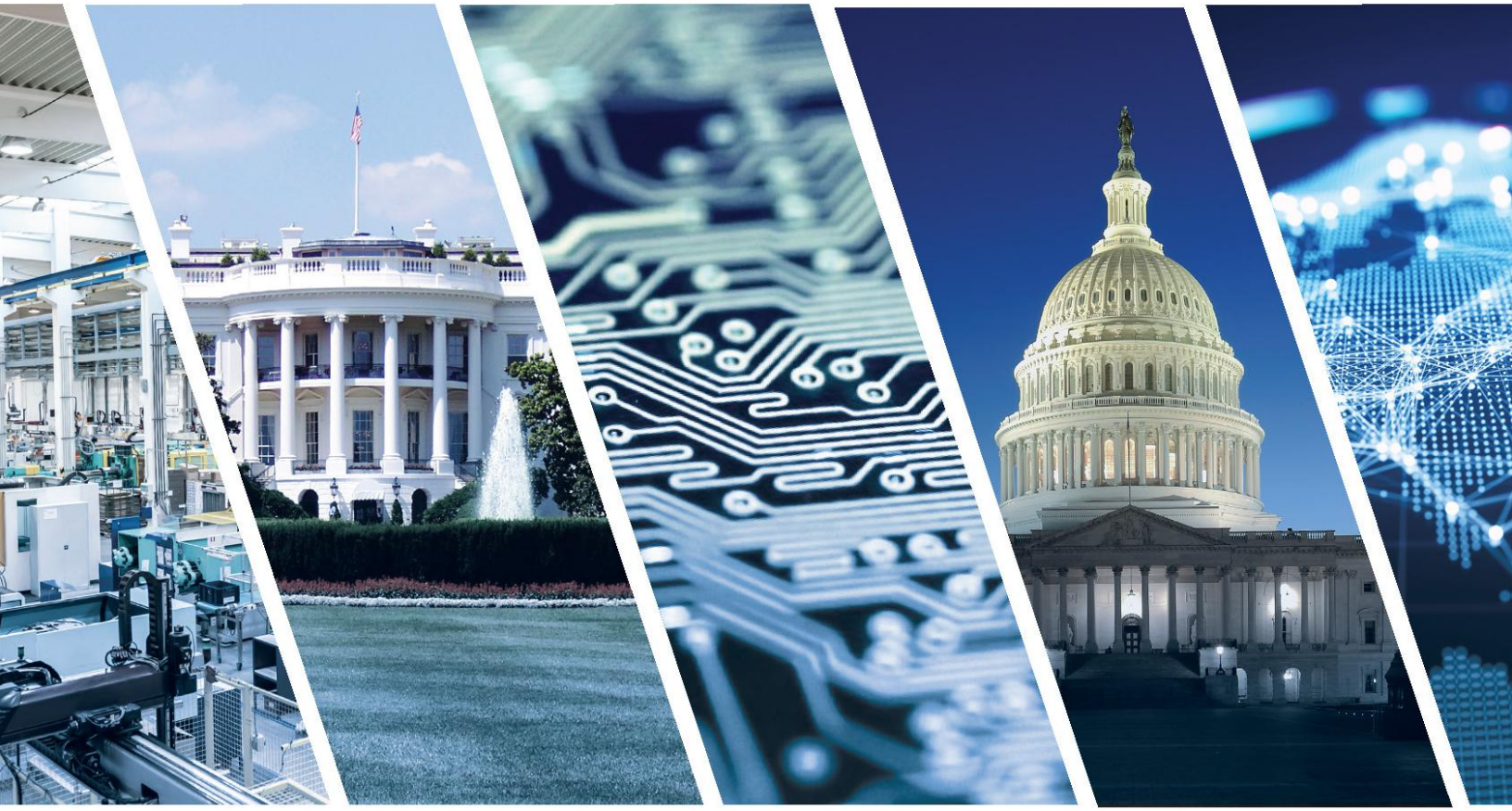
TECH POLICY TO-DO LIST



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INFORMATION TECHNOLOGY & INNOVATION FOUNDATION

Tech Policy To-Do List

Policy discussions about technology and innovation issues often focus narrowly on iconic places like Silicon Valley or Boston's Route 128 corridor. But America's innovation-driven, high-tech economy actually is widely diffused—and every state and congressional district has a stake in its success.

As a nonpartisan think tank focusing on the rapidly evolving intersection of technology, innovation, and public policy, one of the Information Technology and Innovation Foundation's most important roles is to develop actionable insights and proposals that policymakers can trust to foster innovation, growth, and progress for every congressional district and state in the country. Here, we provide a menu of such ideas for the administration and Congress.

The Tech Policy To-Do List is not intended to be a comprehensive analysis of all tech policy issues currently before Congress. Nor should the fact that a proposal is excluded here be interpreted to mean that ITIF doesn't support it. Rather, this list is intended to highlight a selection of new ideas (beyond simply increasing funding for existing programs or broad regulatory or tax changes) that may not yet have received adequate attention. It is organized by topic area, with short summaries of each idea and citations for additional details.

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INNOVATION AND COMPETITIVENESS

Innovation

The Energy Department should expand its Lab-Embedded Entrepreneurship Program (LEEP) across all of the national laboratories it oversees.

DOE's LEEP program represents a new technology transition model of "inside-out" innovation, getting the labs to transition from a historical focus mainly on moving their own technologies outside the lab, to a new "outside-in" model that gives entrepreneurs access to the advanced technology, equipment, and know-how that the labs possess. There are three LEEPs: Cyclotron Road at Lawrence Berkeley, the Chain Reaction Innovations (CRI) program at Argonne National Laboratory, and the Innovation Crossroads program at Oak Ridge National Laboratory. All labs should develop a LEEP program.

More details: *Peter L. Singer and William B. Bonvillian, "'Innovation Orchards': Helping Tech Start-Ups Scale" (Information Technology and Innovation Foundation, March 2017), http://www2.itif.org/2017-innovation-orchards.pdf.*

OMB should require federal research agencies to report five years of data on their patent licenses and royalties as part of their annual budget requests.

Federal agencies could do a better job of commercializing inventions and discoveries made in national labs and other federally funded research centers. Recent studies find federally funded university research is about five times more likely to result in a licensed patent technology than research funded at federal labs, and about seven times more likely to result in an active patent license. Requiring agencies to provide data on their licensing activities would apply pressure on lagging agencies and centers to improve and inculcate more competition among federal labs to inspire greater licensing activity.

More details: *Stephen J. Ezell and Robert D. Atkinson, "ITIF Comments Responding to Administration Request for Information Regarding Federal Technology Transfer Authorities and Processes" (Information Technology and Innovation Foundation, July 2018), https://itif.org/publications/2018/07/30/comments-national-institute-standards-and-technology-regarding-federal.*

The White House or Congress should create an OMB Office of Innovation Policy Review.

Federal agencies too often propose regulations with little consideration of how they will affect innovation. And while the Office of Management and Budget (OMB) Office of Information and Regulatory Affairs (OIRA) is tasked with reviewing major regulations from a cost-benefit perspective, it does not explicitly review regulations for impacts on longer-term dynamic effects (e.g., innovation). To remedy this, the administration or Congress should create within OMB an Office of Innovation Review whose mission should be to serve as an "innovation champion" in the regulatory process. The office should have authority to push agencies to either affirmatively promote innovation or achieve a particular regulatory objective in a manner least damaging to innovation.

More details: *Stuart Benjamin and Arti Rai, "Structuring U.S. Innovation Policy: Creating a White House Office of Innovation Policy" (Information Technology and Innovation Foundation, June 2009), https://itif.org/publications/2009/06/24/structuring-us-innovation-policy-creating-white-house-office-innovation.*

The White House should charge every major federal agency with naming a chief innovation officer to craft and implement an innovation strategy.

Federal agencies can drive innovation not only in their own programs and operations, but also in the broader sphere of the economy they influence. Yet few agencies, if any, have formal innovation strategies. The White House should charge every agency with developing a comprehensive innovation strategy. This should cover not only how the agencies themselves will innovate internally, but also how they can spur innovation in the sectors of the economy they impact. To ensure these plans are carried out, the White House should appoint chief innovation officers (CINOs) for every cabinet-level agency (along with other technology-related agencies, such as NASA), and these federal CINOs should meet quarterly to exchange and cross-pollinate best practices for innovation.

More details: *"Transition Memo to President Trump: How to Spur Innovation, Productivity, and Competitiveness" (Information Technology and Innovation Foundation, November 2016), https://itif.org/publications/2016/11/16/transition-memo-president-elect-trump-how-spur-innovation-productivity-and.*

The administration should create a network of acquisition-oriented DOD labs based in regional technology clusters.

To increase the breadth of R&D-based procurement, the administration should create a network of applied defense R&D facilities around regional technology clusters. The network would be similar to the Manufacturing USA program but with numerous smaller centers that are highly focused around the virtuous cycle of firms working with DOD labs and creating products and services that meet military needs. DOD is already moving in this direction, in accordance with former Secretary of Defense Ash Carter's Third Offset strategy, which seeks to counter declining force sizes with the development of novel capabilities and concepts. For example, the Defense Innovation Unit Experimental (DIUx) seeks to create bridges between the Pentagon and the commercial technology sector. While DIUx is a good start, its budget is tiny compared to the changing demands for new technologies within the military. Accordingly, DOD should invest $500 million to develop similar centers as technology platforms across the country. Given that DOD already operates dozens of laboratories across nearly two dozen states, in many cases existing labs could shift their research and commercialization strategies to better align with adjacent technology clusters. In other regions, the department would need to develop new assets.

More details: *Stephen Ezell and Scott Andes, "Localizing the economic impact of research and development: Policy proposals for the Trump administration and Congress" (Information Technology and Innovation Foundation, and the Bass Initiative on Innovation and Placemaking at Brookings, December 2016), https://itif.org/publications/2016/12/07/localizing-economic-impact-research-and-development-policy-proposals-trump.*

Congress should transform the Small Business Administration (SBA) into the New Business Administration (NBA).

On a host of issues, from productivity to wages and benefits, environmental protection, and exports, large and medium-sized companies outperform small businesses. Even on job creation, it is new, fast-growing firms that perform better, not small firms. So, while it makes sense for government to help startups get off the ground in the hope that they will become big and successful, it makes little sense for government to continue assisting

corner cafes and pizza parlors in perpetuity. Accordingly, Congress should transform the Small Business Administration (SBA) into the New Business Administration (NBA). Among other things, this would mean targeting SBA loan programs toward high-growth startups and shifting SBA assistance programs to startups. The mission of the SBA's Office of Advocacy should be altered so that it focuses on eliminating or improving those regulations that act as barriers to high-growth startup companies.

More details: *Robert D. Atkinson and Michael Lind, "Big is Beautiful: Debunking the Myth of Small Business" (Cambridge: The MIT Press, 2018), 265.*

Congress should reform the Regulatory Flexibility Act to focus on helping new firms.

The Regulatory Flexibility Act allows the SBA to review the impact of regulations on small businesses. The result is to unfairly exempt small, usually less-productive and lower-wage businesses from the obligations other companies face, thereby distorting economic activity. Congress should refocus the Act on new businesses younger than two years old and even consider exempting these businesses from most regulations as they develop and implement their business plans.

More details: *Robert D. Atkinson and Michael Lind, "Big is Beautiful: Debunking the Myth of Small Business" (Cambridge: The MIT Press, 2018), 265.*

Competitiveness

Increase the share of industry representatives on the National Science Board.

In the 1980s, as the U.S. faced stiff international competition in a wide range of industries, there was a bipartisan recognition that the National Science Foundation (NSF), while remaining a science and engineering research funding agency, also should do more to help U.S. competitiveness. But this focus eroded over time, such that NSF is now principally dedicated to funding science, with little consideration given to how to it could also support economic competitiveness. One reasons for this is that (as of September 2019) just 1 out of the 26 members of the National Science Board (NSB)—which helps set the direction for NSF—is from industry; the rest represent academia. As part of any national innovation and competitiveness legislation, Congress should require that at least 40 percent of the NSB be from industry (either actively employed in industry or retired).

More details: *Robert D. Atkinson, "The Competitive Edge: A Policymaker's Guide to Developing a National Strategy" (Information Technology and Innovation Foundation, December 2017), https://itif.org/publications/2017/12/06/competitive-edge-policymakers-guide-national-strategy.*

Congress should create a U.S. Economic Competitiveness Commission.

It's impossible to have a vibrant economy without a globally competitive traded sector. Dozens of nations have specific strategies to ensure they do, and so should the United States. To that end, Congress should create a 13-member commission that provides an independent assessment of U.S. competitiveness in traded sectors, including but not limited to manufacturing. A report released every other year should analyze U.S. weaknesses and offer targeted recommendations to address them and improve the country's position across

key traded sectors. House and Senate leaders from the respective parties should each appoint three members and the administration one member.

More details: *Stephen Ezell and Robert D. Atkinson, "Fifty Ways to Leave Your Competitiveness Woes Behind: A National Traded Sector Competitiveness Strategy" (Information Technology and Innovation Foundation, September 2012), https://itif.org/publications/2012/09/20/fifty-ways-leave-your-competitiveness-woes-behind-national-traded-sector.*

Congress should create a commission to identify mechanisms to combat corporate short-termism and promote long-term investment in innovation.

Any national innovation and competitiveness policy needs to include measures to counter the pressure that corporations face to demonstrate short-term financial performance, because it leads to less long-term business investment in the foundations of innovation. Congress should establish a national commission to identify legislative and regulatory measures that would encourage companies to invest more for the long term. For example, such a commission might consider a proposal from the Institute of Corporate Directors to replace quarterly financial reports with less frequent updates, such as half-yearly results.

More details: *Robert D. Atkinson, "Restoring Investment in America's Economy" (Information Technology and Innovation Foundation, June 2016), https://itif.org/publications/2016/06/13/restoring-investment-americas-economy.*

Congress should mandate the creation of a traded-sector analysis unit within the federal government.

No federal entity is responsible for competitiveness analysis. Statistical agencies see their jobs as accumulating facts, not analyzing them. Treasury, the Federal Reserve Bank, and other agencies are focused on the business cycle, not on competitiveness. Other economic agencies focus on implementation. Thus, there is shockingly little understanding of where the United States is and is not competitive globally. So, Congress should task the National Institute of Standards and Technology (NIST) with creating a new traded-sector analysis unit that prioritizes interpretation and analysis. It should assess key indicators of overall U.S. competitiveness performance—such as foreign direct investment, jobs, output, and market share—and develop strategic policy road maps for key traded sectors.

More details: *Stephen Ezell and Robert D. Atkinson, "Fifty Ways to Leave Your Competitiveness Woes Behind: A National Traded Sector Competitiveness Strategy" (Information Technology and Innovation Foundation, September 2012), https://itif.org/publications/2012/09/20/fifty-ways-leave-your-competitiveness-woes-behind-national-traded-sector.*

The White House or Congress should require OMB's Office of Information and Regulatory Affairs to incorporate a "competitiveness screen" in its review of federal regulations.

Before global trade intensified, the federal government could afford to impose new regulations and give little thought to their impact on competitiveness. But today, regulation can increase costs or impose rigidities to an extent that makes globally traded industries less competitive internationally. To remedy this, Congress or the White House should require OIRA to review any new, nontrivial regulations to assess their impact on first-order competitiveness, and OIRA should place the highest priority on reviewing and reforming existing regulations that negatively affect traded sectors.

More details: *Stephen Ezell and Robert D. Atkinson, "Fifty Ways to Leave Your Competitiveness Woes Behind: A National Traded Sector Competitiveness Strategy" (Information Technology and Innovation Foundation, September 2012), https://itif.org/publications/2012/09/20/fifty-ways-leave-your-competitiveness-woes-behind-national-traded-sector.*

Congress or the White House should create a national industrial intelligence unit within the National Intelligence Council to better assess competitive challenges to the U.S. economy.

There is no entity within the federal government responsible for coordinating agency efforts to analyze and respond holistically to the strategic challenge of foreign innovation mercantilism. To fill this gap, the president should establish and staff a new national industrial intelligence unit, ideally within the existing National Intelligence Council, and charge it with developing a better process and structure to understand the specifics and long-term implications of other nations' economic development strategies so the United States can respond more effectively. It should also develop approaches to better leverage and disseminate intelligence assets to boost the competitiveness of U.S. companies.

More details: *Robert D. Atkinson, Nigel Cory, and Stephen Ezell, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation" (Information Technology and Innovation Foundation, March 2017), https://itif.org/publications/2017/03/16/stopping-chinas-mercantilism-doctrine-constructive-alliance-backed.*

The White House should create a sub-directorate within the National Security Council to champion a whole-of-government response to foreign innovation mercantilism.

