



Statement Before the
Senate Committee on Banking, Housing, and Urban Affairs

***“Confronting Threats From China:
Assessing Controls on Technology and
Investment, and Measures to Combat Opioid
Trafficking”***

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I. Introduction

Today's hearing is about issues of technology, economics, public health, and national security, but it is occurring against the backdrop of the 30th anniversary of the Beijing massacre. This is a solemn day not just in Chinese history, but in world history. I was a fourth-year undergraduate student at the University of Virginia when the protests broke out and was preparing for language study in Taiwan when the events of June 3rd and 4th unfolded. China confounded expectations then, and it has since. Few expected a regime to take such actions, and few expected it to survive and become the major power that it is today. In so many ways, big and small, China continues to defy expectations.

As someone who cares deeply about China, the United States and the globe, one of the largest lessons I take from my years of working on China and US-China relations is our need to adopt a posture of principled pragmatism: we need to be guided by our values, but we also need to be smart in how we pursue them. A clear purpose needs to be married to well-reasoned and effective policy. Our purpose should be to encourage and press for humane governance in China domestically and its responsible behavior internationally. Pursuing these goals requires a combination of engagement with China, deterrence and opposition to some of its policies and actions, and collaboration with friends and allies in the Asia-Pacific and beyond. But most importantly, success requires making America the best it can be. Our direct effect on China will always be limited. We have a much greater ability to make our own economic, social and political systems stronger, serve as a model for others, and have them recognize how their national interests are best served by having a good relationship with the United States.

I elaborate on these principles in my statement as they apply to advanced technology. I first briefly describe China's ambitious policy goals in promoting high technology and the array of policies it is deploying toward these ends. I then summarize the results to date and likely future trajectory. The main point is that although China has made progress and is likely to continue to do so, there is wide variation across industries in the level of success and the effect on the United States and global economy. On this foundation, I turn to discuss America's current policy approach in responding to China's high-tech drive. Presently, the United States is only utilizing a single policy tool – bilateral brinksmanship – and this approach has limited utility. To be more effective, the United States will need an "all-of-the-above" approach that involves greater coordination with friends and allies and much more attention to strengthening the foundations of our own technology ecosystem.

II. China's High-Tech Drive: Ambitions and Tools

China's technology goals are amazingly ambitious. Its leaders are no longer satisfied being a low-cost assembly point along the global supply chain and only utilizing Western technology.¹ China wants to be a major high-tech leader. Although the Made-in-China 2025 (MC2025) technology plan focuses on a small handful of technologies, MC2025 is part of China's 13th Five-Year Plan, and this plan includes dozens of industrial policies and hundreds of advanced

¹ Scott Kennedy "The Beijing Playbook: Chinese Industrial Policy and Its Implications for the United States," in James Andrew Lewis, ed., *Meeting the China Challenge* (Washington, DC: CSIS, January 2018), pp. 1-9.

technology sectors, from artificial intelligence and information and communications technologies (ICT) to commercial aircraft, and from materials to new-energy vehicles and pharmaceuticals. Beijing's motivation is multi-fold; it has a clear economic logic, seeking to move from low-valued added segments of industries to higher-value added parts of industries, spur consumption and improve the lives of its people, all of which together should raise China's long-term growth prospects.

But the leadership also views advanced technologies in political and international terms. China wants to use technology to improve domestic governance, for example, by making traffic move more efficiently, reducing crime, and improving coordination across government agencies. It also wants to reduce domestic security risks, people and movements that could threaten the Chinese Communist Party's (CCP) hold on power. Developing and acquiring advanced technologies also serves China's national security goals, making China's military better able to defend its borders and near-abroad and have power projection capabilities. This gives China the ability to deter potential foes, including the United States, in times of peace, as well as better prepare for potential conflicts along its perimeter, including the border with India, the Korean peninsula, Taiwan Strait, and South China Sea.

Just as the motivations behind China's high-tech drive are multifold, it is drawing on all the powers of the state and society to achieve them. Most importantly, although Beijing employs markets to carry out research and development (R&D), promote industries, and create consumer services, the Chinese state – the government and CCP, at the national and local levels – is deeply involved in every aspect of this drive.

