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Congress Should Fully Fund NSF's TIP Directorate to Make America More Competitive Versus China

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Congress has authorized $20 billion over five years to fund the National Science Foundation's Technology Innovation Partnership, but lawmakers have appropriated just $410 million. To win the techno-economic war with China, America needs the TIP directorate to be fully funded.

KEY TAKEAWAYS

- NSF has long funded curiosity-driven research with the intent of producing basic knowledge rather than supporting U.S. technological advancement and competitiveness.
- The NSF Directorate for Technology, Innovation, and Partnership (TIP) was established in 2022 with a more tightly focused mission of accelerating key technologies to advance U.S. competitiveness.
- Congress has authorized $20 billion over five years to fund the TIP directorate as part of the CHIPS and Science Act. But lawmakers have appropriated just $410 million.
- Operating with just a fraction of its intended budget, TIP so far has funded translational research with industry partners in critical technologies, including biotechnology and wireless communications.
- TIP has conducted collaborative research on key technologies with international allies, including India and Japan.
- Congress should not cut TIP's budget and should instead fund TIP with at least $1 billion for this fiscal year. Congress and the Trump administration should also lift hiring restrictions.

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INTRODUCTION

When Congress passed the CHIPS and Science Act of 2022, it authorized $81 billion to the National Science Foundation (NSF) over five years, with only one-fourth to go to the Directorate for Technology, Innovation, and Partnership (TIP), which NSF had launched shortly before this legislation.[1] The predecessor bill, the Endless Frontier Act, assigned about two-thirds of the new funding to TIP, but due to intense university lobbying for no-strings-attached funding, the final bill significantly reduced TIP's share.

Congress intended TIP funding to (1) support use-inspired and translational research and accelerate the development and use of federally funded research and (2) strengthen U.S. competitiveness by accelerating the development of 10 key technologies.

Despite congressional authorization, TIP has received only a fraction of the promised funding: $410 million in supplemental appropriations from the CHIPS and Science Act—far below the $20 billion authorized for FY 2023 to FY 2027. Given China's massive investment in the 10 technologies the act focuses on, the investment to date is a drop in the bucket.

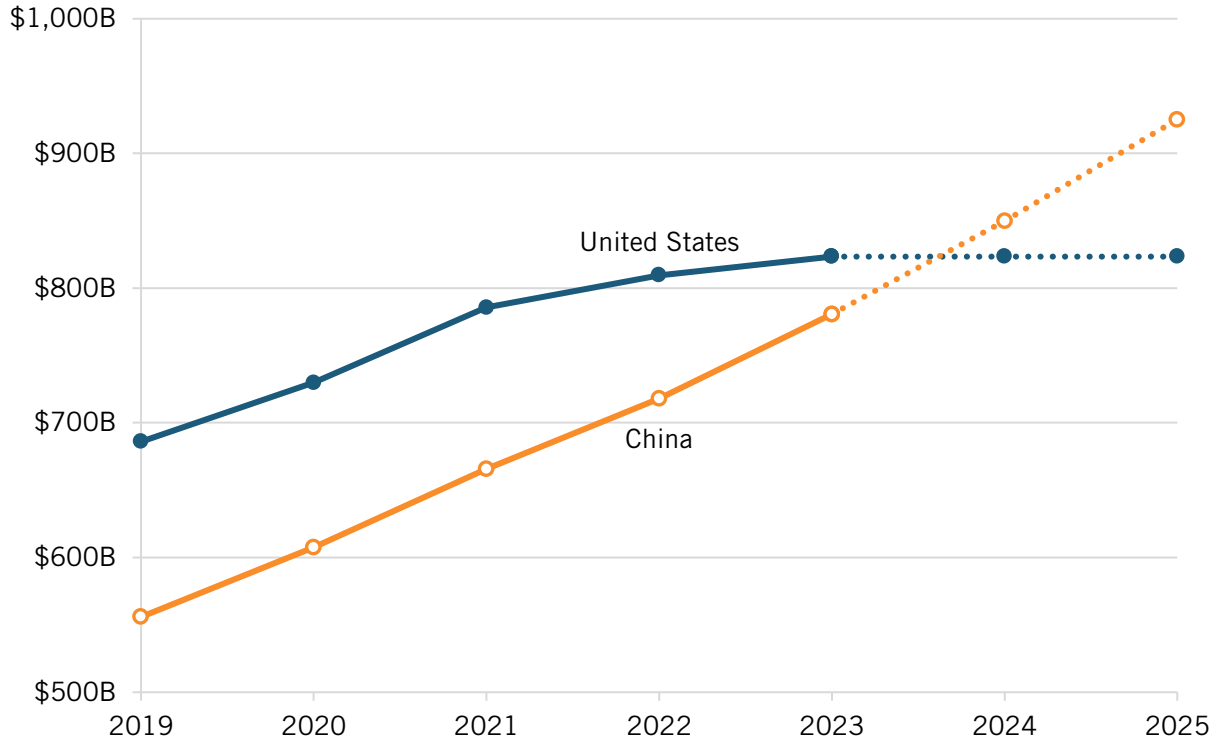
If Congress and the Trump administration want to avoid losing the techno-economic war with China and expand research and innovation, both of which the TIP program promises to deliver, Congress needs to fund TIP in this fiscal year with at least $1 billion.