There are no senior directors in the international economics directorate of the National Security Council (NSC) who are charged with developing strategy or executing tactics to combat foreign countries' innovation-mercantilist practices. Indeed, such competitiveness issues have almost always been a second-order priority in U.S. foreign policy compared with diplomacy and national security considerations. Yet America's national security increasingly depends on its technological leadership. That is why the president should create an NSC sub-directorate, with a senior director or special assistant plus two or three directors to liaise with the highest levels of the executive branch in conceiving and executing a whole-of-government approach to combatting foreign innovation mercantilism.

More details: *Robert D. Atkinson, Nigel Cory, and Stephen Ezell, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation" (Information Technology and Innovation Foundation, March 2017), https://itif.org/publications/2017/03/16/stopping-chinas-mercantilism-doctrine-constructive-alliance-backed.*

Productivity

Congress or the president should direct key federal agencies to incorporate productivity growth into their missions.

No economic or financial entity in the federal government—including the National Economic Council, the Council of Economic Advisers, the Commerce Department, and the Federal Reserve Board—has the goal of advancing productivity as an explicit part of its mission. Congress or the president should rectify this by mandating that all such executive agencies to make productivity growth a core focus. As part of this order, the president should direct OMB to identify 50 government programs or processes that should be overhauled technologically to deliver greater value at lower cost to taxpayers through increased productivity.

More details: *Robert D. Atkinson, "Think Like an Enterprise: Why Nations Need Comprehensive Productivity Strategies" (Information Technology and Innovation Foundation, May 2016), http://itif.org/productivity.*

The National Economic Council should create a national commission on productivity.

Lagging productivity growth is the country's central economic challenge, yet few policymakers focus on it, and to the extent that they do, they typically consider only the broadest of measures. To bring attention to the issue and begin shaping a more focused national productivity policy, the president should appoint a national commission on productivity. The committee should explore economic policy options that go beyond the conventional approach of focusing only on ensuring there is a generally conducive business climate with basic "factor inputs" such as skilled labor and ready access to capital.

More details: *Robert D. Atkinson, "Think Like an Enterprise: Why Nations Need Comprehensive Productivity Strategies" (Information Technology and Innovation Foundation, May 2016), http://itif.org/productivity.*

Congress should establish a state and local government productivity innovation fund.

State and local governments account for around 11 percent of U.S. employment. Unless they find a way to boost labor productivity, their fiscal challenges will grow and U.S. productivity growth will lag. Yet, too few state and local governments boldly experiment with ways to boost productivity through innovation. To help them, Congress should provide funding to NIST to establish a productivity services challenge program to fund pilot programs by lower levels of government. This would be similar to Denmark's Agency for Digitization, which provides funding focused on automating public administrative procedures. State and local governments that win funding and successfully implement projects should be required to help other governments copy their innovations.

More details: *Robert D. Atkinson, "Think Like an Enterprise: Why Nations Need Comprehensive Productivity Strategies" (Information Technology and Innovation Foundation, May 2016), https://itif.org/publications/2016/05/04/think-enterprise-why-nations-need-comprehensive-productivity-strategies.*

Education and Training

Congress should establish a GI bill for entrepreneurship.

Improving transitions for veterans (and their spouses) from military service to civilian life is an important challenge. Some are interested in applying their skills to entrepreneurial ventures. But for most, there are few resources available to help them make their dreams a reality. One model is the Veteran Entrepreneur Initiative at the University of California, San Diego. UCSD has established a program where veterans in the region can obtain, at no cost, a Certificate in Entrepreneurship, which involves entrepreneurship courses in the business school, or participate in Veteran Ventures, an accelerator program to help veterans turn good ideas into businesses. The university also offers these classes at the area Marine and Naval bases for men and woman who are still in the military but planning to transition to civilian life in the next two years. Congress should work to bring exemplary programs such as this to national scale by providing every veteran or service member who is within two years of leaving the military an entrepreneurial support voucher that they can use at a public or private university that establishes such a support program following guidelines approved by a federal agency like NIST.

More details: *Michael Franklin, "UC San Diego's Veteran Entrepreneur Initiatives Take Flight," UC San Diego News Center, May 11, 2017, https://ucsdnews.ucsd.edu/feature/uc_san_diegos_veteran_entrepreneur_initiatives_take_flight.*

Congress should allow students taking short-term courses for occupational credentials to qualify for Pell grants and other federal aid.

Many forms of education now focus on shorter-term courses leading to credentials, but students cannot receive Pell Grants for them. Congress should amend the Pell program to enable students taking such courses to qualify. In addition, Congress should allow Pell grants to pay for career counseling and career-navigation assistance before a worker is enrolled in a training program.

More details: *Robert D. Atkinson, "How to Reform Worker-Training and Adjustment Policies for an Era of Technological Change" (Information Technology and Innovation Foundation, February 2018), https://itif.org/publications/2018/02/20/technological-innovation-employment-and-workforce-adjustment-policies.*

The Labor Department should promote an "Investors in People" program.

The Investors in People program is an internationally recognized accreditation held by 10,000 organizations across the world that support and manage people well for sustainable results, including better and broader workforce training efforts. The Department of Labor should promote such a program and standard.

More details: *Robert D. Atkinson, "How to Reform Worker-Training and Adjustment Policies for an Era of Technological Change" (Information Technology and Innovation Foundation, February 2018), https://itif.org/publications/2018/02/20/technological-innovation-employment-and-workforce-adjustment-policies.*

Congress should support industry-led skills alliances.

Workforce-training programs are more effective when they are led by industry. As such, Congress should provide funding to the Department of Labor, in conjunction with the Department of Commerce, to support industry-led (or union-led) workforce-training alliances, either established as regional or sectoral initiatives.

More details: *Robert D. Atkinson, "How to Reform Worker-Training and Adjustment Policies for an Era of Technological Change" (Information Technology and Innovation Foundation, February 2018), https://itif.org/publications/2018/02/20/technological-innovation-employment-and-workforce-adjustment-policies.*

Congress should establish a stronger federal floor under state unemployment insurance systems.

As competitive pressures for states to have a "good business climate" have increased, many have cut unemployment benefits and restricted eligibility. To remedy this, Congress should set a national floor for benefits by increasing the employer tax rate 1 percent under the Federal Unemployment Tax Act and then increasing the offset tax credit to employers by the same amount. Doing so would raise some states' minimum tax rates, thereby reducing the competitive pressure to keep their benefits and eligibility low.

More details: *Robert D. Atkinson, "How to Reform Worker-Training and Adjustment Policies for an Era of Technological Change" (Information Technology and Innovation Foundation, February 2018), https://itif.org/publications/2018/02/20/technological-innovation-employment-and-workforce-adjustment-policies.*

Congress should transform the TAA into TTPAA.

The United States established the Trade Adjustment Assistance (TAA) program in the 1960s both to help workers hurt by trade and to reduce opposition to it. Given the expected increase in technology-driven layoffs with emerging technologies, Congress should adapt and expand TAA into a comprehensive Trade,

Technology, and Policy Adjustment Assistance Act (TTPAA)—to help workers displaced not just by trade, but also by technology or government policy decisions (e.g., defense base closures).

More details: *Robert D. Atkinson, "How to Reform Worker-Training and Adjustment Policies for an Era of Technological Change" (Information Technology and Innovation Foundation, February 2018), https://itif.org/publications/2018/02/20/technological-innovation-employment-and-workforce-adjustment-policies.*

Congress should better enable workers to receive unemployment insurance while they are in training.

An ideal time for workers to obtain new skills to enter new occupations is when they are unemployed. While federal law requires states to allow workers enrolled in certified training programs to collect unemployment insurance, few states adequately inform unemployed workers of this option, and many actively limit the number of qualifying courses. Congress should require all states to actively and clearly notify workers once they apply for unemployment insurance that they qualify for unemployment insurance benefits if they are in approved training.

More details: *Robert D. Atkinson, "How to Reform Worker-Training and Adjustment Policies for an Era of Technological Change" (Information Technology and Innovation Foundation, February 2018), https://itif.org/publications/2018/02/20/technological-innovation-employment-and-workforce-adjustment-policies.*

Congress should create a New Schools America fund to support states and cities in developing new kinds of schools.

Educational improvement fundamentally depends on innovation, which requires new forms of learning and schooling. Yet most education "reform" involves doubling down on more of the same. The federal government needs to play a catalytic role in fostering more systemic and transformative educational innovation. A New Schools fund would encourage states to institute a new governance and funding model to support specialized schools, including schools focused on science, technology, engineering, and math (STEM); project-based learning; and experiential learning.

More details: *Robert D. Atkinson and Merrilea Mayo, "Refueling the U.S. Innovation Economy: Fresh Approaches to STEM Education" (Information Technology and Innovation Foundation, December 2010), https://itif.org/publications/2010/12/07/refueling-us-innovation-economy-fresh-approaches-stem-education.*

Congress should offer planning grants for regions that want to create alternative types of STEM high schools or universities.

In recent years, a number of universities have begun offering unique approaches to STEM education. They champion experiential learning models in which all teaching is STEM- or technology-oriented and operated on an interdisciplinary basis. Students have to complete internships and solve real engineering and technical problems. In much the same way, STEM-focused high schools allow students to fully explore subjects such as computer science at the secondary level and have proven effective in promoting more and better STEM education, including in poorer school districts. Congress should support this experimentation by appropriating $10 million for the National Science Foundation (NSF) to offer planning grants through its existing Transforming Institution Grants program.

More details: *Stephen Ezell and Robert D. Atkinson, "25 Recommendations for the 2013 America COMPETES Act Reauthorization" (Information Technology and Innovation Foundation, April 2013), https://itif.org/publications/2013/04/22/25-recommendations-2013-america-competes-act-reauthorization; Adams Nager and Robert D. Atkinson, "The Case for Improving U.S. Computer Science Education" (Information Technology and Innovation Foundation, May 2016), https://itif.org/publications/2016/05/31/case-improving-us-computer-science-education.*

Congress should establish cash prizes for colleges and universities that succeed in graduating more STEM students.

America could graduate significantly more STEM students if only colleges and universities made it a priority. To give them incentives to do so, Congress should appropriate approximately $325 million over five years for the NSF to award prizes to colleges and universities that dramatically increase the rate at which freshmen STEM students graduate with STEM degrees, and that demonstrably sustain the increase. Awards could be sized in tiers for small, mid-sized, and large universities. Alternatively, Congress could require NSF to consider an institution's record on STEM "switch-outs" and dropouts, especially among women and minority students, in fields such as engineering and computer science, as a factor in awarding research grants.

More details: *Stephen Ezell and Robert D. Atkinson, "25 Recommendations for the 2013 America COMPETES Act Reauthorization" (Information Technology and Innovation Foundation, April 2013), https://itif.org/publications/2013/04/22/25-recommendations-2013-america-competes-act-reauthorization; Adams Nager and Robert D. Atkinson, "The Case for Improving U.S. Computer Science Education" (Information Technology and Innovation Foundation, May 2016), https://itif.org/publications/2016/05/31/case-improving-us-computer-science-education.*

Congress should create a NSF-industry Ph.D. fellows program.

Doctoral fellowships are key factors in producing more Ph.D. degrees in STEM fields. But compared with the number of science and engineering graduates, NSF now awards less than half as many research fellowships as it did in the 1960s. Rather than expanding the existing NSF Graduate Research Fellowship program (currently funded at $102 million), Congress should appropriate $21 million per year for a new program, where NSF and industry match funds on a dollar-for-dollar basis to support an additional 1,000 STEM Ph.D. fellows.

More details: *Robert D. Atkinson and Merrilea Mayo, "Refueling the U.S. Innovation Economy: Fresh Approaches to STEM Education" (Information Technology and Innovation Foundation, December 2010), https://itif.org/publications/2010/12/07/refueling-us-innovation-economy-fresh-approaches-stem-education.*

Congress should require colleges to report their National Survey of Student Engagement scores.

The National Survey of Student Engagement measures more than 1,300 colleges on student participation in the various programs and activities they offer for learning and personal development. The data can help show which institutions offer compelling educational experiences, but few publicly report their scores. Therefore, Congress should require reporting this data as a "check-off" criterion in the certifications and representations section of any federal higher-education grant proposal.

More details: *Robert D. Atkinson and Merrilea Mayo, "Refueling the U.S. Innovation Economy: Fresh Approaches to STEM Education" (Information Technology and Innovation Foundation, December 2010), https://itif.org/publications/2010/12/07/refueling-us-innovation-economy-fresh-approaches-stem-education.*

The Department of Education should provide matching grants to states for establishing teacher-certification programs in computer science.

To provide more students with the opportunity to learn computer science in a rigorous manner from a certified teacher, all 50 states should have certification programs that allow graduate students in education fields to become teachers specializing in computer science. The Department of Education should create federal matching grants for states implementing these certification programs to incentivize teachers to acquire certifications without making it a requirement that could force out current teachers.

More details: *Adams Nager and Robert D. Atkinson, "The Case for Improving U.S. Computer Science Education" (Information Technology and Innovation Foundation, May 2016), https://itif.org/publications/2016/05/31/case-improving-us-computer-science-education.*

Congress should subsidize the cost of certifications and master's programs for prospective teachers who successfully teach computer science for five years.

The country faces a nationwide shortage of qualified teachers to expand computer-science education. Subsidizing the cost of certification and providing higher wages for teachers who earn certificates will incentivize teachers to acquire them and make teaching a more attractive option for people who are also in high demand in the private sector. Funding for these grants should come from a new program that resembles the "Computer Science for All" plan in the Obama administration's 2016 budget, which proposed $4.1 billion over three years for states to expand computer-science education.

More details: *Adams Nager and Robert D. Atkinson, "The Case for Improving U.S. Computer Science Education" (Information Technology and Innovation Foundation, May 2016), https://itif.org/publications/2016/05/31/case-improving-us-computer-science-education.*

Congress should establish a knowledge tax credit by allowing expenditures for employee training to eligible for the R&D tax credit.

Training and ongoing education for incumbent workers are critical drivers of productivity growth and rising worker incomes. And a key way workers acquire skills is through on-the-job training provided by employers. But U.S. companies invest much less in training today than they have in the past. Therefore, to spur greater workforce training while at the same time lowering the effective corporate tax rate, Congress should allow employee training expenses to be added to qualified research expenditures under the research and development (R&D) tax credit.

More details: *Robert D. Atkinson, "Effective Corporate Tax Reform in the Global Innovation Economy" (Information Technology and Innovation Foundation, July 2009), https://itif.org/publications/2009/07/19/effective-corporate-tax-reform-global-innovation-economy.*

Congress should establish a process to accredit organizations that provide education certifications.

To spur innovation and lower costs in higher education, the federal government should promote alternatives to traditional college diplomas, so individuals can more effectively demonstrate educational mastery to prospective employers. The Department of Education should establish a program to accredit organizations providing educational certifications in much the same way it oversees organizations that provide accreditation of colleges and universities. Establishing an accreditation process for these certifications will serve as a useful

indicator of quality for public- and private-sector organizations that want to hire individuals who pursue nondegree learning options. At the same time, the process will begin to break the lock between education and credentialing and help create a new market for alternative certifications. This will bring real competitive pressures to bear on colleges and universities, which will create incentives for better educational outcomes.

More details: *Joe Kennedy, Daniel Castro, and Robert D. Atkinson, "Why It's Time to Disrupt Higher Education by Separating Learning From Credentialing" (Information Technology and Innovation Foundation, August 2016), https://itif.org/publications/2016/08/01/why-its-time-disrupt-higher-education-separating-learning-credentialing.*

Congress should encourage federal agencies to accept alternative certifications in lieu of degree requirements.

The federal government should lead by example in breaking the lock between education and credentialing. To that end, it should demonstrate to the private sector the feasibility of using alternative credentials by accepting a suitable set as a substitute for a college degree when filling federal jobs. The Office of Personnel Management (OPM) should change current requirements for many positions to allow individuals with acceptable scores on relevant certification exams to be eligible rather than just those with a college degree.

More details: *Joe Kennedy, Daniel Castro, and Robert D. Atkinson, "Why It's Time to Disrupt Higher Education by Separating Learning From Credentialing" (Information Technology and Innovation Foundation, August 2016), https://itif.org/publications/2016/08/01/why-its-time-disrupt-higher-education-separating-learning-credentialing.*

The Department of Education should encourage the private sector to recognize and rely on alternative certifications in hiring decisions.

The Department of Education should work with corporate partners to encourage the use of alternative certifications in hiring decisions. The goal here is to develop a credential that measures skills that many companies expect college graduates to possess upon graduation. If the top employers in America were to agree that they would treat the relevant certified credentialing programs as equivalent to college degrees, they would help create a new market for alternative certifications.

