



**Statement before the Senate Committee on
Commerce, Science, and Transportation
Subcommittee on Oceans, Fisheries, Climate Change, and
Manufacturing**

***“Promoting and Investing in Small American
Manufacturers”***

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Securing the U.S. Innovation System

Chair Baldwin, Ranking Member Sullivan and Members of the Subcommittee, my name is Sujai Shivakumar, Senior Fellow at CSIS, where I direct the project on Renewing American Innovation. As a bipartisan, nonprofit policy research organization dedicated to advancing practical ideas to address the world's challenges, CSIS's purpose is to define the future of national security. Accordingly, CSIS has launched a major program called Renewing American innovation, which I lead. RAI's purpose is to strengthen the policy foundations that have created the most dynamic and successful innovation system in history to strengthen our national security today and in the future.

Thank you for the opportunity to testify today about the importance of manufacturing and innovation for our national security.

Innovation as a National Security Asset

Innovation has long been critical to addressing the nation's challenges in economic growth and security, and to improving the health and wellbeing of Americans. Indeed, it is important to recognize that our innovation system is itself a national security asset—one that underpins our continued prosperity, competitiveness, and military strength. This asset has to be rejuvenated as new global realities and opportunities arise.

Much of today's industrial strategy was designed in the 1950s to meet our needs during the Cold War. At that time, Congress invested in the nation's continued technological leadership by creating new institutions such as the National Science Foundation, expanding the National Institutes of Health, and by developing new infrastructure for research and development through the organization of National Laboratories and increased funding for research universities.

Federal policy in the postwar period focused on funding research and development at the front end while enabling the commercialization and procurement of new technologies at the back end, allowing new products to reach the market. Early procurement of semiconductors through the Minuteman and Apollo spaceflight programs allowed us to take an early and strong technological lead, becoming a key element of our economic and military superiority over the Soviet Union.

An Innovation Ecosystem for a Multipolar World

Today we can no longer rely on this strategy alone because other countries in recent decades have invested in building their innovation systems, recognizing it as an engine for their own rapid economic development and national strength. They now have the means and often the will to capitalize on the investments we make in R&D. China, for example, invests heavily in building up its workforce and manufacturing infrastructure, enabling that nation to capitalize on the new ideas generated by our world class research system. This strategy allows them to develop advanced weapons and create competitive products for global markets.

We need a new strategy for a technologically multipolar world, a strategy informed by a better understanding of the innovation process. The term "innovation ecosystem" is now widely used to describe rich networks of cooperation among scientists and researchers, entrepreneurs and

investors, small and large manufacturers, high-skilled and technically skilled workers, as well as local, state, and federal agencies. This process, when it works well, is both bottom-up and top-down—it is federalism in action, and it is arguably the secret sauce of American technological leadership.

But this system does not exist in a vacuum. The innovation system relies on all these actors overcoming a variety of barriers to cooperation—they need to speak the same technical language, they must be able to share ideas securely and easily, they need to convince investors of the value of their ideas, and they need to find able partners and collaborators to scale-up and manufacture products, creating jobs and regional economic growth. Fortunately, solutions to many of these problems exist and Congress needs to upgrade and reinvest in these solutions while engineering new ones to strengthen our national innovation system.

Strengthening the Innovation System

What can Congress do to strengthen the American Innovation System?

- **Congress should Reinforce U.S. Standards Leadership:** Technical standards provide the shared vocabulary and grammar that allows researchers, manufacturers, and consumers to speak the same language across the innovation ecosystem. Leadership in setting standards has long allowed the U.S. to set the terms of the technology conversation, but this leadership is under threat. China’s leaders recognize the commercial and national security advantages of standards leadership, especially in emerging communications technologies. They have embarked on a China Standards 2035 strategy and are actively participating in global standards-setting organizations. The role of the National Institute for Standards and Technology in working with the private sector to develop global technological standards needs to be reinforced by vigorous American reengagement in organizations such as the International Telecommunications Union. We need to recognize that organizations that were previously not the focus of U.S. policy makers’ attention now need to be—they are certainly high on China’s policy agenda.
- **Congress should Secure the Patent System:** Strong intellectual property rights ensure that innovators can benefit from their ingenuity and hard work, creating an opportunity to monetize new ideas. However, in the American system, patents are important not only as incentives to invent, but as incentives to share ideas. The ability to protect an idea provides the security inventors need to bring their innovations into the public forum and forge commercial collaborations with other innovators through licensing agreements. The U.S. needs to maintain the role that its patent system has played in spurring innovation against those who would benefit from weaker enforcement, including defending it vigorously against poaching of intellectual property belonging to small business by large businesses, and by brazen theft through cyber intrusions by China and other rivals. In addition to maintaining our patent system so that it continues to protect our innovative small and medium enterprises we need to include courses in cyber defense as a routine part of our science, engineering, and business education curriculum. Congress can further support this by beefing up our national cyber defense infrastructure.