WHAT IS THE DIRECTORATE FOR TECHNOLOGY, INNOVATION, AND PARTNERSHIP?

China is challenging the United States for global technology leadership. In response to this crisis, Congress passed the CHIPS and Science Act. But shortly before this, the then-director of NSF, Sethuraman Panchanathan, created a new directorate, TIP, within NSF to focus more on both research with industry relevance and technology commercialization to industry. This was to be a somewhat new approach for NSF, which historically had focused the lion's share of its efforts on responding to the needs of university principal investigators whose primary focus was academic publications.

Research in the United States has declined, and that's notwithstanding the recent cuts to research grants by the Trump administration, which will likely have devastating effects on invention disclosures, licenses, and patents in the coming years. This is even more concerning considering that China is investing in research and development (R&D) at far higher rates than the United States is. Between 2019 and 2023, year-over-year growth in R&D investment was just 4.7 percent in the United States, compared with 8.9 percent in China (figure 1). Given that Chinese R&D is less expensive than U.S. R&D, when adjusted for cost-efficiency, China's R&D spending in 2023 was 2.3 times its actual amount—nearly $1.8 trillion.[2] Assuming China continues to increase its investment in R&D at a constant rate while U.S. investment stagnates, 2024 data will show that China has already surpassed the United States in R&D investment.

Figure 1: Gross expenditures on R&D, 2019–2023, with projections through 2025



When you further consider that a significant portion of U.S. research, up until this point, has been invested in projects designed to produce academic publications and not technological advances, the picture is even more bleak.

NSF has historically had one core mission: to support curiosity-inspired research by American scientists. Commercialization of that research and a focus on the research most relevant to American competitiveness has always been a minor focus of the agency. Indeed, NSF has historically made promises of partnerships and university-industry collaboration that were not fully successful, such as its Partnerships for Innovation program (which was sunset earlier this year). The program was launched in 2017 to fund translational research aimed at catalyzing partnerships and transitioning scientific discoveries into marketable products.[3] However, the Information Technology and Innovation Foundation's (ITIF's) analysis shows that not all research funded by the program required a partnership or industry support.[4] The same can be said for its 83 Engineering Research Centers, which boast "strategic university-industry partnerships" but do not require any industry funding match.[5] That is why TIP is so encouraging, as it promises to make these a more important part of NSF.

TIP has received only a fraction of the promised funding: $410 million in supplemental appropriations from the CHIPS and Science Act—far below the $20 billion authorized for FY 2023 to 2027.

Research has long been shown to enable innovation; however, turning that research into a marketable product useful for economic growth and dispersion has a less linear path. Research is translated into products either through academic entrepreneurship, such as patenting or the development of start-ups, or through research partnerships between universities and industry.[6] These partnerships facilitate the transfer of knowledge from researchers to established producers, who possess the necessary resources and expertise to develop innovative products ready for use.[7] For example, researchers developing a new and more powerful large-language model may partner with an existing producer of artificial intelligence (AI) models or a start-up to turn their research into usable products for consumers.

TIP, with its focus on technology advancement and commercialization, makes industry buy-in a prerequisite for all projects receiving funding. Under Subtitle G of the CHIPS and Science Act, TIP grants must "develop mutually beneficial research and technology development partnerships and collaborations among entities such as institutions of higher education, nonprofit organizations, labor organizations, for-profit entities, government entities, and international entities," a guideline meant to guarantee an accelerated path to practical commercialization and use, and a stark contrast from much of NSF's other research.[8] Additionally, Subtitle G states that TIP grants are only to be awarded to research in several key technology focus areas (KTFAs) deemed essential in winning the techno-economic battle against China.

