Fifty Ways to Leave Your Competitiveness Woes Behind: A National Traded Sector Competitiveness Strategy

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The United States needs to implement a comprehensive national traded sector competitiveness strategy organized around the "4Ts" of technology, tax, trade, and talent, as well as access to capital and regulatory reform, in order to bolster the ability of its traded sector firms to compete effectively in global markets.

INTRODUCTION

By definition, countries that wish to successfully compete in the global economy must have highly competitive traded sectors. A nation's traded sector comprises those industries and establishments which compete in international marketplaces and whose output is sold at least in part to nonresidents of the nation. Traded sectors include almost all of a nation's manufacturing activity, some services (such as software, Internet, and engineering services, and entertainment content like music, movies, and video games), and some of the extraction sectors (e.g., farming or mining).[1] Because these industries face market competition that is global in nature in a way that non-traded, local-serving industries (e.g., retail trade or personal services) do not, their success is by no means assured. For example, while we may not know whether Safeway, Giant, or Walmart are going to gain market share in the U.S. grocery store industry, we do know that the industry itself will be healthy, dependent only on the income and purchasing habits of American consumers. On the other hand, while we may not know whether Boeing or Airbus are going to gain market share in the global aircraft industry, we also do not know whether there will be aviation industry jobs in the United States, since this depends on the United States winning in global competition in this industry. Put differently, if a grocer goes out of business another will emerge to take its place to serve local demand, but if a traded sector enterprise such as a manufacturer or software company closes, the one that takes its place may well be located in another country.

It's simply impossible to have a vibrant national economy without a globally competitive traded sector. That's why dozens of nations have implemented specific strategies to bolster the competitiveness of their traded sector industries and enterprises—and why the United States needs to do so as well.

The health of U.S. traded sector enterprises in industries such as semiconductors, software, machine tools, or automobiles—all far more exposed to global competition than local-serving firms and industries—cannot be taken for granted. As Gene Sperling, Director of the National Economic Council (NEC), recently put it, "If an auto plant opens up, a Walmart can be expected to follow. But the converse does not necessarily hold—that a Walmart opening does not definitely bring an auto plant with it."[2] The same could be said for a movie studio, software or Internet company, global engineering consulting firm, or any other establishment facing global market competition. Thus, the international competitiveness of U.S. traded sector establishments is central to the health of America's economy. It's simply impossible to have a vibrant national economy without a globally competitive traded sector, and that's why dozens of nations have implemented specific strategies to bolster the competitiveness of their traded sector industries and establishments.[3]

Manufacturing is a key traded sector and most important reason why it matters is precisely because it is the key enabler of the U.S. economy's traded sector strength. Indeed, there is

no traded sector more important (in terms of scale) to the vitality of America's economy than manufacturing, and in particular advanced, technology-oriented manufacturing. Despite what some pundits and neoclassical economists have argued, manufacturing remains indispensable to the health of the U.S. economy, not just because it is central to traded sector strength but also for four other critical reasons, as noted in our previous publication *The Case for a National Manufacturing Strategy*.[4] First, the United States will have great difficulty balancing its foreign trade without a robust manufacturing sector, for manufacturing accounts for 86 percent of U.S. goods exports and 60 percent of total U.S. exports.[5] Second, manufacturing remains a key source of jobs that both pay well—21 percent more than the average hourly compensation in private sector service industries—and have large employment multiplier effects—each manufacturing jobs supports as many as 2.9 other jobs in the economy.[6] Moreover, average wages in U.S. high-technology industries (which are principally in traded sectors) are 86 percent higher than the average private sector wage.[7] Third, manufacturing, R&D, and innovation go hand-in-hand, with the manufacturing sector accounting for 72 percent of all private sector R&D spending, employing 63 percent of domestic scientists and engineers, and U.S. manufacturing firms demonstrating almost three times the rate of innovation as U.S. services firms.[8] Finally, manufacturing is vital to U.S. national security and defense.[9]

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Unfortunately, the past decade was a particularly difficult one for America's traded sectors in general and manufacturing in particular. As Nobel Prize-winning economist Michael Spence has demonstrated, from 1990 until the Great Recession started in 2007, the U.S. achieved virtually no growth in traded sector jobs.[10] The malaise has been a downright decline in manufacturing, as the United States lost nearly one-third of its manufacturing workforce in the previous decade, saw on net over 66,000 manufacturing establishments close, accrued a trade deficit in manufactured products of over $4 trillion, and experienced a decline in manufacturing output of 11 percent at a time when U.S. GDP increased by 11 percent (when measured properly).[11] Moreover, every lost manufacturing job has meant the loss of an additional two to three jobs throughout the rest of the economy. The 32 percent loss of manufacturing jobs was a central cause of the country's anemic overall job performance during the previous decade, when the U.S. economy produced, on net, no new jobs.[12] And while some have seized on the recent modest rebound in manufacturing jobs off Great Recession lows, the reality is that, at the rate of growth in manufacturing jobs that occurred in 2011, it would take until at least 2020 for employment to return to where the economy was in terms of manufacturing jobs at the end of 2007.[13] Simply put, the broader U.S. economy won't fully recover until its traded sectors—including manufacturing—regain their global competitiveness.