More details: *Joe Kennedy, Daniel Castro, and Robert D. Atkinson, "Why It's Time to Disrupt Higher Education by Separating Learning From Credentialing" (Information Technology and Innovation Foundation, August 2016), https://itif.org/publications/2016/08/01/why-its-time-disrupt-higher-education-separating-learning-credentialing.*

Congress should allow students to use federal aid for alternative learning options, such as massive open online courses.

Much of the direct cost of college is tuition, but most of the rest is room, board, and other living expenses. Federal student aid covers the direct costs of college and some other expenses. Similarly, Congress should allow students pursuing nondegree educations to be eligible for federal student aid to cover the costs of enrolling in programs, such as certain professional certification programs approved by the Department of Education and massive open online courses (MOOCs), as well as their living expenses. In addition, students should not have to be enrolled in a college or university to use federal student aid to pursue alternative learning options.

More details: *Joe Kennedy, Daniel Castro, and Robert D. Atkinson, "Why It's Time to Disrupt Higher Education by Separating Learning From Credentialing" (Information Technology and Innovation Foundation, August 2016), https://itif.org/publications/2016/08/01/why-its-time-disrupt-higher-education-separating-learning-credentialing.*

The Department of Education should conduct a regular survey of employer skill needs.

Better information on what skills employers value would help spur innovation across the educational system. Unfortunately, this information is often difficult to find because there is no national survey on the specific skills employers desire in recent graduates. The Department of Education should launch an annual employer survey that asks these questions, and it should make the findings available to the public with individual employer information anonymized.

More details: *Joe Kennedy, Daniel Castro, and Robert D. Atkinson, "Why It's Time to Disrupt Higher Education by Separating Learning From Credentialing" (Information Technology and Innovation Foundation, August 2016), https://itif.org/publications/2016/08/01/why-its-time-disrupt-higher-education-separating-learning-credentialing.*

Manufacturing

Congress should create manufacturing reinvestment accounts for small and mid-sized enterprises.

Congress should establish a 401(k)-like deferred-investment program that would give small and mid-sized manufacturers greater resources to bootstrap themselves by allowing them to make tax-deferred investments through manufacturing reinvestment accounts. The funds would be available for tax-free withdrawal if used for R&D, workforce training, or capital equipment investments. Connecticut has already put such a program in place.

More details: *Stephen Ezell and Robert D. Atkinson, "Fifty Ways to Leave Your Competitiveness Woes Behind: A National Traded Sector Competitiveness Strategy" (Information Technology and Innovation Foundation, September 2012), https://itif.org/publications/2012/09/20/fifty-ways-leave-your-competitiveness-woes-behind-national-traded-sector.*

Congress should direct the Small Business Administration to shift its focus toward traded-sector firms.

The Small Business Administration (SBA) treats all industries alike in its funding priorities, but industries serving local markets play no role in supporting economic competitiveness, and for the most part their funding simply shifts activity from one firm to another. Neither of these things is true for firms in industries that are globally traded, such as manufacturing, yet only 7.5 percent of loans under the SBA's primary program for assisting small businesses go to manufacturers. Congress should require the SBA to develop a plan to significantly increase the share of support going to traded-sector firms. Congress should then require that a significant share of SBA lending—both guarantees and direct lending—fund scale-up activities for small and mid-sized traded-sector firms.

More details: *Stephen Ezell and Robert D. Atkinson, "Fifty Ways to Leave Your Competitiveness Woes Behind: A National Traded Sector Competitiveness Strategy" (Information Technology and Innovation Foundation, September 2012), https://itif.org/publications/2012/09/20/fifty-ways-leave-your-competitiveness-woes-behind-national-traded-sector.*

Congress should pass the Made in America Manufacturing Communities Act.

The act authorizes a public-private program to enhance how federal economic development funds encourage American communities to focus not only on attracting individual investments, but also on transforming

themselves into globally competitive manufacturing hubs. The act awards preferential consideration to designated communities for up to $1.3 billion in existing federal economic development assistance across 11 federal agencies, thereby reducing burdens that communities and small manufacturers face in navigating and accessing federal support. The legislation will assist regions in thinking strategically about how and where they can be competitive in emerging industries and value chains.

More details: *Robert D. Atkinson and Stephen Ezell, "Ten Principles to Guide the Trump Administration's Manufacturing Strategy" (Information Technology and Innovation Foundation, January 2017), https://itif.org/publications/2017/01/31/ten-principles-guide-trump-administrations-manufacturing-strategy.*

Congress should authorize $100 million to expand the manufacturing universities pilot program within the Department of Defense.

Engineering education in the United States has increasingly moved toward more abstract engineering science, leaving university engineering departments more concerned with producing pure knowledge than educating students and working with industry to solve real-world problems. To bridge this gap, the United Sates should designate a core of at least 20 "manufacturing universities" that revamp their engineering programs to focus much more on manufacturing engineering, particularly on work that is relevant to industry. The 2017 National Defense Authorization Act (NDAA) authorized $10 million for such a program at the Department of Defense, the Manufacturing Engineering Education Grant Program. Congress should now ramp up funding to expand it.

More details: *Stephen Ezell and Robert D. Atkinson, "Fifty Ways to Leave Your Competitiveness Woes Behind: A National Traded Sector Competitiveness Strategy" (Information Technology and Innovation Foundation, September 2012), https://itif.org/publications/2012/09/20/fifty-ways-leave-your-competitiveness-woes-behind-national-traded-sector.*

Congress should increase funds for the Manufacturing USA program to build out more manufacturing-innovation institutes.

Manufacturing USA is a public-private network of manufacturing-innovation institutes that have played a critical role in revitalizing America's industrial commons and that have contributed to U.S. leadership across a range of advanced-manufacturing process and product technologies. Thus far, 14 institutes have been launched to focus on technologies, including additive manufacturing, digital manufacturing and design innovation, lightweight and modern metals, power electronics, advanced composites, integrated photonics, flexible hybrid electronics, clean-energy smart manufacturing, revolutionary fibers and textiles, robotics, and biopharmaceuticals manufacturing. Congress should appropriate funds to support a next round of industry-identified institutes and support a share of their ongoing operations.

More details: *David M. Hart, Stephen Ezell, and Robert D. Atkinson, "Why America Needs a National Network for Manufacturing Innovation" (Information Technology and Innovation Foundation, December 2012), https://itif.org/publications/2012/12/11/why-america-needs-national-network-manufacturing-innovation.*

The administration should launch two new research institutes under the auspices of the Manufacturing USA program to spur innovation in transportation infrastructure.

Manufacturing USA—launched in 2012 as the National Network for Manufacturing Innovation—brings together industry, universities, community colleges, and government agencies to support precompetitive

R&D to accelerate innovation in manufacturing. The administration should expand the program with two new institutes led by the Department of Transportation. The first institute should bring together industry, government, and university partners to pursue the R&D necessary for advancing high-impact intelligent-transportation systems and autonomous vehicles, so that these lifesaving technologies reach America's roadways faster. A second institute should investigate new materials for surface transportation, including longer-lasting materials.

More details: *Stephen Ezell and Robert D. Atkinson, "From Concrete to Chips: Bringing the Surface Transportation Reauthorization Act Into the Digital Age" (Information Technology and Innovation Foundation, May 2015), https://itif.org/publications/2015/05/19/concrete-chips-bringing-surface-transportation-reauthorization-act-digital.*

Congress should spur advanced manufacturing by increasing funding for NSF's industry-university partnerships for engineering and cooperative research, and by requiring industry matching funds.

NSF's Engineering Directorate oversees two forms of industry-university partnerships: Engineering Research Centers (ERCs) and Industry/University Cooperative Research Centers (I/UCRCs). Unfortunately, both programs are quite small and have a scant focus on supporting advanced manufacturing. In fact, only two of the 17 active ERCs focus on advanced manufacturing, while only seven of the 84 I/UCRCs are manufacturing-oriented, with few working on manufacturing process technologies that could be widely diffused across America's broader manufacturing base. Moreover, the ERCs engage with industry weakly and too often conduct academic research of limited industrial relevance. Accordingly, Congress should increase NSF funding for the I/UCRC program to at least $50 million per year and triple ERC funding to a level closer to $100 million annually, while also requiring that ERC funding be matched at least 40 percent by industry within five years for centers to retain funding. If need be this could be done in a budget neutral way by reducing funding for other parts of NSF.

More details: *Stephen J. Ezell, Robert D. Atkinson, and David Hart, "ITIF Comments Responding to Administration RFI for National Strategic Plan for Advanced Manufacturing" (Information Technology and Innovation Foundation, April 2018), http://www2.itif.org/2018-comments-national-strategic-plan-advanced-manufacturing.pdf.*

Taxes

Congress should increase the Alternative Simplified Credit to boost private R&D.

The U.S. R&D tax credit is far less generous than that of most other countries. Congress should either increase the alternative simplified credit for R&D from 14 percent to 20 percent—or expand it by enacting a three-tiered credit for qualified expenses that are 50 percent, 75 percent, or 100 percent above firms' previous three-year averages. At the low end, they would continue to receive a 14 percent credit; in the middle band, they could receive a 20 percent credit; and at the high end, they could earn a 40 percent credit.

More details: *Robert D. Atkinson, "Expanding the R&E Tax Credit to Drive Innovation, Competitiveness and Prosperity" (Information Technology and Innovation Foundation, July 2007), https://itif.org/publications/2007/07/24/expanding-re-tax-credit-drive-innovation-competitiveness-and-prosperity.*

Congress should broaden and expand the R&D credit for collaborative research.

The United States provides a 20 percent credit for collaborative R&D, but it only applies to energy research. Congress should eliminate the energy restriction. Research consortia, whether with companies or universities, tend to focus more on more basic and exploratory research, which have big spillovers, with many of the benefits going to other firms and society. Therefore, firms do less of this kind of research than is economically optimal. That is why a number of other countries, including Canada, Denmark, Hungary, Japan, France, Norway, Spain, and the United Kingdom have in the last decade established more generous incentives for this form of research.

More details: *Robert D. Atkinson, "Effective Corporate Tax Reform in the Global Innovation Economy" (Information Technology and Innovation Foundation, July 2009), https://itif.org/publications/2009/07/19/effective-corporate-tax-reform-global-innovation-economy.*

Congress should make companies' expenditures on global standards setting eligible for the R&D credit.

Business investments to participate in global standard-setting processes are an important component to ensuring U.S. competitiveness. But because of the free-rider problem (where companies benefit from the actions of other companies), U.S. companies appear to under invest in standards-settings activities, just as they do in R&D. Moreover, some nations, particularly China, subsidize company participation in global standards-setting bodies in order to assure that the agreed upon standards favor their companies. To remedy this, Congress should change the research and experimentation tax credit to allow companies to include their spending on global standard-setting activities when they calculate their total expenditures on research and experimentation.

More details: *Robert D. Atkinson, "Deep Competitiveness," Issues in Science and Technology, Vol. XXIII, No. 2, Winter 2007, https://issues.org/atkinson-4/.*

Congress should pass the Support the Small Business R&D Act.

In December 2015, Congress passed the PATH Act, which expanded small businesses' access to the R&D credit by permitting them to claim the credit against their employment taxes or against their alternative minimum credit (AMT) tax. But not enough small businesses are aware that this legislation greatly expands their access to the credit. Accordingly, Congress should pass the Support Small Business R&D Act, which would require the SBA and the IRS to expand knowledge-sharing and training on these instruments and provide a report to Congress on their progress.

More details: *Stephen Ezell, "A Policymaker's Guide to Smart Manufacturing" (Information Technology and Innovation Foundation, November 2016), https://itif.org/publications/2016/11/30/policymakers-guide-smart-manufacturing.*

Congress should create global knowledge investment zones to attract foreign direct investment.

The federal government should enable a limited number of global knowledge investment zones in and around research agglomerations (e.g., Research Triangle, N.C.; Rochester, N.Y.; and Ames, Iowa) to attract high-value-added foreign direct investment. Communities would compete for the designation by offering incentives such as property-tax waivers, and firms eligible to relocate there would receive a generous mix of

benefits to spur innovation and jobs, including special R&D tax credits, streamlined access to university technology, and visa preferences.

More details: *Stephen Ezell and Robert D. Atkinson, "Fifty Ways to Leave Your Competitiveness Woes Behind: A National Traded Sector Competitiveness Strategy" (Information Technology and Innovation Foundation, September 2012), https://itif.org/publications/2012/09/20/fifty-ways-leave-your-competitiveness-woes-behind-national-traded-sector.*

Similar to countries with so-called "patent-box" regimes, Congress should allow U.S. companies to pay a lower corporate tax rate on income generated from innovation-based products.

"Patent boxes" are among the most interesting developments in the race for global competitiveness. So named because they appear as check boxes on tax forms, they allow corporate income from the sale of patented products to be taxed at lower rates than other income. If designed to link the incentive to conducting R&D or producing innovation-based products domestically, this tax reduction would go even further in spurring innovation-based U.S. job creation. By lowering the effective corporate tax rate for knowledge-based firms located in the United States, an "innovation box" also would make it easier for them to take on competitors in other nations that provide robust innovation incentives.

More details: *Robert D. Atkinson and Scott M. Andes, "Patent Boxes: Innovation in Tax Policy and Tax Policy for Innovation" (Information Technology and Innovation Foundation, October 2011), https://itif.org/publications/2011/10/04/patent-boxes-innovation-tax-policy-and-tax-policy-innovation.*

Congress should allow investors in small research companies to use the net operating losses associated with that research.

Current law prevents passive investors from taking advantage of net operating losses or research tax credits of the companies in which they invest. This makes sense for tax shelters that are never meant to be profitable. But it makes it even harder for small research companies to find investors. Congress should create an exception for companies that devote over half of their expenses to research and development and that have fewer than 250 employees and less than $150 million in assets. Investors could only use that portion of the losses or credit that was devoted to qualifying research activity.

More details: *John Wu and Robert D. Atkinson, "How Technology-Based Start-Ups Support U.S. Economic Growth (Information Technology and Innovation Foundation, November 29, 2017, https://itif.org/publications/2017/11/28/how-technology-based-start-ups-support-us-economic-growth.*

Congress should allow small research companies to carry their net operating losses forward even after a change in ownership.

Firms can normally carry past operating losses forward in order to deduct them from future income, thereby lowering their taxes. Under Section 382 of the tax code, firms lose this ability when they undergo a change in ownership. Since small research firms often engage in successive financing rounds before achieving success, this provision makes it hard for them to ever recover their past losses and artificially inflates their historical income for tax purposes. Congress should exempt that portion of net operating losses that are generated by small firms that conduct qualifying research and development activities. Ernst & Young estimated that this change would increase direct investment in these companies by $4.9 billion and boost their employment by 25,000 jobs.

More details: *John Wu and Robert D. Atkinson, "How Technology-Based Start-Ups Support U.S. Economic Growth (Information Technology and Innovation Foundation, November 29, 2017, https://itif.org/publications/2017/11/28/how-technology-based-start-ups-support-us-economic-growth.*

Tech Transfer

Congress should support the innovation potential of rural areas by creating rural innovation institutes.

Many rural areas have suffered decades-long economic decline or stagnation. One way to restore their growth would be to boost their innovation potential. This would help those areas' own economic growth prospects and contribute to America's overall innovation system. Congress should support rural innovation by creating a nationwide network of rural innovation institutes in sectors such as aquaculture, agriculture, wind and water energy, mining, and timber. For example, Congress could task the U.S. Department of Agriculture (USDA) with leading a major technology initiative around how to get more value-added out of rural communities through fishing, fiber, food, wind, water, etc. Such a program, perhaps in coordination with the U.S. Department of Commerce's Manufacturing Extension Partnership, also could build on and support existing rural manufacturing clusters, such as the carpet cluster in rural Alabama and the snowmobile cluster in northern Minnesota.

More details: *Stephen Ezell and Scott M. Andes, "Localizing the Economic Impact of Research and Development: Policy Proposals for the Trump Administration and Congress" (Information Technology and Innovation Foundation and Brookings Institution, December 2016), https://itif.org/publications/2016/12/07/localizing-economic-impact-research-and-development-policy-proposals-trump.*

Congress should introduce an Open Commercialization Infrastructure Act.

One way to increase the use of America's national R&D infrastructure would be to pass an "Open Commercialization Infrastructure Act" that permits private use of bonded facilities—including universities, federal labs, and public libraries—for certain activities related to entrepreneurial education and training as well as for economic development and job creation. This would be useful because buildings that are financed through tax-exempt bonds currently are not permitted to develop private programming. For example, a small business trying to develop a commercial product would be restricted from taking advantage of a 3-D printer in a makerspace at a bonded facility such as a public library. This and many other kinds of private activities that benefit entrepreneurs—such as business incubators, accelerators, and training programs—are important for broader economic development. Congress should ensure more infrastructure is available for such purposes.

