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China's Technological Rise: Challenges to U.S. Innovation and Security

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Good morning Chairman Yoho, Ranking Member Sherman, and members of the Committee; thank you for inviting me to share the views of the Information Technology and Innovation Foundation (ITIF) on the challenge from China to America's innovation and security. 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 been involved in the issue of U.S.-China trade policy, writing extensively about "innovation mercantilist" policies China uses to unfairly compete economically with the United States. I very much appreciate the opportunity to comment on these issues today.

The Challenge from Chinese Innovation Mercantilism

There is a growing understanding that China is an outlier when it comes to the global norms and rules governing trade, investment, and economic policy, and that the "innovation mercantilist" behavior on the part of the Chinese government represents a threat not only to the U.S. economy, and increasingly to its advanced-technology industries, but also to the global economy.

Previous U.S. administrations sought engagement and dialogue with Chinese leaders in the hope that this would lead the Chinese government to retreat from its mercantilist path. But rather than reform, China has doubled down on its unfair, mercantilist strategies and is now seeking global dominance in a wide array of advanced industries that are key to U.S. economic and national security interests. And it should be clear what the end game is: Chinese-owned companies in a wide array of advanced industries gaining significant global market share at the expense of American (and European and Japanese) firms' market share. If successful, the end game could be significantly less U.S. technological capabilities in a range of advanced industries from information technology (semiconductors all the way to devices), aerospace, instruments, life sciences, and software.

As such, unless U.S. policymakers want to accept such an outcome as beyond their control, it's time for a new approach to Chinese innovation mercantilism that moves beyond the push for continued dialogue, and instead makes it clear to Chinese leaders that such unfair, harmful policies cannot be practiced with impunity. Yet this fight cannot be about individual tactics, for the Chinese government has shown itself to be quite adept at abandoning certain tactics when they become discredited globally, only to adopt new ones in service of its overall mercantilist strategy. Any new China trade focus needs to be not just on tactical wins, but more broadly on rolling back the entire Chinese innovation mercantilist strategy and getting China to finally become a responsible player in the global trading system.

The Trump administration has now a key opportunity to press Chinese leaders for a fundamental economic policy reset that will move the world economy back toward the rule of law and market-based policies. However, to succeed, such a new policy will need to be pursued with great care and sophistication. The Chinese government is not without retaliatory weapons and it has shown a willingness to use them to fight back against legitimate efforts to stop China's manipulation of the global trading system. And because of the lack of the rule of law in China, Chinese officials could very well use their powers to retaliate against U.S.

firms doing business in China. Let there be no doubt: such an outcome would be bad for the U.S. economy and U.S. jobs.

As such, Congress should encourage the Trump administration to make clear that any new China trade strategy is based not on punishing China or seeking to hold it down; but rather on restoring the global trading system to a rules-based one. In essence, the Trump administration should make it clear that it is acting more "in sorrow, than in anger," and that any punitive actions directed toward China are only in place until the Chinese government makes needed reforms.

While tougher action on the part of the U.S. government will be needed, the time when U.S. unilateral action could suffice has passed. The last time that was possible was perhaps during the first term of the Obama administration when the United States possessed enough leverage to press China on its own. But after at least two decades of mercantilist policies, China is no longer as dependent on the United States economically and has considerably more degrees of freedom. As such, any action toward China on trade needs to be through a strong and unified coalition, particularly with nations like Australia, Canada, Germany, Japan, and the United Kingdom. All of these nations' economies have been hurt by Chinese mercantilism and are even more likely to be hurt going forward as China ramps up a robust innovation mercantilism designed to obtain global technology leadership. By working together, China will have many fewer options to avoid modifying its mercantilist strategy.

Finally, the most important strategic factor that should guide the Trump administration's policy toward China is to differentiate between protectionism and prosecution. In other words, trade enforcement, including tariffs, should be a tool designed to fight foreign protectionism, not a tool to reduce competitive pressures on firms in the United States. This may sound like a semantic difference, and indeed, most in the Washington trade establishment refuse to accept the difference (seeing any stepping up against Chinese trade practices as U.S. protectionism). But there is a critical difference. The goal for America should not be to withdraw from the global trading system and emulate the mercantilists. High and permanent tariffs would do that and would constitute protectionism. Rather, the goal should be for the United States to be willing to fight for the soul of the global trading system by taking needed steps to pressure China into significantly reducing its use of mercantilist policies. That would be prosecution in the service of free trade.

Why Chinese Innovation Mercantilism Matters

Chinese trade imbalances have generated a significant deleterious impact on U.S. employment and output, particularly in manufacturing. For example, Justin Pierce of the Federal Reserve Board of Governors and Peter Schott of the Yale School of Management link PNTR (permanent trade relations) with China in 2000 with "the sharp decline in U.S. manufacturing employment beginning in 2001."[1] MIT economists David Autor, David Dorn, and Gordon Hanson estimate that the United States lost 982,000 manufacturing jobs between 2000 and 2007 because of Chinese import competition.[2] ITIF has found that when U.S. manufacturing output growth is accurately measured, it becomes clear that the growing overall U.S. trade deficit was responsible for almost two-thirds of jobs lost in the 2000s (e.g., approximately 3.8 million jobs), with a significant share of this the result of unbalanced trade with China.[3]

But the challenge regarding Chinese mercantilism going forward is different than it was over the last 15 years. That challenge was largely to U.S. low- and mid-tech manufacturing, where Chinese policies hollowed out traditional U.S. manufacturing. The current and emerging challenge will be around advanced industries that the United States currently leads or holds strong global positions in, because those are the industries China is now targeting for dominance. I urge you to consider what a world would look like in 15 years where U.S. technology jobs in industries as diverse as aerospace, chemicals, computers, instruments, motor vehicles, medical equipment, pharmaceuticals, semiconductors, and software and Internet are significantly reduced due to Chinese policies focused on gaining 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 were to fall significantly related to the yuan, it is certainly possible that America could regain a not-insignificant share of the production lost to China in the 2000s 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 in the United States. But if America's technology base was substantially lost, no adjustment of currency decline could bring it back because national strength 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 could not simply buy some semiconductor equipment and start cranking out 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 research and development (R&D) scientists coupled with an innovation ecosystem (universities training the right talent, a network of suppliers of materials, etc.). Once those capabilities are lost, they are essentially gone, and are very difficult to resurrect.

