, taking photos and writing detailed technical notes to bring back to China. And as Daniel Golden writes in *Spy Schools* there have been cases where Chinese graduate students enrolled in U.S. universities use their access to valuable scientific and engineering information to bring that back and provide it to Chinese companies.[15]

Chinese trade secret theft also represents an increasing challenge. A prime example is Boston-based American Superconductor (AMSC), which provides software, design, and hardware solutions for wind manufacturers and energy providers. American Superconductor's top customer, the Chinese-based wind turbine manufacturer Sinovel Wind Group, faced criminal and civil actions for paying an AMSC employee to steal proprietary power-converter and control-system software, which it then used illegally in its wind turbines to meet electricity grid standards.[16] The employee, an engineer at one of AMSC's subsidiary's, was recently found guilty of industrial espionage in Austria. In another telling case, the global agriculture firm Monsanto decided to open production and research facilities for advanced corn technology in China and proceeded to develop experimental fields growing genetically enhanced corn. It wasn't long before the advanced corn was systematically stolen, clearly an effort by the Chinese government to gain access to the IP embedded in Monsanto's corn.[17]

Weak IP Enforcement:

Weak enforcement of IP law is another vector. Chinese firms can often copy and reengineer foreign technologies with impunity (what they call introducing, digesting, absorbing and re-innovating), even those technologies protected by patents. As a *MIT Sloan Management Review* article, "Protecting Intellectual Property in China," noted, "Intellectual property protection is the No. 1 challenge for multinational corporations operating in China."[18] According to the U.S. International Trade Commission, in 2009, U.S. IP-intensive enterprises conducting business in China reported losses of approximately $48.2 billion in sales, royalties, or license fees due to Chinese IPR infringement.[19] In 2018, according to the American Chamber of Commerce in China, one-quarter of surveyed U.S. companies cited "Insufficient protection offered by text of IP-related laws and regulations," while 24 percent cited, "Difficulty prosecuting IP infringements in court or via administrative measures" as significant challenges.[20]

Interestingly, there is new evidence that China favors domestic over foreign patent applicants when it comes to strategic industries. As the report "Technology Protectionism and the Patent System: Strategic Technologies in China," published in 2016 by Gaétan da Rassenfosse and Emilio Raiteri finds, "Foreign applications in technology fields that are of strategic importance to China (as defined by being listed on the MLP) are 4 to 7 percentage points less likely to be approved than local applications, all else equal."[21] As they note, "While much analysis has focused on unequal enforcement of IP rights in China, this is the first study to find systematic evidence of bias in the granting of patents against foreigners in China. Given the

importance of industrial policy in China and the country's strong focus on indigenous innovation and intellectual property, the empirical results provide a case of technology protectionism by means of the patent system."[22]

State-Backed Purchases of U.S. Technology Companies:

An increasingly important way for Chinese firms to gain access to needed technology is to simply buy up U.S. technology companies or invest in high-tech startups. Indeed, until recently, a not-insignificant share of Chinese foreign direct investment into the United States was in technology industries. According to Select USA, the top four industrial categories in terms of numbers of Chinese FDI projects from 2003 to 2015 were electronics, industrial machinery, software and information technology services, and communications.[23] The Rhodium Group reports that over the last 16 years there has been roughly $18 billion of Chinese FDI into ICT and electronics industries deals, with most of that in just the last few years. Of the $4.9 billion invested in electronics, $4.2 billion was invested in 2016, with 99.99 percent of that going to buy U.S. firms.[24] Of the $14.2 billion invested in ICT, 74 percent was made from 2014 to 2016, with more than 95 percent going to acquisitions.[25] These numbers would have been considerably larger if the federal government had not informally or formally blocked some deals through the Committee on Foreign Investment in the United States (CFIUS). Fortunately, Chinese inward FDI has dramatically fallen in the last two years as it became clear that the U.S. government would take a harder look at their attempts to buy U.S. technology. And of course, the recent enactment of the Foreign Investment Risk Review Modernization Act (FIRRMA) will hopefully help even more going forward.

The role of Chinese government money in U.S. deals is underreported in part because of the opaque nature of this support. As Wang and Wang note, many Chinese firms lack transparency, making it difficult for host countries to know enough about the investing firm.[26] This was evident for example in the attempted purchase of German semiconductor equipment firm Aixtron by a Chinese investor where there were "a web of relations among the customer, the buyer, and the Chinese state."[27] Moreover, the Chinese government channels funds to supposedly private investment bodies, making it look as if these deals are commercial.

The main purpose of most Chinese technology companies buying U.S. technology companies is not to make a profit, but to take U.S. technology to upgrade their own technology capabilities. The Rhodium Group notes that in the aviation sector, "The dominant player is aviation conglomerate AVIC, which is looking to the US market to upgrade its technology and other capabilities."[28] Likewise, in the electronics and electrical equipment sector, "Chinese investors are drawn to the US electronics and electrical equipment sector for building their brands, expanding their sales and distribution channels, and upgrading their innovative capacity and technology portfolios."[29] Investments in pharmaceuticals and biotechnology are "often driven by upgrading technology (such as Wuxi's acquisition of AppTec, a laboratory services firm)."[30] As one study of Chinese FDI estimated, 30 percent of the private firm deals and 46 percent of the SOE deals are motivated by technology acquisition.[31] The authors go on to state that Chinese acquisition of overseas firms "has become the most widely used methods [of investing overseas] for Chinese firms, largely because it provides rapid access to proprietary technology."[32]

China has also ramped up its efforts to buy into early-stage U.S. technology start-ups. A recent report from DOD's Defense Innovation Unit Experimental (DIUx) finds that "Chinese participation in venture-backed startups is at a record level of 10-16% of all [U.S.] venture deals (2015-2017) and has grown quite rapidly in the past seven years."[33] And some of this investment comes from venture firms that are backed by Chinese governments (federal or provincial). For example, the Zhongguancun Development Group, a state-owned enterprise headquartered in Beijing has set up "Danhua capital" to promote the strategy of "Zhongguancun capital going global and bringing in overseas advanced technology and talents."[34] Likewise, Shenzen Capital Group, a purportedly private venture capital firm that has invested in at least one advanced U.S. technology company,[35] has actually received about 80 percent of its invested capital from the Chinese government,[36] and its investments are focused, not surprisingly, to match the central governments key targeted industries. The firm even boasts a chart that compares the technology allocation of its investments and how it compares to the governments priorities.[37]

FDI acquisition is not the only path to U.S. technology capabilities. For example, China is investing in U.S. research universities to gain access to their research, often with U.S. state government-backing. For example, Maryland is committing nearly $600,000 over three years to build up the Maryland International Incubator, in a bid to attract high-tech companies from China and elsewhere to collaborate with University of Maryland researchers. Of the 18 companies in the incubator, nine are from China, with most of these being biotech companies.[38] In addition, Chinese firms have become investors in early stage U.S. technology companies. These include the venture capital arms of Chinese Internet companies such as Alibaba or Tencent. The idea is to invest in start-ups and use that as a way to bring technology and knowledge back to China. Indeed, at least a few Silicon Valley experts report that they are seeing a significant uptick in Chinese venture investment in Silicon Valley. This trend could very well increase in coming years as China sees that its traditional acquisition route becomes more difficult. We see this pattern in other nations as well. 40 percent of venture capital in Israel in 2015 reportedly came from China.[39]

Forced Technology Transfer as a Key Weapon in the Chinese Arsenal

Dwarfing these tools is forced technology transfer. Although China's World Trade Organization (WTO) accession agreement contains rules constraining it from tying foreign direct investment or market access to requirements to transfer technology to the country,[40] China routinely requires firms to transfer technology in exchange for being granted the ability to invest, operate, or sell in China.[41] As Harvard Business School professors Thomas Hout and Pankaj Ghemawat document in "China vs the World: Whose Technology Is It?," Chinese technology transfer requirements as a condition of market access have affected scores of companies in industries as diverse as aviation, automotive, chemicals, renewable energy, and high-speed rail.[42] To be sure, because such conditions usually contravene China's WTO commitments, officials are careful not to put such requirements in writing, usually resorting to oral communications to pressure foreign firms to transfer technology.[43] In 2011, then-U.S. Treasury Secretary Timothy Geithner laid such concerns about China's technology transfer requirements, stating that "we're seeing China continue to be very, very aggressive in a strategy they started several decades ago, which goes like this: you want to sell to our country, we want you to come produce here. If you want to come produce here, you need to transfer your technology to us."[44] In 2012, 23 percent of the value of all foreign direct investment projects were joint ventures.[45] And the U.S.-China Business Council's "2014 China Business Environment Survey" reports that 62 percent of companies

had concerns about transferring technology to China, while 20 percent reported that they had been requested to transfer technology to China within the past three years.[46]

Forced technology transfer is not new. A 1987 Congressional Office of Technology Assessment report states, "Although most U.S. firms approach the China market with the intent to sell products, many find they must include technology transfer if they wish to gain access to the China market."[47] But what is new are two things. First, there are more foreign companies seeking to get in the Chinese market, such that the scale of forced technology transfer is much larger than it was two decades ago. In 2015 for example, 6,000 new international joint ventures, amounting to $27.8 billion of FDI inflows, were established in China.[48]

Second, the sophistication and value of the technology the Chinese government is now demanding is significantly higher than in decades past when U.S. companies could afford to give their Chinese "partners" older generations of technology, confident that the U.S. firms could innovate faster. Now for many foreign advanced industry companies, doing business in China requires transferring ever-more valuable technology to Chinese joint venture partners. In 2013, 35 percent of U.S. business respondents in China said that tech transfer requirements were a concern, and 42 percent in advanced technology industries voiced this concern.[49] Fifty-six percent of survey respondents who gave a response thought that tech transfer requirements were increasing.[50] And as USTR points out in its 301 report on China, it is likely that these numbers are under-reported.[51]

For example, the CEO of a large multinational telecommunications equipment company shared with ITIF that he opened up a large R&D facility in Beijing that employs over 500 scientists and engineers. When asked if he did this to access Chinese engineering talent, he responded bluntly: "Unless I promised the Chinese Government that I would open up an advanced technology lab there, I was told that I would not be able to sell to the Chinese telecommunications providers," (most of which are de facto controlled by the Chinese government).