There are five important principles guiding the Chinese state's role: 1) The state has the right to intervene at any time for any reason; 2) State officials have discretion to adopt discrete policies to promote or hinder any industry, company or region as necessary; 3) Funding and investment for priority sectors often occurs in the expectation of future demand, not existing demand already reveal by market signals; 4) The state would prefer to direct support to firms that are both politically safe and economically competent, but special support goes to state-owned enterprises (SOEs) even when they do not perform well; and 5) Strategically use globalization to China's advantage, not as an end in itself.² The Chinese state does encourage business competition, even internationally, and in some industries it is extremely fierce, but competition occurs within this larger political economy, and so it is controlled with the explicit hope of achieving specific economic and political goals.

On the basis of these motivations and guiding principles, the Chinese state mobilizes every tool at its disposal to achieve these ends. Funding is at the heart of the system, including government spending, subsidies, and state-directed bank credit. China's securities markets as well as private equity and venture capital are a growing part of the equation, particularly with regard to advanced technologies. High-tech firms receive tax benefits, access to low-cost land and other incentives. China now spends over 2% of gross domestic product (GDP) on R&D, equal to the

² Barry Naughton, "China's Distinctive System: Can It Be a Model for Others?" *Journal of Contemporary China*, no. 65 (2010), pp. 437-460.

average of advanced industrialized countries. In absolute terms, it has the world's second large R&D budget, only behind the United States. In some industries, its investment outpaces that of everyone else. Although over 75% of R&D is by companies, the state is still able to incentivize and direct spending in its priority areas. For example, in the case of semiconductors, national and local governments have created a series of investment funds that total at least \$150 billion. They are supporting the creation of dozens of fabrication facilities around the country even though a straightforward market analysis would suggest this scale of investment is wasteful.

Beyond finances, there is a rich panoply of interwoven policy tools available to promote advanced technology: extensive support for universities and vocational schools to develop more talent, active participation in setting technical standards, government procurement that encourages or mandates buying Chinese products, and high environmental performance standards. China has a love-love approach to intellectual property (IP). On the one hand, it would love Chinese to develop their own IP. It has developed world-class IP laws and regulations, encouraged the filing of patents and copyrights at unprecedented levels, developed regulatory systems and markets for licensing IP, and developed courts to adjudicate IPR disputes, most of which occur between domestic litigants. On the other hand, if it runs into obstacles creating IP domestically, it would love to obtain this IP from abroad, legally if possible, illegally if necessary. Most independent analysts believe China is the largest source of commercial IP theft globally, no longer focused on toys and CDs, but instead on everything from advanced materials to commercial aircraft components, drug formulas, and telecom systems.

A key element of China's high-tech drive is its strategic use of globalization. In addition to sending millions of students abroad over the last few decades to obtain advanced degrees in engineering and science, Chinese financial institutions and companies have ramped up outward investment and acquisition of overseas companies. Cumulative Chinese investment in the United States from 1990 to 2018 was \$145.14 billion. Of this amount, 92% were acquisitions of existing American companies, and 75% of investment was by private Chinese companies. High-tech is a huge part of Chinese investment; energy and ICT have received a great deal of attention, but in the last two years, because of restrictions in those sectors, a higher proportion of funding has flowed into pharmaceuticals, biotech and healthcare.³ Beyond investment abroad, Chinese companies also are opening R&D centers in Silicon Valley and other high-tech hubs around the world.

Domestically, China has increased efforts to attract foreign talent to work for Chinese industry and uses the leverage of its large domestic market to persuade foreign companies to share their technology with local partners. As a consequence, China has been able to ameliorate the weaknesses of its own top-down innovation system by utilizing innovation nurtured in more hospitable environments. And finally, China has stepped up its efforts to shape global rules to legitimate its current system of economic governance and make decisions consistent with its own interests. China is deeply active in the G20, WTO, IMF, standards-setting bodies, and other

³ Rhodium Group, "US-China Investment Hub," <https://www.us-china-investment.org/us-china-foreign-direct-investments/data>; and Thilo Hanemann et al, "Two-Way Street: 2019 Update," May 2019, https://arraysproduction-0dot22.s3.amazonaws.com/rhodiumgroup/assets/icon/RHG_TWS-2019_Full-Report_8May2019.pdf.

existing institutions. It is also building alternative or parallel institutions, such as the Asian Infrastructure Investment Bank (AIIB), and advocating competing norms, such as Internet sovereignty, that better fit with its less liberal worldview.