More details: *Stephen Ezell and Scott M. Andes, "Localizing the Economic Impact of Research and Development: Policy Proposals for the Trump Administration and Congress" (Information Technology and Innovation Foundation and Brookings Institution, December 2016), https://itif.org/publications/2016/12/07/localizing-economic-impact-research-and-development-policy-proposals-trump.*

Congress should allocate a share of federal research funding to promote technology transfer and commercialization, such as through a Spurring Commercialization of Our Nation's Research Program.

The current federal system for funding research pays too little attention to commercializing technology and is still based on the linear model that assumes basic research gets easily translated into commercial activity. To address this, the administration should work with Congress to establish an automatic set-aside program that

allocates a modest percentage of federal research budgets to technology-commercialization activities. For instance, Congress could allocate 0.15 percent of agency research budgets to fund university, federal laboratory, and state government technology-commercialization and innovation efforts. The funds could be used to provide: 1) "commercialization capacity-building grants" to institutions of higher education pursuing specific initiatives to improve their capacity to commercialize faculty research, and 2) "commercialization-accelerator grants" to support institutions of higher education pursuing initiatives that allow faculty to directly commercialize research in an effort to accelerate research breakthroughs.

More details: *Stephen Ezell and Robert D. Atkinson, "25 Recommendations for the 2013 America COMPETES Act Reauthorization" (Information Technology and Innovation Foundation, April 2013), https://itif.org/publications/2013/04/22/25-recommendations-2013-america-competes-act-reauthorization.*

Congress should develop a proof-of-concept, or "Phase Zero," individual and institutional grant award program within major federal research agencies.

The Small Business Innovation Research (SBIR) program and Small Business Technology Transfer (STTR) program both support innovation, but their approval processes are high bars to clear for very early stage companies. Too often, there is insufficient funding available at universities (or from other sources) to push nascent technologies to the point where these companies can receive SBIR or STTR grants. A national "phase-zero" proof-of-concept program would address this problem by helping more projects cross the so-called "valley of death" from early stage research to commercialization, by providing infrastructure (e.g., expertise, personnel, and small business and venture capital engagement), and by facilitating the cultural change necessary for universities, federal laboratories, and other nonprofit research organizations to better support these kind of commercialization activities. Kentucky and Louisiana, among other states, have developed such "phase-zero" grants to help firms apply for SBIR grants and support early proof-of-concept research. One way Congress could implement such a proof-of-concept program would be through a grant program to states that agree to match funds on a dollar-for-dollar basis.

More details: *Stephen Ezell and Scott M. Andes, "Localizing the Economic Impact of Research and Development: Policy Proposals for the Trump Administration and Congress" (Information Technology and Innovation Foundation and Brookings Institution, December 2016), https://itif.org/publications/2016/12/07/localizing-economic-impact-research-and-development-policy-proposals-trump.*

Congress should allow a greater share of SBIR and STTR grant awards to be used for commercialization activities.

SBIR's impact could be much greater if some facets of the program were geared significantly more toward commercialization. Awardees currently are prohibited from using grant money to fund critical commercialization activities that would enable them to raise their profiles and accomplish certain key milestones so they can build prototypes of new products or services, acquire commercial customers, attract private capital, or accelerate market entry. These activities cover the gamut from intellectual-property development and prosecution to marketing and staff recruitment. To fill these gaps, SBIR awardees should be permitted to expend at least 5 percent of their SBIR funds on commercialization-oriented activities. For instance, the Support Startup Business Act (S. 2149), co-sponsored by Sens. Chis Coons (D-DE) and Cory Gardner (R-CO), would allow program awardees to allocate up to $50,000 of their awards for

commercialization-related activities, including services such as market validation, IP protection, market research, and business model development.

More details: *Stephen Ezell and Scott M. Andes, "Localizing the Economic Impact of Research and Development: Policy Proposals for the Trump Administration and Congress" (Information Technology and Innovation Foundation and Brookings Institution, December 2016), https://itif.org/publications/2016/12/07/localizing-economic-impact-research-and-development-policy-proposals-trump.*

Congress should direct NSF to establish stronger university entrepreneurship metrics and use them to provide stronger incentives for commercializing research.

Congress should direct NSF to partner with NIST to develop a metric for universities to report entrepreneurship and commercialization information annually, including data on new business starts by faculty, spin-offs, license agreements, patenting, and industrial funding of research. Congress should further direct agencies to factor these metrics into their decisions to award research funds.

More details: *Stephen Ezell and Robert D. Atkinson, "Fifty Ways to Leave Your Competitiveness Woes Behind: A National Traded Sector Competitiveness Strategy" (Information Technology and Innovation Foundation, September 2012), https://itif.org/publications/2012/09/20/fifty-ways-leave-your-competitiveness-woes-behind-national-traded-sector.*

The administration should expand NSF's I-Corps program.

NSF's innovative I-Corps program fosters entrepreneurship that can lead to the commercialization of technology that has been supported previously through NSF-funded research. While the I-Corps program has been a resounding success, it still lacks sufficient scope across the vast array of government agencies that support novel research that could be commercialized. Accordingly, the administration should expand the I-Corps program to cover all federal agencies with major extramural R&D budgets to further entrepreneurial training for federally-funded scientific researchers. The Innovators to Entrepreneurs Act of 2018 (H.R. 5086, co-sponsored by Reps. Lipinski (D-IL), Webster (R-FL), Johnson (D-TX), and Comstock (R-VA)) would establish such a program.

More details: *"Transition Memo to President Trump: How to Spur Innovation, Productivity, and Competitiveness" (Information Technology and Innovation Foundation, November 2016), https://itif.org/publications/2016/11/16/transition-memo-president-elect-trump-how-spur-innovation-productivity-and.*

Congress should fund a pilot program supporting experimental approaches to technology transfer and commercialization.

A number of organizations are experimenting with novel approaches to bolstering technology transfer from universities (and national laboratories) to industry and accelerating commercialization. Congress should support these novel approaches by including $5 million in the reauthorization of the America COMPETES Act to fund experimental programs through a grant process managed by the Commerce Department's Office of Innovation and Entrepreneurship.

More details: *Stephen Ezell and Robert D. Atkinson, "25 Recommendations for the 2013 America COMPETES Act Reauthorization" (Information Technology and Innovation Foundation, April 2013), https://itif.org/publications/2013/04/22/25-recommendations-2013-america-competes-act-reauthorization.*

Congress should create an "Innovation Voucher" program operated by NIST.

As in almost a dozen other countries, these vouchers can spur innovation and stimulate knowledge transfer by allowing small and mid-sized enterprises to "buy" expertise from universities, national labs, and research institutions to conduct studies, analyze the innovation potential of new technologies, etc. A promising example has been the Small Business Voucher Pilot program in the Energy Department's Office of Energy Efficiency and Renewable Energy (EERE), which has provided vouchers to 114 small business across 31 states, disbursing more than $22 million since 2015. For example, the Oak Ridge National Laboratory (ORNL) collaborated to launch "RevV," a $2.5 million manufacturing innovation program that offers vouchers for manufacturers in Tennessee to access the world-class researchers and facilities at ORNL. The administration should work with Congress to extend such vouchers across the entire federal lab system under the auspices of NIST by authorizing $50 million that would be state-matched.

More details: *Stephen Ezell and Robert D. Atkinson, "Fifty Ways to Leave Your Competitiveness Woes Behind: A National Traded Sector Competitiveness Strategy" (Information Technology and Innovation Foundation, September 2012), https://itif.org/publications/2012/09/20/fifty-ways-leave-your-competitiveness-woes-behind-national-traded-sector.*

IT AND DATA

Cybersecurity

The administration and Congress should require the federal government to offer an electronic identification to U.S. residents who desire one.

Many nations are investing in electronic ID (e-ID) systems that allow individuals to prove their identities, or attributes about their identities, to information systems. Without federal action, this market will remain stagnant in the United States, which will inhibit people from being able to complete transactions entirely online, such as opening up a bank account. The government should spur the supply of e-IDs by directing a federal agency to offer them to U.S. residents for a reasonable fee. Both the State Department and the Department of Homeland Security have systems and processes in place that could be adapted to issue e-IDs. They could be offered as standalone products, such as smartcards or software certificates for mobile phones, or on existing identification documents, such as passports.

More details: *Daniel Castro, "Explaining International IT Application Leadership: Electronic Identification Systems" (Information Technology and Innovation Foundation, September 2011), https://itif.org/publications/2011/09/15/explaining-international-it-application-leadership-electronic-identification.*

Congress should create a robust national standard for data-breach notification.

Congress should establish a uniform federal standard for data-breach notification to extricate consumers from the current patchwork of different state requirements that provide uneven protection. Congress should reject all attempts to simply add an additional layer of regulation that would benefit neither consumers nor industry, and instead preempt state laws.

More details: *Daniel Castro and Alan McQuinn, "Why We Need a Robust National Standard for Data Breach Notification," Christian Science Monitor, June 10, 2015, http://www.csmonitor.com/World/Passcode/Passcode-Voices/2015/0610/Opinion-Why-we-need-a-robust-national-standard-for-data-breach-notification.*

Congress should require all federal agencies that discover security flaws to disclose them in a timely and responsible manner and to work with private industry to fix them.

One of the most serious cybersecurity threats comes from so-called "zero day" attacks, which are designed to exploit vulnerabilities that a developer either doesn't know about or hasn't had time to fix. While most professional security researchers in the private sector and academia adhere to responsible disclosure policies to mitigate the threat from these vulnerabilities, U.S. government agencies do not. Therefore, Congress should pass legislation that directs U.S. government agencies that discover vulnerabilities in software or hardware products to responsibly notify their developers in a timely manner every time so they can fix the vulnerabilities.

More details: *Daniel Castro and Alan McQuinn, "Unlocking Encryption: Information Security and the Rule of Law" (Information Technology and Innovation Foundation, March 2016), https://itif.org/publications/2016/03/14/unlocking-encryption-information-security-and-rule-law.*

Congress should examine whether U.S. courts can better balance the interests of individuals and the state by allowing law enforcement to hold suspects in contempt of court when they refuse to disclose encryption keys for their secured data.

The Fifth Amendment attempts to balance the rights of individuals and the needs of society. However, encryption offers a unique and significant interest for the state in compelling production of decrypted information, as encrypted information is often impregnable without the key. Achieving a fair balance of interests between citizens and the state requires permitting law enforcement—but only under lawful court order—to compel someone to turn over a password or encryption key if law enforcement can prove a convincing interest in acquiring that information. Congress should investigate how best to achieve this balance.

More details: *Daniel Castro and Alan McQuinn, "Unlocking Encryption: Information Security and the Rule of Law" (Information Technology and Innovation Foundation, March 2016), https://itif.org/publications/2016/03/14/unlocking-encryption-information-security-and-rule-law.*

Congress should establish an "18F" for cybersecurity.

Congress should direct the General Services Administration (GSA) to establish an office that collaborates with other agencies on cybersecurity issues, bringing in top private-sector talent to improve government security. This team should be modeled off some of the most successful aspects of the existing GSA office known as 18F, but with a focus on cybersecurity. The goal of this initiative would be to incorporate private-sector knowledge and nongovernment culture into high-impact, high-priority federal government cybersecurity projects. Members of this team could serve short-term stints based on new projects, agency needs, and available funding.

More details: *18F, https://18f.gsa.gov.*

Congress should require companies to publish security policies to promote transparency with consumers.

Most companies publish privacy policies, which create a transparent and accountable mechanism for regulators to ensure companies are adhering to their stated policies. But no such practice exists for

information security practices, which has resulted in vague standards, regulation by buzzword, and information asymmetry in markets. By publishing security policies, companies would be motivated to describe the types of security measures they have in place rather than just make claims of taking "reasonable security measures." This is a concrete step that policymakers can take to improve security practices in the private sector.

More details: *Daniel Castro, "How Congress Can Fix 'Internet of Things' Security," The Hill, October 28, 2016, http://thehill.com/blogs/pundits-blog/technology/303302-how-congress-can-fix-internet-of-things-security.*

SBA should form a small business cybersecurity co-op.

Small businesses often don't know what types of cybersecurity products and services they should be buying, or if they do know, they often can't afford them because the per-user costs are too high. Companies that sell IT security products and services often use variable pricing based on the number of users or require minimum purchase amounts. These high per-user costs make these solutions unattractive or unfeasible for many small businesses. SBA should assist small businesses by establishing a cybersecurity cooperative to create a large pool of willing buyers for various cybersecurity products and services, including cyber risk insurance. Participation in the cybersecurity co-op could be open to any small business and depending on the level of interest, it could be organized around particular regions or sectors. The co-op could identify and evaluate cybersecurity products and services for its members and negotiate better rates for its users than they could get on their own. Establishing a co-op would allow small businesses to get more value for their cybersecurity investments and increase adoption of best-in-class cybersecurity tools, as well lower costs for those selling these products and services by reducing their customer acquisition costs.

More details: *Daniel Castro, "Testimony to the U.S. Senate on Preparing Small Business for Cybersecurity Success," April 25, 2018, https://itif.org/publications/2018/04/25/preparing-small-business-cybersecurity-success.*

SBA should establish a certification program for "part-time" cybersecurity professionals.

Many small businesses either cannot afford or cannot justify hiring a qualified cybersecurity professional, so they assign cyber responsibilities to an employee who works on them "part time." Unfortunately, virtually all cybersecurity certification programs are tailored for people who do this as their full-time job. As a result, small business employees who only work on cybersecurity as a small part of their job don't pursue these credentials and are often under-qualified. To address this problem, SBA should develop a low-cost, vendor-neutral certification program for small business employees who serve as their companies' designated cybersecurity experts. The curriculum for the certification should be regularly reviewed to ensure it is accurate, comprehensive, and up-to-date. SBA could authorize professional certification organizations to award the certification to those who master the material. This would help small businesses assess whether they have staff qualified to handle cybersecurity and ensure their investments in training are worthwhile.

More details: *Daniel Castro, "Testimony to the U.S. Senate on Preparing Small Business for Cybersecurity Success," April 25, 2018, https://itif.org/publications/2018/04/25/preparing-small-business-cybersecurity-success.*

SBA should create a cybersecurity boot camp for small businesses.

Many small businesses do not have anyone who is properly trained on cybersecurity issues, but they still need to mitigate common cyber threats. So SBA should develop a free online "Cybersecurity Boot Camp" that provides small businesses the concrete steps they need to create a basic cybersecurity program to address the most critical cyber threats they face. Participants should not be expected to come with any prior knowledge and they should be able to repeat the boot camp as often as necessary. SBA should update the content regularly so it contains information on known, as well as emerging, threats.

More details: *Daniel Castro, "Testimony to the U.S. Senate on Preparing Small Business for Cybersecurity Success," April 25, 2018, https://itif.org/publications/2018/04/25/preparing-small-business-cybersecurity-success.*

Data Innovation

The White House should direct federal agencies to develop sector-specific AI strategies to spur AI adoption and development in industry.

The federal government has significant influence and involvement in sectors such as health care, transportation, and education through grants and other funding, procurement, and regulation. Federal agencies should be charged with developing sector-specific AI strategies to shape their policies affecting these industries in ways that support AI transformation.

More details: *Joshua New, "Why the United States Needs a National Artificial Intelligence Strategy and What It Should Look Like" (Center for Data Innovation, December 2018), https://www.datainnovation.org/2018/12/why-the-united-states-needs-a-national-artificial-intelligence-strategy-and-what-it-should-look-like/.*

Congress should direct the Economic Development Administration to encourage state governments to foster AI industry development.

Congress should appropriate funds for the Economic Development Administration to create a state economic development competition in which states would compete for funds to establish their own state development plans and policies for supporting AI development, especially through new startups.

More details: *Joshua New, "Why the United States Needs a National Artificial Intelligence Strategy and What It Should Look Like" (Center for Data Innovation, December 2018), https://www.datainnovation.org/2018/12/why-the-united-states-needs-a-national-artificial-intelligence-strategy-and-what-it-should-look-like/.*

The White House should direct federal agencies to support the development of shared pools of high-quality, application-specific training and validation data in key areas of public interest.

It can take large pools of data to "train" AI systems, but it can be difficult and costly to amass this training data. Federal agencies overseeing sectors where AI applications could advance key public interests, such as in agriculture, education, public safety, and law enforcement, should gather and share this data to spur the development of these valuable AI applications. For example, NIST should work with law enforcement agencies, civil society, and other stakeholders to develop shared, representative datasets of faces that can serve as an unbiased resource for organizations developing facial recognition technology.