Programs similar to TIP have been created elsewhere, yielding positive results. For instance, Japan has its Cross-ministerial Strategic Innovation Promotion Program (SIP), and the European Union's Horizon Europe, both of which invest in research on technology deemed critical for competitive advantage.[9] Like TIP, Japan's SIP promotes 12 key technology areas selected to "contribute to the resurgence of the Japanese economy."[10] The initiative steers researchers toward partnerships with private firms or other research institutions, a key step in translating research into a competitive advantage. Research selected for the program is chosen for its perceived ability to catalyze Japanese industrial competitiveness. Following the successful completion of the research, the results are shared with research institutes, universities, and private firms.

WHAT HAS TIP ACCOMPLISHED?

Congress authorized $20 billion for TIP over the five years from 2023 to 2027 to fund research into 10 KTFAs: AI; advanced communications; advanced computing and semiconductors; advanced energy and industrial efficiency technology; advanced materials; biotechnology; data and cybersecurity; disaster prevention and mitigation; quantum computing; and robotics and automation.[11] At least nine of them (perhaps not disaster prevention) are essential to techno-economic competition with China.[12] Funding for projects in these areas was allocated across several programs, including support for small businesses, cross-university collaboration, and the development of regional technology hubs, or "engines."

But Congress has not followed through on its commitment to TIP. Of the $4 billion per year that was authorized for TIP, just $410 million has been appropriated. (Through additional funding from NSF, total TIP funding has now reached $2.1 billion, though only $410 million comes from supplemental appropriations beyond regular-order funding.) Unsurprisingly, a program with the intended budget of $20 billion can't build up U.S. competitiveness in critical technologies with just 10 percent of the budget.

Yet, with the modest funding it's received, TIP has distinguished itself from the legacy NSF directorates as a potential leading voice in U.S. innovation and technology commercialization. With its $2.1 billion budget, TIP has funded programs aimed at generating regional innovation and growth, workforce development, and improved competitiveness in two KTFAs, with the hope of expanding these efforts in the future.

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Technology Translation and Development

TIP is strategically targeting high-leverage areas for rapid commercialization, utilizing its limited resources efficiently. With just $2.1 billion available for the development of critical technologies, it selected specific technology areas as having the greatest potential for growth in competitiveness with the smallest investment. These are technologies where investments have the greatest impact in translating technological breakthroughs into marketable products.

Even with limited funding, TIP has launched several programs to advance and accelerate technology commercialization, including the following:

- Use-Inspired Acceleration of Protein Design (USPRD), focusing on research using AI for protein and enzyme design.[13]
- Advancing Cell-Free Systems Toward Increased Range of Use-Inspired Applications (CFIRE), focusing on reducing the cost and increasing the range of uses for cell-free systems in biochemical processes.[14]
- Breaking the Low Latency Barrier for Verticals in Next-G Wireless Networks, focusing on identifying and solving existing problems in both the fifth-generation network and next-generation wireless networks to provide powerful low-latency communications.[15]

All research projects awarded grants through these programs participate in an Ideas Lab, a collaborative workshop between experts in industry and academia, where potential solutions to technology translation in these areas are discussed. Both industry and academia are eligible to apply for these grants.

Congress intended for research into 10 critical technology areas to be funded under TIP, and that won't be possible without a significant increase in available funds.

Regional Innovation and Economic Growth

ITIF has written extensively about the potential benefits of regional innovation hubs when properly administered, including their ability to drive regional growth and develop into a self-sustaining innovation ecosystem.[16] We have also written at length about the possible costs of tech dispersion, or the designation of dozens of metropolitan areas as hubs, with several agencies, including the Department of Commerce, Department of Defense (DOD), and the Small Business Administration (SBA), awarding modest grants in just a few technologies, with little coordination between agencies. Tech dispersion neither sparks economic growth nor helps develop a self-sustaining regional tech hub; instead, it provides a small, one-time investment in a regional industry.[17] Unlike other hub efforts, NSF's Regional Innovation Engines (NSF Engines) program shows promise of being more than just dispersion, but rather a targeted regional development effort with industry partnership at the forefront.

