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Foreign Research Collaboration in an Era of Strategic Competition

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Let me start by thanking the National Science Board for the invitation to present on the important topic of *Foreign Research Collaboration in an Era of Strategic Competition*. I'll use my time to describe how the topic of foreign research collaboration presents in the current context of heightened strategic competition between the United States and China. Based on work my colleagues and I have done over the past 18 months, I will offer a handful of recommendations, which are intended to foster U.S. leadership in Science and Technology while protecting national security.

Same Issue, Different Context

It's worth providing a bit of background as to why an economics program at a national security-focused think tank came to study foreign research collaboration in the first place.

My program at the Center for Strategic and International Studies – better known as CSIS – concentrates on global economic governance and America's role in the global economy. Over the past few years, our work increasingly has focused on areas of growing economic competition between the United States and China; as well as areas where U.S. economic leadership is undermined by factors both external and domestic.

One such area is foreign investment. Traditionally, the openness of our economy to foreign investment has been celebrated as a source of strength, attracting financial and human capital to the United States. While that favorable assessment prevails today, investment trends earlier this decade

produced a growing concern that a subset of foreign investment in the United States may actually undermine our national security. Specifically, there was a growing recognition that at least some foreign investment targeted sensitive technologies and data as part of a coordinated strategy by China to build its own capacity in strategic sectors.

Congressional hearings in 2017 and 2018 described China's focus on investments in fields such as Artificial Intelligence or "AI", semiconductors, and robotics¹. At the same time, the December 2017 National Security Strategy called out China (and Russia) for challenging "American power, influence, and interests" in an attempt to "erode American security and prosperity". The broad assessment of China's intentions, combined with a pattern of Chinese investment in strategic sectors, provoked fears that such investments would ultimately accrue to China's military and economic advantage².

These concerns led to a general consensus in Washington that the process for reviewing foreign investment in the United States for possible threats to national security required an update. My program and others at CSIS followed various reform proposals with three key questions in mind:

- First, how would any reform address identified threats to national security?
- Second, what impact might reform have on the attractiveness of the United States as a destination for financial and human capital; and on our economic outlook?
- Third, to what extent will allies and partners of the United States – specifically those that possess advanced capabilities in science and technology – adopt similar policies?

In late-2017, CSIS launched a small, closed-door dialogue with government representatives from allies and partners of the United States in an attempt to

¹ See for instance *Evaluating CFIUS: Challenges Posed by a Changing Global Economy*, January 9, 2018, U.S. House of Representatives, Subcommittee on Monetary Policy and Trade, Committee on Financial Services; and *CFIUS Reform: Examining the Essential Elements*, January 18, 2018, U.S. Senate, Committee on Banking, Housing, and Urban Affairs.

² *National Security Strategy of the United States of America*, December 2017. <https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf>.

answer these questions. From our earliest meetings, it became apparent that “inbound” foreign investment was not the only area of concern. Equally worrisome to many in the national security community in the United States – as well as to key allies and partners, but to varying degrees – was the transfer of sensitive technologies including in the context of licensing and joint venture agreements, what became known as “outbound” investment.

Ultimately, the reform that was signed into law sought to address potential risks stemming from both “inbound” and “outbound” sources³:

- Risks stemming from inbound investment were addressed in the Foreign Investment Risk Review Modernization Act or FIRRMA, which expands the government’s authority to review foreign investment in the United States to include non-controlling, non-passive investments involving critical technology, critical infrastructure and sensitive personal data.
- Risks stemming from outbound transfers were addressed in the Export Control Reform Act or ECRA, which directs the Commerce Department to identify emerging and foundational technologies for possible inclusion on the Commerce Control List.

The Treasury Department, which leads the inter-agency effort to screen inbound investment, is currently finalizing the regulations to implement FIRRMA. The Commerce Department, which administers the Export Administration Regulations (EAR) including the Commerce Control List, has thus far identified broad categories for the types of technologies under evaluation for possible inclusion on the Commerce Control List. These categories include biotechnology, AI, advanced computing technology, quantum information and sensing technology, robotics, brain computer interfaces and advanced materials among others⁴.

³ John S. McCain National Defense Authorization Act for Fiscal Year 2019. <https://www.congress.gov/bill/115th-congress/house-bill/5515/text>.

⁴ <https://www.federalregister.gov/documents/2018/11/19/2018-25221/review-of-controls-for-certain-emerging-technologies>. Importantly, Commerce specified that it “does not seek to expand jurisdiction over technologies that are not currently subject to the EAR, such as ‘fundamental research’ described in § 734.8 of the EAR.”