More details: *Joshua New, "Why the United States Needs a National Artificial Intelligence Strategy and What It Should Look Like" (Center for Data Innovation, December 2018), https://www.datainnovation.org/2018/12/why-the-united-states-needs-a-national-artificial-intelligence-strategy-and-what-it-should-look-like/.*

The White House should direct federal agencies to develop and pilot "data trusts."

Businesses, government agencies, and researchers often avoid sharing with one another data that would be mutually beneficial due to concerns about its sensitive or proprietary nature. Federal agencies, particularly the Department of Commerce and Department of Health and Human Services, can remedy this by establishing a framework of "data trusts" that have clearly defined rights and responsibilities for how the parties involved will use the data. Data trusts could greatly increase the amount of data available for data innovation and AI development in sectors such as health care, which often deals with sensitive information, and for the economy as a whole, as businesses would have greater confidence to share their proprietary data.

More details: *Joshua New, "Why the United States Needs a National Artificial Intelligence Strategy and What It Should Look Like" (Center for Data Innovation, December 2018), https://www.datainnovation.org/2018/12/why-the-united-states-needs-a-national-artificial-intelligence-strategy-and-what-it-should-look-like/.*

Congress should fund the National Science Foundation to create a competitive AI fellowship program for at least 1,000 computer science students annually.

Countries such as Canada and the United Kingdom have launched initiatives to increase the numbers of students on track to become highly-skilled AI workers. The United States should adapt its own version of these initiatives to remain competitive.

More details: *Joshua New, "Why the United States Needs a National Artificial Intelligence Strategy and What It Should Look Like" (Center for Data Innovation, December 2018), https://www.datainnovation.org/2018/12/why-the-united-states-needs-a-national-artificial-intelligence-strategy-and-what-it-should-look-like/.*

Congress should fund a program at the National Science Foundation to provide competitive awards for up to 1,000 AI researchers to remain in academia for a period of five years.

Though individual businesses may benefit from attracting the best AI faculty talent from universities, the overall AI innovation ecosystem suffers as it reduces the number of AI experts that can help new students cultivate these skills. These awards would incentivize more AI researchers to stay in academia and help U.S. universities meet the demand for AI skills.

More details: *Joshua New, "Why the United States Needs a National Artificial Intelligence Strategy and What It Should Look Like" (Center for Data Innovation, December 2018), https://www.datainnovation.org/2018/12/why-the-united-states-needs-a-national-artificial-intelligence-strategy-and-what-it-should-look-like/.*

The White House should direct the CIO Council to establish a strategic initiative devoted to AI.

Federal agencies can greatly advance their own missions as well as advance AI as a whole by being robust adopters of AI, however agencies face a variety of barriers, including lack of awareness and strategic leadership, procurement challenges, and talent shortages. The federal CIO Council was established to help overcome such challenges, and while the council currently has an initiative devoted to "data analytics and big data," which would likely cover certain aspects of AI adoption, there should be a more explicit focus on AI.

More details: *Joshua New, "Why the United States Needs a National Artificial Intelligence Strategy and What It Should Look Like" (Center for Data Innovation, December 2018), https://www.datainnovation.org/2018/12/why-the-united-states-needs-a-national-artificial-intelligence-strategy-and-what-it-should-look-like/.*

The Department of Defense should prioritize the use of AI to support its missions protecting national security.

DOD is well aware of the benefits AI can offer for national security and intelligence, recognizing that maintaining the lead in AI would help the United States maintain information superiority and enable faster and more accurate decisions both on and off the battlefield. Though national security agencies been at the forefront of developing and adopting AI in government, they face many of the same obstacles as the rest of the public sector and some that are unique. To take full advantage of AI, DOD should do several things: create a body with government and industry stakeholders to accelerate the adoption of dual-use AI technologies by the military; establish a cross-agency task force to identify opportunities to simplify the acquisition process for AI; pursue and expand the use of alternative acquisition mechanisms as workarounds cumbersome procurement policies; and increase the visibility of AI appropriations by establishing a new Program Element (PE) specifically for AI.

More details: *Joshua New, "Why the United States Needs a National Artificial Intelligence Strategy and What It Should Look Like" (Center for Data Innovation, December 2018), https://www.datainnovation.org/2018/12/why-the-united-states-needs-a-national-artificial-intelligence-strategy-and-what-it-should-look-like/.*

Congress should require financial regulators to adopt modern data standards.

The Security and Exchange Commission (SEC) and other financial regulatory agencies have adopted modern, machine-readable, structured data standards for their corporate-reporting requirements, but still also require outdated and redundant unstructured data formats, which limits the utility of the data for regulators and the financial sector alike. Congress should require all financial regulatory agencies to adopt modern data-reporting standards and abandon outdated, less useful formats.

More details: *Daniel Castro and Joshua New, "Accelerating Data Innovation: A Legislative Agenda for Congress" (Information Technology and Innovation Foundation, Center for Data Innovation, May 2015), https://www.datainnovation.org/2015/05/accelerating-data-innovation-a-legislative-agenda-for-congress.*

Congress should develop robust data on U.S. coastlines.

Geospatial data on America's 95,000 miles of coastlines is inaccurate and dated, despite its critical importance to the economy, infrastructure planning, disaster response, and the environment. Congress should create a national coastal-mapping information platform that allows the National Oceanic and Atmospheric Administration (NOAA) and other state and federal agencies to develop accurate geospatial data on coastlines and share this data with each other and the public.

More details: *Daniel Castro and Joshua New, "Accelerating Data Innovation: A Legislative Agenda for Congress" (Information Technology and Innovation Foundation, Center for Data Innovation, May 2015), https://www.datainnovation.org/2015/05/accelerating-data-innovation-a-legislative-agenda-for-congress.*

Congress should require statewide education databases to properly link longitudinal student records.

Most states, as well as the District of Columbia, Puerto Rico, and the Virgin Islands, have received federal grants to develop statewide longitudinal data systems (SLDSs) to collect and analyze student data. These systems can include data about early childhood education, K-12 education, postsecondary education, and workforce information—known collectively as P-20w information. The stated goal of the SLDS program is to create systems that fully link this P-20w data, which could help policymakers make more informed decisions about education policy and labor-market needs. But prior rounds of grant funding have not required states to implement full P-20w linkage. As a result, the completeness and quality of longitudinal student data varies widely by state. In future rounds of SLDS grant funding, Congress should require states to collect and properly link all P-20w data in their systems and make this data as usable as possible.

More details: *Daniel Castro and Joshua New, "Accelerating Data Innovation: A Legislative Agenda for Congress" (Information Technology and Innovation Foundation, Center for Data Innovation, May 2015), https://www.datainnovation.org/2015/05/accelerating-data-innovation-a-legislative-agenda-for-congress; Joshua New, "Building a Data-Driven Education System in the United States" (Information Technology and Innovation Foundation, Center for Data Innovation, November 2016), https://www.datainnovation.org/2016/11/building-a-data-driven-education-system-in-the-united-states.*

The Department of Education should support the development of a model data-driven school district.

There are no examples of a truly data-driven education system, even though better use of data has the potential to significantly improve how educators teach children and how administrators manage schools. The Department of Education should provide leadership by launching a challenge to establish a multiyear, fully data-driven school-system pilot that can serve as a model for educators around the country. In coordination with researchers, educators, and education-technology developers, the agency should develop criteria for proposed pilots and provide implementation funding. To participate in the challenge, school districts should commit to making de-identified education data collected in the pilot available to researchers, to making student data easily exportable, and to sharing information about their successes and failures with other school districts that wish to adopt data-driven approaches. Additionally, the district should be required to identify areas where state or federal restrictions on collection and use of data limit its ability to improve education. Finally, the winning district should prioritize projects that can be easily replicated by other school districts.

More details: *Joshua New, "Building a Data-Driven Education System in the United States" (Information Technology and Innovation Foundation, Center for Data Innovation, November 2016), https://www.datainnovation.org/2016/11/building-a-data-driven-education-system-in-the-united-states.*

The White House should establish a national Internet of Things strategy.

The private sector is developing connected technologies to support smart homes, cities, and infrastructure, but these advancements are piecemeal and fragmented. To encourage a more comprehensive, systematic approach to the Internet of Things (IoT), the White House should develop a national strategy that spurs public and private adoption of the Internet of Things.

More details: *Daniel Castro and Joshua New, "Accelerating Data Innovation: A Legislative Agenda for Congress" (Information Technology and Innovation Foundation, Center for Data Innovation, May 2015), https://www.datainnovation.org/2015/05/accelerating-data-innovation-a-legislative-agenda-for-congress.*

Congress should direct the Federal CIO Council to establish an IoT taskforce to provide leadership and cross-government coordination to support adoption and deployment of the Internet of Things.

The federal government generally lacks strategic leadership and coordination when it comes to federal adoption and deployment of the Internet of Things. To remedy this, Congress should direct the federal CIO Council to establish a task force that is responsible for cross-government leadership on this technology. This IoT task force should be charged with educating agency leadership, fostering collaboration across agencies, and developing and sharing best practices for deploying IoT applications. The task force should also identify how to reform procurement policies to better acquire IoT solutions and develop data-skills training programs for federal employees.

More details: *Daniel Castro, Joshua New, and Alan McQuinn, "How Is the Federal Government Using the Internet of Things," Information Technology and Innovation Foundation, Center for Data Innovation, July 25, 2016, https://www.datainnovation.org/2016/07/how-is-the-federal-government-using-the-internet-of-things.*

Congress should direct every federal agency to develop an action plan for how it will use IoT solutions to cut costs and improve services.

Few federal agencies have pursued opportunities to use the Internet of Things to operate more efficiently and effectively. Therefore, Congress should direct all federal agencies to create a strategic plan for how they will adopt and deploy the Internet of Things to cut costs and improve the quality of their respective services. Action plans also should address any unique obstacles agencies face in adopting and using the technology. And the action plans should explain how agencies will improve their operations by leveraging new opportunities presented by the Internet of Things and the data these technologies generate.

More details: *Daniel Castro, Joshua New, and Alan McQuinn, "How Is the Federal Government Using the Internet of Things," Information Technology and Innovation Foundation, Center for Data Innovation, July 25, 2016, https://www.datainnovation.org/2016/07/how-is-the-federal-government-using-the-internet-of-things.*

Congress should direct GSA to establish an "IoT Corps" to work on high-impact IoT projects.

GSA should establish a team of government employees who can be assigned to work on high-impact IoT projects at federal agencies. The goal of this "IoT Corps" would be to develop a strong workforce with the skills to deploy the Internet of Things throughout government. Members of this team could rotate to new assignments every couple of years based on new projects, agency needs, and available funding. This model of government service would build off some of the successful aspects of 18F and the U.S. Digital Service.

More details: *Daniel Castro, Joshua New, and Alan McQuinn, "How Is the Federal Government Using the Internet of Things" (Information Technology and Innovation Foundation, Center for Data Innovation, July 25, 2016), https://www.datainnovation.org/2016/07/how-is-the-federal-government-using-the-internet-of-things.*

Congress should authorize and fund develop a globally competitive smart-cities program.

The United States is missing an opportunity to be a global leader in smart cities—cities that rely on networked sensors and data technologies to drive decision-making and improve municipal services and infrastructure, including transportation, due in part to a lack of federal support or guidance. Though the Department of Transportation launched a smart city pilot in 2015, it was a one-off project and the country lacks any ongoing, institutionalized smart city development program. Congress should establish a smart-city

pilot program and funding mechanism to spur the development of comprehensive smart-city services that leverage the Internet of Things.

More details: *Joshua New, Daniel Castro, and Matt Beckwith, "How National Governments Can Help Smart Cities Succeed" (Information Technology and Innovation Foundation, Center for Data Innovation, October 2018), http://www2.datainnovation.org/2017-national-governments-smart-cities.pdf.*

OMB should direct federal agencies to allocate preference points for credit and loan applications that propose using smart infrastructure to significantly lower life-cycle project costs.

The Environmental Protection Agency (EPA) water-infrastructure programs, including the State Revolving Fund and the Water Infrastructure Finance and Innovation Act Program, provide credit and loan assistance for local drinking-water and wastewater infrastructure, but lack incentives to use innovative technologies that can deliver significant savings. Agencies should allocate preference points in reviewing applications that seek credit and loan assistance for projects that propose using smart infrastructure to significantly lower life-cycle project costs.

More details: *Robert D. Atkinson, et al., "A Policymaker's Guide to Digital Infrastructure" (Information Technology and Innovation Foundation, May 2016), https://itif.org/publications/2016/05/16/policymakers-guide-digital-infrastructure.*

The president should establish a digital-infrastructure council.

Without proactive public policies, the transition to hybrid and digital infrastructure will take longer than it should. To speed up the process, the president should establish a digital-infrastructure council, made up of key officials from agencies that manage infrastructure, including the departments of Housing and Urban Development, Transportation, Defense, Energy, Interior, the EPA, and the Federal Energy Regulatory Commission. These officials should meet regularly to discuss how their agencies plan to use digital technologies—such as the Internet of Things, data analytics and artificial intelligence—to improve infrastructures they help manage.

More details: *Robert D. Atkinson, "Build Smarter Infrastructure," U.S. News & World Report, January 9, 2017, https://www.usnews.com/opinion/op-ed/articles/2017-01-09/donald-trumps-infrastructure-plan-should-be-smart-and-digital.*

Congress should establish innovation set-aside mechanisms across grant programs for infrastructure.

At the local level, authorities often find new infrastructure technologies difficult to finance, given that evidence of their impact is still developing. And federal agencies typically lack mechanisms to integrate new technologies into their core infrastructure investments. Innovation set-asides would allow agencies to dedicate resources alongside their core grant programs—offering flexible funding for experimental new technologies to be deployed and evaluated with major infrastructure projects.

More details: *Robert D. Atkinson, et al., "A Policymaker's Guide to Digital Infrastructure" (Information Technology and Innovation Foundation, May 2016), https://itif.org/publications/2016/05/16/policymakers-guide-digital-infrastructure.*

Congress should permit USDA to publicly release common land unit data.

USDA's Farm Service Agency maintains a database of common land units (CLU)—the smallest unit of land that has a permanent, contiguous boundary, a common land cover and land management, and a common

owner or producer—which covers cropland in the United States. CLU data could provide private sector and the public at large valuable information to optimize land use, monitor environmental hazards, and support small-business interests, but Congress bars USDA from sharing this data publicly. Congress should permit USDA to share the data to spur advances in precision agriculture, create new business opportunities, and improve farm productivity.

More details: *Daniel Castro, Joshua New, and Matt Beckwith, "10 Steps Congress Can Take to Accelerate Data Innovation" (Information Technology and Innovation Foundation, Center for Data Innovation, May 2017), http://www2.datainnovation.org/2017-data-innovation-agenda.pdf.*

Congress should require corporate data transparency.

Corporate registration rules in the United States typically require companies to disclose their legal owners, but not their "beneficial owners," who influence and profit from a shell company's transactions and can hide behind complicated, opaque ownership layers, making shell corporations attractive covers for illicit financial activity, including tax evasion, money laundering, evading sanctions, and financing criminal activity. Because of this, the United States is the third-biggest tax haven in the world, behind only Switzerland and Hong Kong. Congress should pass legislation requiring that all states collect corporate beneficial-ownership data and make it easily accessible to regulators and the public by publishing it online in open and machine-readable formats.

More details: *Daniel Castro, Joshua New, and Matt Beckwith, "10 Steps Congress Can Take to Accelerate Data Innovation" (Information Technology and Innovation Foundation, Center for Data Innovation, May 2017), http://www2.datainnovation.org/2017-data-innovation-agenda.pdf.*

Congress should address the LGBT data gap.

Government-sponsored data collection often omits demographic information about sexual orientation, which leads to poor understanding about how policies impact the lesbian, gay, bisexual, and transgendered (LGBT) community. This limits the availability of critical information about important issues such as homelessness, which disproportionately affect the LGBT population, and the government cannot address disparities unless it can assess them. Congress should establish uniform policies for federal agencies to collect data on sexual orientation and gender identity and require all health programs receiving federal funding or other forms of support to collect sexual orientation and gender-identity information, just as they collect other important demographic information.

More details: *Daniel Castro, Joshua New, and Matt Beckwith, "10 Steps Congress Can Take to Accelerate Data Innovation" (Information Technology and Innovation Foundation, Center for Data Innovation, May 2017), http://www2.datainnovation.org/2017-data-innovation-agenda.pdf.*

Congress should direct HHS to implement a unique patient identifier.