There is an additional reason why losing advanced tech industries is more 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 and build a factory, entry into innovation-based industries requires not just physical capital but also 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; close to zero in the case of software. In these kind of innovation 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 or jet airplanes), and if a mercantilist-supported competitor gains global market share, the market-based competitor loses market share. Moreover, that firm's revenues go down much more than its costs. 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.

Thus, the loss of advanced tech 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 overall U.S.

wages. The second is on national security and the defense industrial base. U.S. global defense leadership is based not principally on the size of our nation or on the amount of money America spends on defense; it is based first and foremost on U.S. technology leadership. Our service men and women go into any conflict with the advantage of fielding technologically superior weapons systems. But that advantage depends on the U.S. economy having global technological superiority, not just in defense-specific technologies but also 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.

The Goals of Chinese Innovation Mercantilism

In 2015, Chinese President Xi Jinping unabashedly trumpeted a goal of making China the "master of its own technologies."[4] 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 attract foreign direct investment (FDI) and to induce foreign multinational corporations to shift production to China.[5] It used an array of unfair tactics to achieve that goal, including systemic currency manipulation, massive subsidies to firms to move production to China, 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 essentially announced that modern Chinese economic strategy sought *absolute advantage* across virtually all advanced technology industries. It fundamentally 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 wishes to dominate in production of both advanced technology products such as airplanes, semiconductors, and pharmaceuticals *and* commodity manufacturing. 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, Chinese President Xi Jinping 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 industries. As the Mercator Institute for China Studies in Germany writes in its report, "Made in China 2025: The Making of a High-Tech Superpower and Consequences for Industrial Countries," "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."[6] And as discussed below, the Chinese government is also targeting semiconductors.

Thus, it's no exaggeration to suggest that, without aggressive action, the United States may face a world within two decades years 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. This not only has potentially serious implications for America's future economic security, it has perhaps even more serious implications for America's national security and military superiority

Chinese Innovation Mercantilism Tactics

As the Information Technology and Innovation Foundation 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 "The Worst Innovation Mercantilist Policies of 2016"—China has deployed a vast panoply of innovation mercantilist practices that seek to unfairly advantage Chinese advanced-industry producers over foreign competitors.[7] 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; 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.

Most of these policies and practices are oriented around one overriding goal: acquiring foreign technology know-how. For Chinese government leaders are well aware that they cannot meet their indigenous innovation objectives on the time scale they have set without aggressively acquiring foreign expertise and knowledge. A principal way Chinese officials attempt to meet this goal is through forced technology transfer. Although China's World Trade Organization (WTO) accession agreement contains rules forbidding the country from tying foreign direct investment or market access to requirements to transfer technology to the country, it remains commonplace that China requires firms to transfer technology in exchange for being granted the ability to invest, operate, or sell in China.[8] As Harvard Business School professors Thomas Hout and Pankaj Ghemawat document in their report "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.[9] To be sure, because such

conditions contravene China's WTO commitments, officials are careful not to put such requirements in writing, often resorting to oral communications to pressure foreign firms to transfer technology.[10] In 2011, then-U.S. Treasury Secretary Timothy Geithner laid such concerns about China's technology transfer requirements in the open, 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."[11] Indeed, 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.[12] Likewise, a 2012 American Chamber of Commerce in China survey reported that 33 percent of its respondents stated that technology transfer requirements were negatively affecting their businesses.[13] Put simply, technology transfer requirements as a condition of doing business in China remain a key pillar of China's innovation mercantilist strategy. Moreover, over the last five years, China has ratcheted up its demands. Now for many foreign advanced industry companies, doing business in China requires transferring ever-more valuable technology to Chinese joint venture "partners".

In addition, China's anti-monopoly law has been designed in a way 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."[14] 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 IP if access to it is "essential for others to effectively compete and innovate."[15] 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.[16]

Another way China acquires technology and intellectual property is to steal it. As a recent *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."[17] According to the U.S. International Trade Commission (ITC), 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.[18] That figure has continued to increase. Subsequently, *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.[19] Likewise, a recent European Union-commissioned study found that, among European manufacturers, the loss of IP in China reduces their potential profits by 20 percent annually.[20] 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.[21] In a recent survey of the

business environment in China conducted by the U.S.-China Business Council, 98 percent of companies surveyed report that intellectual property rights enforcement in China remains a concern for them.[22]

Around three years ago, the Chinese government added a new tactic directly attacking foreign companies. One basis of the attacks is that U.S. technology products were asserted to not be secure and therefore the Chinese government had the right to intervene. One tool of these attacks is a propaganda campaign carried out in the state-controlled media, with multiple articles claiming that U.S. tech company products were not secure, with one government blog threatening "to severely punish the pawns of the villain." These attacks happened at the same time Chinese President Xi Jinping took over the reins of a new Communist Party-led committee on cybersecurity. It's hard to underestimate the role of Edward Snowden's National Security Administration (NSA) revelations in this change of tactic. Before Snowden, the Chinese government was reticent to play this intimidation card. But Snowden gave the Chinese government the cover it needed to claim the moral high ground and go after U.S. tech companies on trumped-up charges of lack of security. In 2014, the Chinese central government ruled that government offices were prohibited from running Windows 8 (although many, if not most, Chinese government offices steal, rather than purchase Windows anyway). Soon after, investigators from China's State Administration for Industry and Commerce raided Microsoft facilities in four Chinese cities, claiming it was investigating whether Microsoft violated China's anti-monopoly laws. The Microsoft case was not the first attack on U.S. technology companies. Over the last several years, virtually every leading American ICT company has found itself in the Chinese cross hairs. Apple CEO Tim Cook was forced to publicly apologize for purported problems with iPhone warranties. Next up was Qualcomm and Cisco, with the National Development and Reform Commission claiming that both were monopolists. Around the same time, the Chinese government announced a "De-IOE" campaign designed to pressure Chinese companies into replacing their IBM, Oracle, and EMC products with Chinese-made ones. The harassment of Microsoft appeared to be a tit-for-tat response to the Justice Department indictment in 2014 of five Chinese military offices for hacking into U.S. companies' computers to steal trade secrets. Indeed, the Chinese government has shown time after time that it doesn't just act to even the score when the United States takes action against China; it responds with overwhelming force.