The NSF Engines program selected nine engines run by teams of innovators in industry and higher education to focus on developing workforce, research, and production capacity in key technology areas, including semiconductors in central Florida, energy transition in Baton Rouge, Louisiana, and regenerative medicine in the Winston-Salem, North Carolina, metropolitan area.[18] Winners of the NSF Engines program were allocated an initial $15 million with the potential of receiving up to $160 million over the next 10 years (assuming funding allows for such an investment).[19] Regions selected by NSF to participate in NSF Engines are those not traditionally associated with the tech boom that has occurred over the last two decades. Rather, selected areas are located in a variety of states across the country—both red and blue, politically—and have the workforce and industries necessary to drive industrial growth in key sectors. TIP's investment of $200 million in NSF Engines has already been matched 2-to-1 by private investors and other government agencies.[20] As of March 31, 2025, TIP reports that the NSF Engines program has seen a tenfold return on taxpayers' dollars.[21]

ITIF has written that there should have been more coordination between the NSF Engines program and the Economic Development Agency (EDA) regional technology hubs program (a program first proposed by ITIF). Specifically, it would have been better, in our view, for EDA and TIP to co-fund more metropolitan areas in order to ensure a greater chance of reaching critical mass.

Workforce Development

A core objective of TIP is to develop a strong workforce in key technology areas where the United States experiences a skills gap. Investments from TIP have expanded the NSF Entrepreneurial Fellowship, providing a minimum grant of $350,000 to fellows, as well as access to labs and research facilities, to translate research into commercially available products.[22] TIP investments in the fellowship, which the nonprofit Activate administers, have resulted in 36 researchers launching 28 start-ups nationwide.[23]

Additionally, TIP has absorbed NSF's Innovation Corps (I-Corps) program. I-Corps is a training program designed for researchers and scientists seeking to transform their laboratory discoveries into commercially viable products through the development of start-ups and small business ventures, thereby reducing the time between laboratory breakthroughs and products reaching the market. Programs under I-Corps include technology translation training for both individual teams of researchers and hubs, which are regional centers that combine several universities. Nearly 1,400 I-Corps-participating teams have launched start-ups, raising over $7 billion in funding since 2011.[24]

The CHIPS Act has invested billions in building U.S. semiconductor manufacturing fabrication plants, but the United States also needs highly skilled workers to fill these roles. The National Network for Microelectronics Education (NNME), a workforce-building initiative led by TIP, has been allocated $200 million from the CHIPS Act to invest in the training of future semiconductor and microelectronic industry workers. This initiative aims to develop a nationwide network of educational facilities that train workers at all levels of the industry.[25]

HOW TIP CAN FILL IN THE GAPS IN THE U.S. INNOVATION ECOSYSTEM

When the United States fights in a war, DOD, the National Security Council, and intelligence agencies develop a cohesive and integrated strategy for success. However, as the United States draws closer and closer to losing a war to China in the realm of techno-economic hegemony, no such cohesive, multi-agency strategy exists. TIP can and should play a leading role in bringing various agencies together, in partnership with the White House Office of Science and Technology Policy (OSTP).

TIP has already established memorandums of understanding (MOUs) with the Office of the Director of National Intelligence, the National Institute of Standards and Technology (NIST) and EDA, all of which allow open, cross-agency coordination on projects such as Regional Engines or building a network of semiconductor workforce training materials.[26]

Increasing TIP's network of MOUs across the government is a meaningful first step in open communication and collaboration between agencies. OSTP should outline pertinent areas of cross-government cooperation in KTFAs between NSF and other agencies, as well as with high-level state officials. Applicable agencies for such a partnership include DOD and SBA, both of which administer their own regional technology hubs, or NIH, Centers for Disease Control and Prevention, and relevant officials from the states of Massachusetts and North Carolina, which are all heavily involved in biotechnology research. Such collaboration across government agencies will ensure that the United States has a clear, cohesive strategy to bolster competitiveness in critical technologies, rather than 10 different strategies from 10 different offices. Additionally, coordination will likely reduce the cost of research, ensuring that multiple agencies are not undertaking duplicate research.

Along with reducing duplicative research, TIP, with its focus on translational research, can facilitate open communication with other agencies to identify areas of existing research that are ideal for commercialization and connect those researchers with relevant industry partners. TIP has already begun to perform such tasks within NSF, parsing through research within the agency's other directorates and identifying model candidates for industry partnerships. With

greater funding, TIP could establish an advisory council strictly for this purpose, furthering the shift of NSF from basic, curiosity-driven research to competitiveness-driven innovations.