The Chinese government has employed the weapon of forced technology transfer to gain technological know-how in a variety of industries. A well-known case in point concerns high-speed rail. Over the past 15 years China built the largest high-speed rail network in the world. That massive purchase of rolling stock, signal systems, and related equipment was something no foreign rail producer could afford to ignore. As such, the Chinese government had enormous leverage to pressure foreign producers to give the Chinese state-owned enterprise competitors key technology and IP. The Chinese term for this is "exchanging market for technology."[52] As Chen and Haynes document, in 2004 the State Council of China adopted a new railway development strategy that shifted from just subsidizing domestic producers in order to help them improve their technology to one where they "introduce advanced technology through joint design and manufacturing, [with an ultimate objective to] to build a Chinese brand."[53] After that the state Ministry of Railways (MOR) launched three tenders for foreign high-speed electric trains and in each one MOR stipulated that foreign companies had to collaborate with domestic partners in the competition and had to transfer key technologies to achieve localization.[16] The tender included two key conditions: to win, the bidder had to transfer technology to China and the final products had to marketed under the Chinese state-owned enterprise rail car brand. This was all in support of the government's "Action Plan for the Independent Innovation of Chinese

High-Speed Trains." As a result, multiple foreign train companies were pressured to transfer valuable technology to the Chinese companies (now principally one company due to the central government forcing the two main companies to merge into a powerful national champion, Chinese Railway Construction Corporation, now the largest rail producer in the world.) As Chen and Haynes write, "The result is a new HSR [high speed rail] industry in China has emerged which now serves the new vast HSR network and looks externally to export its new skill in HSR production and its new cutting-edge activity in HSR innovations." Not only are CRCC and related Chinese companies virtually guaranteed all Chinese rail projects, but CRCC is now aggressively exporting trains and train systems containing advanced foreign technology to other nations, backed with generous export subsidies from the central government. For example, the China Export-Import Bank (a state agency) announced in 2017 the equivalent of $30 billion in financing assistance for CRCC exports.[54] (Surprisingly, the U.S. Department of Commerce International Trade Administration, in its document promoting U.S. rail export opportunities to China, makes no mention of the fact that the lion's share of these opportunities come with forced technology transfer requirements.[55])

The Chinese have employed different tactics to the same end in the biopharmaceutical industry, where various policies enable Chinese firms to get access to U.S. technology. For example, the relatively short six-year term for data exclusivity, coupled with the lack of a formal definition of a "new chemical entity," means the Chinese government can pressure U.S. firms to turn over important data to Chinese generic drug firms. Similarly, the Chinese government requires that any drugs sold in China must go through Chinese clinical trials, even if they are approved in the United States. This extends the time for sales before a company can sell a drug by as much as 8 years, meaning that the company has only 12 years left of patent-protected sales in China before a Chinese generic company can copy the drug. Moreover, in China, unlike the United States and Europe, there is no extension of marketing exclusivity at the back end to take into account long clinical trial delays. Moreover, China also issues compulsory licenses for the intellectual property for particular drugs.[56] Finally, it presses foreign biopharmaceutical companies to form joint ventures if they want their drugs more easily put on the government list of drugs to qualify for reimbursement.[57]

We also see this in cloud computing. China requires companies running cloud-computing operations to be locally controlled. This means that if a company like Amazon Web Services or Microsoft wants to serve the rapidly growing Chinese market it must partner with a Chinese company and sell their services under the Chinese company brand. And as part of this partnership the expectation is that the foreign cloud provider will provide the Chinese firm with technology and know-how.[58] Chinese cloud providers, like Aliyun, the cloud services unit of Alibaba, is able to establish its own data centers in the United States without any similar requirements.

The Chinese have long had policies in place requiring joint ventures with local firms in order for foreign companies to produce automobiles in China.[59] And many of those production JV requirements also include joint R&D facility requirements. The government is now doubling down on this approach in order to be the global leader in electric vehicles. For example, Renault-Nissan and Ford Motor have established joint electric-car ventures in China.[60] Indeed, the New Energy Vehicles program under Made in China 2025 strategy requires foreign companies wishing to sell in China to disclose and share valuable technology with their local

joint venture partner.[61] We see this pattern in many other advanced technology industries, including wind turbines.[62]

Tools to Force Technology Transfer:

The Chinese have a host of tactics with which they use to pressure foreign companies to transfer technology. All involve "making them an offer they can't refuse." The first and most important is to set up industries that are off-limits to fully-owned foreign direct investment. China's "Catalogue of Industries for Foreign Direct Investment" classifies industries based on categories: "encouraged," "restricted," "prohibited." Other industries are considered to be "permitted." It is in the restricted category, (which includes 35 sectors, such as automobiles, commercial aircraft, and high-value added telecommunications services) that foreign firms are legally required to partner with a domestic firm in a joint venture.

China wields a host of other weapons to help foreign firms understand that it is in their interest to share their technology. One is to bring bogus anti-trust charges against foreign advanced industry companies and then as part of the settlement make it clear that they must transfer technology to local Chinese partners.[63] And with Chinese courts largely rubber-stamping the government's dictates, foreign companies have little choice but to comply. And, all too often, complying means changing their terms of business so that they sell to the Chinese for less and/or transfer even more IP and technology to Chinese-owned companies, often after paying substantial fines to the government.[64]

Another tool is to force foreign companies operating in China to store data about Chinese users in China and turn over encryption keys and source code for inspection. Likewise, in some industries companies must disclose trade secrets as a precondition for receiving regulatory approvals for investments. Still another is to tie regulatory and licensing approvals needed for operation in China to technology transfer. Still another is to tie purchases by the state, including state-owned enterprises, to technology transfer. For example, the Commercial Aircraft Corporation of China (COMAC) requires foreign suppliers to enter into JVs with Chinese suppliers if they want to sell to COMAC.[65]

China's anti-monopoly law has been designed so the government can use it to force foreign companies to license technology at favorable rates to Chinese firms. Article 55 states, "This Law is not applicable to undertakings' conduct in exercise of intellectual property rights pursuant to provisions of laws and administrative regulations relating to intellectual property rights; but this Law is applicable to undertakings' conduct that eliminates or restricts competition by abusing their intellectual property rights."[66] Yet, for the Chinese government, "abuse" means charging market-based IP licensing fees to Chinese companies. This provision has been used to take legal action against companies whose only "crime" is to be innovative and hold patents. Indeed, the Chinese law allows compulsory licensing of IP by a "dominant" company that refuses to license its intellectual property (IP) if access to it is "essential for others to effectively compete and innovate."[67] And with Chinese courts largely rubber-stamping the government's dictates, foreign companies have little choice but to comply. All too often, complying means changing their terms of business so that they sell to the Chinese for less and/or transfer even more IP and technology to Chinese-owned companies, often after paying substantial fines to the government.[68]

Separately, there exists growing concern that "secure and controllable" measures mandated by China's National Security Law and Cybersecurity Law may force source code (i.e., intellectual property) disclosure and may also induce or force the localization of design or manufacturing processes of ICT products such as semiconductors or servers. Specifically, on November 7, 2016, China enacted a new Cybersecurity Law that introduces (further) restrictive requirements on foreign technology companies: *The Economist* aptly described it as a "techno-nationalist Trojan horse."[69] China's new cybersecurity law—through discriminatory standards and forced local data-storage requirements—reinforces existing policies that segment its citizens and tech firms, in addition to its broader Internet ecosystem, from the rest of the world. The law is significant, as it represents China's first enactment of rules on the collection and use of personal data. The law forces companies in "critical information infrastructure" to store users' "personal information and other important business data" in China, a concept known as "forced localization."[70]

China may use the law to expand an existing—and controversial—cybersecurity regulation that is highly discriminatory toward foreign tech firms and products. The cybersecurity law states that China will introduce a cybersecurity multilevel protection scheme (MLPS) for ICT products used in network security by CII sectors. This requirement is perhaps based off an existing MLPS that China has applied for information security (although this is unclear from the wording in the law).[71] This potential relationship raises serious concerns for foreign technology companies, as this earlier MLPS was highly discriminatory—it prohibited certain sectors from using foreign IT products and forced foreign companies to transfer IP and source code to China for review.[72]

Equally troubling is the potential for China to use the law to revive the use of a highly discriminatory standard for IT products—the so-called "secure and controllable" concept—and intrusive security audits, both of which can be used to discriminate against foreign firms and to force the disclosure of valuable intellectual property. The law calls for the use of "secure and trusted" network services and productions, without defining the term. Current deliberations by China's National Information Security Standards Technical Committee (NISSTC) on what this concept means (see below) and past Chinese government policy proposals point toward its mercantilist intent.[73] This concept, along with its analogous "independent and controllable," "secure and controllable," or "indigenous and controllable" terms have been a part of Chinese technology policymaking debates ever since the country backed down on implementing such a rule as part of a banking law in 2015. (That proposed banking law used a "secure and controllable" provision as part of an explicit aim to replace foreign technology goods with local ones. China decided to "withdraw" this provision after it generated significant opposition from tech companies and trading partners, especially the United States.)[74] Essentially, China wants to force software companies, network-equipment makers, and other tech companies to disclose source code to supposedly prove their products can't be compromised by hackers.[75] Source code—the instructions that make a computer program run—enable technology to do the amazing things it does. For companies developing software, protecting source code is necessary to prevent other entities from stealing and free riding on the large research and development costs associated with software development. Source code is at the heart of a company's competitive advantage, but being digital, it is at heightened risk of duplication. Given China's poor protection of IP, not to mention its role in the cybertheft of foreign trade secrets, it's unsurprising that foreign firms and trading partners, such as the United States, have reasonable fears that such intrusive inspections are simply a way to access and steal valuable intellectual property.

Other Steps to Gain Technology Dominance

Once Chinese firms gain access to needed foreign technology, the next step of the Chinese strategy is to ensure that they have the capital needed to scale up. This involves direct and indirect subsidies and also designing markets protected from foreign competition so the Chinese firms can accumulate capital. Once firms have the technology, competencies and scale to go global, the government often subsidizes global market expansion, such as through the China Export-Import Bank (an entity the World Bank has funded) and China's Export and Credit Insurance Corporation (Sinosure).[76] Moreover, by leading to global overcapacity and selling below cost, China uses that overcapacity as a cudgel to disrupt the economics of innovation-based industries (i.e., subsidized competition prevents foreign competitors from earning reasonable profits from one generation of innovation to reinvest in future generations of innovation) and thus weaken foreign competitors, enabling Chinese firms to gain even more global market share.