An increasingly important way for Chinese firms to gain access to needed technology is to simply buy up U.S. technology companies. Indeed, a not-insignificant share of Chinese FDI into the United States is now in technology industries. According to Select USA, the top four industrial categories in terms of numbers for 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 were 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).

Much Chinese FDI comes from state-owned enterprises that often have different motives than simply maximizing profits. Rather, their investments are often to serve state goals. According to the Rhodium Group,

from 2002 to 2016, of the 582 acquisition deals, about 20 percent (116) were made by government-owned corporations, accounting for about 30 percent of the total monetary value.[26] Information and communications technology and electronics industries deals totaled roughly $18 billion, with government-backed deals accounting for roughly $5 billion of this amount. Moreover, the lines between public and private in Chinese firms is opaque, with many "private" firms having deep financial and other ties to the Chinese government.

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.[27] 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."[28] Moreover, the Chinese government channels funds to supposedly private investment bodies, making it look as if these deals are commercial. One Center for Strategic and International Studies report admits that "in order to successfully lobby the Ministry and receive adequate financial resources, the private enterprises have to link corporate goals with national government initiatives, otherwise the Ministry will be reluctant to endorse the companies' OFDI initiatives."[29]

Thus, 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 in order 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."[30] 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."[31] Investments in pharmaceuticals and biotechnology are "often driven by upgrading technology (such as Wuxi's acquisition of AppTec, a laboratory services firm)."[32] 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.[33] 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…"[34]

And as the German Mercator Center for Chinese Studies notes:

> Chinese high-tech investments need to be interpreted as building blocks of an overarching political programme. It aims to systematically acquire cutting-edge technology and generate large-scale technology transfer. In the long term, China wants to obtain control over the most profitable segments of global supply chains and production networks. If successful, Made in China 2025 could accelerate the erosion of industrial countries' current technological leadership across industrial sectors.[35]

The report goes on to note that, "There are strong indications that the absorption of advanced technology is an increasingly prevalent motive for the state's push for outbound FDI. From this perspective, Made in China 2025 can be read as a grand strategy for technology-seeking investment."[36] As the report continues:

> The Chinese state promotes investment in leading foreign technology enterprises with the aim of systematically acquiring cutting-edge technology and generating large-scale technology transfer. Since state-led FDI in high-tech sectors is a new phenomenon, its full extent and precise effects are not yet entirely clear. But it is a realistic scenario that the widespread technology absorption by China will contribute to the erosion of industrial countries' technological leadership in specific industries.[37]

In other words, Chinese tech-based FDI acquisitions are just one tactic in a comprehensive strategy of global knowledge acquisition in order to catch and ultimately surpass current technology leaders, including the United States. As one study of Chinese acquisitions of German firms noted, "Cherry picking strategic assets of hidden champions, knowledge absorption, and gaining access to high-end markets are major strategic intentions behind the M&As."[38] The report goes on to note that "[what] most acquirers were targeting was the inherent knowledge of the target firms held by the employees in the form of engineering capabilities or process know-how, the knowledge embodied in its technological assets like products, machines and plants, the brand in terms of reputation and customer relationships as well as the worldwide distribution and service assets."[39] The report concludes that this is different than most FDI from other nations where the acquirer seeks integration, synergy, and efficiencies.

China uses other tactics as well to gain global market share in technology industries. The Chinese government enforces a wide array of domestic content requirements in advanced industry products as a way to favor domestic technology companies. 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.[40] 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."[41]

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.[42] 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.[43] 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."[44] 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."[45] 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."[46]

Chinese technology firms also have an advantage over U.S. firms in their ability to suffer losses in foreign markets, both for their investments and sales. As Wang and Wang write, "China itself is a huge market, which means that firms losing profits in overseas markets can be compensated by selling their goods in the domestic market. For instance, Chinese consumer electronics producer TCL has been losing profits in overseas markets, but it survives with the profits from selling in the domestic market."[47] This then explains the fundamental difference between state-backed and purely commercial FDI acquisitions. When a corporation from Canada, Germany, or any other market-based economy looks to acquire a U.S. technology firm they have to balance the purchase price with the benefit to them, and in many cases acquisitions do not make financial sense. But when the principal goal is not profit, but national economic advancement and attaining military capabilities, many more deals make sense, especially when the Chinese government is footing at least part of the bill.

Finally, the Chinese government has limited exports of rare earth elements (REE) which are a group of seventeen minerals that are widely used in high-technology products such as hybrid cars, tablet computers, high performance magnets, and light-emitting diodes. Realizing that they controlled significant sources of REE global production and that this could be used as a leverage point, in July 2010, the Chinese government significantly reduced its export quotas on rare earth elements, causing world prices to greatly increase compared to domestic Chinese prices. For example, in April 2010 the price for cerium oxide was $5/kg, but after the export controls the price skyrocketed to $151 Kg in May 2011. At the same time domestic prices were just $29/kg. Moreover, the Chinese government made it clear to industrial consumers of REE's that they could have all they wanted at a cheap price if they just moved their factories to China. Both as the central source of extraction and by restrictively controlling the exports of many rare earth elements vital to the production of high-tech products, China tries to force the manufacturing of those products to center in China. As further inducement, it makes those elements available at a far cheaper price to in-country manufacturers. At least as recently as 2015, China was estimated to control 89 percent of global rare earth production.[48]

The Case of Semiconductors

Semiconductors are the "steel" of the digital economy; the core building blocks of innovation in a wide array of other industries and applications. As such, continued innovation in semiconductors is critical for continued global innovation in the digital economy. And strong domestic capacity is critical to U.S. national security. The United States invented semiconductors and related technologies and government support, including through funding for research universities and defense procurement, played a key role in enabling U.S. leadership. However, starting in the 1970s, aggressive government policies, including large government subsidies, from the "Asian Tigers of Japan, Korea, and Taiwan enabled the creation of robust competitors to the United States. And in some cases, these subsidies led to significant overcapacity in the industry, driving down margins and hurting investment in the next generation of innovation. Moreover, in all nations the industry is substantially globalized with different parts of the supply chain in different nations. But

notwithstanding both factors, according the U.S. Commerce Department, the industry is the top U.S. exporting industry, and ran a $42 billion trade surplus in 2012.[49] Equally importantly, the United States specializes in higher value added segments of the semiconductor industry (R&D, design, advanced manufacturing).