International cooperation in critical technology among allied nations can also be spearheaded under TIP. Several U.S.-allied nations have agencies similar to TIP for improving technological competitiveness, yet there is no other place in the government where international collaborative efforts can be established with these agencies on research and technology development. Yet, collaboration could reduce the financial burden of research funding for cooperating countries while enabling secure information sharing and innovation.

TIP can facilitate open communication with other agencies to identify areas of existing research that are ideal for commercialization and connect those researchers with relevant industry partners.

TIP, along with other directorates under NSF, has already successfully undertaken collaborative programs with allied international counterparts to conduct both basic research and translational, market-ready research. The Verticals-enabling Intelligent Network Systems (VINES) is a funding opportunity that supports research to enhance wireless communication networks, specifically in the name of advancing next-generation network systems. A network of agencies and industry partners supports VINES, including NSF, Department of Homeland Security, Qualcomm, Ericsson, Intel, and international partners from Finland, India, Japan, and Sweden.[27]

Applicants to VINES can be teams of either only U.S.-based researchers or teams of researchers from the U.S. and one other partner country. Awards granted to teams of researchers from two countries will receive funding from both nations, thus lessening the financial burden for each country, while both countries get to share the knowledge gained from the research. TIP, if allocated the money from Congress, would like to invest $50 million in this funding opportunity.

RECOMMENDATIONS

Boost TIP Appropriations to $1 Billion for the Coming Fiscal Year

TIP was promised $20 billion over five years to fund critical research into key technology areas. Only $410 million of that funding has been appropriated beyond regular-order funding. At minimum, Congress should not cut TIP funding. And if it is serious in responding to the China challenge (a point that remains in doubt), Congress needs to boost appropriations significantly. Congress should extend the period over which the CHIPS Act authorizes TIP funding beyond 2027 and appropriate $1 billion to the directorate for fiscal year 2026.

However, even with an additional $1 billion in appropriated funds from the CHIPS and Science Act, TIP would not be able to undertake funding opportunities in all 10 key technologies that Congress identified as being critical to U.S. competitiveness. It would, at most, be able to fund opportunities in a handful of technologies. An additional $1 billion should be added each fiscal year until annual appropriations for TIP reach or exceed $4 billion per year.

Any cuts to TIP or NSF in general at this time would be deeply concerning and have significant adverse effects on U.S. competitiveness. President Trump's new budget proposal suggests a cut of 56 percent to NSF and a 43 percent cut to TIP.[28] Cutting its already minimal budget would obviously leave the directorate in worse shape than it started.

TIP is also operating with a 45 percent smaller workforce as of January 2025 as a result of departures from attrition, deferred resignation programs, early retirement offers, and other cuts made in compliance with directives from the U.S. Department of Government Efficiency compounded by the ongoing federal hiring freeze. A smaller workforce, coupled with the hiring freeze, has made it impossible to expand TIP's network of programs into critical technology areas. Congress must make it a priority to fund TIP and lift the hiring freeze for TIP, giving the agency a greater opportunity to help fight and win the U.S.-China advanced technology war.

Expand International Research Collaboration

International cooperation between national technology agencies presents an opportunity for technological innovation and information sharing between the United States and allied countries at potentially lower costs. However, navigating diplomatic and congressional bureaucracy can slow down these partnerships at a time when the United States must make technological innovation its top priority. The Department of State should identify countries that are automatically approved for scientific engagement, thus streamlining the path to partnership.

The nations identified would be countries with which the United States is closely allied and those that possess the resources necessary to make the partnership mutually beneficial. Countries not included would be those well known as having conflicting interests with the United States, including China.

Conduct Frequent Reviews of TIP's Performance

Under the CHIPS and Science Act, six years after its establishment, TIP is to be reviewed by the National Academies to evaluate its success in achieving its stated purpose under the bill.[29] While any review of TIP is welcome and encouraged, the urgency of this program requires greater and more frequent oversight. The Government Accountability Office should conduct biennial reviews of TIP to ensure that it is operating effectively and fulfilling its stated purpose under the CHIPS Act. Specifically, it should assess whether TIP is still prioritizing programs in translational research that involve industry partnerships and funding research in relevant areas of competitiveness for the United States.