The Chinese government also works to limit foreign competition for its budding national champions. For example, in the high-end equipment manufacturing sector, China maintains a program that conditions the receipt of a subsidy on an enterprise's use of at least 60 percent Chinese-made components when producing intelligent manufacturing equipment.[77] And despite the fact that China "clarified and underscored ... that it agreed that enterprises are free to base technology transfer decisions on business and market considerations" at a December 2014 meeting of the United States-China Joint Commission on Commerce and Trade (JCCT), USTR notes that China has "announced two measures relating to [local procurement of] information technology equipment used in the banking services sector and in providing Internet- or telecommunications-based services more generally."[78]

China also lavishes Chinese firms that have obtained foreign technology with massive subsidies. As George and Usha Haley document in their book, *Subsidies to Chinese Industry: State Capitalism, Business Strategy, and Trade Policy*, China's game plan has long been to "aggressively subsidize targeted industries to dominate global markets." As they document, in the 2000s, China provided almost $100 billion in subsidies to just three industries alone: $33 billion for paper, $28 billion for auto parts, and $27 billion for steel.[79] China's share of global solar panel exports grew from just 5 percent in the mid-2000s to 67 percent today, with Chinese solar output turbocharged by at least $42 billion of subsidies from 2010 to 2012 alone.[80] China now wants to replicate this strategy in other advanced-technology industries, such as semiconductors and electric batteries.[81] For instance, China's National Integrated Circuit (IC) Strategy calls for at least $160 billion in subsidies to create a completely closed-loop semiconductor industry in China, including explicit plans to halve Chinese imports of U.S.-manufactured semiconductors by 2025 and eliminate them entirely by 2035. The "Made in China 2025 Strategy" is supported by some 800 state-guided funds to the tune of more than $350 billion, including advanced-battery manufacturing, wide-body aircraft, and robotics.

China has also made the development of indigenous technology standards, particularly for information and communications technology products, a core component of its industrial development and economic growth strategy. China has committed to developing unique national standards for dozens of high technology and ICT products—in many cases where international standards already exist—developing homegrown standards

for everything from mobile telecommunications services and wireless local area networks to encryption technologies and the Internet of Things.[82] In some cases, such as with WAPI (the Wireless Local Area Network Application and Privacy Infrastructure standard that China developed as an alternative to the WiFi standard), China attempted to require that all wireless networking products sold in China would have to be WAPI-compliant and use its encryption method, in contravention of its commitment to let foreign enterprises use desired technologies in the provision of telecommunication services.[83] As USTR notes, "China has continued to pursue unique national standards in a number of high technology areas where international standards already exist, such as 3G and 4G telecommunications standards, Wi-Fi standards and information security standards."[84] More commonly, however, Chinese officials "pressure foreign companies seeking to participate in the standards-setting process to license their technology or intellectual property on unfavorable terms."[85] Clearly, China has not met its commitments in the telecommunications sector, either in terms of market access or in refraining from promulgating technology standards that allow companies "to use any technology they choose to provide telecommunications services."[86]

What is at Stake?

Given China's Made in China 2025 plan, it is no exaggeration to suggest that, without aggressive action, the United States may face a world within two decades where U.S. jobs in industries as diverse as semiconductors, computers, biopharmaceuticals, aerospace, Internet, digital media, and automobiles are significantly reduced due to Chinese policies unabashedly targeting domestic and global market share in those industries.

It is important to understand that the challenge to America's leadership in technology-based industries is much different than the process of losing more commodity-based, low-skilled industries to China in the 2000s. If, for example, the value of the dollar was to fall significantly related to the yuan (and other currencies), it is possible that America could regain at least some of the production lost to China in industries like textiles and apparel, furniture, metal parts, and other similar low- and medium-value added products. Companies could simply buy machines, set up factories, and restart production domestically in a cost-effective way. But if America's technology companies were severely weakened or even put out business, no currency decline could bring them back because competitiveness in technology industries is based less on cost and more on a complex array of competencies at the firm- and ecosystem-level. For example, a firm cannot simply buy some semiconductor equipment and start producing chips. To do that would require not just machines but deep and complex tacit knowledge embedded in the firm in workers (from the shop floor to scientists to managers) coupled with an innovation ecosystem (universities training the right talent, a network of suppliers, etc.). Once those capabilities are lost, they are essentially gone, and are very difficult to resurrect absent massive government intervention.

There is an additional reason why losing advanced technology industries is problematic. Most technology-based industries have high barriers to entry. In contrast to the t-shirt industry where entry largely requires just capital to buy sewing machines, entry into innovation-based industries requires both physical and intellectual capital. In an industry like semiconductors, for example, firms spend hundreds of millions, if not billions, of dollars developing technical capabilities to enable production. Producing the first chip of a particular generation is incredibly expensive because of the amount of R&D involved. Producing the second chip is much cheaper because only the material and labor costs are involved. In this sense, fixed costs are extremely

high, but marginal costs are low. In these innovation-based industries losing market share to unfairly competing firms supported by their innovation mercantilist governments means two things. First, sales fall. This is true because global sales are largely fixed (there is only so much demand for semiconductors, jet airplanes, and other similar advanced products), and if a mercantilist-supported competitor gains market share, the market-based competitor loses share. Second, because profits decline more than sales, it is now more difficult for the market-based innovator to reinvest revenues in the next generation of products or services, meaning that the mercantilist-supported entrant has an advantage in the next generation of products. This can lead to a death spiral whereby the market-based leader can lose complete market share.

A loss of advanced technology industries has two major negative impacts on the U.S. economy. The first is on prosperity, as the average wage in these industries is approximately 75 percent higher than average U.S. wages.[87] The second is on national security and the defense industrial base. U.S. defense superiority is based is in large part on technological superiority. Our service men and women go into any conflict with the advantage of fielding technologically superior weapons systems. But maintaining that advantage depends on the U.S. economy maintaining global technological superiority, not just in defense-specific technologies but in a wide array of dual-use technologies. To the extent the United States continues to lose technological capabilities to China, U.S. technological advantage in defense over China will diminish, if not evaporate, as U.S. capabilities whither and Chinese ones strengthen. It is certainly a highly risky proposition to assume that the United States can continue its weapons systems superiority over the Chinese if: 1) the Chinese continue to advance, largely through unfair, predatory practices at the pace they are; and 2) the United States loses a moderate to significant share of its advanced technology innovation and production capabilities. As ITIF wrote in 2014, "The United States defense system is still the most innovative in the world, but that leadership is not assured and is in danger of failing. This decline is not only impacting defense innovation and capabilities, but also overall commercial innovation and U.S. competitiveness."[88]

What the U.S. Government Should Do?

The main approach currently to pressure the Chinese government to behave as a more responsible global actors is the imposition of tariffs under Section 301 authority. The Trump administration has placed tariffs on a wide array of Chinese exports in an effort to bring the Chinese government to the negotiating table. It is not clear if this approach will succeed.

Regardless, there are additional tools the federal government should consider employing. But perhaps the most important step is to develop joint campaign with our allies. The United States should be doing much more to develop such a coordinated agenda with like-minded allies as that will help create pressure that will make it more likely that China feels like it has no choice but to play more by the rules.

In any case, the U.S. government can and should take a number of steps on its own. And there are steps Congress could take to help roll back Chinese innovation mercantilism.

The first relates to boosting the institutional capacity of the federal government to understand and address these issues. **The House should introduce and pass a companion to the National Economic Security Strategy Act of 2018 (S 2757).** By requiring the administration to develop a national economic strategy to

support the national security strategy, the legislation will not only help the administration make stronger connections between economic security and national security, it will help identify challenges and policy needs. By focusing attention not only on the strengths and weaknesses within American industry related to national security broadly defined, but also on the threats from other nations, policymakers will be better prepared to take the decisive steps that are required.

Congress should instruct USTR to bring a WTO case against China over its ongoing failure to publish thousands of trade-related final measures, including subsidies, in a single official journal as it's required to do under WTO rules. One reason it's been difficult to bring subsidy cases against China at the WTO is that China fails to properly publish its subsidies. Getting the WTO to enforce China's publication requirements would make it possible to bring additional WTO cases for subsidy or other violations, such as forced IP or technology transfer.

The United States also needs a new regime to contest China's strict technology-licensing laws. Under Chinese contract law and technology import-export regulations (or TIER), a foreign licensor into China is obligated to offer an indemnity against third-party infringement to the Chinese licensee.[89] In other words, a foreign licensor licensing into China has to provide insurance that practicing the licensed technology does not infringe any IP held by a third party. But, under TIER, this legal obligation only attaches to "technology import contracts." That is, this obligation only attaches to a foreigner licensing technologies into China; the Chinese licensor has no such obligation. This discriminates against foreign licensors. The foreign licensor is legally bound to offer something that the Chinese licensee is not, making it difficult for small companies, companies which may experience high litigation risks in China's litigious environment, and companies engaged in collaborative research and development (such as cross-licensing, open-source licensing, and charitable activities) to arrive at mutually beneficial licensing agreements. TIER makes it almost impossible for small companies, such as start-ups, to license their breakthrough technologies in China, because no start-ups (due to their limited resources) would be able to conduct the complex analysis required by China's high-litigation environment and industrial policies that limit the value of foreign IP in order to offer insurance against third-party infringement disputes. While large multinational companies could avoid this issue by licensing technology (e.g., through their China-based subsidiaries), start-up companies cannot do so because they typically do not have subsidiaries in China. Consequently, the impact of the mandatory indemnification requirement on small- and medium-sized companies, and especially start-ups, is particularly acute.

Another provision in TIER mandates that in technology-import contracts, improvements belong to the party making the improvements, which typically is the Chinese licensee. Thus, foreign licensors, including U.S. firms, cannot negotiate to own any improvements or to share the improvements with Chinese licensees, even if both licensing parties desire for the improvements to be shared or owned by the foreign licensors. Moreover, TIER prohibits any technology-import contracts to "unreasonably restrict the export channels" of the Chinese licensee, thereby impeding the ability of the two licensing parties to allocate markets as they see mutually beneficial. Put simply, U.S. companies are obligated under TIER to let Chinese firms own the improvements and cannot freely negotiate with Chinese entities.

To address this discrimination, **Congress should enact a regime whereby if Chinese entities seek licenses in the United States, then the Chinese enterprise must license on the same terms by which foreigners are required to license into China.** Such legislation would specifically require the Chinese licensor to offer an indemnity against infringement by the U.S. licensee and to stipulate that the U.S. licensees are entitled to own the improvements they make and receive a reasonable market allocation under the licenses. Another possible approach would be for Congress to pass legislation requiring that the U.S. company whose original technology was improved by the Chinese entity receives an automatic exclusive license to use that improved technology [in the United States], such that the full potential of the original technology owned by the U.S. companies is not encumbered by improvements owned by the Chinese entity. Although technology-licensing law is usually a matter of state contract law, the legislation would be enacted pursuant to Congress's power to legislate international commerce.

There are other ideas that are at least worth considering and developing further.