Link to Research Collaboration

You will no doubt recognize many of the broad categories on the Commerce Department's list as areas of focus for leading research institutions in the United States and around the world. Little more than a year after we launched our closed-door dialogue, we began to observe that areas of interest in the context of foreign investment screening and expanded export controls also featured prominently in U.S. government efforts to ensure research integrity.

As detailed in our September report on research collaboration, U.S. government agency actions – initially at least – appeared largely uncoordinated. Late-spring of this year, however, may have marked a turning point, with the White House Office of Science and Technology Policy, through the National Science and Technology Council, launching the Joint Committee on Research Environments or JCORE to bring a “whole of government” approach to address the most pressing challenges facing the U.S. research and scientific community⁵. Specifically, JCORE's Subcommittee on Research Security “aims to protect America's researchers from undue foreign influence without compromising our values or our ability to maintain the openness and integrity of our innovation ecosystem.”

I've thus far framed the issue as one that emerged in the past few years out of heightened strategic competition between the United States and China. But the Board is well aware that concern over sensitive research “leakage” is not new and can be traced back to the Cold War when concern focused on scientists from the Soviet Union, and a lesser extent, Iran.

At that time, the United States, while acknowledging the potential risks, opted to preserve the openness of the U.S. research ecosystem and control only a relatively small subset of classified research. National Security Decision Directive 189, issued under the administration of President Ronald Reagan, set out to control classified research but leave most research, and the products of fundamental research, unrestricted to the maximum extent possible.

⁵ Stephanie Segal and Dylan Gerstel, *Research Collaboration in an Era of Strategic Competition*, CSIS, September 2019.

This judgment reflected the view that such openness overwhelmingly benefitted the United States. In the decades since NSDD 189 was issued, it has been reaffirmed by the administrations of President George H.W. Bush; President George W. Bush; and President Barack Obama.

The question of how best to protect national security considering the risks presented by an open research environment and a strategic rival seeking competitive advantage is being asked again today. This time, the main country of concern is China. And while the problem is familiar, there are ways in which the challenge is different.

China as the Main Country of Concern

The most obvious way in which China is different is its scale. With a population of 1.4 billion, China is the world's most populous country. With a gross domestic product of roughly \$14 trillion, it is the world's second largest economy, behind only the United States. With China's economy forecast to grow at a rate roughly three times that of the U.S., China may well surpass the United States as the world's largest economy in the next decade. By some measures, China's economy is already the world's largest.

China has also developed a plan to translate economic power into investment to fuel innovation leadership. President Xi has called innovation the primary driving force behind development and the strategic underpinning for building a modernized economy. The U.S.-China Economic and Security Review Commission's *2019 Annual Report to Congress* notes the Chinese government's "whole-of-society strategy to attain leadership in AI, new and advanced materials, and new energy technologies⁶." Part of this strategy entails increased investment in research and development (R&D), which has steadily grown throughout the decade and is now roughly equivalent to R&D investment by European Union countries as percent of gross domestic product⁷.

⁶ U.S.-China Economic and Security Review Commission, *2019 Report to Congress*, November 2019. <https://www.uscc.gov/sites/default/files/2019-11/2019%20Annual%20Report%20to%20Congress.pdf>.

⁷ *Math and Science Technology Indicators*, OECD. https://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB

Alongside increased R&D funding, China has boosted efforts to train researchers in science and technology fields. As noted in our report, of the more than 7.4 million students who obtain a bachelor's degree in China every year, more than one-third are in science and technology fields, as compared with less than one-fifth in the United States. And while China and the United States produce roughly the same number of PhD recipients in science, technology, engineering and mathematics or "STEM" fields, over a third of U.S. STEM PhD recipients are temporary visa holders, underscoring our reliance on foreign students for S&T research.

Of course, investment does not always translate into genuine innovation. While experts may debate relative standings across various research fields and critical technologies, there is little doubt that China is gaining ground. Publication statistics reveal China as the most frequent partner in cross-border research cooperation. More granular data also show China gaining ground, with its share of biotechnology-related patents increasing from 3.2 percent at the start of the decade to 6.3 percent as of 2017; the trajectory in nanotechnology-related patents is even more pronounced, with China's share increasing from 6.3 to 14.1 percent.

The issue of leadership is particularly relevant to the discussion on restricting access to information produced in federally-funded fundamental research, as restricting collaboration where other countries are at the cutting-edge may inadvertently limit our own access to advanced research and divert top talent to third countries.