Yet while they should lead the way, market forces acting alone will not lead to a renaissance in traded sector performance. A sustained recovery will require effective public policies to support and underpin U.S. traded sectors. Therefore, the federal government needs to articulate a comprehensive national traded sector competitiveness strategy that addresses the "4Ts" of technology, tax, trade, and talent, as well as finance (providing access to capital), regulatory reform, and better competitiveness analysis. As the Information Technology and Innovation Foundation (ITIF) documented in *The Case for a National Manufacturing Strategy*, beyond the vital importance of traded sectors such as

manufacturing to a nation's economic health, the United States needs such a strategy because: 1) over a dozen competitor countries have implemented strategies to support their manufacturing and other traded sectors;[14] 2) systemic market failures and externalities affect manufacturing activity; and 3) if and when a country loses key traded sectors like manufacturing, it's unlikely to get them back.[15]

The goal of a U.S. traded sector competitiveness strategy should be to ensure that the United States offers the world's best traded sector environment, in part by ensuring that U.S. traded sector firms have access to the world's best technology, talent, and infrastructure, but also the best business and regulatory environment. It should design the nation's business, regulatory, tax, and innovation policy environments to make the United States the world's most attractive location for R&D and business investment (including foreign direct investment) in manufacturing and other traded sectors. It should promote a set of policies that support the entire lifecycle of technology development—from R&D, invention, and innovation, to scale-up for efficient production and market development—designed so that U.S. establishments and workers can capture maximum value added. And it should go beyond the country's goal to double exports to ensure the United States becomes a net exporter again.[16]

Some will argue that if government would simply cut taxes and burdensome regulations, work to decrease domestic energy costs, and generally get out of the way of business, then U.S. traded sectors would thrive. While certainly smart actions in these areas are sorely needed, they won't be sufficient to restore America's global competitive position. Rather, the United States needs to adopt the model embraced by leading manufacturing and technology economies such as Germany, Japan, Korea, and others which recognizes that markets relying on price signals alone will not usually be as effective as smart public-private partnerships in spurring stronger traded sector performance. These countries understand that government can—and must—play a constructive role in helping their traded sector firms compete. Ultimately, having a traded sector strategy is simply a way for the United States to understand what it needs to do—whether it's cutting the effective corporate tax rate, reducing regulatory burdens expanding research funding, etc.—to help its traded sectors become more productive and innovative. Moreover, having a strategy is necessary to help align, coordinate, and amplify the effect of the various state and federal programs that currently exist to assist U.S. traded sector firms.

Some may argue that two documents released by the Obama Administration early in 2012—*The Competitiveness and Innovative Capacity of the United States*, released in January 2012, and *A National Strategic Plan for Advanced Manufacturing*, released in February 2012—already suffice to represent a traded sector competitiveness strategy for the United States.[17] For its part, *The Competitiveness and Innovative Capacity of the United States* report is more of an assessment of America's traded sector competitiveness than a strategy to strengthen it. And while the *Strategic Plan* represents an excellent start, it focuses primarily on advanced manufacturing and addresses the technology components, whereas a more comprehensive strategy that also addresses the tax, trade, talent, and finance elements and their impact on traded sectors is needed. The Obama Administration has also spearheaded creation of the Advanced Manufacturing Partnership (AMP), a national effort bringing

together the federal government, industry, universities, and other stakeholders to identify and invest in emerging technologies with the potential to create high-quality domestic manufacturing jobs and enhance U.S. competitiveness.[18] In July 2012, the President's Council of Economic Advisors, in conjunction with the AMP Steering Committee, released an additional *Report to the President on Capturing Domestic Competitive Advantage in Advanced Manufacturing.*[19] While these reports represent important assets and a start toward building a framework for U.S. traded sector competitiveness, they are necessary but not sufficient. The country still needs a clear and comprehensive U.S. traded sector competitiveness strategy that both goes beyond the sterile ideas that have been recycled for the better part of three decades and that includes key actionable policies that Congress and the Administration should undertake.