Tighten the process of issuing student visas from students coming from China and strengthen FBI-university partnerships to limit inappropriate IP transfer. This would also serve the purpose of limiting intellectual property theft from U.S. universities sometimes carried out by Chinese graduate students sent to the United States for that purpose. At minimum, the FBI should engage in a stronger partnership with U.S. research universities to help them better understand how to take steps to better identify students here for the purpose of intellectual property transfer and how to limit such access. The point is not to just limit access and transfer of sensitive military technology subject to deemed export controls, but also advanced technology that can help China compete with the United States.

Limit ongoing science and technology cooperation with China. It makes little sense to engage in S&T cooperation with China, especially considering that much of that cooperation is lopsided with the United States contributing more than the Chinese.

Take a hard line on limiting most Chinese investment in the United States, including in Chinese-backed tech accelerators.[90] With the passage of FIRRMA and the Export Control Act it will be easier for the administration to do this, but Congress should use oversight to ensure that they are taking advantage of these new authorities.

Prohibit Chinese firms that are stealing IP from accessing the U.S. banking and financial system. The administration could deny Chinese-headquartered enterprises access to listing on U.S. stock exchanges if they fail to provide financial statements in line with generally accepted accounting principles.

Build an "inspection wall" against counterfeit and pirated Chinese goods, with the goal of stopping them all. China accounts for 87 percent of counterfeit goods seized each year, with costs estimated to be between $30 and $40 billion.[91] Tougher border enforcement would harm Chinese exporters illegally shipping goods to the United States.

Prevent foreign governments from abusing America's "foreign sovereign compulsion" defense for mercantilist ends. China and other countries in recent years have abused the doctrine of "foreign sovereign compulsion" to justify anticompetitive behavior that has harmed U.S. interests even though it has passed muster in U.S. courts. For instance, the U.S. Second Court of Federal Appeals in 2016 threw out a case against Chinese vitamin C makers alleged to have conspired to fix prices and limit supplies in international markets, including in the United States, on grounds that the behavior was directed by the Chinese government and thus wasn't actionable under U.S. antitrust law because deference must be given to the official policies of foreign governments (i.e., the foreign sovereign compulsion defense). While this verdict was recently reversed by the U.S. Supreme Court, Congress should curb foreign governments' ability to abuse the foreign sovereign compulsion defense for these kinds of mercantilist ends.[92] One way to do so would be to require courts to give consideration to the implications for U.S. industries' global competitiveness in cases involving the foreign sovereign compulsion defense.[93] Congress should also eliminate a regulation that exempts mergers involving Chinese state-owned enterprises from having to be announced in accordance with U.S. antitrust law.

Pass legislation that allows firms to ask the Department of Justice for an exemption to coordinate actions regarding technology transfer and investment to other nations. One of the key levers China has is that it's a monopsonist: its market is so large it can essentially compel foreign companies to hand over technology in order to sell their products in China. But if companies in a similar industry can agree that none of them will transfer technology to China in order to gain market access, then the Chinese government will have less leverage over them. The same would be true if companies agreed that they would not invest in China until China improved its IP protections. Such an amendment to antitrust law would be similar to the 1984 Cooperative R&D Act, which allowed firms to apply to form pre-competitive R&D consortia.

Stand up a new arm of DOJ's antitrust division focused on foreign government-enabled and led antitrust violations. Currently, DOJ can bring actions against foreign firms if they are found to be acting in an anticompetitive manner. DOJ needs to not only be able to but be willing to bring actions against foreign firms if their actions are helped by their state in a way that leads to anticompetitive results. In the case of China, its subsidies, forced technology transfer, IP theft, and other unfair actions give Chinese firms unfair advantages that distort markets in an anticompetitive manner. DOJ should be able to investigate cases and if they found a violation, bring those to an administrative law judge who would adjudicate the case and the damages the U.S. government could impose on the Chinese companies that benefited from the anti-competitive Chinese government policies or practices. The challenge will be that not all Chinese companies likely to have cases brought against them are involved in the U.S. market. But some are, and for the ones that aren't such a ruling would effectively preclude them from entering the U.S. market.

Take stronger actions to make the United States more competitive. Finally, it is important to note that while policies and actions to roll back foreign mercantilist actions are critical, the United States does need to do much more to boost U.S. competitiveness at home. Among other steps this includes expending lending authorities for the Export-Import Bank;[94] increased funding for pre-competitive research, including for the Manufacturing USA program; increased efforts to develop STEM talent, a more generous R&D tax credit and other steps. For example, at least 26 other nations field a more generous R&D tax incentive, 21 other

nations fund more university-based R&D and many more nations invest more in industrially-relevant R&D.[95] As such American needs its own Made in USA 2028 program where the federal government identifies the technologies most important to America's national and economic security and allocates at least an additional $25 billion annually to support their development.[96] Moreover, the federal government should work to establish a deeper North American supply chain, as at least somewhat of an alternative to the Chinese supply chain. This would entail maintaining (if not improving) NAFTA and expanding it to other Latin American nations.

In summary, taking firms and strategic action against Chinese predatory, mercantilist practices is long overdue. Whether or not such actions can be successful is an open question. But one thing is clear: not taking action will make it much easier for the Chinese government to achieve their goal of dominating global technology industries.

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Mr. HURD. Thank you, sir.

I would now like to recognize the gentleman from California, Mr. Issa, for his opening rounds of questions.

Mr. ISSA. Thank you, Mr. Chairman.

And what wasn't said in this open hearing is much of what you know directly about China's espionage and their successful effort to gain huge amounts of technology by stealing it systematically over the last probably four Presidents, so this is a bipartisan problem.

I am going to start with Mr. Neuffer. You said something—look, I come from your industry. We go back a long way. I watched us systematically sell out to the Chinese. I watched us systematically move our fabs to China. Now, I appreciate your discussion of exports, but exports and imports, we could net them and that statistic would probably disappear.

But I think the important question is isn't one of the effects, positive effects of the tariff the fact that virtually every one of your member companies, if they are exclusively in China, are looking for a second location, either a U.S. location if they don't already have one, but even if they do, they are likely looking at the Philippines, South Korea, any number of other places.

So I am not here to defend, and I would like a short answer of the fact, isn't it true that the current activity is causing your companies to second-guess having all or most of their fabs at least for some product lines in China?

Mr. NEUFFER. Great question. First of all, just as a percentage of our global production around the world, the amount of production we do in China is quite small.

Mr. ISSA. How many fabs does ——

Mr. NEUFFER. I don't know the ——

Mr. ISSA.—Intel have in California by the way?

Mr. NEUFFER. I don't know the ——

Mr. ISSA. The answer is zero. So I appreciate ——

Mr. NEUFFER. Well ——

Mr. ISSA.—your talking about Silicon Valley ——

Mr. NEUFFER. Well ——

Mr. ISSA.—but your industry left California for the most part because of unreliable sourcing of electricity and water. Isn't one of the challenges that we have to be more business-friendly in the U.S. for at least those two assets or we are not going to bring those fab plants back here?

Mr. NEUFFER. So, I agree that we need to be more business-friendly, and this is something that we've talked about a lot.

Mr. ISSA. Okay. Well, this administration is ——

Mr. NEUFFER. And ——

Mr. ISSA.—accomplishing that part, but could you just answer the short one? Isn't it true that your members are, as a result of the current situation with China, actively looking and moving if possible assets that they have been producing a China to at least have a second source outside of China?

Mr. NEUFFER. I'm not going to second-guess what's happening in the boardrooms ——

Mr. ISSA. Okay. Then if you are not ——

Mr. NEUFFER.—of my members, but my answer is ——

Mr. ISSA. But wait. No, I was talking about action. I just came back from Beijing.

Mr. NEUFFER. My answer is ——

Mr. ISSA. I was there for four days ——

Mr. NEUFFER. My answer is ——

Mr. ISSA.—and yes, they are.

Mr. NEUFFER. I don't think so.

Mr. ISSA. Okay. Well ——

Mr. NEUFFER. Yes.

Mr. ISSA.—unfortunately, your counterparts in China made it very clear to me that that is what is happening on the ground.

You know, I am hearing that systematic tariffs don't work. I am going to ask a question. And I will go over to the other end and ask this question. You said in your opening comments or remarks that Google should go into China. I will paraphrase Ronald Reagan's quote when he was talking about people who gave him money, somebody questioned whether the contribution that Ronald Reagan got from some group tainted him. And he said people who give me money, I don't sign onto their values, they sign onto mine. Isn't it true that if Google goes into China, complies with Chinese regulations, effectively, they become a Chinese company? So is there really a net gain if you have to play by Chinese rules?

And I will just give you the example. If I go into Africa and I ignore the Foreign Corruption Practices Act, don't I become an African company and essentially lose my U.S. identity?

Mr. ATKINSON. So, to be clear, what I intended to say if I didn't say it was I think we should support or not criticize Google if they want to go into China. If they want to go into China for ——

Mr. ISSA. But you said they should comply with—Ms. Cook—he said ——

Mr. ATKINSON. Yes.

Mr. ISSA.—specifically they should comply with the Chinese rules. In other words, they should change to fit an unfair trade partner. Ms. Cook, you seem to have a comment on that.

Ms. COOK. I think in those ——

Mr. ISSA. Or Ms. Code, I am sorry. I am ——

Ms. COOK. Oh, sorry.

Mr. ISSA. Or Cook. No, it is.

Ms. COOK. Cook, yes.

Mr. ISSA. You can tell my glasses need to be put on.

Ms. COOK. I think the question that—the issue Mr. Atkinson raised related to market share—and I think it—we're cheating—we're deceiving ourselves if we think that the Chinese Government, with its indigenous innovation policies, promoting global giants like Baidu is really going to let Google get any kind of serious ——

Mr. ISSA. Well, and let me ——

Ms. COOK.—market share ——

Mr. ISSA.—ask a closing question ——

Ms. COOK.—so you're compromising your values. Sorry.

Mr. ISSA. The Chinese premier at the World Economic Forum made a speech that any Republican would be proud of, talking about lowering the burden, tax cuts, and so on, but he also said that, in fact, his tax cuts were going to have to replace subsidizing, that he could not subsidize his economy back into working. Does

anyone here really believe that they are going to stop the subsidies that are absolutely pushed toward their indigenous companies and even away from our companies if they are operating in China? Hopefully, this is an easy one, Mr. Atkinson.

Mr. ATKINSON. Their subsidies, I would argue, are WTO illegal, many of them. And if we brought a case ——

Mr. ISSA. We do have cases in the WTO and have for some time, along with the Europeans ——

Mr. ATKINSON. Not on—excuse me. Not on overall catalog subsidy disclosures. Under the WTO session agreement, they were supposed to do that every six months. They haven't done it.

Mr. ISSA. Okay. The chairman is going to take back the time because he should. I'm going to close just by saying that what I like about the WTO process is that it gives plenty of time for people to think about it because it is slow as can be. Thank you.