Now China has taking a page out of the Tigers' play book and attempting to build its own domestic semiconductor industry. While China has long seen the semiconductor industry as a key industry for development it was not until recently that it made a serious play to grow the industry. China's government has set ambitious, long-term national guidelines for the development of its semiconductor industry, including specific revenue targets of 20 percent compound annual growth and increasing the industry's size to $140 billion by 2020.[50] The strategy also calls for China to reduce imports of U.S. semiconductors by half in 10 years and to eliminate them entirely within 20 years and make China the world's leader in IC manufacturing by 2030. As part of this plan, China wants 70 percent of the semiconductor chips used by companies operating in China to be domestically produced by the year 2025.[51] China justifies this strategy on the basis that integrated circuits are the nation's largest import. But as ITIF has shown, the only reason for this is because China runs a massive trade surplus in products that include semiconductors. Indeed, over half of the semiconductors imported to China are reexported.[52]

A key tactic in their 2014 strategy "National Guidelines for Development and Promotion of the Integrated Circuit (IC) Industry" was to charter a National Integrated Circuits Industry Investment Corporation that intends to invest more than $100 billion in China's semiconductor industry over the next decade with the goal of creating a completely closed-loop semiconductor ecosystem, from design and prototyping to manufacturing, assembly, packaging and test, materials, and equipment.[53] Between national and provincial government funds, the industry is expected to be supported with as much as $160 billion of government-backed funds.[54] The direction is clear, as in statements such as "Make up our mind, push forward persistently; Focus on the bottleneck, innovation is the route; Stress the focal point, coordinate in development; Companies are the players, market is the direction; and Concentrate resources to make world-class companies" and "Set up state leading group for development of integrated circuit industry, push forward the coordination of works with an emphasis on top planning."[55]

To defend against charges of inappropriate government subsidies, the Chinese government claims that its China Integrated Circuit Industry Investment Fund Co. Ltd., is actually a private sector entity operating according to market principles. In reality it is a fund established by MIIT, staffed in large part by former MIIT officials, and funded by the Ministry of Finance and Chinese SOEs—including China Mobile, China Tobacco, and the China Development Bank—presumably because the latter were "asked" to do so by MIIT and the State Council.[56] MIIT presumably established the fund this way, as opposed to simply funneling subsidies through MIIT, in order to avoid any potential WTO challenge against unfair government subsidies. But this laundered money does not make it any less of a subsidy. Chinese central government officials also supported the creation of a number of local semiconductor subsidy funds which also are used to subsidize foreign acquisitions. Thus, when Chinese officials assert that this is a new kind of IC strategy based not on government subsidies, but rather on market principles, they are obscuring the fact that the new strategy is still based on government subsidies, but in this case usually in the form of equity investments that may or not get

ever paid back. Indeed, many of these Chinese firms would be unable to acquire foreign IC firms without such subsidies, as their balance sheets would be inadequate.

For example, Jiangsu Changjiang Electronics Technology Co. used $300 million from the national IC fund to help pay for the $780 million acquisition of Singapore's STATs Chip Pac Ltd., a leading provider of semiconductor packaging design assembly and test solutions.[57] The IC fund backed the buyout firm seeking to buy U.S.-based Lattice Semiconductor Corp.[58] And they were purportedly behind the purchase of Germany's Aixtron.[59] In some cases, these deals are truly perverse, as in the case of Chinese firm Apex Microelectronics buying the U.S. printer company Lexmark. Prior to the acquisition, Apex had been accused of producing counterfeit printer cartridges and infringing the patents of U.S. printer companies, including Lexmark.[60] And despite having revenues about one-tenth those of Lexmark, Apex was able to purchase Lexmark at a 17 percent premium over listed stock price, in part because it received funding from the Chinese national IC fund.[61] Indeed, the company is now 5 percent owned by the IC fund.[62]

China's government intends to pull a wide array of industry policy levers in its pursuit of building up its semiconductor sector. For example, the IC Promotion Guidelines call for public and state-owned enterprise (SOE) procurement decisions in sectors such as telecommunications and Internet service providers to be "based on projects aimed at expanding domestic demand" and "based on secure and reliable" software and hardware products. China's integrated circuit industry will also benefit from preferential research and development subsidy programs, including "national megaprojects" that subsidize the commercial R&D and product development undertaken by Chinese semiconductor companies and special grants from government agencies that allow Chinese semiconductor firms to fund and operate their R&D programs with direct government support through a "national enterprise technology center program."[63]

The Chinese government is also orchestrating efforts to acquire foreign technology. Chinese government leaders, including at the Ministry of Industry and Information Technology (MIIT), are well aware that they cannot meet the IC plan's objectives without buying up the expertise and knowledge they need through foreign acquisitions. Indeed, as a report from Bain Consulting counseling Chinese IC companies stated, "Since reaching scale through organic growth would be an almost insurmountable challenge, domestic Chinese players should look for partnerships (often with followers with strong IP that could benefit from funding and access to China's market) and takeover opportunities of companies looking to leave the industry or divest, both inside and outside of China."[64] Likewise, as a report from a major integrated circuit conference in Shanghai noted, "clearly there will be a focus on [foreign] M&A [mergers and acquisitions] to achieve the rapid technological scale up necessary to realize the vision of the new national policy."[65]

That is why China has been on a global buying spree to try buy up companies all along the IC value chain including Spreadtrum Communications, RDA Microelectronics, and Micron.[66] As the Mercator Center for Chinese Studies notes:

> Since 2014, new policies by the Chinese government to promote the development of China's semiconductor industry have fueled a boom in acquisitions in this segment. The first major deals were completed in 2015, including the purchase of Integrated Silicon Solutions for about $736

million. Total investment in semiconductors has reached more than $1 billion, but semiconductor deals have received considerable scrutiny from the Committee on Foreign Investment in the United States (CFIUS), dampening the prospects for several announced acquisitions.[67]

For example, China tried to buy its way into a leading U.S. semiconductor company, Western Digital. The Western Digital deal was one of a string of numerous acquisitions that Chinese firms have attempted along the semiconductor value chain.[68] Notably, China's Tsinghua Unigroup—a state-owned enterprise once headed by the son of former Chinese President Hu Jintao—bid $23 billion for Idaho-based Micron Technologies. That deal fell apart after Senators Orrin Hatch (R-UT) and Chuck Schumer (D-NY) raised national security concerns. So Unigroup pivoted, working through its Unisplendour subsidiary to try to acquire a 15 percent stake in Western Digital. Interestingly, before China's Ministry of Commerce then suddenly approved Western Digital's 2012 acquisition of Hitatchi, Ltd.'s hard drive business—a deal that competition authorities in the United States, Europe, Australia, and Japan all had studied and approved, but China had slow walked, thereby preventing Western Digital from achieving $400 million in savings. Western Digital is now the third global information technology company to accept investments from Chinese state-owned corporations in order to win such antitrust regulatory blessing. However, the investment was later withdrawn after it became clear that CFIUS would not approve the deal.