This report presents 50 federal-level policy recommendations to help restore U.S. traded sector competitiveness (and an additional 13 state-level recommendations). The recommendations are organized around federal policies regarding the "4Ts" of technology, tax, trade, and talent as well as policies to increase access to capital, reduce regulatory burdens, and enable better analysis of the competitiveness of U.S. traded sectors.

While we believe all 50 recommendations are needed, we list what we believe are the most critical 10 recommendations here:

1. Create a network of 25 "Engineering and Manufacturing Institutes" performing applied R&D across a range of advanced technologies.
2. Support the designation of at least 20 U.S. "manufacturing universities."
3. Increase funding for the Manufacturing Extension Partnership (MEP).
4. Increase R&D tax credit generosity and make the R&D tax credit permanent.
5. Institute an investment tax credit on purchases of new capital equipment and software.
6. Develop a national trade strategy and increase funding for U.S. trade policymaking and enforcement agencies.
7. Fully fund a nationwide manufacturing skills standards initiative.
8. Expand high-skill immigration, particularly that focused on the traded sector.
9. Transform Fannie Mae into an industrial bank.
10. Require the Office of Information and Regulatory Affairs (OIRA) to incorporate a "competitiveness screen" in its review of federal regulations.

Finally, while the report presents 50 specific recommendations, it also articulates four key themes that permeate the report and which should be viewed as essential thematic components of a U.S. traded sector competitiveness strategy. Beyond implementing

specific policies, these are the key themes U.S. policymakers must embrace if the United States is to restore its traded sector competitiveness:

1. The federal government must place strategic focus on its traded sectors, because it simply can't rely entirely on its non-traded sectors to sustainably power the U.S. economy.

2. The United States needs to embrace and reintegrate an engineering culture. While America has thrived on science-based innovation and has a strong science culture, it needs to become much more of an engineering economy. The notion that the United States can win through science alone is fallacious, because science is a public good that's freely traded around the world, whereas gains from engineering-based innovation are capturable and appropriable within nations.

3. The United States must move toward an economic system more focused on production than consumption. This means being willing to give short-term consumption less priority in our politics. Examples include raising the gasoline tax to invest more in roads and highways, pushing for a lower U.S. dollar, and raising taxes on individuals in order to cut them on businesses, particularly those in traded industries.

4. There is a need to seriously rethink the structure of the global trading system and ensure that it is a trading system based on market-oriented principles. Unfortunately, the last decade in particular has seen a troubling rise in "innovation mercantilism," which fundamentally hurts the U.S. competitive position while violating the spirit and often the letter of the World Trade Organization.

BOX 1: TOP 50 FEDERAL POLICIES TO STRENGTHEN U.S. TRADED SECTOR COMPETITIVENESS

Principal Actor | Cost?

Technology Policy

- **Create a nationwide network of at least 25 "Engineering and Manufacturing Institutes" performing applied R&D across a range of advanced technologies.**
- **Support the designation of at least twenty U.S. "manufacturing universities."**
- Increase federal support for the NSF Engineering Research Center and Industry/University Cooperative Research Center programs, and require a higher industry match for ERC funding.
- Create a Spurring Commercialization of Our Nation's Research (SCNR) program to support university, state, and federal laboratory technology commercialization initiatives.
- **Increase funding for the Manufacturing Extension Partnership.**
- Create an innovation vouchers program for SME firms to redeem at labs or univeristies.
- Establish stronger university entrepreneurship and technology transfer metrics.
- Expand usage of Title III of the Defense Production Act and increase funding for Department of Defense ManTech program to rebuild the defense industrial base.

Tax Policy

- Lower the effective U.S. corporate tax rate.
- **Increase R&D tax credit generosity and make the R&D tax credit permanent.**
- Make clear that process R&D qualifies for the R&D tax credit.
- Establish a collaborative R&D tax credit for multi-stakeholder research.
- Expand the R&D tax credit to cover expenditures for workforce training.
- Strengethen the domestic production deduction.
- **Institute an investment tax credit on purchases of new capital equipment and software.**
- Implement "patent boxes" to promote R&D commercialization.
- Expand foreign trade zones to include a value-added tax incentive.

Trade Policy

Trade Promotion

- Better support and align programs to boost U.S. exports.
- Better promote reshoring.
- Create global knowledge investment zones (GKIZs) to attract foreign direct investment (FDI).
- Provide forgivable loans to companies supporting repatriated jobs to distressed/rural areas.
- Update the charter of the Committee on Foreign Investment in the United States (CFIUS) to address the realities of modern-age state capitalism.
- Review export control policies that inhibit U.S. exports.