While U.S. hospitals and doctors have widely adopted electronic health records, health-care providers do not have an accurate and efficient method to match patients to their records, so they often rely on Social Security numbers as identifiers, creating quality, safety, and cost problems. The Department of Health and Human Services (HHS) has identified an "urgent and critical" need to create a standardized system of unique patient identifiers for health care, and the original language of the Health Insurance Portability and Accountability

Act (HIPAA) would have created a national universal patient-identifier system, but subsequent legislation blocked the implementation of such a program. Congress should direct HHS to implement a unique patient identifier as originally intended by HIPAA.

More details: *Daniel Castro, Joshua New, and Matt Beckwith, "10 Steps Congress Can Take to Accelerate Data Innovation" (Information Technology and Innovation Foundation, Center for Data Innovation, May 2017), http://www2.datainnovation.org/2017-data-innovation-agenda.pdf.*

Congress should incentivize the adoption of electronic health records for mental-health providers.

In 2009, Congress passed legislation to incentivize the use of electronic health records (EHRs) among doctors and hospitals, but it excluded long-term care, public health, and mental- and behavioral-health providers from participating. As a result, EHR adoption has grown overall, but it has lagged significantly among providers ineligible to participate in the incentives program. This means that the 43 million adults in the United States who suffer from some form of mental illness receive suboptimal care. Moreover, a lack of interoperable EHRs limits the ability of researchers to study the efficacy of different treatments or the relationships between mental-health conditions and various diseases. Congress should expand the health information technology incentives program to include mental- and behavioral-health providers and facilities.

More details: *Daniel Castro, Joshua New, and Matt Beckwith, "10 Steps Congress Can Take to Accelerate Data Innovation" (Information Technology and Innovation Foundation, Center for Data Innovation, May 2017), http://www2.datainnovation.org/2017-data-innovation-agenda.pdf.*

Congress should foster the use of alternative credit data.

Approximately 45 million Americans are unable to get loans because they can't produce enough data about themselves to generate a credit score. This limits upward mobility for many people who are not credit risks. Congress should pass legislation that explicitly allows utilities, telecommunications companies, and landlords to report on-time payments to credit-reporting agencies. This would provide credit-reporting agencies sufficient data to generate scores for millions of credit-worthy candidates, thereby making more Americans eligible for credit.

More details: *Daniel Castro, Joshua New, and Matt Beckwith, "10 Steps Congress Can Take to Accelerate Data Innovation" (Information Technology and Innovation Foundation, Center for Data Innovation, May 2017), http://www2.datainnovation.org/2017-data-innovation-agenda.pdf.*

Congress should enable consumers to access their utility data.

Many utilities now provide homes with smart meters—electronic devices that monitor and report detailed information about how much electricity, gas, and water they are using—but consumers don't always have access to this information, even though providing it would offer benefits to consumers and society at large. For example, the Department of Energy found that providing consumers tools to monitor their energy consumption resulted in approximately 10 percent savings on energy bills. Congress should require utility providers to provide consumers access to their consumption data at no cost, in a timely manner, using an open standard.

More details: *Daniel Castro, Joshua New, and Matt Beckwith, "10 Steps Congress Can Take to Accelerate Data Innovation" (Information Technology and Innovation Foundation, Center for Data Innovation, May 2017), http://www2.datainnovation.org/2017-data-innovation-agenda.pdf.*

The administration should prevent financial-services firms from limiting third-party access to data that would allow more competition and innovation for consumers.

Some players in the financial-services industry have taken steps to limit third-party access to their data in ways that restrict competition, reduce market transparency, and harm consumers. The Consumer Financial Protection Bureau (CFPB), the Office of the Comptroller of the Currency, and the Securities and Exchange Commission (SEC) should address this by establishing rules for financial institutions to allow third parties to access customer data, securely and with customers' permission.

More details: *Daniel Castro and Michael Steinberg, "Blocked: Why Some Companies Restrict Data Access to Reduce Competition and How Open APIs Can Help" (Information Technology and Innovation Foundation, November 2017), http://www2.datainnovation.org/2017-open-apis.pdf.*

The Department of Transportation should prevent airlines from limiting third-party access to data that would enable more competition and innovation for consumers.

As in financial services, some players in the airline industry, have taken steps to limit third-party access to their data in ways that restrict competition, reduce market transparency, and harm consumers. The Department of Transportation (DOT) should address this by requiring airlines to make all ticket-pricing information publicly available in a standardized format and prohibit unfair marketing practices that limit distribution of this information to certain companies. In addition, DOT should require airlines to allow third parties to complete transactions for their customers.

More details: *Daniel Castro and Michael Steinberg, "Blocked: Why Some Companies Restrict Data Access to Reduce Competition and How Open APIs Can Help" (Information Technology and Innovation Foundation, November 2017), http://www2.datainnovation.org/2017-open-apis.pdf.*

E-Government

The administration should establish a position of Chief Innovation Officer within the White House.

The Bush administration established a position of federal chief information officer (CIO), whose job was to focus on the federal IT enterprise. The Obama administration added the position of the chief technology officer (CTO), whose job involved supporting technological innovation in the broader society and economy as well as innovation in the federal enterprise. But these are really two quite distinct roles and should be occupied by two different people. As such, the Trump administration should task the CTO with all matters of external innovation (i.e., how federal policies and programs can drive innovation outside the federal enterprise) and create a new chief innovation officer (CINO), whose responsibility would be to coordinate and drive innovation within the federal enterprise.

More details: *Robert D. Atkinson, Daniel Castro, and Stephen Ezell, "Enabling Customer-Driven Innovation in the Federal Government" (Information Technology and Innovation Foundation, July 2017), https://itif.org/publications/2017/07/10/enabling-customer-driven-innovation-federal-government.*

OMB should establish a bottom-up innovation tool for federal employees.

In any innovative organization, ideas for doing business in new ways come from all levels of the organization, including from frontline workers. This is much less common in the federal government, but the emergence of powerful and scalable social-networking technologies could make it much easier. It would be especially valuable given that 80 percent of federal workers are outside the District of Columbia, and most are engaged in delivering services to citizens. Thus, the OMB should develop a tool to enable any federal employee to propose innovation ideas in a structured format. In reviewing these ideas, the focus should be on what ideas can be implemented across government, rather than in just one agency. The initiative could be akin to an internal challenge.gov.

More details: *Robert D. Atkinson, Daniel Castro, and Stephen Ezell, "Enabling Customer-Driven Innovation in the Federal Government" (Information Technology and Innovation Foundation, July 2017), https://itif.org/publications/2017/07/10/enabling-customer-driven-innovation-federal-government.*

OPM should rank agency functions in terms of innovation.

A related way to provide incentives for agencies to innovate would be to develop an annual ranking of agencies that are the most and least innovative when it comes to enterprise innovation. Agencies such as the National Aeronautics and Space Administration (NASA) and the National Science Foundation (NSF) are often ranked by employees as being innovative, but it's not clear if this is because their mission is explicitly about technical innovation or because they are innovative internally. Annual surveys of federal agencies should begin to include questions such as, "How innovative is your agency?" and, "To what extent do your managers encourage you to contribute innovative new ideas to your agency?" Currently the OPM employee survey asks only that employees rate how well creativity and innovation are rewarded (not very well, for just 38 percent say it is). This would help rank agencies in terms of innovation so that Congress and the administration could help and pressure lagging agencies to be more innovative.

More details: *Robert D. Atkinson, Daniel Castro, and Stephen Ezell, "Enabling Customer-Driven Innovation in the Federal Government" (Information Technology and Innovation Foundation, July 2017), https://itif.org/publications/2017/07/10/enabling-customer-driven-innovation-federal-government.*

Congress should pass legislation allowing federal agencies to talk to "customers."

It has become a truism of private-sector innovation that companies need to regularly communicate with their customers and users. Yet, not only is the federal government not used to doing this; in some cases, federal law makes it extremely difficult to do so. This means that often federal agencies are guessing what users actually value. Toward rectify this, Congress should allow agencies to reach out to customers who affirmatively opt in with their consent, not only to ask their views on the quality of government services, but also to give them timely information about federal services (e.g., the State Department emailing passport holders four months before their passports are due to expire). Congress should pass such legislation, and agencies should take advantage of it, using the resultant data to regularly redesign services.

More details: *Robert D. Atkinson, Daniel Castro, and Stephen Ezell, "Enabling Customer-Driven Innovation in the Federal Government" (Information Technology and Innovation Foundation, July 2017), https://itif.org/publications/2017/07/10/enabling-customer-driven-innovation-federal-government.*

The administration should expand the number of innovation "skunk works" in federal agencies.

One key to successful private innovation has often been to create "skunk works"—separate organizational entities not constrained by the dominant corporate mindset or rules. Pioneered by Lockheed in the 1950s, a number of major corporations now have similar entities. The idea behind skunk works is to create a dedicated space, less unencumbered by the day-to-day concerns of providing services or products, and also less unencumbered by the rules and routines governing companies. And many of these skunk works are not just focused on identifying and launching new ideas, but on killing old ones. For example, the National Security Agency (NSA) has an internal accelerator called "Incubation Cell" that views its mission as killing bad ideas because they will otherwise persist. A few agencies, such as the NSA, CIA, and HHS, have skunk works-like efforts. However, the administration should establish a pilot program where four or five additional agencies establish skunk works focused on disruptive innovation within their operations.

More details: *Robert D. Atkinson, Daniel Castro, and Stephen Ezell, "Enabling Customer-Driven Innovation in the Federal Government" (Information Technology and Innovation Foundation, July 2017), https://itif.org/publications/2017/07/10/enabling-customer-driven-innovation-federal-government.*

The administration should expand the Presidential Innovation Fellows program.

The Obama administration established the Presidential Innovation Fellows program to pair talented technologists and innovators with top civil servants to innovate around pressing problems. The Trump administration should at least double the size of this program.

More details: *Robert D. Atkinson, Daniel Castro, and Stephen Ezell, "Enabling Customer-Driven Innovation in the Federal Government" (Information Technology and Innovation Foundation, July 2017), https://itif.org/publications/2017/07/10/enabling-customer-driven-innovation-federal-government.*

The White House should create an innovation ideas panel within OMB.

The relationship between companies or entrepreneurs that might have solutions for the federal government and federal agencies is extremely formalized and bifurcated. Companies and entrepreneurs often have valuable knowledge and insights about what the problems are that get in the way of agency innovation and what innovations can provide solutions. The White House should create a process by which companies and entrepreneurs can present problems and/or solutions to a small panel of federal OMB officials, who would thereby gain better insight into key problems and types of solutions that keep presenting themselves in government. The panel would then work with agencies to help ensure that these solutions get a fair hearing in the procurement process.

More details: *Robert D. Atkinson, Daniel Castro, and Stephen Ezell, "Enabling Customer-Driven Innovation in the Federal Government" (Information Technology and Innovation Foundation, July 2017), https://itif.org/publications/2017/07/10/enabling-customer-driven-innovation-federal-government.*

Congress should temporarily exempt one federal agency from stifling rules.

The straightjacket of rules can limit innovation within federal agencies. In the absence of comprehensive reform, one answer is for the House and Senate Government Reform Committees to pass legislation allowing one small federal agency to be completely exempt from these rules, including civil service and procurement rules, for a period of three years. The agency would continue to be bound only by civil laws. After three years,

the Government Accountability Office (GAO) should do a soup-to-nuts evaluation of how it has worked. Based on the results of such a pilot program, Congress could then decide whether to expand it.

More details: *Robert D. Atkinson, Daniel Castro, and Stephen Ezell, "Enabling Customer-Driven Innovation in the Federal Government" (Information Technology and Innovation Foundation, July 2017), https://itif.org/publications/2017/07/10/enabling-customer-driven-innovation-federal-government.*

OMB should establish a federal innovation awards program to recognize innovators.

An innovation awards program focused on efforts to innovate in the federal government would encourage agencies and personnel to take more risks toward innovative solutions. OMB should either establish such a program on its own or encourage a third-party organization such as a university, consulting firm, or government-technology media company to do so.

More details: *Robert D. Atkinson, Daniel Castro, and Stephen Ezell, "Enabling Customer-Driven Innovation in the Federal Government" (Information Technology and Innovation Foundation, July 2017), https://itif.org/publications/2017/07/10/enabling-customer-driven-innovation-federal-government.*

Congress should allow agencies to divert a small share of their budgets to innovation projects.

Congress should allow agencies to allocate a small share of their operating budgets to serve as an internal innovation seed fund, so they can start pilot projects more easily. The authority could be set to expire after five years, at which point GAO would have to assess the results.

More details: *Robert D. Atkinson, Daniel Castro, and Stephen Ezell, "Enabling Customer-Driven Innovation in the Federal Government" (Information Technology and Innovation Foundation, July 2017), https://itif.org/publications/2017/07/10/enabling-customer-driven-innovation-federal-government.*

Congress and federal agencies should allow more shared-savings partnerships.

Agencies should be able to get budget authority for investments that offer a positive net-present-value return on investment. But despite the potential benefits, funding for such investments is often lacking. In these cases, agencies should be able to engage in partnerships with the private sector in which businesses invest the capital to create and operate programs and in return keep a share of the savings or revenue.

More details: *Robert D. Atkinson, Daniel Castro, and Stephen Ezell, "Enabling Customer-Driven Innovation in the Federal Government" (Information Technology and Innovation Foundation, July 2017), https://itif.org/publications/2017/07/10/enabling-customer-driven-innovation-federal-government.*

OMB should require federal agencies to monitor and report metrics about website performance to a public dashboard.

The federal government should better track website metrics to promote accountability. OMB should require that federal agencies participate in the Digital Analytics Program (DAP) hosted by GSA, and OMB and GSA should expand DAP to include additional metrics, such as page-load speed, mobile friendliness, and accessibility. The government also should consolidate the data it collects on federal websites into a single pubic dashboard. Since most website tests can be automated, OMB should mandate that each agency regularly test its websites against each of these metrics and provide the data to the public dashboard.

More Details: *Daniel Castro, Galia Nurko, and Alan McQuinn, "Benchmarking U.S. Government Websites" (Information Technology and Innovation Foundation, November 2017), https://itif.org/publications/2017/11/27/benchmarking-us-government-websites.*

OMB should launch a website modernization sprint to fix known problems with federal websites.

Many federal agencies have known problems with their websites. OMB should direct agencies to launch a series of "sprints" to address known problems, especially failures to meet security and accessibility requirements. Addressing these problems quickly is especially prudent given the threats that cyberattacks pose to national governments.

More Details: *Daniel Castro, Galia Nurko, and Alan McQuinn, "Benchmarking U.S. Government Websites" (Information Technology and Innovation Foundation, November 2017), https://itif.org/publications/2017/11/27/benchmarking-us-government-websites.*

OMB should establish desktop and mobile page-load speed benchmarks for federal websites.

Many federal agencies have yet to optimize their websites for page-load speed. Past administrations have set the precedent of establishing standards and best practices for federal websites based on consumer convenience, accessibility, and security. Given that the majority of federal websites still need to significantly improve their page-load speeds, OBM should work with the federal CIO to develop federal guidelines on page-load speed across devices.

More Details: *Daniel Castro, Galia Nurko, and Alan McQuinn, "Benchmarking U.S. Government Websites" (Information Technology and Innovation Foundation, November 2017), https://itif.org/publications/2017/11/27/benchmarking-us-government-websites.*

OMB should launch a federal website consolidation initiative.

OMB should launch a website consolidation initiative with the goal of eliminating and consolidating duplicative or unnecessary websites. Additionally, each newly created website should have a planned life cycle, which sets a specific date when it should be removed (and archived) or renewed and refreshed. The same planning mechanism should be employed for old government websites.

More Details: *Daniel Castro, Galia Nurko, and Alan McQuinn, "Benchmarking U.S. Government Websites" (Information Technology and Innovation Foundation, November 2017), https://itif.org/publications/2017/11/27/benchmarking-us-government-websites.*

Internet

Congress should give gig-economy platforms a five-year exemption from labor laws that treat worker benefits as evidence of an employer-employee relationship.

Labor law classifies most gig-economy workers as independent contractors. Platform providers and workers say this distinction is necessary for workers to have the flexibility they want. But if platform providers want to give workers benefits such as tax withholding, training, health insurance, or pensions, they risk having contractors reclassified as regular employees. Waiving this risk for five years would give companies a chance to set up programs for workers without fear of lawsuits. If companies establish such programs, then Congress

could make the exemption permanent or extend it to other alternative work arrangements. If not, then Congress could allow the exemption to expire automatically.

More details: *Joe Kennedy, "Three Paths to Update Labor Law for the Gig Economy" (Information Technology and Innovation Foundation, April 2016), https://itif.org/publications/2016/04/18/three-paths-update-labor-law-gig-economy.*

Congress should establish a single, national license for telehealth providers.