In the short run, China's efforts in semiconductors are not likely to have a significant negative impact on other players, including US firms. This is in large part because unlike other industries, such as solar panels, LED lighting and liquid crystal displays (LCD) That are much simpler to produce (largely based on buying complex and expensive equipment and running it), mastery of semiconductor technology is more complex. Yet, the long-term implications have the potential to be significantly negative for the United States. With technologies like solar, LED lights and LCDs, massive Chinese subsidies led to significant global oversupply with the result being that many firms not backed by their governments were either forced out of the business or lost significant market share. This not only hurt market-based developed nations, it significantly hurt global innovation in these areas since Chinese firms were less innovative and spent less on R&D than firms in developed nations.[69]

There is a very real risk that this dynamic will happen in semiconductors, particularly in memory (DRAM and NAND), which is more of a commodity and where price (and quality) determine market share. The semiconductor industry is somewhat unique in that capital and energy costs account for as much as 60 percent of total production costs, and therefore Chinese subsidies for capital and energy, can provide a major advantage, amounting to a large, nontariff barrier. For example, XMC, a contract chip producer owned by the Chinese Hubei provincial government, who had partnered with U.S. flash-memory maker Spansion in 2015,[70] is building a massive plant (almost 1 square kilometer of production space). The plant, funded by the Chinese IC fund and the provincial government, will produce up to 300,000 64 layer 3D NAND (the latest version of flash memory chips) units per month. But experts suggest that success is not assured and if XMC is successful that this will not happen overnight; it might be five years before real overcapacity occurs. Overall, the Chinese still lag in technology behind the leaders. But one advantage they have, besides massive subsidies and the ability of their firms to burn cash (e.g., sustain losses) for many years in order to gain market share, is that they Chinese government is forcing consolidation around a few national champions, particularly

Tsinghua Unigroup, that will be able to gain the scale needed to effectively challenge the global leaders. China's path the significant global market share would be significantly accelerated if they could acquire or form a joint venture with a leading foreign semiconductor firm, hence their focus on acquisitions and forced technology transfer. In short, China's going to do whatever it takes to build a world-class domestic semiconductor industry, and if they are successful, this will not only take market share away from U.S. firms, it will harm global semiconductor innovation by leading to lower margins and less R&D investment.

What Congress and the Trump Administration Can Do

Limiting China's ability to harm U.S. advanced technology industries, including the semiconductor industry, will require two main kinds of actions. The first is to limit's ability to access the most important U.S. and other foreign technologies (e.g., the "crown jewels"), while also rolling back their broader unfair innovation mercantilist practices, including subsidies. The second is to develop and implement a U.S. advanced technology development strategy. I will focus mostly on the former but offer a few thoughts on the latter.

Policies Toward China: ITIF recently issued a report, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation," with a detailed set of recommendations.[71] Based on that let me suggest several steps here. First, neither U.S. domestic law, or our free trade agreements (FTAs) and bilateral investment treaties (BITs) as currently configured, nor multilateral WTO approaches are working; China will not systematically ameliorate its mercantilist strategies and policies unless it is proactively compelled to do so by outside pressure that goes beyond the narrow, legalistic limits of the WTO. That means this contest will be won, first and foremost, not in the tribunals of Geneva, but in the court of global opinion. Accordingly, Congress should charge USTR and the State Department with building a "bill of particulars" clearly and comprehensively enumerating the vast extent of Chinese innovation-mercantilist policies. This should not be about recycling the China chapter from the annual USTR National Trade Estimate report. Rather, this bill of particulars should comprehensively detail the array of unfair, mercantilist practices China engages in and concretely demonstrate how those practices harm the United States and the entire world economy, rich and poor nations alike. At the same time, Congress should require the State Department, USAID, and other relevant federal agencies and departments with producing research that documents how Chinese mercantilism has hurt developing nations' economic growth.

We also need stronger organizational capabilities within the federal government. One reason why is that the United States largely continues to consider specific instances of Chinese innovation mercantilism—such as the challenge of Chinese acquisition of U.S. technology enterprises—on an ad hoc, case-by-case basis. There is no entity in government charged with considering the challenge from a holistic, strategic perspective across agencies to analyze, understand, anticipate, and respond. In particular, no entity analyzes China's capacity to absorb knowledge, to understand its determination to do something with it, or to understand the sources of its technology. A glaring example of this is that it took the U.S. government four years to recognize that China had articulated, and then to get translated into English, its "National Medium- and Long-Term Program for Science and Technology Development," and begin to understand what its implications might be for U.S. industry. And it has been nearly two years since China announced its Manufacturing 2025 plan and yet we've not seen concrete steps by the United States to effectively counter this development.