However, China's deep integration with economic and research ecosystems and leading position in some areas of research should not be interpreted as a green light to proceed with business as usual. One finding from our closed-door dialogue is concern from several countries that foundational principles for scientific discovery are being breeched. Specifically, the confidentiality of the peer review process; transparency and disclosure of funding sources; and the willingness to transform scientific discovery into a public good – aspects once taken for granted as universally accepted among the scientific community – don't appear to enjoy the same adherence from all participants. While the end goal is China's acceptance of fundamental principles of scientific research,

getting there will require improved outreach to the scientific community; more uniform and better dissemination of disclosure requirements; and enhanced enforcement efforts. Ultimately, research integrity cannot be legislated or regulated; it must be led by the scientific community itself.

Recommendations

As I was preparing my comments for today, it occurred to me how well the three questions we asked in the context of evaluating reforms to foreign investment screening apply to foreign research collaboration:

- First, how would any action address identified threats to national security?
- Second, what impact might actions have on the attractiveness of the United States as a destination for human (if not financial) capital; and what impact will this have on our outlook – in this case our innovation ecosystem?
- Third, to what extent will allies and partners of the United States – specifically those that possess advanced research capabilities – adopt similar policies?

We must have implicitly had these questions in mind when we developed the recommendations in the research collaboration report. Before I get to them, I should highlight the disclaimer: namely that our recommendations are based on available *unclassified* information which reveals a very real threat posed by a small fraction of foreign researchers working illicitly to gain access to sensitive science and technology. Of course, we don't know what we don't know, and ultimately governments, researchers, and the private sector will need to reassess the trade-offs between openness and security and update policies accordingly and on an ongoing basis.

Now for the recommendations:

1. Our top recommendation doesn't have to do with China as much as our own commitment to developing science and technology talent in the United States as well as retaining foreign researchers. The United States will only

remain at the innovation frontier by investing in research and human capital. This includes improving STEM outcomes in primary and secondary education, attracting and retaining more women and minorities in STEM fields, and expanding pathways for foreign students to remain in the country after completing their degrees.

2. Develop and maintain a realistic inventory of global innovation leadership. An informed view of the landscape is needed to craft policies that preserve U.S. access to cutting-edge science. I understand there is an ongoing study by the National Science Foundation and the JASON advisory group; we hope policymakers can utilize the study's findings and ensure funding for regular reviews and updates of science and technology leadership.

3. Limit restrictions on collaboration only to those areas that pose an identified threat to national security. Consistent with NSDD 189, federal agencies should articulate clear, narrow restrictions on sensitive projects while exempting fundamental research from heightened control.

4. Standardize federal policy guidance to agencies and research institutions. OSTP – through JCORE – should lead in deepening interagency efforts to develop common policy guidance and disclosure best practices for funders and research institutions. Recommendations should cover oversight and enforcement mechanisms that respect due process and are transparent and open to public comment. These policies should undergo regular review to ensure they adequately address risks.

5. Deepen processes to connect government and non-government stakeholders. Congress and the administration should reaffirm their support for scientific advisory boards, such as JASON and the National Academies of Sciences, Engineering, and Medicine, and consult these groups during the policy formation process.

6. Enhance efforts to enforce existing policies. Existing policies on peer review, disclosure, and classification have the potential to address many research leakage vulnerabilities, but enforcement by universities and research institutions remains an issue. Working with industry, academic associations,

and individual universities, the U.S. government should codify and disseminate best practices. Violations of IP protections and academic integrity protocols should be handled through enforcement actions, which may require additional funding for compliance officers, including in federal grants.

7. Work with allies and partners in areas of highest concern. A unilateral approach risks losing talent without addressing risks to academic integrity and national security. Outreach to allies and partners should be supported by specific evidence of activity of concern, such as military-sponsored researchers, rather than broad threats of IP leakage. Deepening information and intelligence sharing will help educate allies and partners on high-risk areas where restrictions may be necessary.

I'll end my formal comments with a brief elaboration on the last recommendation. Our dialogue has revealed that other countries have similar concerns when it comes to adherence to the basic foundational principles of scientific research. They too are concerned about the confidentiality of the peer review process; the transparency and disclosure of funding sources; and the willingness to transform scientific discovery into a public good through the dissemination of research results. They separately have concerns around the ultimate application of certain research collaborations.

At the same time, they view China as an innovation leader and an important research partner. They recognize there may be difficult decisions on the horizon when it comes to partnering on emerging technologies. Above all, the countries we consulted view the scientific community as the lead partner in preserving research integrity and enforcing adherence to the basic foundational principles of scientific research.

Thank you for your attention and I look forward to your questions and comments.