Complex state licensing requirements prevent health-care providers licensed in one state from providing telehealth services in another. To address this challenge and further enhance development of telehealth services, Congress should establish a single, national license for telehealth providers. For those concerned about infringing on states' rights, the legislation could have a sunset provision if states later create a multistate compact adopting a nationwide licensing standard.

More details: *Daniel Castro, Ben Miller, and Adams Nager, "Unlocking the Potential of Physician-to-Patient Telehealth Services" (Information Technology and Innovation Foundation, May 2014), https://itif.org/publications/2014/05/12/unlocking-potential-physician-patient-telehealth-services.*

Congress should pass anti-SLAPP legislation to protect public speech online.

Congress should pass federal legislation to reduce strategic lawsuits against public participation (known as SLAPPs) by creating a baseline level of protection for citizens' rights of petition and free expression. A SLAPP effectively censors public speech by invoking the court system to intimidate critics. By enacting legislation, the federal government can both protect the rights of individuals and enable e-commerce to flourish.

More details: *Daniel Castro and Laura Drees, "Why We Need Federal Legislation to Protect Public Speech Online" (Information Technology and Innovation Foundation, May 2015), https://itif.org/publications/2015/05/04/why-we-need-federal-legislation-protect-public-speech-online.*

Privacy

Congress should reform the Electronic Communications Privacy Act to ensure citizens have a right to privacy for electronic data whether it is stored on a device or remotely in the cloud.

The Electronic Communications Privacy Act (ECPA) was enacted in 1986 and has not kept pace with advancing technology. For example, there are different levels of protection afforded to the privacy of an individual's data based on where the data is stored and how long the data has been stored. Where possible, the privacy of an individual's communication should be the same regardless of the type of technology used to facilitate the communication.

More details: *Robert D. Atkinson et al., "Winning the Race 2012 Memos" (Information Technology and Innovation Foundation, September 2012), https://itif.org/publications/2012/09/05/winning-race-2012-memos.*

The administration should engage with U.S. trade partners to create a "Geneva Convention on the Status of Data."

The United States should engage with its trade partners to establish international legal standards for government access to data through a "Geneva Convention on the Status of Data." This would create a multilateral agreement establishing international rules for transparency, settling questions of jurisdiction,

producing better coordination of international law-enforcement requests, and limiting unnecessary access by governments to the data on citizens of other countries. Only by working to establish a global pact can countries hold each other accountable on these issues in the future.

More details: *Daniel Castro and Alan McQuinn, "Beyond the USA Freedom Act: How U.S. Surveillance Still Subverts U.S. Competitiveness" (Information Technology and Innovation Foundation, June 2015), https://itif.org/publications/2015/06/09/beyond-usa-freedom-act-how-us-surveillance-still-subverts-us-competitiveness.*

Congress should close the loophole allowing warrantless digital car searches.

Most Americans expect the Fourth Amendment—which protects individuals from illegal searches—to extend to their digital lives. However, there has been a long-standing exception for vehicles: law enforcement officials can stop and search a vehicle based on probable cause without having to get a warrant from a judge. As "connected cars" become increasingly linked to people's digital identities, there is a risk that police will use this exception to conduct digital searches without warrants. Congress should prevent this by requiring law enforcement to obtain a warrant before they can access data from a vehicle. In doing so, Congress should maintain the vehicle exception for physical searches and also maintain law enforcement's access to data held by third parties, such as automakers or wireless providers, through warrants or other lawful processes.

More Details: *Daniel Castro and Alan McQuinn, "Congress Should Close the Loophole Allowing Warrantless Digital Car Searches," TechCrunch, February 25, 2018, https://techcrunch.com/2018/02/25/congress-should-close-the-loophole-allowing-warrantless-digital-car-searches/.*

Congress should extend constitutional protections against unwarranted searches of digital devices to border crossings.

The Supreme Court ruled in 1977 that there are different Fourth Amendment standards for border crossings. This precedent now allows border agents to search the digital devices of anyone entering or leaving the United States without a warrant or even suspicion of wrongdoing. However, searching modern devices is more analogous to searching travelers' homes, bank files, and health records than their suitcases. Congress should pass Sen. Ron Wyden's (D-OR) "Protecting Data at the Border Act" to extend constitutional protections against unwarranted searches of digital devices to border crossings.

More Details: *Alan McQuinn, "Digital Rights Don't Stop at the Border," Real Clear Policy, August 25, 2017, https://www.realclearpolicy.com/articles/2017/08/25/digital_rights_dont_stop_at_the_border_110338.html.*

Congress should combat "revenge porn" by: 1) Passing legislation to criminalize nonconsensual distribution of sexually explicit images; 2) Creating a special FBI unit to assist victims of nonconsensual pornography; and, 3) Directing the Department of Justice to work with the private sector on best practices for online services to quickly remove nonconsensual pornography.

The distribution of sexually explicit images without a subject's consent, commonly referred to as "revenge porn," exists in a legal gray area in much of the country, such that victims have few options for recourse, and perpetrators go unpunished. To reverse this trend, Congress should pass legislation that makes revenge porn a federal crime. Congress also should create a special unit in the Federal Bureau of Investigations to assist victims of nonconsensual pornography and pursue the worst offenders, since local law-enforcement officials

are often unprepared to respond swiftly. Finally, Congress should direct the Department of Justice to partner with the private sector to identify and disseminate best practices for addressing this problem.

More details: *Daniel Castro and Alan McQuinn, "Why and How Congress Should Outlaw Revenge Porn" (Information Technology and Innovation Foundation, July 2015), https://itif.org/publications/2015/07/15/why-and-how-congress-should-outlaw-revenge-porn.*

Congress should pass legislation to create a national privacy framework that streamlines regulation, preempts state laws, establishes basic consumer data rights, and minimizes the impact on innovation.

Congress should establish a unified national approach to privacy by preempting state laws. Such legislation should protect and promote innovation by minimizing compliance costs and restrictions on data use. It also should address concrete privacy harms, not hypothetical ones, improve transparency requirements, and strengthen oversight and enforcement through the FTC. Congress should not include data-minimization requirements, universal opt-in rules, purpose-specification requirements, limitations on data retention, a right to deletion, a private right of action, or privacy-by-design requirements.

More details: *Alan McQuinn and Daniel Castro, "A Grand Bargain on Data Privacy Legislation for America" (Information Technology and Innovation Foundation, January 2019), https://itif.org/publications/2019/01/14/grand-bargain-data-privacy-legislation-america.*

Transportation

Congress should prioritize intelligent-transportation systems by adopting a new "cement and chips" approach to infrastructure funding.

Intelligent transportation systems (ITS)—the application of information and communications technologies to bring actionable, real-time intelligence to every actor and asset in a transportation network—deliver a cost-benefit ratio at least nine times higher than traditional highway-infrastructure investments. Congress should prioritize ITS deployments in surface-transportation reauthorization bills by devoting no less than 5 percent of Highway Trust Funds allocated to states to support digital and ITS-based infrastructure projects.

More details: *Stephen J. Ezell and Robert D. Atkinson, "From Concrete to Chips: Bringing the Surface Transportation Reauthorization Act Into the Digital Age" (Information Technology and Innovation Foundation, May 2015), https://itif.org/publications/2015/05/19/concrete-chips-bringing-surface-transportation-reauthorization-act-digital.*

Congress should encourage deployment of intelligent systems by requiring the Transportation Department to provide incentives through the federal highway program for states to adopt tolling.

Tolling can play a key role in generating the funding to pay for expanded, more efficient roadway capacity. But too many states do not want to support toll-funded projects because they fear public opposition, despite the fact that the public usually supports toll projects that are introduced. Lowering the share of federal funding for non-toll projects from the current 80 percent share to 60 percent, while funding the full 80 percent for toll projects, would provide a stronger incentive for states to establish more toll projects.

More details: *Stephen J. Ezell and Robert D. Atkinson, "From Concrete to Chips: Bringing the Surface Transportation Reauthorization Act Into the Digital Age" (Information Technology and Innovation Foundation, May 2015), https://itif.org/publications/2015/05/19/concrete-chips-bringing-surface-transportation-reauthorization-act-digital.*

Congress should move toward establishing a national road user charge system.

Instead of gas taxes or general fund revenues, road user charges are the most viable and sustainable long-term "user pay" option for the federal government to raise adequate and appropriate revenues to provide the federal share of funding for the nation's surface transportation system. Both real-world examples and academic research demonstrate that such a system has the capacity not only to raise needed revenues but also to provide additional benefits, including more efficient use of transportation infrastructure and reduced environmental and other social costs. As such, Congress should accelerate the transition to a system, in part by charging the Department of Transportation with the development of technical standards and regulations for the operation of such a system.

More details: *Robert D. Atkinson, "A Policymaker's Guide to Road User Charges" (Information Technology and Innovation Foundation, July 2019, https://itif.org/publications/2019/07/26/best-way-fund-us-surface-transportation-system.*

BROADBAND TELECOMMUNICATIONS

Congress should settle the net neutrality debate by giving the FCC new authority over broadband to craft rules around blocking, throttling, and prioritization.

There is ample room for a bipartisan compromise in the long-running net neutrality debate that would simultaneously lock in uncontroversial, bright-line protections for Internet traffic; end the absurd swings back and forth in FCC jurisdiction depending on which party is in power; and secure funding to help close the digital divide. The starting point for such a compromise should be a new broadband title in the Communications Act that enshrines widely agreed-upon open Internet rules.

More details: *Doug Brake "Democrats, Please End The Net Neutrality Nightmare," Morning Consult, January 15, 2019, https://morningconsult.com/opinions/democrats-please-end-the-long-national-net-neutrality-nightmare/; Doug Brake, "Why We Need Net Neutrality Legislation, and What It Should Look Like" (Information Technology and Innovation Foundation, May 2018), https://itif.org/publications/2018/05/07/why-we-need-net-neutrality-legislation-and-what-it-should-look.*

Congress should fund a one-off acceleration of rural broadband infrastructure deployment.

The private-investment broadband model is a success story in providing high-performance Internet access to the majority of U.S. households. But it is impossible to profitably serve widely dispersed populations in rural areas, justifying government programs to ensure robust communications services for as many U.S. residents as financially reasonable. Congress should allocate one-time funding that would be focused on genuinely unserved areas, where the economic benefit from connectivity is greatest, and rely on proven means such as reverse auctions. Federal financial support also should be used to encourage local jurisdictions to take additional steps to remove barriers to deployment. Local and state governments should streamline access to public rights of way and utility poles, adopt "dig-once" policies, and ensure fees are based on cost and are competitively neutral.

More details: *Doug Brake, "A Policymaker's Guide to Rural Broadband Infrastructure" (Information Technology and Innovation Foundation, April 2017), https://itif.org/publications/2017/04/10/policymakers-guide-rural-broadband-infrastructure.*

Congress and the FCC should maintain a robust subsidy program to help low-income Americans gain connectivity, ideally through a simple and streamlined voucher system.

The federal government should ensure that broadband is affordable for low-income residents. The ideal program would feature a simple and streamlined voucher system providing eligible participants a subsidy that could be put toward virtually any communications tool of their choosing. The program's funds would be disbursed directly to eligible participants and integrated with other subsidy programs, such as the Supplemental Nutrition Assistance Program. Putting the individual at the center of an effective communications subsidy program would help reduce fraud and allow market forces to best serve diverse consumer needs. The Communications Act restricts the Federal Communications Commission's (FCC's) current Lifeline program a number of ways, and there are only so many improvements that can be made at the administrative level within a statute designed for the voice telephone market of the mid-1980's. Count Lifeline among the many areas where congressional action could greatly improve the status quo.

More details: *Doug Brake, Comments to FCC on Modernizing the Lifeline Program for the Broadband Era, February 2018, http://www2.itif.org/2018-fcc-lifeline-comments.pdf; Doug Brake, Comments to FCC on Modernizing Lifeline Program, August 2015, https://itif.org/publications/2015/08/31/itif-comments-modernizing-lifeline-program.*

Congress should charge DHS with analyzing national security risks in the telecommunications supply chain on an ongoing basis.

As telecommunications supply chains grow ever more complex, networks in the United States may rely on systems and components sourced from countries that may contain vulnerabilities. While it makes sense to confront the practice of innovation mercantilism that helps some of these products achieve success in the global market, further action to assure the security of the U.S. telecommunications supply chain should be a part of a broader trade policy strategy. Ideally this would be through open, ongoing review of these companies' equipment and practices.

More details: *Doug Brake (Testimony before the U.S.-China Economic and Security Review Commission, March 8, 2018, http://www2.itif.org/2018-testimony-china-5g.pdf); Robert D. Atkinson et al., "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation" (Information Technology and Innovation Foundation, March, 2017, https://itif.org/publications/2017/03/16/stopping-chinas-mercantilism-doctrine-constructive-alliance-backed).*

Congress should empower the National Telecommunications and Information Administration (NTIA) with tools to transition federal spectrum systems to more efficient uses.

The proliferation of wireless broadband has been a boon to the economy. But more spectrum is needed, and the time is ripe to improve mechanisms to repurpose existing spectrum allocations. To that end, Congress should continue expanding the Spectrum Relocation Fund to pay for relocation studies, general planning of relocation and/or sharing, and research into new, more efficient equipment for federal spectrum users. This expansion should include consideration of mechanisms to allow for more direct upgrade of legacy federal radio systems such that private companies can assist in freeing up federal spectrum, potentially through spectrum overlays.

More details: *Robert D. Atkinson and Doug Brake (Comments to the House Energy and Commerce Committee on Communications Act Update, April 25, 2014); Doug Brake, "5G and Next Generation Wireless: Implications for Policy and Competition"*

(Information Technology and Innovation Foundation, June 2016); Wireless Opportunities: Improving Federal Radio Systems and Freeing Spectrum for New Uses, (Panel Discussion on Improving Federal Radio Systems May 17, 2017).

The White House should coordinate a multi-agency effort to streamline access, permitting, and leasing of federal land and assets to speed buildout of fiber and wireless networks.

Agencies should facilitate network deployment on federal lands and buildings with a uniform, expedited process for permitting and leasing to ease siting of wireless infrastructure or new fiber networks. As it stands, gaining access to federal rights of way can take significantly longer than contracting with private parties. The Office of Science and Technology Policy should coordinate a multi-agency effort to make this process as uniform and streamlined as possible, putting in place a single regime for deploying network infrastructure assets of the departments of Agriculture, Commerce, Defense, Interior, Transportation, Veterans Affairs, and the U.S. Postal Service.

More details: *Doug Brake and Robert D. Atkinson, "Comments to Agriculture and Commerce Departments on Broadband Opportunity Council Policy Reforms," June 2015, https://itif.org/publications/2015/06/10/itif-advises-broadband-opportunity-council-focus-low-hanging-broadband-fruit.*

Congress should build upon the spectrum pipeline.

Spectrum is a key input to important general-purpose technologies such as mobile broadband and the Internet of Things. To best leverage their potential, Congress should charge the National Telecommunications and Information Administration with the development of a long-term pipeline of spectrum to be repurposed for wireless broadband. This spectrum should include a mix of both licensed and unlicensed use.

More details: *Robert D. Atkinson and Doug Brake (Comments to the House Energy and Commerce Committee on Communications Act Update, April 25, 2014), https://itif.org/publications/2014/04/25/communications-act-update-should-continue-liberalize-spectrum-management; Doug Brake, "5G and Next Generation Wireless: Implications for Policy and Competition" (Information Technology and Innovation Foundation, June 2016), https://itif.org/publications/2016/06/30/5g-and-next-generation-wireless-implications-policy-and-competition.*

Congress should reform the FCC's merger review process.

The FCC reviews telecommunications mergers under the notoriously squishy public-interest standard, leading to an unpredictable process and, occasionally, the appearance of transactional conditions drawn out of merging parties. Congress should add more specificity to the public-interest standard in the context of merger review. That should include a requirement that the FCC evaluate a merger's impact on dynamic innovation.

More details: *Robert D. Atkinson, "The Role of Competition in a National Broadband Policy" (Information Technology and Innovation Foundation, October 2007), https://itif.org/publications/2009/03/16/role-competition-national-broadband-policy.*

Congress should help lower the cost of deploying broadband.

Policies that promote the efficient deployment of infrastructure, such as "dig once" requirements that would install conduit along highways during federally funded roadwork, can go a long way in reducing the high cost of deploying broadband infrastructure. But Congress could go further by making receipt of federal

infrastructure funds by localities contingent on adopting a model municipal code that would streamline access to rights of way and municipal infrastructure such as utility or light poles.

More details: *Doug Brake and Robert D. Atkinson, (Comments to Agriculture and Commerce Departments on Broadband Opportunity Council Policy Reforms, June 2015), https://itif.org/publications/2015/06/10/itif-advises-broadband-opportunity-council-focus-low-hanging-broadband-fruit.*

TRADE AND GLOBALIZATION

USTR should suspend or withdraw duty-free access to the United States when countries fail to protect U.S. intellectual property or enact barriers to digital trade.