To remedy this deficiency, the president should establish and staff a new National Industrial Intelligence Unit (which could be housed within the existing National Intelligence Council) charged with developing a better process and structure to understand the specifics and long-term implications of other nations' economic development strategies, particularly China's, so that the United States can respond more effectively. In particular, this group would develop a better process and structure to understand the long-term implications of China's economic development strategy on U.S. competitiveness. It would also develop approaches to better leverage intelligence assets to boost the competitiveness of U.S. companies. This would not constitute industrial espionage, but rather sharing knowledge in the public domain (such as the MLP) about the competitiveness strategies of Chinese enterprises and industries as well as developing better intelligence on the true source of Chinese government involvement in and financing of Chinese companies and the front organizations they set up in the United States, as was the case in the attempted Canyon Bridge acquisition of Lattice Semiconductor.[72] And as part of the Council's mission, it should be charged with sharing commercial intelligence on China with our allies, particularly those in Europe, as they have much less developed capabilities vis-à-vis China. The National Industrial Intelligence Unit should also prepare a report examining the extent to which Chinese innovation-mercantilist policies—such as forced joint ventures, forced tech and IP transfer, and completed or attempted Chinese acquisitions of U.S. advanced-technology enterprises—have contributed to the outsourcing of manufacturing and other activities to China and is leading to the hollowing out of the U.S. defense industrial base. As suggested in the *U.S.-China Economic and Security Review Commission's 2016 Report to Congress*, such a report "should detail the national security implications of a diminished domestic industrial base (including assessing any impact on U.S. military readiness), compromised U.S. military supply chains, and reduced capability to manufacture state-of-the-art military systems and equipment."[73]

Congress should also call on the Department of Commerce to publish reports on strategic economic and trade issues regarding China, including comprehensive review of China's "Made in China 2025" and Internet Plus initiatives, including their forced localization of R&D and manufacturing requirements, to determine their potential impact on domestic U.S. production and market access for U.S. firms.

The federal government also needs stronger processes to contest Chinese innovation mercantilism. This should start by elevating trade enforcement across the interagency process. U.S. trade agencies are often unable to respond to cases where China has broken trade rules because other government agencies, including the State Department—many with their own engagement with Chinese counterparts and agency-specific interests—veto stronger action. The growing range of issues discussed in bilateral engagement and the intersection of trade with many of these interests means that there are many agencies involved in the bilateral relationship. Each agency has its own specific interests in China, which are often either ignorant of China's economic strategy or have a desire not to rock the boat. Those agencies devoted to engaging with foreign nations on diplomatic, security, and financial concerns (such as the Departments of State, Judiciary, and Treasury) should be relegated to an advisory capacity in the interagency trade process. Enforcement should be left to those agencies that are equipped to do it best and have the largest stake in a strong and globally competitive U.S. economy, in particular, the Department of Commerce, USTR, and the new White House Trade Council.[74]

The administration also needs to strengthen the rules of engagement in negotiations with Chinese negotiators. The increasingly diverse set of bilateral issues the United States has with China means that many agencies and officials have been drawn into the framework over time, making it difficult to have a single and consistent message and approach on key issues. If the bilateral framework for managing the relationship is not focused on getting outcomes on core issues, China will continue to rely on the disorganization of the U.S. government to use the complexity of the bilateral relationship to obfuscate and make minor trade-offs, all the while failing to focus on or respond to core U.S. interests. The Trump administration should therefore prioritize issues, attention, and resources and weigh the value of each engagement based on progress toward outcomes. The ever-growing range of issues involved in the bilateral relationship is diluting and diverting attention from achieving outcomes on the most significant trade and economic issues at stake. The current bilateral framework for trade and economic issues—the U.S.-China Joint Commission on Commerce and Trade and the U.S.-China Strategic and Economic Dialogue, as well as the high-level cybersecurity dialogue—needs streamlining and strict management to ensure that only core issues get addressed in the short periods in which senior officials are directly involved.

Moreover, China all too often uses these forums as way to play a rope-a-dope, delaying strategy. Either there is real tangible progress from the Chinese government from these dialogues or the Trump administration should put them on hold until there is. And all agencies involved—from State to Treasury—should receive strict marching orders from the White House on strategy and tactics, so they are all working toward common goals, just as is the case with Chinese government agencies when they are involved in these dialogues. Furthermore, the prevailing focus on presidential summits—though useful—threatens the ability to efficiently deal with the broad array of issues in the relationship. Too often, issues are passed up to respective leaders to resolve, as lower-level discussions prove unproductive. Such emphasis benefits the opaque Chinese system and China's strategy to delay and defer action, as the upward referral of issues is intended principally to stall and to prevent progress. For the relationship to function, these lower-level dialogues should be expected to achieve results at a speed that reflects the maturity and capabilities of each side and which reflects the need for efficiency in addressing trade and economic issues that can have a significant impact during long-, drawn-out processes that depend on the principals.

Congress should also press the administration to focus on improved monitoring and transparency. The Chinese government has consistently failed to provide the WTO and its trading partners with required information, translated into English (or another official WTO language), regarding policies related to trade in goods, services, intellectual property, subsidies, and foreign investment. Such transparency requirements may appear mundane and bureaucratic, but they are critically important to judging whether a country is abiding by its WTO commitments and whether grounds exist for a trade dispute. In fact, USTR should bring a WTO case regarding this enduring lack of transparency. Moreover, the lack of transparency is part of the reason why USTR needs more people on the ground: to better monitor Chinese government actions. The lack of transparency is part of the reason why USTR needs more people on the ground—to better monitor Chinese government actions. China's governance system is notoriously opaque, complex, and multi-layered with overlapping and often inconsistent national, provincial, and municipal government policies. While such an approach is unnecessary for most trade partners, there is an ongoing need for more USTR officials in China, as USTR has repeatedly reported that many aspects of Chinese policy are hidden away in unpublished

measures (including legally unrecognized normative or regulatory documents), oral directives, and Communist Party secret red letter documents. These transparency concerns extend to the provincial and municipal governments which also regularly fail to publish their measures.[75] Furthermore, China regularly fails to provide at least a 30-day period for public comment on drafts of trade- and economic-related regulations and rules as it agreed to at the U.S.-China Strategic and Economic Dialogue in 2008 and 2011. And Chinese agencies frequently adopt measures that take effect immediately when China's WTO obligations require it to allow comments by other agencies and then to translate the measures into a WTO official language and officially publish them before implementation, except in certain cases (such as emergency).