At the same time, TIP should continue to make its information more transparent and machine-readable. As it currently stands, it is extremely difficult for outside researchers to access complete information on all TIP awards in a machine-readable format, including what area of research, the level of industry engagement, the relation to the 10 key technology areas, the total funding amount, and other pertinent information.

Move the ERC and IUCRC Programs Under TIP

The Industry-University Cooperative Research Centers (IUCRC) and ERC programs are long-standing NSF initiatives that aim to engage industry, particularly through translational research. Given TIP's focus on industry relevance, it makes little sense not to house these two programs within TIP. In addition, future ERCs and IUCRCs should thus be aligned with the 10 strategic key technology areas the Senate has charged TIP with supporting.

Additionally, the framework for awarding funding under ERC should be adjusted. NSF should require at least some level of financial commitment from industry partners before making any future ERC awards. TIP should also ensure that existing and new ERCs more effectively coordinate with other similar federally funded programs. For example, NSF's ERC for Cell

Manufacturing Technologies should coordinate with the National Institute for Innovation in Manufacturing and Biopharmaceuticals (NIIMBL), as both conduct research on cell manufacturing, but with a lower-level TRL focus for the ERC and a higher-level focus for NIIMBL.

CONCLUSIONS

Unlike the typical NSF directorate, TIP is a deliberate pivot toward translating scientific and engineering research into commercial innovations and national competitiveness. In just three years and with only 10 percent of its authorized funding appropriated, TIP has made measurable progress, launching translational research programs, supporting workforce development, and establishing cross-agency and international partnerships to further technology research and development.

Now, in 2025, it's time for Congress to fund the program in full. Failing to do so would be one more nail in the coffin of techno-economic defeat at the hands of China.

But without full funding, TIP cannot fulfill its mandate. A directorate designed to operate with a $20 billion budget cannot be expected to lead American innovation on only a fraction of that amount. Further delays or cuts would not only stall promising programs but also squander a rare bipartisan investment in the nation's long-term industrial competitiveness.

Congress recognized the importance of TIP in 2022. Now, in 2025, it's time for Congress to fund the program in full. Failing to do so would be one more nail in the coffin of techno-economic defeat at the hands of China.

Acknowledgments

The authors would like to thank Randolph Court for his editorial assistance. Any errors or omissions are the authors' responsibility alone.

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ENDNOTES

1. Stephen Ezell and Stefan Koester, "Three Cheers for the CHIPS and Science Act of 2022! Now, Let's Get Back to Work" (ITIF, July 29, 2022), https://itif.org/publications/2022/07/29/three-cheers-for-the-chips-and-science-act-of-2022-now-lets-get-back-to-work/.
2. Trelysa Long, "China Is Catching Up in R&D—and May Have Already Pulled Ahead" (ITIF, April 9, 2025), https://itif.org/publications/2025/04/09/china-catching-up-rd-may-have-already-pulled-ahead/.
3. "Partnerships for Innovation (PFI)," U.S. National Science Foundation, 2025, https://www.nsf.gov/funding/opportunities/pfi-partnerships-innovation/504790/nsf23-538.
4. ITIF assessed the presence of industry partnerships by reading through a random sample of research proposals collected from the pool of active grants for the PFI program in 2025. No proposals sampled mentioned an industry partner.
5. "Engineering Research Centers," U.S. National Science Foundation, https://www.nsf.gov/eng/engineering-research-centers.
6. Esther de Wit-de Vries et al., "Knowledge Transfer in University-Industry Research Partnerships: A Review," *The Journal of Technology Transfer*, vol. 44 (2019): 1236–1255, https://link.springer.com/article/10.1007/s10961-018-9660-x.