Mr. HURD. Thank you, Darrell.

I would now like to recognize Ms. Kelly for her first round of questions.

Ms. KELLY. Thank you, Mr. Chair.

Mr. Atkinson, your organization released a report in March 2018 on the impact of tariffs on United States economy. In your report you wrote ITIF estimates that a 10-percent tariff levied on Chinese information and communication technology imports would slow the growth of U.S. output by $163 billion over the next 10 years, and a 25 percent tariff would slow output by $332 billion. You argue that, and I quote, "Applying tariffs would needlessly harm the U.S. economy." And then just last week the administration imposed tariffs on $280 billion of Chinese imports. How will last week's tariffs affect the U.S. economy?

Mr. ATKINSON. The—we haven't done a thorough analysis of all the tariff lines in that $250 billion, but clearly—I think it's important to differentiate between what are called producer goods and consumer goods. So if you put a tariff on shoes, let's say, the impact is someone has to pay more for shoes. If you put an impact on a machine or a piece of software or a device that a company or an organization uses or the Federal Government uses to become more innovative and more productive, we're going to slow down innovation and productivity. So there are a number of—there are a number of products in that new regime of the $250 billion that would do that, and the result would be slower productivity and innovation in the U.S. because of that.

Ms. KELLY. Okay. And then you said that you weren't going to say—I am paraphrasing quotes—are good or bad but if used, they just need to be used strategically. And I am just back to the WTO. I have steel industry in my community, and they go to the WTO often to settle dumping or low prices and things like that. And I don't know; it seems like, in listening to them, I don't know. Maybe it is effective, but as someone said, it is so slow. But they are extremely frustrated. And what do you think in this field how, you know—do you think it would really be effective and efficient or—I don't get that impression from some of my steel people.

Mr. ATKINSON. Sure. This is why I argue we need to treat China differently with regard to trade policy. So must other countries we have a process-oriented trade policy. If they violate something,

there's a judicial process called the WTO. There's negotiations. We go through that. Yes, it's a little bit slow. It generally works, and it deals with the fact that many countries, including the U.S., have some protection. There's policies for other reasons.

China's different, and that's why really fundamentally I don't buy the notion that the WTO alone could solve this problem. I use that as one example of something we should do, but it's got to be part of a much broader arsenal if you will because the Chinese know how to play—they know how to play the WTO to their advantage. One of the key advantages they have is they don't have written rules and laws. So to go to the WTO and win, we point to a law in Argentina that says X, and we can win that case, but there's no law in China on tech transfers, and therefore, they deny it. It doesn't mean it doesn't happen. It happens through administrative guidance and forcing in a meeting that you had to do this, so harder to prosecute those in the WTO.

Ms. KELLY. Okay. So we need a lot of tools in the toolbox.

Mr. Neuffer, when President Trump announced tariffs last month, he included the semiconductors from China as one of the products, and you stated at that time, and I quote, that the semiconductors imported, like you said today, from China were hurting American chipmakers, not China's, and will do nothing to stop China's problematic and discriminatory trade practices. How do tariffs on imports from China hurt American chipmakers?

Mr. NEUFFER. Thanks for that question. I just want to set the record straight from a question from Representative Issa.

Ms. KELLY. Yes.

Mr. NEUFFER. I just want to underscore that 50 percent of our production is still here in the U.S., and while most of the manufacturing in the U.S. started in California over the years, it's spread out through the country, like I said, in 19 States. Intel, for example has massive fabs in Oregon and Arizona ——

Mr. HURD. And Texas.

Mr. NEUFFER.—and New York and in Texas, exactly. So it was just a natural maturing of the industry.

And I also want to state for the record that if you look at American companies' global fab production are—quite a small portion of that is done in China. Most of it is done in the U.S. and other parts of the world.

As for your question—thank you. The reality is the tariffs on semiconductors only hit U.S. semiconductor makers and makers of our allies like Japan, Taiwan, and Korea. The semiconductors—most of our semiconductors we make that go to China, they go there for some backend low-value assembly test and packaging. Basically, you take these wafers, you chop them up, you test them, you put them in these little things with leads. That's low-value stuff that adds about 10 percent of the value.

Some of those chips come back here. Some of them go to other parts of the world. It's the ones come back here that get hit with the tariff. Chinese semiconductor manufacturers sell almost all of their chips in China and none or almost no chips to the U.S. So while we applaud the administration's effort to try to shut down the forced tech transfer and shutdown the illegal theft of IP that we're having with China, this is just a very blunt tool, and the

semiconductor industry has gotten caught in the dragnet. And it's us getting hurt by this, and there's—it's not building leverage on the Chinese to potentially draw them to the negotiating table to get other outcomes.

Ms. KELLY. Are they aware of this, that it hurts? It doesn't help ——

Mr. NEUFFER. The administration ——

Ms. KELLY.—in your particular ——

Mr. NEUFFER. I believe so.

Ms. KELLY. Okay. One common stipulation for American companies doing business in China, as has been talked about, is forcing them to engage in joint ventures or technology sharing. What are the dangers of a Chinese company with connections to the Communist Party appropriating American technology through joint ventures or other business deals? And is there real concern that American technology could be reverse engineered for military use?

Mr. NEUFFER. Yes, so these are all real concerns for sure. Joint ventures, we do them all over the world. We do them here and we do them in China. And the thing to keep in mind is, you know, we have regimes in place through export control that ensure that sensitive technologies do not seep out into regimes like China. And our companies are very careful about adhering to those export control regimes.

The other piece of this is IP has been the lifeblood. Intellectual property, process technology has been the lifeblood of the semiconductor industry. The leaders of these companies are obsessive with trying to ensure that IP stays in their companies because if it ends up outside of their companies, their business disappears. Thank you.

Ms. KELLY. We all agree China must be held accountable for IP theft and other unfair trade practices, but it is very concerning that this trade war is escalating and causing real harm to Americans. Can the members of the panel describe what the effects of full-blown trade war would be for the technology industry in the United States? And whoever wants to start is fine.

Mr. ATKINSON. Sure. So I think there's only two things that can happen out of this. One is eventually the Chinese will give. They'll cry uncle and they'll come to the negotiating table. I am still—I don't want to say I am optimistic but I'm open-minded to that. I really think that's a possibility, so we don't know what's going to happen.

The other possibility is they just dig their heels in and they say forget it, we're never going to do this. And then the question for the U.S. becomes do we really want to have a really bifurcated global trading system almost going back to the Cold War era where you had a communist block that traded with itself and a non-communist block. And I think the cost of that would be quite significant for the U.S. It would be in two kinds of costs. One would be transition costs, so companies would have to move their facilities out of China. And we should be realistic; the vast majority of them are not coming to the U.S. They went there for a reason, oftentimes cost, so they would go to places like Vietnam or, as Mr. Issa said, the Philippines or maybe India or places like that. So I don't think we're getting—it's not like we're going to get much back.

The other thing would be companies are there for a reason, and so if they have to go somewhere else, the costs will go up, and that would end up, again, hurting our ability to be global leaders because some of those products we sell in third markets. And so there's very good research on this that shows that when U.S. technology companies sell overseas, even when they don't produce that, a lot of those benefits come back to the United States in the form of high-wage jobs of designers, of R&D folks, of marketing, of sales, and all of that. So we depend a lot in our economy on jobs that—where the manufacturing isn't here, and so if we lose some of that because we have to have higher prices over, let's say, the Japanese or the Germans or something, it could hurt U.S. jobs.

Ms. KELLY. Thank you.

Ms. COOK. Tariffs are a little bit outside of my usual area of expertise, but I think I would just mention that, you know, if we're looking at the cost of the Chinese Government's internet censorship, especially the Great Firewall imposes on the Chinese—on U.S. companies, they already actually—it's a huge act of protectionism essentially that costs billions and billions of dollars. I mean, the reason companies like Google consider sacrificing their values is because they think they're going to be able to get access to 800 million internet users. That's more—almost triple the population of the entire United States.

So I think, you know, again, not trade wars and tariffs are necessarily the answer, but I think it is worth keeping in mind that the starting point right now in this sector of online services is that the Chinese Government has imposed an enormous and very costly restriction that has huge economic implications, not just human rights implications, on U.S. companies.

So I think anything the U.S. could do—again, I'm not sure tariffs are necessarily the answer to counter that—is a good—including, you know, funding the scaling up of circumvention tools to allow more Chinese people to access the services without having to get the approval of the Chinese Communist Party gives leverage in other areas of negotiation as well and is—would—could be a very important investment of taxpayer money ——

Ms. KELLY. Thank you.

Ms. COOK.—so a little bit of a different perspective.

Mr. CHENG. Like Ms. Cook, I am not a trade specialist, so—but I would suggest that there are several questions that need to be answered in order to address the Representative's question. For example, I think that when it turned out that banning sales of all U.S. inputs to ZTE would effectively kill that company, that came almost certainly as a surprise to Chinese decision-makers, probably to even some American decision-makers. It highlights the lack of clarity regarding actual vulnerabilities in Chinese companies.

Now, let me emphasize this is not an argument for tariffs whatsoever. What it is an argument for is a desperate need for us to better understand how supply chains work in both directions. What are actual Chinese vulnerabilities whether in the IT realm or perhaps in the petrochemical realm, in land reclamation, which has applications for the South China Sea? Because it may well be that there are more Chinese vulnerabilities in less-identified key subsectors than is generally widely recognized.

The other question that remains also unclear is the Made in China 2025 program, which is to say what happens if China actually succeeds? We are here concerned about the potential impact of American tariffs on the global trade system, and that's a very reasonable question. But do we think that if China succeeds in in truly becoming self-sufficient in key IT areas, that China will all of a sudden then say but we support a global trading system, or will they now be insulated like their information ecology and environment behind in an industrial equivalent of a Great Firewall to basically say now that we're safe, bye. Thank you very much.

Ms. KELLY. Thank you.

Mr. NEUFFER. Can I take a shot at that ——

Ms. KELLY. Sure.

Mr. NEUFFER.—that question? Thank you. So just, again, for us, tariffs on us is puzzling because Chinese company enterprise don't send semiconductors to the U.S., so there's no leverage built. The other thing I'd like to say is 80 percent of our sales are overseas, China and other markets. Our customers are overseas, like most American companies, multinational companies, so anything that depresses trade is a risk for us financially, commercially.

We do hope that these tariffs draw the Chinese to the negotiating table so we can get some beneficial outcomes, but until we get to that point, we are all at risk of hurting our economies. And after that, we hope—if they come to the negotiating table, they get strong outcomes, you know, all great, but if they don't come to the negotiating table and we don't get strong outcomes, where do we go from here? So a lot of questions about this.