Multiple USTR reports show that China's repeated failures to be transparent are part of a consistent pattern to avoid scrutiny for discriminatory and trade-distorting regulations rules and other measures involving subsidies, preferences, anti-competitive government practices, etc. A specific example is China's extensive use of subsidies and its blatant disregard for WTO required transparency regarding such measures, as well as its failure to release detailed information in the government's budget, the state capital operating budget (SCOB). Despite WTO commitments to submit regular notifications on what subsidies it provides, China did not file its first notification after WTO accession (in 2001) until 2006. Five years later, in 2011, it submitted a second notification for subsidies provided during the period 2005 to 2008. In 2015, it provided a third notification for the period 2009 to 2014. Beyond the delay, all three notifications were significantly incomplete and excluded numerous subsidies that the United States knows the Chinese central government provides, and none of these notifications included any of the extensive subsidies provided by provincial or local governments.[76] Since 2011, the United States has made formal requests (e.g., counter-notifications) for information from China regarding over 350 unreported Chinese subsidy measures. China has failed to provide a complete and comprehensive response. This speaks to the need for a strengthened and emboldened USTR that can quickly respond to China's failure to abide by WTO transparency obligations and bilateral commitments. A revamped and properly resourced USTR, supported by strong interagency and U.S. embassy and consulate teams, should have the capability to identify, analyze, and publicly respond each and every single time China fails to play by the rules it has agreed to uphold. In this way, USTR can play a role in increasing transparency regarding China's innovation mercantilism, which the country purposely tries to obscure through the use of unaccountable federal or provincial government bodies issuing administrative orders or policies, sometimes informally, to foreign companies on a whole host of issues. This transparency focus should form part of a broader effort to build support among likeminded countries for a tougher response. The objective should be to not just rely on naming-and-shaming, but on identifying actionable cases. Literally, USTR should put out a statement each and every time China fails to deliver proper notification. And, as noted above, USTR should go even further, by compiling a comprehensive "bill of particulars" listing all of the mercantilist actions China takes, including all the ways in which it is not complying with the letter or spirit of its WTO obligations, and then working to make U.S. allies, the media, and the world aware of just how out of line Chinese policies are.

To complement larger USTR and Department of Commerce teams in China, the U.S. government should increase funding specifically for English-language translations of relevant documents, including key Chinese industrial-strategy publications. The language barrier adds another level of opacity around Chinese trade and economic policy. WTO reports on China's trade-policy regime have repeatedly stated that it was not possible

to explain a Chinese policy or to confirm a statement made by the Chinese authorities because the underlying documents were only available in the Chinese language.[77] Yet China has an obligation to publish in a WTO language, and such a translation undertaking is not unique: the European Union translates all of its official documents, including those related to trade, into 24 languages, and other countries also have similar translation burdens (e.g., Canada, Belgium, and Switzerland).

Also, I urge Congress to update CFIUS to reflect the nature of Chinese government influence. A core component of liberalized trade is liberalized foreign direct investment, yet it is clear that U.S. FDI into China faces significantly different conditions than Chinese FDI faces in the United States. As noted, in many cases, U.S. firms seeking market access in China, particularly ones with sophisticated technology, must engage in a joint venture with a Chinese firm. As one industry article advising U.S. companies wrote, "To participate in China's industry ecosystem, it is essential to establish connections with the stakeholders in China, such as government, customers, suppliers, and even competitors, and to seek opportunities in cooperation and development through mutual understanding and engagement."[78] With regard to the life-sciences market in China, an industry analyst writes that, "To enter the Chinese market, you may come in by licensing an asset, which we have done, or you can create a joint venture, which we have also done. But you cannot go in by yourself."[79] And as the U.S. Congressional Research Service reports, "The OECD's 2014 FDI Regulatory Restrictiveness Index, which measures statutory restrictions on foreign direct investment in 57 countries (including all OECD and G20 countries, and covering 22 sectors), ranked China's FDI regime as the most restrictive, based on foreign equity limitations, screening or approval mechanisms, restrictions on the employment of foreigners as key personnel, and operational restrictions (such as restrictions on branching, capital repatriation, and land ownership)."[80] Chinese investment in the United States faces vastly fewer restrictions. Because of this steep divergence, Congress and the Trump administration should insist on a level playing field, and mutual access should be a core principle. As a report on Chinese acquisitions of German firms noted, the "EU should emphasize … the need for mutuality: if Chinese firms are given free access to more and more 'crown 7 jewels' of German industry, China … would have to further open up their FDI regime and the possibilities for M&A in their territories."[81] In other words, as long as China restricts U.S. investment in China, largely to take technology, the federal government should feel few constraints to use stricter investment review as a tool to insist upon better behavior from the Chinese government.

Since Chinese efforts to intentionally target U.S. advanced-industry enterprises across a range of high-value-added sectors only continues to intensify, the procedures of the Committee on Foreign Investment in the United States (CFIUS) need to be strengthened to ensure that Chinese entities, particularly those guided or backed by Chinese-government influence or funding, are not able to acquire U.S. companies or technology that could damage America's economic or national security. According to the Foreign Investment and National Security Act (FINSA) of 2007 (P.L. 110-149), CFIUS may conduct an investigation on the effect of an investment transaction on national security if the covered transaction is a foreign government-controlled transaction (in addition to if the transaction threatens to impair national security, or results in the control of a critical piece of U.S. infrastructure by a foreign person). CFIUS has worked fairly effectively in some technology areas, especially semiconductors, as attempted acquisitions of Fairchild, Micron, GCS, Lumileds, Western Digital, and Aixtron have been stopped either formally or informally.[82] However, it has not prevented all acquisitions. For example, a Chinese investor group bought Silicon Valley semiconductor firm

ISSI in 2015. Moreover, Chinese firms are getting more sophisticated about attempted acquisitions, including hiring the best U.S. legal, financial, and public relations talent to advocate for their U.S. technology acquisitions, and obscuring their involvement in U.S. shell companies, as they did with the attempted acquisition of Lattice Semiconductor.[83]

As such, there is a need for CFIUS reform. Congress should, at a minimum, update the charter of CFIUS to address the realities of modern-age state capitalism.[84] Other nations, and particularly China, have put in place coordinated strategies to systemically target key defense and industrial technologies resident in U.S. enterprises and attempt to acquire them by having state-owned or -financed enterprises purchase the U.S. entity, using the veneer that these are "market-based" transactions. Because the threat to both the U.S. defense industrial base and the U.S. industrial base is systemic, the charter of CFIUS needs to be updated to allow reviewers to move beyond case-by-case examinations to assess and gauge systemic threats and examine covered transactions in a broader context. They have arguably done this with semiconductors, but they should expand that scope. CFIUS also needs greater capacity to review attempted acquisitions by Chinese firms of small and young U.S. technology firms that might reflect promising future technology capabilities for the nation.