Trade Enforcement

- **Develop a national trade strategy and increase funding for U.S. trade policymaking and enforcement agencies.**
- Exclude mercantilist countries from the Generalized System of Preferences (GSP).

Principal Actor	Cost?	
	✓	• Ensure U.S. and multilateral foreign aid policies don't act as mercantilist enablers.
	✓	• Combat foreign currency manipulation.
		• Encourage companies to bring WTO cases by allowing them to take a 25 percent tax credit for expenditures associated with doing so.
		Market Opening
	✓	• Forge new trade agreements, including a high-standard Trans-Pacific Partnership (TPP) and Trans-Atlantic Partnership (TAP).
		Talent Policy
	$	• **Fully fund a nationwide manufacturing skills standards initiative.**
	$	• Expand manufacturing vocational education programs at community colleges.
	$	• Expand funding for NSF's Advanced Technological Education program.
	$	• Provide funding to create 400 new STEM-focused high schools.
	$	• Create an NSF-Industry Ph.D. Fellows program.
	$	• Expand and modify NSF's Integrative Graduate Education and Research Training (IGERT) program.
	$	• Provide support for recent Ph.D. graduates to work with SME manufacturers.
	✓	• **Expand high-skill immigration, particularly that focused on the traded sector.**
		Finance Policy
	$	• Create Manufacturing Reinvestment Accounts.
	✓	• Authorize the Ex-Im Bank to provide loan assistance to SMEs and firms competing against subsidized foreign competitors.
	✓	• **Transform Fannie Mae into an industrial bank.**
	✓	• Shift the Small Business Administration's focus to traded sector firms.
	✓	• Assist SMEs in traded sectors in obtaining access to credit, in part by creating loan guarantee programs.
		Regulatory Policy
	✓	• Form an Office of Innovation Review (OIR) in the Office of Management and Budget (OMB).
	✓	• **Require the Office of Information and Regulatory Affairs (OIRA) to incorporate a "competitiveness screen" in its review of federal regulations.**
	✓	• Increase industry participation in the federal rule-making process.
	✓	• Streamline regulatory compliance procedures for companies.
		Competitiveness Assessment
	$	• Increase funding for federal statistical agencies, particularly the Census Bureau, Bureau of Economic Analysis (BEA), and the Bureau of Labor Statistics (BLS) and consolidate those agencies into a single national statisitical agency.
	✓	• Create a new traded sector analysis unit within the National Institute of Standards and Technology.
	✓	• Create a United States Economic Competitiveness Commission.
	✓	• Appoint at least one member to the Council of Economic Advisors (CEA) whose background is in business or innovation, rather than economics.

*Top 10 policy recommendations in bold

Actors:

- Congress (Legislative)
- White House (Administrative Branch)

Cost:

- ✓ "Just do it" (revenue neutral policies)
- $ Requires Funding
- Tax Incentives

WHY TRADED SECTOR COMPETITIVENESS MATTERS

Many neoclassical economists dismiss the notion that any sector is more important than any other, including traded sectors. But traded sector competitiveness is important because without it a nation's terms of trade decline—that is, a nation must give up more of its goods and services to exchange for what it needs to import. Usually, trade imbalances among countries are balanced through the adjustment mechanism of currency exchange rates. But if this cannot happen, the result is lost jobs. And indeed, this is what has happened to the United States over the last decade in particular as it has run up massive trade deficits. The dollar has not declined as much as it should, for three reasons. First, the dollar is still seen as the global reserve currency, with nations buying dollars for security. Second, many investors, including national governments (and not just China's), manipulate their own currency for competitive advantage.[20] And third, U.S. policy makers (Treasury officials in particular) persist in the belief that their job is to prevent free markets from working by defending a strong dollar. In this situation, unless America's traded sector firms are more competitive in their own right, the result is lost domestic output and lost jobs, which cascade throughout the economy, acting as a stiff "economic headwind" that overall economic growth must fight against.