Although China certainly has regulations and policies that contravene its commitments to the WTO and the United States, it makes greater use of discriminatory policies and behaviors that less obviously violate international rules. Chinese officials and companies have learned (in part from Western practice) how to “game” the system. The WTO covers many areas, but is far from comprehensive, and the global standards for finance, currency, antitrust, the digital economy, and elsewhere are either too vague or lack “teeth” to ensure compliance. Moreover, even in areas covered by the WTO, China can mask industrial policy as private commercial activity. For example, beyond official subsidies the state can decisively shape the decisions of creditors, investors, and borrowers in ways that fit its interests and create an entirely uneven playing field. Masking industrial policy makes it much harder to identify and constrain.

China’s ambitions, motivations, policy tools, and approach toward globalization all come together particularly tightly in the context of information and communications technologies, the Internet and cybersecurity. Developing the Internet and related technologies serves economic, domestic security, and national security goals simultaneously. Chinese President and Communist Party chief Xi Jinping has repeatedly emphasized the multiple roles of the Internet and the importance of cybersecurity. For example, in a major 2016 speech, he said: “We have to take the initiative in the Internet development in our country. In order to protect cyber security and national security, we have to overcome the bottleneck of core technology. (We should) strive to leapfrog in certain areas and aspects.”⁴

China's famed "social credit system" as well as its smart-cities and safe-cities programs serve multiple purposes. Collecting data about your finances and acquaintances may uncover unpaid bills that make you a high-risk borrower or genuine criminal behavior, but could also be used to determine your political leanings and if you are likely to take to the streets. Developing telecom hardware and mobile technologies makes economic activity far more efficient and connects businesses and consumers, but it also gives the CCP and China's intelligence agencies greater understanding of potential opponents, at home and abroad. China has developed a complex and multifaceted policy and regulatory scaffolding for managing every aspect of the Internet and cybersecurity. While much of this would be needed in any circumstance, American industry and independent observers view much of this effort as overly burdensome and discriminatory.⁵

III. The Mixed Results of China's High-Tech Drive

⁴ “Speech to Cyber Security and Informatization Work Seminar,” *People’s Daily*, April 20, 2016, <http://cpc.people.com.cn/n1/2016/0420/c64094-28289000.html>.

⁵ Samm Sacks and Manyi Kathy Li, “How Chinese Cybersecurity Standards Impact Doing Business in China,” CSIS Briefs, August 2018, <https://www.csis.org/analysis/how-chinese-cybersecurity-standards-impact-doing-business-china>.

China's ambitions are one thing, the actual results another. In general, China has made substantial progress in developing advanced technologies. In the most recent data provided by the Global Innovation Index, China has moved up to rank 17th among the 126 countries it tracks.⁶ This index includes over 100 metrics related to both inputs (such as financing and education) as well as outputs (scientific publications, patents, and new products). China has separated itself from other developing countries, such as Brazil and Russia, and has moved closer to the United States (6th), Germany (9th), South Korea (12th), and Japan (13th).⁷ China is now the world's largest source of patents, granting over 2.44 million patents in 2018.⁸ Even if a large percentage are not reflective of truly innovative activity, a growing proportion are. It is no longer accurate to see the Chinese simply as a bunch of copycats.⁹

That said, there is a great deal of variation across sectors. In some industries, Chinese firms are doing exceptionally, creating innovations at an impressive rate. This is particularly true in ICT, from telecom equipment and handsets to Internet applications. This is in part because the technology barriers to entry in the Internet are lower than other sectors – you need a laptop and some coding skills – but it also a product of this sector being dominated by private companies. We know of larger firms such as Alibaba, Tencent, and Baidu, but there are hundreds of thousands, if not millions, of ICT start-ups, and they are part of a rich ecosystem of money, talent and services that span the country and beyond.