One thing we have been looking at in particular is what these tariffs do to IT spend, so tech products become more expensive, so IT spend becomes more expensive. And if IT spend is depressed, given that tech products—what you call them, Rob? Super technology ——

Mr. ATKINSON. Super capital.

Mr. NEUFFER. Super capital. Tech products are super capital that drive growth throughout the entire economy. If the IT spend starts dropping, that has an exponential multiplier effect throughout the entire economy, and this is something we're worried about. Thank you.

Ms. KELLY. Thank you. And I am done.

Mr. HURD. I just finished 38 town halls in five days, and I am in Cotulla, Texas, which is part of south Texas. Most people know Cotulla as part of the energy boom. And the first question I got was actually on China. And a young woman asked me—and I know this question is slightly outside of our talk today. I know we are talking about IT, but I promised this constituent that I was going to be with a bunch of smart people and I would ask this question. How did China become the manufacture of millions of drugs that Americans take every day, right? And did they use predatory practices similar to those that we are seeing in the IT space? I would just welcome does anybody have a quick answer to that? Mr. Cheng, go ahead.

Mr. CHENG. I am even less of a drug person than I am a ——

Mr. HURD. Tariff person?

Mr. CHENG. Yes, sir. But my understanding—and this is without the benefit of having stayed at a Holiday Inn Express—is that China does produce a great deal of fentanyl. Fentanyl is a key component for opioids. Whether that was predatory or not is much less clear. My very, very limited understanding is that, as with these other technology areas, that it's a complex mix of domestic demand due to everything from changing views of what should be prescribed under what circumstances, legal coverage, all those things, to, you know, the Chinese taking advantage of a market that appeared without necessarily indulging in predatory practices.

Mr. HURD. Good copy. Ms. Cook, do you have any opinions?

Well, the constituent of the 23rd thanks you for that question, Mr. Cheng.

Project Maven, DOD contract to work with commercial companies to do artificial intelligence along moving video, recently, Google made a fairly large statement about not participating in this project because, ultimately, the information that they were going to potentially identify could lead to a terrorist being identified and eventually the U.S. Government doing with terrorists what we generally do, kinetic strike. The area that I haven't seen enough conversation on—now, you juxtapose that with Google's potential decision of getting involved in a search engine in China that violates, you know, freedom of expression, right, another value issue.

The beneficiary of both of those decisions is China. You have an important American company involved on the pointy end of the spear when it comes to artificial intelligence breaking from Department of Defense, which arguably has the most data available to train algorithms. That is a strategic win for the Chinese. Have we seen—and we know that Chinese spy agencies do everything from stealing information and trying to influence.

So my question is are we concerned or have we experienced or have we, you know, seen what I would call Chinese active measures when we talk about active measures using disinformation, influence operations? We talk a lot about how the Russians are doing this; why shouldn't China do this in our elections? But we don't talk enough about Chinese use of active measures when it comes to achieving a strategic goal like separate—driving a wedge between American companies and the U.S. Government. Opinions, thoughts, suggestions? I open it up.

Mr. Atkinson, would you like to start us off?

Mr. ATKINSON. Yes, just a couple things to clarify. I actually believe that it is not in the Chinese interest to have Google come in. They're going to do whatever they want to do with information, blocking—doesn't make any difference whether there's a foreign company there or not, so I think that's in our interest, as I said before.

There's a new book by a colleague of mine Darren Tromblay, who is now at GW who used to be in the FBI for many, many years in commercial counterintelligence. And this book is a—it just came out maybe four months ago, and it's a very good history of how foreign governments have used active measures against us, Russia, and China. And in that book there are many, many, many examples of how China is doing that. I can't say whether they've been

doing that in the Google case that you alluded to with Project Maven, but they do that. And they use, you know, active measures, passive—and they use all sorts of measures to try to get our—to influence us and our companies to make decisions that aren't in our interest.

Mr. HURD. Ms. Cook, any opinion?

Ms. COOK. I'm not privy to I think the kind of information that would address whether that happened in the Google case, but to echo Mr. Atkinson's comment, in general, the Chinese Communist Party uses a variety of measures to influence the United States, through media, through pressures to create censorship here in the United States, through various ways of recruitment and gaining access to information.

And I think I would just comment that if you flip it on its head and you look at the area of artificial intelligence, it's one of the areas where Chinese companies are emerging at the forefront using very questionably ethical methods. A lot of the AI Chinese companies are heavily invested and have lots of government contracts in Xinjiang that's being—and their information is essentially being used to catch Muslims to send them to reeducation camps.

They're able to use the massive amount of data they have access to to gain a more competitive edge internationally as well in the sense of both issues related to racial bias and artificial intelligence. They now have a contract with the Zimbabwean Government that will actually turn Zimbabwean citizens' data over to a Chinese company that will allow them to further improve their algorithms so they have access to Uighurs who ethnically look, say, Middle Eastern or central Asian, Chinese who look East Asian, and now Africans who—South sub-Saharan Africans that gives really potentially a competitive edge in an industry. They're anticipated to take a 44-percent market share by 2023.

One point is that one of those companies, a major investor is actually U.S. chipmaker QUALCOMM. So you have a situation where U.S. investors in general tend to reward problematic behavior like that because it can be very profitable but also where you have U.S. companies, potentially rather than investing in U.S. artificial intelligence firms to gain a competitive edge, are investing in a Chinese firm with very questionable, you know, practices.

So I think some of the recommendations related to developing a comprehensive artificial intelligence strategy, as well as something like the Global Online Freedom Act that would hold companies to certain ethical standards, could be a way of pushing back both against other restrictions but also potentially, you know, suspicions and other ways in which the Chinese Government tries to gain influence in the U.S. tech environment.

Mr. HURD. And then, Ms. Cook, I would agree with you that we do need a national artificial intelligence strategy. Robin and I and our teams just put out a report this week highlighting, you know, some of the things that we have learned in our various hearings on artificial intelligence. I think you and I have done half of the hearings in Congress on artificial intelligence, and I believe that is important, as well as the need for a national strategy on quantum. I would say artificial intelligence right now is dumb, but the way it is going to get smart is once we achieve quantum. And I think

these two things are connected, even though the science behind both are very different. So I agree.

And this is why we do these things. The suggestion of the Global Online Freedom Act, hearing about this, getting this feedback on other initiatives that are out there is something that we are able to continue to sink our teeth and to go.

And, Mr. Cheng, the previous question on, you know, Chinese active— and I would even welcome the comments on—are U.S. companies prepared to defend against state-sponsored actors? I think I know the answer, having been in the private sector to help some companies do this, but are we seeing a recognition of all these, you know, issues that— and Mr. Atkinson eluded to and probably that are mentioned in this book that was quoted. Mr. Cheng?

Mr. CHENG. Sure. Three issues: one, the broader issue of Chinese influence operations ties into the Chinese view of political warfare. This is part of their doctrine. This is part of the specific missions assigned to the Chinese military. It includes a—so-called three warfares, public opinion warfare, which is a constant ongoing activity which is going on right now. It is not necessarily tied to a specific armed conflict, psychological warfare and legal warfare, manipulating both Chinese and foreign laws, regulations, treaties in order to achieve given political ends.

One can imagine in the context of both public opinion and psychological warfare that the Chinese may well be inquiring of any foreign company, do you really think we will allow you into our markets if you are participating in a potential adversary's defense contracts? Whether or not that has occurred is not open to public, you know, open-source information. I would obviously defer to those who have access to far better data on that. But I simply throw out there the Chinese doctrine, which is publicly available, talks about the importance of employing the three warfares constantly against all potential adversaries.

With the—on the issue of Google in China, I'm afraid I need to disagree with my fellow panelists. In the first place, the presence of Google in China would be a de facto endorsement of the Chinese information environment, that a company that specifically left after Chinese attack would then reenter would be spun in the context, again, of that public opinion warfare as proof of one of two things: Either China's market is so important that you will put up with almost anything we do to you; or two, that China's environment has improved to the point where you would voluntarily come back.

As for the issue of market share, the Chinese in other areas have been very, very clear. There is a market share that they will allow you, and if you should pass that, then in that case, per Darth Vader in Empire Strikes Back, "I am changing the terms of the deal. Pray I do not change them further."

And the way the Chinese go about this in terms of the issue of defending against attack too often takes pathways that we are—some take pathways that we are familiar with, direct cyber intrusion, et cetera, but particularly in the context of joint ventures and the things, they often involve, for example, staffing the H.R. department. If I decide who the joint venture hires, then in that case that creates a very different set of potential vulnerabilities.

The other aspect here is whether or not companies themselves recognize—I think IT companies, ICT companies, semiconductor companies may well be aware of the vulnerabilities that are entailed. Banking companies are very much aware of the need to protect information. But it's the midsize company that feels it has to go into China that often has a small IT department to begin with that is far more likely to therefore say, well, but we do mid-level chemicals, we do paints, we do agricultural seedlings. Why would the Chinese attack us? I mean, obviously, you know, if we are a major defense contractor, of course they'll go after them, but why would they go after the makers of new headlamps? That—the Chinese have this voracious maw for all types of IPs, sometimes not recognized within the broader American corporate ——

Mr. HURD. Mr. Cheng, you have mentioned earlier about trying to understand real actual vulnerabilities of Chinese companies, and you used the ZTE example. And I agree with you. I think we should have gone forward and not allowed the U.S. components to be used in ZTE, and that would have sent a clear message to the Chinese that we are being serious. Do you have any examples—I know you said one of the things we need to do is actually understand that, and I am going to take that back to some of my friends to help ensure that we have a better understanding. But do you know of and can you ID a couple of current vulnerabilities in some of these Chinese companies that may be some items that this committee can take up or even other legislators take on and move with?

Mr. CHENG. I don't know if this is within the purview of this committee, but let me give a different example. CCCC Dredging, CCCC is a Chinese state-owned enterprise. The Chinese, as they're doing South China Sea land reclamation, which of course has also been in the news, as they're building these new islands, it is not the Chinese military that's going out there, it's not the Chinese Ministry of Interior. They go to their own state-owned enterprises and say you, go and dredge up all the coral—it doesn't matter what the environmental impact is, dredge up thousands of tons of coral and build this new island. Many of those companies are using specialized dredging equipment that has not been manufactured in China, so therefore, they are going to European, American, foreign companies buying specialized equipment, dredger hoppers, equipment like that to basically destroy the environment of the South China Sea and build strategically important islands.

Operating in a maritime environment, as any maritime engineer will tell you—also, I should note here I am not one of those either—is a very harsh environment. Things break. That means spare parts have to be purchased from abroad, which means CCCC Dredging is basically employing imported equipment to alter the situation in the South China Sea. Why we would allow that to continue given the strategic importance of that region is problematic in my opinion.