- **Congress should Encourage Entrepreneurship:** Americans celebrate entrepreneurship and recognize that failure is often a step on the path to commercial success. But entrepreneurs often find it challenging to demonstrate their idea’s technological potential to investors. Many promising technologies are lost to the so-called “Valley of Death” between early-stage research and commercial adoption due to lack of sustained investment. Federal programs like the Small Business Innovation Research Program (SBIR) help bridge this gap through merit-based awards. A key finding of a major National Academy of Sciences study¹ is that SBIR alerts potential investors of technologies with commercial viability, improving the functioning of private capital markets. Congress needs to institutionalize this exceptionally effective program, one that is widely emulated abroad as a best practice in innovation policy.²
- **Congress should Continue to Focus on US based Manufacturing:** Seeking to capture the global market opportunity in emerging technologies, major U.S. competitors in Europe and East Asia have launched targeted, large-scale programs, with significant government funding to develop these new technologies, refine them, and ultimately manufacture them within their national borders. National and regional investment undertaken by our foreign competitors are significantly larger than comparable U.S. investment and are more weighted toward later-stage applied research and product development. In response, the United States has sought to build a nationwide network of cooperative research Centers, known as the Manufacturing USA institutes, which are loosely modeled on the German Fraunhofer system and are designed to support translational innovation by companies—particularly small firms. While the program has significant potential to strengthen innovation networks, these programs are underfunded. With just 14 institutes, Manufacturing USA is a relatively lean program compared to the 70+ Fraunhofers. China, by contrast, has borrowed the Manufacturing Center concept and apparently has expanded it significantly.³
- **Congress should Connect Regional Resources:** The innovation system, as a network of networks, can be strengthened by building connections across existing research, financing, and manufacturing assets at the state and regional level. The NIST Manufacturing Extension Partnership (MEP) helps small- and medium-sized manufacturers make these connections so that they have the resources needed to improve efficiency, reduce costs, create new products, and find new markets.⁴ The *CHIPS and Science Act* expands MEP to extend its work with small- and medium-sized manufacturers to improve cybersecurity, worker training, and supply chain resiliency. This support is welcome and needs to be followed up with sustained and substantial funding from Congress. Above all, it has to be a long-term effort.

¹ National Research Council. *An Assessment of the SBIR Program*. Washington, DC: The National Academies Press, 2008. <https://doi.org/10.17226/11989>.

² Jonathan M. Barnett. *Innovators, Firms, and Markets: The Organizational Logic of Intellectual Property*. Oxford University Press, 2021.

³ National Academies of Sciences, Engineering, and Medicine. *Securing Advanced Manufacturing in the United States: The Role of Manufacturing USA: Proceedings of a Workshop*. Washington, DC: The National Academies Press, 2017. <https://doi.org/10.17226/24875>.

⁴ National Research Council. *21st Century Manufacturing: The Role of the Manufacturing Extension Partnership Program*. Washington, DC: The National Academies Press, 2013. <https://doi.org/10.17226/18448>.

- **Congress should Build and Broaden a Skilled Technical Workforce:** Renewing America’s innovation system requires overcoming decades of underinvestment in the American workforce. Federal efforts must encourage training programs anchored on industry-relevant skills and must promote hands-on experience through industry internships and in community colleges through public-private partnerships. In response to globalization and advances in science and technology, American firms are demanding workers with strong interpersonal, technical, and problem-solving skills. Employers also increasingly cite the presence of a skilled workforce as a key factor in decisions to re-shore production.⁵ Congress can support and enhance strategies ensuring that all stakeholders, including students, workers, employers, and educational institutions, have the right incentives to improve the quality of technical education and training, and develop new models of governance to encourage fruitful experimentation and collaboration. Universities, like other institutions, need to adapt to new challenges—and they need the right incentives to do so.

A New Agenda

Our nation’s innovation system – which is the foundation of our economic competitiveness and national security – is continually strengthened by encouraging new ideas, nurturing entrepreneurship, and fostering cooperative connections. As I have outlined, there is no silver bullet. We need to do all of this on a sustained basis. In times past, Congress has repeatedly stepped up to renew and strengthen this critical national asset. That opportunity is at its door again.

⁵ National Research Council. *Rising to the Challenge: U.S. Innovation Policy for the Global Economy*. Washington, DC: The National Academies Press, 2012. <https://doi.org/10.17226/13386>.