China's pharmaceutical sector has been far less successful, but its prospects are relatively robust compared to many other industries because of the kinds of talent and firms entering the sector. Pharma is the most globalized of any Chinese industry. Most company founders and top researchers have studied in the United States and Europe and are deeply familiar with the pharma industry, the entire drug development process, and the regulatory systems developed by the Food & Drug Administration (FDA). Many of these firms have raised funds from American venture capital firms and have deep relationships with one or more of the leading Western pharma firms.

In contrast to sectors such as these, there are another group of high-tech industries in China that have seen some success, but at a tremendous cost. In these sectors, China has developed technology at home or acquired it from abroad, and then pushed massive investments to scale-up the industries. But in the process, they have attracted far too many firms and investment, with the result being mediocre technological progress but outrageous levels of overcapacity. This kind of problem originally emerged in industries such as steel, aluminum, glass, and paper, but in the last decade have spread to several high-tech sectors. Solar, wind, electric vehicles, and robotics are

⁶ "Global Innovation Index," <https://www.globalinnovationindex.org/Home>.

⁷ Scott Kennedy, *The Fat Tech Dragon: Benchmarking China's Innovation Drive* (Center for Strategic and International Studies, August 2017), <https://www.csis.org/analysis/fat-tech-dragon>.

⁸ China's National Intellectual Property Administration, Monthly Report December 2018, <http://www.sipo.gov.cn/docs/2019-01/20190129105822724812.pdf>.

⁹ Shaun Rein, *The End of Copycat China: The Rise of Creativity, Innovation and Individualism in Asia* (Wiley, 2014); and Kai-Fu Lee, *AI Superpowers: China, Silicon Valley and the New World Order* (Houghton Mifflin Harcourt, 2018).

the most obvious, but overcapacity affect those industries where products are easily standardized, and funding is easily available. The results are fast-growing industries, but ones where the vast majority of producers are nowhere near the cutting edge, and supply outstrips likely demand. These industries are ripe for consolidation, but to avoid being stuck with unsold inventories, there is a huge incentive for companies to dump their products abroad. The result of such competition unconstrained by the penalty of losing is to put companies that face tighter budget constraints at a huge disadvantage. These circumstances threaten the vitality of supply chains and business models built on assumptions of a more competitive market environment.

The last group of high-tech sectors in China are those that have yet to succeed and do not show much promise, at least in the next decade or so. These tend to be industries closer to the cutting edge, with very high technology barriers to entry. But the Chinese compound these difficulties by bringing the heavy hand of the state into play, in some instances dictating that state-owned firms must dominate or that commercial activity must closely follow state guidelines.

The best example is commercial aircraft. China has developed a regional jet, the ARJ21, to compete with Bombardier and Embraer. The plane has been a bust. It was launched far behind schedule, and only one airline currently has it in its fleet. Industry experts tell me that the plane is extremely loud, and so passengers are given earplugs. Individual aircraft are often grounded for maintenance. China has a somewhat more promising narrow-body larger aircraft, the C919, in development. Aimed to compete against Boeing's 737 and the Airbus A320, the C919 is technically an improvement over the ARJ21, but almost all of the critical technologies on the plane, from the avionics to the engines, are from the United States and Europe. Moreover, the plane is far behind schedule, and even once the plane can go into commercial operation, it will take a long time for the Chinese to be able to fully service an entire fleet. China also has a wide-body aircraft on the drawing board, the CRJ929, but this plane is really just notional, and there is a large chance it will never actually be developed. Wide-body aircraft are far more complicated than single-aisle planes, and the market is already well developed. Moreover, by the time the CRJ929 might be ready, the entire commercial aircraft industry may have moved on to new technologies and business models. In short, particularly compared to other sectors, it feels as if in commercial aircraft, the Chinese are far behind and not making up ground quickly.