A third area is basically speaking—and this goes directly to monetary issues—why do the Chinese list on foreign stock exchanges? They list on foreign stock exchanges for two reasons: one, obviously access to capital; but two, because it is a de facto, again, endorsement of the company. The Chinese play up the idea that if they are

allowed to list on the New York Stock Exchange, then they have fulfilled U.S. SEC requirements. The bizarre part is that sometimes these companies are partly state-owned enterprises, which have an opacity to them. But again, they are nonetheless at times allowed to list on our stock exchanges.

Mr. HURD. Mr. Neuffer, we are going to get back to in round two, but I'm going to defer now and recognize Robin Kelly for a second round of questions.

Ms. KELLY. Thank you. Something that has always been a concern to me—and part of it is when I go back to my district and I visit my companies. They always talk about the lack of a qualified workforce. And can you guys talk about this in that arena, that because of immigration or because of lack of investment in education or training and those kind of things, how—I know we feel it now, but it seems like we are going to feel it even more in the future. I don't mean to look at you but you ——

Mr. NEUFFER. Can I start? Thank you.

Ms. KELLY. Yes.

Mr. NEUFFER. So a couple of things. First of all, electrical engineers drive the semiconductor industry. These are the guys—electrical and chemical engineers, these are the guys who make semiconductors. A lot of these young kids coming into this profession like to go off and make the coolest app and work for big internet companies, so there's a bit of a problem there. But a bigger problem is that we don't—our government does not have big enough emphasis on promoting STEM education and our immigration policy is broken so that we can't get the numbers of STEM employees from overseas that we need.

And if you go to any semiconductor company, there are dozens if not hundreds of job openings for STEM applicants. So there needs to be a remedy. These are huge, systemic problems and riven with controversy, but until we get to the bottom of this, our industry, the semiconductor industry is at risk because you've got to have the talent to build these incredibly innovative semiconductors and stay at the tip of the technology spear. Thank you. Yes.

Ms. KELLY. I am on the board of trustees of the college I graduated from, and then I am on an advisory from the other college I graduated from, and it is amazing. When I was at the graduation for one of the colleges, the lack of international students in engineering. I mean, it was unbelievable the change in both colleges. We talked about how they just haven't been getting the applications.

Mr. NEUFFER. Interesting.

Mr. CHENG. When it comes to foreign students, one source that you probably do not have a shortage of is Chinese. China represents probably one-third of the current foreign student population of the United States, many of which are in STEM. The problem is that many of these students, the question becomes what is that they are coming here to study? They are studying STEM obviously, but are they staying ——

Ms. KELLY. Right.

Mr. CHENG.—or are they here particularly focused on programs which will have dual use and military benefit and then going home?

We have seen a generational shift within the context of Chinese students. In the past, many of them tended to stay here. This is also true abroad, that is to say in Europe and elsewhere, but more and more of those students seem to be going home. Whether that's due to economic opportunities at home or due to pressure is much less clear.

I certainly would not disagree that this country needs more engineers and more STEM students in general, but I would highlight that simply because you are getting an education in the STEM field does not any longer mean that you are in fact getting STEM education. There are professors who apparently are teaching math courses whose focus is on the fundamental underlying racism and sexism of math. Now, how that will help produce better electrical and aerospace engineers is beyond me, but I do think that if we are going to focus on STEM, that we need to be focused on actually producing people who can produce 5 nanometer circuit wafers, who can produce better rocket engines for Blue Origin or ULA, who can produce, you know, better systems engineering and quantum computing and not necessarily engaged in whether or not, you know, a focus on math is somehow giving way to some of our worst historical habits.

Ms. KELLY. Thank you.

Mr. ATKINSON. Thank you. I just also would be remiss if I didn't use this opportunity to thank you both for this excellent report that you both released I guess yesterday on AI. We at ITIF really applaud it and think it's exactly in the right direction, so thank you.

Ms. KELLY. Thank you.

Mr. ATKINSON. I just want to quickly come back to the prior comment from Congressman Hurd. I think one of the challenges with this—and I—one of the challenges with this issue is we—our—I don't want to say complete but pretty serious lack of knowledge in the U.S. Government, we don't know the answer to your question, and we should know that. And it's partly because we simply don't have an institutional home for that level of global supply chain analysis, and I think we have to have that.

Congresswoman, with regard to your question, I actually think this is a much easier solution than people think. It tends to be framed as how do we convince a bunch of fourth-graders to somehow like STEM. We've done a lot of research on this. We've come up with a fairly comprehensive strategy. There are lots of kids who like it. We don't give them enough of the right opportunities.

So one of the things that we've proposed and supported, more specialty math in high schools, particularly in disadvantaged communities. They play an incredibly effective role in getting kids who might not otherwise be into that. They go to college—a good example of that is the San Antonio Math and Science High School—sorry, the Dallas Math and Science High School, 90 to 95 percent Hispanic and black students, almost 100—in fact, I think their rate of getting AP exams—5s on the AP exams exceeds most high schools in the country right now.

Secondly, at college level, we know that one of the big problems is colleges could take more and have more students go through that, but they intentionally limit the slots in commuter science and engineering. They force people to leave the discipline who want to

stay and are good students, and that's a budget issue and an incentive issue. And I think the Federal Government can provide more incentives to get universities to focus on—University of Washington, a good example, the C.S. department head I talked to, I asked him how many slots they could add without reducing ability— without quality? He said we could double the number of Washington State students in our C.S. department, but we aren't given the budget to do it.

Ms. KELLY. We actually started a STEM academy in my district just with my office exposing sixth, seventh, and eighth graders to different things that they could do with a STEM career, but of course it is hard to keep up because we are just a little office, but I know we piqued the interest and just trying to give opportunity and broaden their horizons, so thank you. Thank you.

Mr. HURD. Picking up on the issue of education, roughly 40 percent of the people that are actually in STEM education, in master's and Ph.D. programs in the United States, are Chinese. And so my question is the United States has benefited from the brain drain of every other country for the last couple decades. Let's continue that. When you are at 3.8 percent unemployment, that means every industry needs people, whether it is agriculture or artificial intelligence.

When you are at multiple quarters of 4 percent growth, of rising wages, you know, rising average income, the thing that can stall the economy is not having the proper workforce to take advantage of these opportunities. Two ways to do that, grow our own, we have talked about that, something that we have got to continue to do, but it is also through immigration. And you have people that are coming here and getting Ph.D.'s, master's, and they are having difficulty in getting the right visa in order to stay here and continue to work for U.S. companies.

And so my question is, is the opportunity of having a smart person from somewhere else stay here and start a company here and be involved here, does that outweigh potential counterintelligence concerns about this being something directed by the Chinese Government? Who would like to start that out? Mr. Atkinson, let's go ahead and go with you.

Mr. ATKINSON. I don't think we know the answer to that honestly. You're right on both sides of that. The Chinese students who come here, get a STEM graduate degree, and then stay are of value to the U.S. economy and to our innovation system.

I think one thing we could do and should do more is I think our universities tend to have a blind eye towards threats. There's a famous case at Duke University where they—Chinese students came, enrolled in the Ph.D. program, and essentially took the cloaking—this was Defense Department—the cloaking technology, they took it. And this was a few years ago, and so the—Duke wasn't aware of it and they hadn't thought about it. We need to make sure—through the FBI counterintelligence efforts, we need to make sure that every university has procedures and processes in place to at least limit that so they're aware of it.

Mr. HURD. So going on that, Mr. Atkinson, I am going to ask a broader question. Look, when you look at the amount of venture capital that has been deployed in Chinese companies, the amount

of Chinese capital being deployed in let's call it broader Silicon Valley, do those companies recognize the national security threat of the investments that is coming from potential Chinese investors?

Mr. ATKINSON. No.

Mr. HURD. There it is.

Mr. ATKINSON. The lion's share have no concern or interest. They—you know, they just want the money.

Mr. HURD. Ms. Cook? I know there are two questions there ——

Ms. COOK. Yes, I ——

Mr. HURD.—answer them both, one, either.

Ms. COOK. I would just go back to Mr. Cheng's previous point about the way the Chinese Government looks at foreign political influence. It doesn't always necessarily separate the kind of military counterintelligence or things that we would look at as being more aggressive with softer forms of influence. And I think from that perspective a lot of the Chinese students here are victims themselves in many ways of pressures, of consular officials sitting in on meetings of the Chinese student associations at U.S. universities. If you look especially at the ——

Mr. HURD. You are saying Chinese ——

Ms. COOK. Consular officials well ——

Mr. HURD.—officials in the United States at a U.S. student group ——

Ms. COOK. At a meeting, so—yes, for ——

Mr. HURD.—with Chinese students at a U.S. university?

Ms. COOK. Yes. So it ——

Mr. HURD. Okay.

Ms. COOK.—might not be the full meeting. It might be just—certainly—well, one specific anecdote that I heard from a Chinese student, this was a number of years ago. This is getting a little more attention now related to elections within a university and one of the women who was trying to stand for election at this Chinese student's scholar associations happen to practice Falun Gong. And the consular officials basically went around the table of the specific officers or students and applied other pressures basically to pressure the students in that association not to elect her.

And other ways in which—there's been a series of articles and investigations recently, especially in foreign policy I think, about the way the diplomatic—the Chinese diplomats influence Chinese student associations in the United States. Some of it's with funding. Some of it is with actual like reporting requirements and things like that. And again, these students—this is not without force behind it. I mean, I think we have to—again, it's very tricky because a lot of times the students are themselves—they have family in China, and the Chinese Government is very adept at pressuring family to get people abroad to do things. And so I think that's a threat to the safety and well-being of the Chinese students in American universities that our American universities aren't dealing with.

But also it comes back to this bigger question of the way in which the Chinese diplomats and Chinese officials exert pressure on individuals here in the United States and potential actions that the U.S. Government could do because the same diplomats will also go and pressure an advertiser who they see advertising in the local

dissident Chinese newspaper in New York City or will go and threaten the—a journalist who has family back in China who's working for Radio Free Asia or things like that. And the U.S. Government has been—in some cases there's real evidence about this and there isn't a strong response. There isn't a demarche. There isn't—I mean, these are violations of diplomatic conventions.

So, I mean, I think that—again, this question of the way in which the Chinese embassies and consular officials are able to have communication, exert pressure on Chinese students ultimately can have very important counterintelligence ramifications because it's not necessarily that Chinese students are coming here ahead of time deciding to try to steal technologies. They can—the Chinese Government has the avenues and the power to put them and their families under tremendous pressure.

Mr. HURD. Sure.