A number of developing countries that benefit from duty-free access to the United States under the Generalized System of Preferences (GSP) program—most notably Brazil, India, Indonesia, and Thailand—have enacted policies that breach the GSP's trade, market access, or intellectual property criteria. USTR should use its own reporting—especially the National Trade Estimates of Foreign Trade Barriers report and the "Special 301" report on intellectual property—to pro-actively initiate reviews of GSP beneficiaries, and when they enact such policies the administration should suspend or withdraw their U.S. market access under the GSP unless they show a genuine and timely commitment to comply with the terms as agreed.

More details: *Nigel Cory and Robert Atkinson, "Time to Restrict GSP Benefits to Fight Trade Mercantilism" (Information Technology and Innovation Foundation, August 2018), https://itif.org/publications/2018/08/20/time-restrict-gsp-benefits-fight-trade-mercantilism.*

Congress should create an Office of Competitiveness within USTR.

The U.S. Trade Representative (USTR) too often fights tariff or trade agreement wars of the past. It is not set up, either institutionally or philosophically, to fight the current war against rampant innovation mercantilism fueled by nontariff barriers, intellectual-property coercion and theft, and discriminatory industrial policies. To address this, Congress should create an Office of Competitiveness within USTR to identify foreign government policies and practices that do not necessarily violate World Trade Organization (WTO) rules but clearly hurt U.S. commerce. Similar to the State Department's Office of Policy Planning, it should be charged with focusing on U.S. trade policy in the context of globalization and competitiveness.

More details: *Robert D. Atkinson, Nigel Cory, and Stephen Ezell, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation" (Information Technology and Innovation Foundation, March 2017), https://itif.org/publications/2017/03/16/stopping-chinas-mercantilism-doctrine-constructive-alliance-backed.*

Congress should empower the U.S. International Trade Commission to investigate and issue "trade enforcement advisory opinions."

Congress should empower the U.S. International Trade Commission (ITC) to investigate and issue reports on allegations of trade violations that U.S. companies claim are happening with trading partners, such as China. This could be done by expanding Section 332 of the Tariff Act of 1930. These ITC reports, in the form of "trade advisory opinions," would provide a valuable middle option along the spectrum—with bilateral talks at one end and WTO dispute cases at the other, thus shedding light on whether U.S. trade partners are violating

trade rules and whether such a case is credible and worthy of a potential complaint at the WTO or under bilateral free trade agreements.

More details: *Robert D. Atkinson, Nigel Cory, and Stephen Ezell, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation" (Information Technology and Innovation Foundation, March 2017), https://itif.org/publications/2017/03/16/stopping-chinas-mercantilism-doctrine-constructive-alliance-backed.*

Congress and the Department of Commerce should streamline Section 337 to make it easier for small and medium-sized U.S. enterprises to contest unfair competition from imported products.

Section 337 of the Tariff Act of 1930 declares the infringement of a U.S. patent, copyright, or registered trademark (among other acts of unfair competition) to be an unlawful practice in import trade. That provision has generally worked well, but it could be improved in several ways. First, the administration and Congress should work to ensure that the ITC has the direction, resources, technical competence, and confidence to handle a broader range of IP-related cases, especially regarding trade secrets. Second, the Commerce Department should broaden engagement with small and medium-sized enterprises to ensure that a broader cross-section of companies is aware of Section 337. Finally, the 337 process should be made even faster to prevent goods containing or benefitting from stolen IP from entering the United States. A speedier process, managed by a strong interagency group led by the Secretary of Commerce, could both prevent counterfeit goods from entering the United States and serve as a deterrent to future offenders.

More details: *Robert D. Atkinson, Nigel Cory, and Stephen Ezell, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation" (Information Technology and Innovation Foundation, March 2017), https://itif.org/publications/2017/03/16/stopping-chinas-mercantilism-doctrine-constructive-alliance-backed.*

The administration should amend the trade-information reporting mechanism the U.S. Census Bureau uses so that it asks companies whether they are being forced to transfer technologies.

Forced technology transfer remains a serious challenge for U.S. companies. For instance, according to the U.S.-China Business Council, at least 23 percent of U.S. companies had been asked to transfer technology to China in the past three years, while 59 percent of companies were worried about being requested to do so. Between outright IP theft and forced technology and IP transfer, China has orchestrated "the greatest transfer of wealth in history," according to former director of the National Security Agency, General Keith Alexander, which has cost the United States hundreds of billions of dollars. Accordingly, the United States should start to track this, asking companies if they are being forced to transfer technologies on annual U.S. Census Bureau surveys, such as the Annual Survey of Manufacturers or the Annual Wholesale Trade Survey.

More details: *Contact ITIF Vice President for Global Innovation Policy Stephen Ezell at sezell@itif.org.*

Congress should pass legislation that allows U.S. firms to ask the Justice Department for an antitrust exemption to coordinate actions regarding technology transfer and investment in other nations.

A key feature of China's mercantilist strategy is that China is essentially a monopsonist: The Chinese marketplace is such a large prize that its gatekeepers can take advantage of the competitive pressures foreign companies face by compelling them to hand over technology as a condition of doing business in the country. But if companies in a similar industry can agree that none of them will transfer their technologies to China in

order to gain market access, then the Chinese government will have much less leverage. Permitting this type of coordination would be similar to the 1984 Cooperative R&D Act, which let firms apply to form precompetitive R&D consortia.

More details: *Robert D. Atkinson, Nigel Cory, and Stephen Ezell, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation" (Information Technology and Innovation Foundation, March 2017), https://itif.org/publications/2017/03/16/stopping-chinas-mercantilism-doctrine-constructive-alliance-backed.*

Congress should amend U.S. antitrust law to ensure that state-sponsored and state-directed foreign enterprises are not exempt from prohibitions on unfair pricing behavior.

China has abused the doctrine of foreign sovereign compulsion, along with principles of international comity, to justify anticompetitive behaviors that have harmed U.S. interests. For instance, in the long-running "Vitamin C" case, Chinese companies accused of price fixing on the U.S. market have been able to use the defense that they were directed to engage in such anti-competitive behavior by the Chinese government, a position which U.S. courts have upheld under the Foreign Sovereign Immunity Act (i.e., the "act of state" doctrine). That case has gone to the U.S. Supreme Court, but Congress could forestall use of such tactics in the future by amending U.S. antitrust laws to ensure that state-sponsored or state-directed foreign enterprises are not exempted from prohibitions on unfair pricing behavior in U.S. markets.

More details: *Robert D. Atkinson, Nigel Cory, and Stephen J. Ezell, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation" (Information Technology and Innovation Foundation, March 2017), http://www2.itif.org/2017-stopping-china-mercantilism.pdf.*

Congress should call on USTR to produce an annual Global Mercantilist Index that comprehensively documents and ranks trade barriers imposed by America's trading partners.

USTR's Special 301 Report provides an annual review of countries that maintain inadequate intellectual-property protections and enforcement mechanisms, and its National Trade Estimate Report on Foreign Trade Barriers (NTE) provides an effective inventory of significant foreign barriers to U.S. exports and investment. But America lacks a consolidated report that comprehensively identifies all of the innovation-mercantilist policies of America's trading partners and ranks the worst offenders.

More details: *Michelle Wein, Stephen Ezell, and Robert D. Atkinson, "The Global Mercantilist Index: A New Approach to Ranking Nations' Trade Policies" (Information Technology and Innovation Foundation, October 2014), https://itif.org/publications/2014/10/08/global-mercantilist-index-new-approach-ranking-nations-trade-policies.*

Congress should increase the resources available for USTR, the Interagency Trade Enforcement Center, and the International Trade Administration to negotiate new trade agreements and bolster enforcement activities.

USTR and the Interagency Trade Enforcement Center (ITEC) are under-resourced, so they lack the capacity to think strategically about the implications of foreign economic and trade policies, and they can't pursue trade-enforcement activities as vigorously as is necessary to counter new forms of protectionism. Congress should increase USTR funding to match the administration's FY 2019 budget request of $63 million, increase ITA's budget by $3 million, and provide $90 million for ITA's Enforcement and Compliance Unit

so that the United States can better contest counterfeit or other IP-infringing goods and services from entering the country.

More details: *Robert D. Atkinson, Nigel Cory, and Stephen Ezell, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation" (Information Technology and Innovation Foundation, March 2017), https://itif.org/publications/2017/03/16/stopping-chinas-mercantilism-doctrine-constructive-alliance-backed.*

CLEAN-ENERGY INNOVATION

Congress should establish an RD&D program and an innovation hub on negative emissions technologies within the Department of Energy (DOE).

It is increasingly probable that reductions in global carbon emissions, if they happen at all, will not be steep enough to limit the rise in average global temperature to two degrees Celsius, as called for by the Paris climate accord. New technologies and systems that remove carbon dioxide or other greenhouse gases from the air may be required if humanity is to achieve that essential goal. Only the federal government has the capacity and motivation to make RD&D investments on a large scale and with the requisite urgency to tackle this challenge.

More details: *Colin Cunliff, "An Innovation Agenda for a Low-Carbon Energy Future: Bridging Gaps in the Federal Energy RD&D Portfolio" (Information Technology and Innovation Foundation, November 2018), https://itif.org/publications/2018/11/28/innovation-agenda-deep-decarbonization-bridging-gaps-federal-energy-rdd.*

Congress should set up two new DOE innovation hubs.

Deep decarbonization of the energy system is an imperative to mitigate climate change. Two key problems for which few solutions are currently available are long-duration energy storage for the electricity system and hydrogen and ammonia production without fossil fuel feedstocks. Innovation hubs on each of these topics that bring together the talent and capabilities of the national labs, leading research universities, and cutting-edge corporate R&D would accelerate progress on these difficult science and technology challenges.

More details: *Colin Cunliff, "An Innovation Agenda for a Low-Carbon Energy Future: Bridging Gaps in the Federal Energy RD&D Portfolio" (Information Technology and Innovation Foundation, November 2018), https://itif.org/publications/2018/11/28/innovation-agenda-deep-decarbonization-bridging-gaps-federal-energy-rdd; and David M. Hart, "Making "Beyond Lithium" a Reality: Fostering Innovation in Long-Duration Grid Storage" (Information Technology and Innovation Foundation, November 2018), https://itif.org/publications/2018/11/28/making-beyond-lithium-reality-fostering-innovation-long-duration-grid.*

Congress should reform tax incentives for low-carbon energy to make them permanent and technology-neutral, and to phase out support for each generation of technology as it matures.

Tax incentives are important mechanisms for sharing risk with private investors in the early deployment phase of energy-technology innovation. Many current incentives, however, are insensitive to technological maturity. They remain fixed, even after the technologies to which they apply are no longer risky. Such incentives have become subsidies that deter, rather than support, innovation. Congress should establish a permanent system of incentives that supports all promising immature technologies, but methodically steps down the incentive as

each technology matures. Decisions about which versions of which technologies should qualify for which rate should be delegated to an appropriate expert body.

More details: *David M. Hart, "Rescuing the Low-Carbon Energy Transition From Magical Thinking" (Information Technology and Innovation Foundation, October 2016), https://itif.org/publications/2016/10/27/rescuing-low-carbon-energy-transition-magical-thinking.*

The White House should tighten energy-efficiency and carbon-control regulations in a predictable, innovation-inducing manner.

Federal regulations on appliances, vehicles, power plants, and industrial facilities (as well as state and local building codes supported by federal technical assistance) prevent significant greenhouse-gas emissions. Although they often cost less than anticipated, they are sometimes overly ambitious and even counterproductive. OMB should establish a best practice among federal agencies in which regulatory agency staff engage with industrial experts to set aggressive but feasible targets in a time frame that allows industry to plan ahead. Long-term targets provide a focus for industrial investments in innovation as well as opportunities to make adjustments if the hoped-for results do not emerge in the expected time frame.

More details: *David M. Hart, "Rescuing the Low-Carbon Energy Transition From Magical Thinking" (Information Technology and Innovation Foundation, October 2016), https://itif.org/publications/2016/10/27/rescuing-low-carbon-energy-transition-magical-thinking.*

Congress should direct the administration to provide well-vetted loan guarantees to high-risk, but technologically proven clean energy projects under its existing authority.

Such projects provide valuable insights that allow follow-on projects to perform better and cost less, but they are usually too risky for private investors to undertake on their own. Federal loan guarantees helped utility-scale solar power and electric vehicle production transition to fully private funding, and they can aid other maturing technologies, such as advanced nuclear power and carbon capture, utilization, and sequestration.

More details: *David M. Hart, "Clean Energy Innovation Policy: A 10-Point Action Plan for the 116th Congress" (Information Technology and Innovation Foundation, January 17, 2019), https://live-itif.pantheonsite.io/publications/2019/01/17/clean-energy-innovation-policy-10-point-action-plan-116th-congress; and Colin Cunliff, "An Innovation Agenda for Deep Decarbonization: Bridging Gaps in the Federal Energy RD&D Portfolio" (Information Technology and Innovation Foundation, November 28, 2018), http://itif.org/publications/2018/11/28/innovation-agenda-deep-decarbonization-bridging-gaps-federal-energy-rdd.*

Congress should direct DOE to establish a carbon-capture demonstration program that funds first-of-its-kind demonstration project for carbon capture at natural gas, steel, concrete, and other large sources of carbon dioxide.

Carbon-capture technologies are essential in the transition to a low-carbon energy system, and the United States has already invested heavily to develop them for coal-fired power plants. However, what works for a coal power plant is not directly portable to a natural gas plant or other industrial sources of carbon emissions, such as cement and steel production. A carbon-capture demonstration program would complement other carbon capture, utilization, and storage (CCUS) incentives such as the 45Q tax credit for carbon storage.

More details: *Colin Cunliff, "An Innovation Agenda for Deep Decarbonization: Bridging Gaps in the Federal Energy RD&D Portfolio" (Information Technology and Innovation Foundation, November 28, 2018), http://itif.org/publications/2018/11/28/innovation-agenda-deep-decarbonization-bridging-gaps-federal-energy-rdd.*

DOE should establish a single carbon capture R&D program—outside the coal program office—that includes carbon sources across all sectors, including cement and steel.

DOE should continue to develop transformational carbon-capture technologies beyond the current generation of amine solvent technologies. May of the research needs for carbon capture—in advanced solvents, sorbents, and membranes—are crosscutting for all sources and capture processes. However, most of DOE's carbon-capture R&D is housed within the Office of Clean Coal and Carbon Management.

More details: *Colin Cunliff, "An Innovation Agenda for Deep Decarbonization: Bridging Gaps in the Federal Energy RD&D Portfolio" (Information Technology and Innovation Foundation, November 28, 2018), http://itif.org/publications/2018/11/28/innovation-agenda-deep-decarbonization-bridging-gaps-federal-energy-rdd.*

DOE should restructure the Office of Nuclear Energy to prioritize advanced nuclear reactor technologies, and Congress should provide sufficient funding to demonstrate at least one advanced reactor design.

DOE has invested in nuclear energy R&D for decades, but this investment has not translated into a new generation of low-cost nuclear power. Shifting priorities, inconsistent funding, and a focus on incumbent technologies have resulted in few advances. Out of a budget of $1.3 billion, DOE-NE spends only 16 percent on advanced nuclear reactor designs, with the rest going to support incumbent technologies, enabling or cross-cutting technologies, and facilities maintenance.

More details: *Colin Cunliff, "An Innovation Agenda for Deep Decarbonization: Bridging Gaps in the Federal Energy RD&D Portfolio" (Information Technology and Innovation Foundation, November 28, 2018), http://itif.org/publications/2018/11/28/innovation-agenda-deep-decarbonization-bridging-gaps-federal-energy-rdd.*

DOE should factor the Defense Department's needs and strengths as an innovator into its applied RD&D strategies and roadmaps to capture interagency synergies.

DOE strategies are appropriately aimed at meeting the energy needs of the commercial sector, with its heavy emphasis on price. DOE should expand its focus to include DoD needs that are congruent or consistent with the civilian market, so that DOE's investments in early stage R&D can transition through DoD's late stage R&D to defense products. Allowing the military to serve as a price-insensitive early adopter can help vendors reduce their costs and become commercially competitive.

More details: *Dorothy Robyn and Jeffrey Marqusee, "Taking the Fight to Clean Energy: What the Military's Investment in Energy Innovation for the Warfighter Means for the Rest of Us" (Information Technology and Innovation Foundation, March 5, 2019), https://www.itif.org/events/2019/03/05/taking-fight-energy-innovation-what-military-investment-energy-innovation.*