Why? To some extent, it is because of the inherent difficulty of the industry. Planes have hundreds of thousands of parts, and they have to work together seamlessly and perfectly on every flight – in the air, with no tolerance for mistakes. Moreover, fleets have to be serviced on an ongoing basis at amazingly high standards. But China has tackled other high-tech challenges of this complexity. What matters here is the weaknesses of the company China has assigned with this task, the Commercial Aircraft Corporation of China (COMAC). COMAC is a subsidiary of the Aviation Industry Corporation of China (AVIC), which is primarily a defense contractor. AVIC and its subsidiaries work in a very closed environment with little international engagement and few market signals. Like its parent, COMAC is hierarchical and internally organized in a way to inhibit information sharing and learning. COMAC has hired a couple hundred international experts from leading companies and regulators, but they have little voice in company management and decisions. As a result, China's prospects in commercial aircraft are

particularly dim. Eventually the C919 will likely be launched, and China can require its domestic airlines to put the C919 into service, and this will provide a chance for learning and improvement. But it is just as likely that the C919 will run into substantial problems and be a highly costly flop.¹⁰

There are a variety of high-tech industries that have similar prospects in China. The other most obvious one is semiconductors. There has been progress in some segments of the industry, but failure is far more common than success, and China shows little likelihood of achieving leadership in the industry any time soon.¹¹

Given this variation, it is inappropriate to see China as a high-tech superpower, but rather as an aggressive competitor with both sizeable strengths and substantial deficiencies. Hence, it does not make sense to be either overly alarmist or comfortably dismissive of China's high-tech ambitions. The truth is somewhere in the middle, and it requires taking an empirical approach and examining industries one-by-one.

IV. American Policy

In a narrow sense, current American policy appears to overestimate China's high-tech prowess, but it probably makes sense to err on the side of caution and prepare for a China that once again defies expectations to overcome many of the challenges described above. That said, the Trump Administration's approach to responding to China's high-tech challenge is overly focused on a single approach: pressure. This stance is understandable given China's highly aggressive approach that threatens the health of individual companies as well as entire industry supply chains and business models. Under Xi Jinping China has made some modest adjustments to market access in some industries, for example, gradually reducing joint-venture requirements for automobiles and liberalizing access to its financial markets, but the overall trajectory is one of greater control and discrimination against foreign industry.

The United States is utilizing several tactics to put an immense amount of pressure on China and try to leave it isolated. The first is raising tariffs across a wide range of industries in order to hurt the economy's growth prospects. The US has raised tariffs on three separate occasions, with tariffs of 25% now covering half of America's imports. The US is now poised to place tariffs on the remainder of China's exports to the United States. The second component of this pressure strategy is to more directly deny China access to American technology and markets. The US passed reforms in 2018 to our laws related to foreign investment and export controls, and these

¹⁰ Amanda Lee, China's Aviation Industry Has A Steep Climb to 'Made in China 2025' Goals, *South China Morning Post*, October 29, 2018, <https://www.scmp.com/business/article/2170746/chinas-aviation-industry-has-steep-climb-made-china-2025-goals>; David Fickling, China Inc.'s Boeing Rival Just Won't Fly, *Washington Post*, March 21, 2019, https://www.washingtonpost.com/business/china-incs-boeing-rival-just-wont-fly/2019/03/21/565b9bf6-4bad-11e9-8cfc-2c5d0999c21e_story.html?utm_term=.91e7db913869.

¹¹ James A. Lewis, *Learning the Superior Techniques of the Barbarians: China's Pursuit of Semiconductor Independence* (Center for Strategic and International Studies, January 2019), https://csis-prod.s3.amazonaws.com/s3fs-public/publication/190115_Lewis_Semiconductor_v6.pdf.

efforts are largely driven by concerns about China. The Committee for Foreign Investment in the United States (CFIUS) is expanding the range of industries and lowering the scale of investment that triggers a national security review. The Commerce Department is developing broader rules to limit exports of foundational and emerging technologies. These restrictions will include both physical technologies as well as individual human talent, what is called “deemed exports.” Finally, the U.S. has modestly adjusted its visa policies, making it harder for Chinese graduate students in the sciences and engineering to gain access to American universities, and also limiting people-to-people exchanges amongst working scientists and other experts. Overall numbers of students and professionals engaging in travel has not fallen much, but the marginal effect has been quite noticeable.