Ms. COOK. So being able to find a way in the United States to actually enforce our laws and stop that type of behavior has both national security implications and student welfare implications for the Chinese students as well.

Mr. HURD. Ms. Cook, you and many of your panelists have commented on something that I have seen. The U.S. intelligence community views intelligence differently than the Chinese view intelligence. And I would say using our vernacular, the intelligence bar for China is significantly lower than what it is for us, and therefore, even though the Chinese believe they are involved in intelligence operations, people on the U.S. I do not believe it is intelligence operations because that is not how we see or view that. And that is a disconnect from being able to have the information and collection on some of these behaviors of Chinese diplomats in our country, and so highlighting this is important.

Mr. Cheng?

Mr. CHENG. So, several points, sir. With regards to the very different view of what intelligence constitutes, we have interesting examples of ship visits to China where a series of fourth-graders each went up to American sailors and asked interesting questions, not like what's it like to be an American sailor, but what is the sonar frequency of your dipping sonar, a fourth grader, who would then promptly go back to the schoolteacher who led them and say, oh, the sailor said it was this. And after about four questions along these lines, the American sailors are finally told you should stop answering their questions, that these are not just innocent questions from fourth-graders.

I do want to emphasize here that there is a danger of course in viewing every Chinese student as a potential agent ——

Mr. HURD. Sure.

Mr. CHENG.—that we do not want to go to a point where we are simply concluding based on ethnicity or ——

Mr. HURD. Sure.

Mr. CHENG.—national origin that people are ——

Mr. HURD. And thank you for making that point, and I would add—and correct me if I am wrong—not all Chinese investment is necessarily a, you know, indication that this is going to lead to some draconian issue in the motherland.

Mr. CHENG. No, I would agree with that as well because there is absolutely a profit motive also at work. Chinese entrepreneurs, like entrepreneurs everywhere, want to make money, want return on investment. That being said, of course, the government is more than happy nonetheless—and it has a vast array of tools—to pressure students, entrepreneurs, venture capitalists to pony up information, whether it's on projects that a professor—you know, an advisor's working on or whether it's new technologies that you're investing in.

This goes to a broader CFIUS-related issue. CFIUS of course is vital, but CFIUS is a gatekeeper. It is our guard at the perimeter. And the problem, whether it's Confucius Institutes, whether it is students working for professors on advanced projects at universities, whether it is venture capital in Silicon Valley, the Route 128 corridor in Massachusetts, or outside Austin, all has the same issue, which is if you've made it past that, there is much less internal policing if you will. It's not that CFIUS is bad or is not enough—it's that CFIUS is not enough but it—we should not be adding to CFIUS' burden. We probably need a new approach to thinking about what happens ——

Mr. HURD. So do you think FIRRMA was adding more burden to CFIUS or was that a move in the right direction? This is the legislation we recently passed in order to give CFIUS deals over transfer of critical technology—of potential investments in critical technology.

Mr. CHENG. I think the idea behind it is vital and essential, sir. I have to admit that I'm not sure whether or not making CFIUS the party responsible is the best approach, not without expanding its staffing ——

Mr. HURD. Sure.

Mr. CHENG.—and purview, but that—you—I think that that effort identified a key shortcoming, not in CFIUS per se but in our broader technology defense if you will.

The last aspect here is simply to note that the issue of active interference within universities, we have seen this by Confucius Institutes, we've seen this by Chinese agents. You know, the previous administration admonished the Chinese about the improper activity of various officials. That was at best tepid but it was at least a first step. We do need, in terms of reciprocity, making very clear to the Chinese that their actions will have serious consequences, not just an admonishment, but whether it means PNG to officials, whether it means curtailing their activities and where they can travel, much like we have the—still imposed on Russian officials and counterparts.

But again, going to the broader information-related issues, not just IT, why is it that the Chinese can limit the presence of VOA and other reporters to one or two—to cover an entire country the size of the United States, but there can be a good dozen Xinhua bureaus with freedom of travel across the United States?

Mr. HURD. Mr. Neuffer, staff is getting uncomfortable, which always means we have been going on too long, so let me end. And this is a question for all of our panelists. You got one more?

Ms. KELLY. Just one.

Mr. HURD. I am going to yield to my friend, Ms. Kelly.

Ms. KELLY. It just takes a one-word answer from each of you. I know we are talking about China, but what country is behind China? With the concerns we have about China, what other country would you say we need to be concerned about? If there are two, that is fine, but ——

Mr. ATKINSON. India.

Mr. HURD. Ms. Cook?

Ms. COOK. I think still probably Russia for the issues that we're looking at, Russia and Iran.

Ms. KELLY. Okay.

Mr. CHENG. I'd agree with Ms. Cook, Russia and Iran.

Ms. KELLY. Okay.

Mr. NEUFFER. And I'll say Russia and India to mix it up.

Ms. KELLY. Okay. Thank you. I am just curious. Thank you.

Mr. HURD. So, Mr. Neuffer, and we will start with you and we will end. Mr. Atkinson, you can have the last word, so make it good. One statement on something else we can be doing other than tariffs, Mr. Cheng has given us several. Don't allow Chinese companies on the New York Stock Exchange. We have Ms. Cook's comments about reintroducing and passing the Global Online Freedom Act. What is something that I can turn to our teams and say, hey, can we get this done? What do we need to do to make this happen? That is what I am looking for, something short, something tight. All of our staffs' pencils are sharpened and ready. Mr. Neuffer?

Mr. NEUFFER. Excellent. One, as Rob said, it's not the only solution but we should be driving more of our problems into the WTO. It takes time, but we usually win in in that fora, and the Chinese respect and are desperate to keep the WTO alive these days.

Two, let's get more regional trade agreements. The TPP was very important for our industry. We were sad it didn't go forward, and it plays a very important role of setting a model for how China and others should behave in the trade arena.

Three, we need to be embracing our allies much more often and much more deeply, as Mr. Atkinson says.

I've been involved in a number of very contentious issues with China, and we worked with our allies very closely and were able to push China back.

Mr. HURD. Okay.

Mr. ATKINSON. China does not like to be isolated. And three, we have to have a very, very strong affirmative agenda, and that affirmative agenda for us needs to focus on peddling faster, and to pedal faster, we need this U.S. Government investing more heavily in basic research, in tech and our sector.

Mr. HURD. Good copy. Mr. Cheng, you are now—and you don't have to repeat the ones you have already said because I have gotten those down.

Mr. CHENG. Okay. On the issue of stolen technologies, we should be treating stolen technology like stolen technology, which is to say you are trafficking in stolen goods; we will therefore punish you for doing so. That opens the door then to RICO, to basically criminal conspiracies, which then places the onus on American subsidiaries and their executives to demonstrate that they are not engaging in the trafficking of stolen goods, which puts them then on our side. I want these people to be doing good business. There's nothing

wrong with competition. But if you are trafficking in stolen goods, then it's not just, you know, your company that will be punished. You're going to lose that nice house, the three cars, and the horse.

Mr. HURD. And we know a few people that are pretty good at handling RICO cases.

Mr. CHENG. Yes, sir. The other thing is just an area of importance, the Internet of Things. If you're worried about artificial intelligence, if you're worried about that that is a giant data swamp, and the IT security associated with IOT at this point is beyond primitive, I mean, pretty much nonexistent. We need to be thinking about setting standards. We need to be thinking about also limiting the amount of data flow from IOT, your coffeemaker, your refrigerator, back to China.

Mr. HURD. Great. Thank you. Ms. Cook?

Ms. COOK. I think we need to and I think we actually can punch quite a big hole in the Great Firewall. We work with circumvention-tool developers to get some of our content on censorship that we translate into Chinese to Chinese users, and we see—we get from the data millions of people every—in a week's span, and that's just one tool accessing it.

Another tool that's on actual mobile phones which are becoming more—which is the main way Chinese people work, also they get to a landing page and content related from Freedom House, content from Radio Free Asia, Voice of America, but also of course Google, Google ads, Facebook, those are the first places people go.

And the U.S. Government has invested tens of millions of dollars in internet freedom projects around the world, and if you look generally, you know, working on circumvention tools isn't necessarily the answer in every country because the tactics are different, and even in China it goes through waves, but right now, there is a real demand after VPNs have been taken off of Apple's iPhone store, the—I spoke to before this hearing a number of circumvention-tool developers who have received U.S. funding in the past but for various reasons it seemed to indicate a level of—a certain degree of mismanagement, to use their words. They're not being used as effectively.

There is emphasis in some cases on developing new tools as opposed to scaling up tools that are being effective and could be scaled up more widely, and so what we—that's why I would urge the committee—and I can connect the staffers to relevant people—to take a look, to speak to people at the BBG, people at the State Department specifically regarding the China portion because for other countries that don't have a firewall, you need other solutions.

But in China, I think there's a real question how this funding has been disbursed, whether it could be—should be increased but could be managed and get to people more effectively because if—you know, one of the developers was saying that these Chinese companies are spending billions of—like the amount of money per user on censoring people, if he had even the fraction of that, he can actually provide, again, access to so many more people.

And so think about what alternative future would be if you have innovation in that area. And one of the ideas he said was don't just have separate circumvention apps. Have circumventions programmed into existing apps. Then you've got Chinese users going

and visit—Google doesn't have to compromise its values because you've got a least a certain market share of Chinese users jumping the firewall. And again, this is—you know, I think there are reasons to believe why this could be possible from a technological perspective without an enormous expense necessarily on taxpayers. So that—I think that's what we would urge to really look at.

Mr. HURD. That's good copy and very helpful. Mr. Atkinson, you have the final word. Make it tight, make it good.

Mr. ATKINSON. I can make it tight; I don't know about the—making it good. We issued a report last year where we laid out a very comprehensive nontariff agenda. There's a whole lot of ideas in there. Let me address three quickly.

One, enact a regime where Chinese entities who seek technology licenses in the U.S. have to essentially get that license on the same terms that they force our companies to license in China, so reciprocity around technology licensing. I would just limit and end most U.S.-China S&T cooperation. I don't see any reason why we have any cooperative agreements with the Chinese when it comes to science and technology.

And third, I would build a—I would spend more money on customs enforcement. There's a lot of Chinese counterfeit goods that still get in this country, and that's a good way to make them suffer pain. They go to make—produce the product, they send it all the way over there, and then we burn it or throw it in the ocean, and that sends them a very clear message so ——

Mr. HURD. That was very good. Thank you.

And I want to thank all the witnesses for appearing before us today. The hearing record is going to remain open for two more weeks for any member to submit an opening statement or questions for the record.

And if there is no further business, without objection, the subcommittee stands adjourned.

[Whereupon, at 11:43 a.m., the subcommittee was adjourned.]

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