7. Association of Public and Land-Grant Universities, "Driving U.S. Competitiveness Through Improved University-Industry Partnerships," https://www.aplu.org/wp-content/uploads/driving-us-competitiveness-through-improved-university-industry-partnerships.pdf.
8. CHIPS and Science Act, H.R. 4346, 117th Cong. (2022), https://www.congress.gov/bill/117th-congress/house-bill/4346.
9. "About SIP," SIP Cross-ministerial Strategic Innovation Promotion Program, https://www.jst.go.jp/sip/en/about_sip.html; "What is Horizon Europe," Horizon Europe, https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en.
10. Ibid.
11. "CHIPS and Science," U.S. National Science Foundation, 2025, https://www.nsf.gov/chips; "Find TIP Awards," U.S. National Science Foundation Directorate for Technology, Innovation, and Partnership, 2025, https://nsf.elsevierpure.com/en/projects/?search=&isCopyPasteSearch=false.
12. Robert D. Atkinson, "Comments to the National Science Foundation Regarding the Technology, Innovation, and Partnership (TIP) Directorate" (ITIF, July 6, 2023), https://itif.org/publications/2023/07/06/comments-to-national-science-foundation-regarding-technology-innovation-and-partnerships-directorate/.
13. U.S. National Science Foundation, "New $40M funding opportunity accelerates the translation of novel approaches to protein design to bolster the U.S bioeconomy," news release, February 26, 2024, https://www.nsf.gov/tip/updates/new-funding-opportunity-accelerates-protein-design?utm_medium=email&utm_source=govdelivery.
14. "Ideas Lab: Advancing Cell-Free Systems Toward Increased Range of Use-Inspired Applications (CFIRE)," U.S. National Science Foundation, https://www.nsf.gov/funding/opportunities/cfire-ideas-lab-advancing-cell-free-systems-toward-increased-range/506275/nsf24-552.
15. U.S. National Science Foundation, "New $12M funding opportunity seeks to break the low-latency barrier for next generation of wireless network applications," news release, February 21, 2024, https://www.nsf.gov/tip/updates/new-funding-opportunity-break-low-latency-barrier?utm_medium=email&utm_source=govdelivery.
16. Robert D. Atkinson et al, "The Case for Growth Centers: How to Spread Tech Innovation Across America" (ITIF, December 9, 2019), https://itif.org/publications/2019/12/09/case-growth-centers-how-spread-tech-innovation-across-america/.
17. Robert D. Atkinson and Trelysa Long, "Tech Hubs or Tech Dispersion?" (ITIF, January 6, 2025), https://itif.org/publications/2025/01/06/tech-hubs-or-tech-dispersion/.
18. "NSF Engines Fact Sheet," U.S. National Science Foundation, https://nsf-gov-resources.nsf.gov/files/2.19.2025_NSF-Engines_FactSheet.pdf?VersionId=laBQi8W.Yjvt4HGTGMdRaIGQZWPq6JyI.
19. Ibid.
20. "About NSF Engines," U.S. National Science Foundation, https://www.nsf.gov/funding/initiatives/regional-innovation-engines/about-nsf-engines.
21. U.S. National Science Foundation, "Accelerating disruptive technologies and bolstering U.S. competitiveness and security," news release, March 31, 2025, https://www.nsf.gov/tip/updates/accelerating-disruptive-technologies-bolstering-us.
22. "About NSF TIP," U.S. National Science Foundation, https://www.nsf.gov/tip/about-tip.
23. "Accelerating disruptive technologies and bolstering U.S. competitiveness and security," U.S. National Science Foundation, https://www.nsf.gov/tip/updates/accelerating-disruptive-technologies-bolstering-us.

24. “NSF I-Corps”, U.S. National Science Foundation, October 2024, https://www.nsf.gov/funding/initiatives/i-corps.
25. U.S. National Science Foundation, “U.S. National Science Foundation and Department of Commerce announce a new $30M funding opportunity, funded by the CHIPS & Science Act, to prepare talent for semiconductor jobs nationwide,” news release, September 27, 2025, https://www.nsf.gov/tip/updates/nsf-department-commerce-announce-30m-funding-opportunity.
26. U.S. National Science Foundation, “U.S. National Science Foundation and Department of Commerce partner to advance semiconductor workforce development,” news release, July 24, 2024, https://www.nsf.gov/tip/updates/us-national-science-foundation-department-commerce-partner; U.S. National Science Foundation, “NSF, EDA announce official coordination on regional innovation programs,” news release, July 26, 2023, https://www.nsf.gov/news/nsf-eda-announce-official-coordination-regional.
27. “Verticals-enabling Intelligent Network Systems (VINES),” U.S. National Science Foundation, June 2025, https://www.nsf.gov/funding/opportunities/vines-verticals-enabling-intelligent-network-systems.
28. Russell T. Vought, Fiscal Year 2026 Discretionary Budget Request (Washington DC: Office of Management and Budget, May 2, 2025), https://www.whitehouse.gov/wp-content/uploads/2025/05/Fiscal-Year-2026-Discretionary-Budget-Request.pdf.
29. CHIPS and Science Act, H.R. 4346, 117th Cong. (2022), https://www.congress.gov/bill/117th-congress/house-bill/4346.