This pressure approach has in the last few months been turned on specific Chinese companies, the most important of which is Huawei. Huawei is by far China’s most successful company, but it is still highly dependent on suppliers from the United States and elsewhere for many of its components. In August 2018 and January 2019 the Trump administration issued two indictments against Huawei for violating sanctions against Iran and stealing American IP. In mid-May 2019 the administration issued an Executive Order banning any American entity from purchasing Huawei equipment (an expansion of the late-2018 step to ban purchases by US government entities). At the same time it also placed Huawei on an “Entity List,” denying it access to American-based components.¹²

It is understandable for the United States to have lost patience with China and utilize pressure as a way to force China to the negotiating table as well as simply better protect American technology central to our national security. In fact, I grudgingly supported the administration’s use of tariffs to capture China’s attention and let it know that the United States was willing to use its power to protect its national interests and accelerate negotiations that would result in China putting substantial constraints on its industrial policies to reduce the damage caused to individual companies, entire industries, and our national security.

However, this approach has now gone too far and is in danger of backfiring to the detriment of the American economy, US national security, and the global economy. Trade tariffs have already created a great deal of “collateral damage,” including a large number of American farmers and companies who have lost export markets, and American consumers who are paying higher prices for goods. If the tariffs on all Chinese goods go into effect, it may be the highest increase in taxes on Americans since the early 1990s. Import tariffs are also highly regressive, disproportionately affecting low-income populations. But as long as there was a chance China could be brought to the negotiating table to reach a good deal, these costs may have been worth the risk. But the line between risky and a huge mistake was crossed when the U.S. placed Huawei on the “Entities

¹² The White House, Executive Order on Securing the Information and Communications Technology and Services Supply Chain, May 15, 2019, <https://www.whitehouse.gov/presidential-actions/executive-order-securing-information-communications-technology-services-supply-chain/>; “Addition of Entities to the Entity List,” *Federal Register*, May 21, 2019, <https://www.federalregister.gov/documents/2019/05/21/2019-10616/addition-of-entities-to-the-entity-list>; and U.S. Department of Commerce Bureau of Industry and Security, Supplement No. 4 to Part 744 – Entity List, <https://www.bis.doc.gov/index.php/documents/regulations-docs/2326-supplement-no-4-to-part-744-entity-list-4/file>.

List.” Huawei is no saint of a company, and the U.S. intelligence community has signaled reasonable alarm about the threat of having Huawei’s 5G technology in American networks and those of our allies. But the Entity List order was drafted far too broadly. It is costing American companies billions of dollars in business in non-sensitive areas such as consumer electronics. Equally important, the networks which are run on Huawei equipment are likely to become increasingly degraded and unstable in a matter of months if not weeks. Huawei operates in 170 countries, with networks for mobile communications, healthcare, finance and other industries.

The U.S. does not so much as need to put aside an approach of pressure so much as dial it back modestly and complement it with two other initiatives. The first would be to reduce tensions with other countries who face the exact same challenges as the United States in China. Our allies in Europe, Asia, and Latin America face the same problems with IP theft and discriminatory policies from China. Instead of closely working together, the Trump administration has threatened or used tariffs against many of them. The global economy’s largest challenge is from China, not everyone that has a trade surplus with the United States. Greater coordination, formally and informally, would make the choice for China far much clearer; the chances of it agreeing to serious reforms and engaging less in IP theft and other harmful practices would increase.

Finally, the U.S. needs to strengthen its own ecosystem for advanced technologies. Not only does the United States need to invest more in R&D for basic sciences and applied technologies, there needs to be greater investment in all levels of STEM education and physical infrastructure. Equally important, in some instances the United States federal and local governments need to do more to spur demand for leading technologies. In some sectors, American experts have created new technologies only to find limited market interest at home. As a result, some of them are lured to sell their technologies to Chinese investors, who have a market ready to scale-up these ideas. Electric-car battery technology is an excellent example. The Department of Energy’s ARPA-E Program has supported such research, but some of the successful results have been sold to or commercialized in China, not the United States. This trajectory needs to be changed, not by mandating where technology can be used, but by creating commercial incentives for them in the United States. In 2018, China’s electric car market was over 1.2 million vehicles; the American market was one-fifth the size, and the gap will likely be larger in 2019 and beyond – unless the U.S. government helps modify incentives for both auto producers and consumers.

I am not calling for an all-out industrial policy. As Congressman Rick Larsen (D-WA) recently declared, “The United States does not need to ‘out-China’ China’; it needs to ‘out-US’ the US.” That said, if done carefully and humbly, the US government can promote new technologies with limited government resources in a market-friendly way. And a more successful American high-tech sector is the best bulwark against the challenge from China.