Moreover, CFIUS reviewers often do not have adequate time to complete a serious analysis, having only 30 calendar days to approve transactions or move them to a second-stage investigation (although there is an ability to extend an investigation for 45 days on top of the original 30). Therefore, Congress should increase the time period permitted for the initial CFIUS review and also better equip CFIUS with additional personnel and financial resources to support more thorough reviews. Congress should also require mandatory notification for deals involving state-owned or state-financed entities by countries of concern such as China and Russia. Attempted acquisitions made by Chinese state-owned or state subsidized enterprises should be blocked outright, as recommended by the U.S.-China Economic and Security Review Commission.[85] Congress should also reform CFIUS so that it can block acquisitions from nations like China and Russia of any U.S. technology companies, including ones that are only indirectly defense-related.

It's also important that as CFIUS committees consider whether the entity in question will come under "foreign control" that they consider "nontraditional" forms of control, such as joint ventures or novel licensing transactions that seek to achieve the same effect as the outright acquisition of a U.S. company. For instance, Chinese acquirers may be exploiting a loophole in CFIUS by designing licensing transactions that, when combined with the associated follow-on agreements that utilize U.S.-based assets to operationalize the licensed intellectual property, are substantively the same outcome as if the Chinese company had simply purchased the U.S. business that holds the intellectual property. CFIUS reform should make clear that these types of deals are "covered transactions" that could be investigated.

The CFIUS chair should also be transferred from the Treasury Department to another department, perhaps the Department of Commerce. Treasury has an important role in tracking investment and other financial flows, but Treasury largely hews closely to the lines of the Washington trade consensus, seeing all or most inward FDI as an unalloyed good. Commerce is better suited to focus on the implications of a given foreign investment on the industrial economy and America's innovation system. But while CFIUS reform is a

minimum, Congress should move beyond the relatively narrow CFIUS process to create a more comprehensive foreign investment review process, as many other nations, including Australia, Canada, and the United Kingdom, have instituted. Indeed, a number of other nations have taken much more proactive measures to prevent the hollowing out of their key industries. For example, both South Korea and Taiwan have essentially banned Chinese acquisition of their domestic semiconductor firms. Under current law, CFIUS can only restrict investments that could adversely affect the United States' national security. As the civilian industrial base has become an ever-more central part of the defense industrial base, however, the current limitations on CFIUS need to be reexamined and a broader national-interest standard established. To be clear, the goal of any foreign investment review scheme should not be to give in to domestic protectionist interests, but to effectively differentiate between foreign direct investment that operates according to market-driven principles and that which operates according to state-directed, mercantilist principles. In other words, when a Chinese company, backed and directed by the Chinese government, attempts to buy an American technology company with the main goal of expropriating its intellectual property and moving it (or the company's operations) to China, that is clearly not in the interest of the United States. It would be important for any such expanded regime not to apply to investments from allies who are designated by the U.S. government as operating largely according to market principles (e.g., nations such as Canada, Germany, Mexico, etc.). Those would continue to operate under the current criteria of effect on national security. Rather, the more stringent review regime would be for nations that operate according to mercantilist principles. In these cases, all inward FDI would at least be reviewed and potentially rejected if deemed harmful to U.S. innovation and competitiveness. If such a regime had been in place, for example, CFIUS would not have approved the Apex acquisition of the U.S. printer company Lexmark, given that Apex was accused of IP theft by U.S. printer companies and was backed by Chinese government money. Some will argue that instituting such a regime would just be emulating the Chinese and thereby closing our economy. On the contrary, it's doing exactly the opposite. It is about working to ensure that China rolls back its mercantilist policies. Indeed, if implemented properly, it would be a measure to improve the integrity of the global trade and investment climate.

Domestic Actions: With regard to domestic actions, it is important to understand that in the new world of intense "race for global innovation advantage" where our competitors are putting in place a host of fair and unfair policies to win in advanced industries, including semiconductors, that the notion that the United States can win by simply having government getting out of the way is an anachronistic notion.[86] U.S. technology firms now compete against other firms backed by their governments, either directly or indirectly. This does not mean, nor should it mean some kind of heavy handed, statist picking of particular winning firms. But it does mean Congress taking the global innovation competitiveness challenge seriously. The fact that the at least 26 other nations field a more generous R&D tax incentive or that 21 other nations fund more university-based R&D or that many more nations invest more in industrially-relevant R&D should be a wake-up call to Congress.[87]

The status quo will no longer cut it. A liberal redistribution strategy that ignores global competition in favor of compensating U.S. workers directly and indirectly will not improve U.S. competitiveness. If U.S. advanced industry firms can't be competitive they will employ fewer high wage workers in the U.S. A conservative supply side strategy that focuses on individual tax cuts and broad-based rollback of regulations will not

improve U.S. competitiveness. Individual tax rates have almost nothing to do with U.S. technology firm competitiveness and while smarter regulations are always needed, poor U.S. regulations are not the principal cause of U.S. competitiveness challenges in advanced technology industries. And a new economic nationalism that closes our markets and pressures companies to bring back work will not improve U.S. competitiveness. Forcing companies to bring back all or most work in their supply chains, especially low value added work, would at the end of the day reduce, not increase, U.S. jobs by making U.S. companies less competitive internationally.

Rather, it is time for both parties to work together to embrace a national innovation-based competitiveness strategy.[88] For the semiconductor industry specifically, this would likely include measures such as a significant increase in the R&D credit and expanding the coverage to include development, not just research; significant expansion of scientific funding in areas related to semiconductors, such as nano-technology and quantum computing; significant expansion of funding for industry-led R&D partnerships, like the Semiconductor Technology Advanced Research Network (STARnet), a partnership between DARPA and semiconductor firms; and liberalizing immigration of advanced STEM workers.

Conclusion:

In summary, now is the time for Congress and the administration to act to not only challenge the Chinese government's innovation mercantilist practices but to put in place a true national innovation-based competiveness strategy. Implementing a China strategy a strategic, measured, and above all respectful way, will not only level the playing field so American companies can effectively compete in China and with Chinese companies outside of China, it will help restore faith in the integrity of the global trading system. Implementing a national innovation strategy will help ensure that U.S. technology firms will maintain global market share, securing not just good U.S. jobs, but U.S. defense capabilities. hank for you inviting me to testify before the Committee today.

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