At the same time, many in Washington believe that small firms are the real jobs engine of the U.S. economy. But the reality is that small "mom-and-pop" firms will not prosper unless larger companies (and high-growth, entrepreneurial "gazelle" companies), the vast majority of which are found in traded sectors, prosper. To understand why the jobs claim is wrong, or at least distorted, it's important to understand the difference between what regional economists refer to as local-serving and export-serving businesses. Consider the Maytag factory that closed in Newton, Iowa several years ago.[21] It was an export-serving business, meaning that it shipped products outside of the local labor market. While a small share of the Maytag washers and dryers coming off the assembly line were sold to local Newton residents, most were sold to customers throughout the nation or even the world, who sent money back to Maytag, who gave some of it to their local workers. In contrast, Newton's local restaurants, dry cleaners, clothing stores, and barber shops are local-serving, as the lion's share of their output is sold to Newton residents, including Maytag workers. If one of these local-serving "Main Street" businesses had gone out of business, it would have had virtually no effect on the output of the Maytag factory. Moreover, another business would more or less automatically expand or emerge to meet local demand. But the Maytag factory closure had an immediate negative impact on the local-serving businesses, whose customers (Maytag workers, its suppliers, and their workers) had much less money to spend locally on meals, haircuts, dry cleaning, and other needs and desires.

The reality is that the majority of U.S. businesses are local-serving. These include, for example, the 219,986 doctors' offices, 166,366 auto repair facilities, 151,031 food and beverage stores, 115,533 gas stations, 111,028 offices of real estate agents and brokers, 93,121 landscaping companies, 75,606 nursing homes, 36,246 furniture stores, 28,336 veterinary offices, 15,666 travel agencies, 4,571 bowling alleys, 2,463 amusement arcades, 858 radio networks, and 26 commuter rail systems.[22] These and millions of other local-serving businesses will neither prosper nor suffer principally on the basis of economic

policies targeted at them. They will not prosper unless large traded sector companies (and high-growth entrepreneurial "gazelle" companies) in the United States prosper.

That's because the engines of a nation's competitiveness are in fact not mom and pop small businesses, but rather firms in traded sectors, high-growth entrepreneurial companies, and U.S.-headquartered multinational corporations. Although such firms comprise far less than 1 percent of U.S. companies, they account for about 19 percent of private-sector jobs, 25 percent of private-sector wages, 48 percent of goods exports, and 74 percent of nonpublic R&D investment.[23] And, since 1990, they have been responsible for 41 percent of the nation's increase in private labor productivity.[24] This in part explains why workers in large firms earn 57 percent more than workers in companies with fewer than one hundred workers.[25] And why, besides getting paid more, workers in large companies get 3.5 times more retirement benefits than workers at firms with less than 100 employees, 2.7 times more paid leave, and 2.4 times more health-care benefits.[26]

Recognizing the importance of traded sector establishments, cities, states, and nations work feverishly to attract and grow the establishments that constitute the manufacturing, operating, or R&D components of large, multi-location enterprises.[27] Take the city of Portland, Oregon, which created *The Portland Plan* to boost the city and region's economic competitiveness to deal with challenges including high unemployment and rising income disparities.[28] *The Portland Plan* explains that "working to strengthen Portland's traded sector businesses will increase the durability of our local economy and will make Portland more fertile ground for non-traded sector local businesses by raising wages and bringing more money into the region."[29] It notes that traded sector businesses improve the local economy in three ways. First, traded sector businesses bring money into the region by selling to people and businesses outside Portland. Second, they help keep local money at home through import substitution, which occurs when local residents and businesses purchase locally produced products instead of importing goods and services. Finally, they improve economic equity since "their productivity and market size tends to lead them to offer higher wage levels. Jobs at traded sector companies help anchor the city's middle class employment base by providing stable, living wage jobs for residents."[30]

This holds not just at the metropolitan and state levels, but at the national level too. Productivity growth—the increase in the amount of output produced by workers per a given unit of effort—is the most important measure and determinant of economic performance for a nation.[31] Economies can increase their productivity in two ways. First, firms can become more productive, usually by investing in new technologies or improving the skills of their workers. This is called the "growth effect," where a nation's productivity goes up not by some sectors getting bigger or smaller, but by all sectors getting more productive. For example, a country's retail, banking, and automobile manufacturing sectors can all increase their productivity at the same time. The second way to increase productivity—called the "shift (or mix) effect"—is more dynamic and disruptive: low-productivity firms and/or industries lose out in the marketplace to high productivity firms and/or industries that are more efficient and can cut prices or boost quality to gain market share.[32] In other words, there is a compositional shift in the mix of firms constituting the economy. This compositional shift often occurs when firms in traded sectors win or lose in

global competition. And while across-the-board productivity growth is certainly needed for an economy to achieve robust and sustained growth, bolstering productivity growth through the shift effect is also vitally important. In other words, traded sectors matter critically.

FEDERAL POLICIES

Technology Policy

A core goal of a U.S. traded sector competitiveness strategy should be to support the development of new technologies that radically improve production processes or that can be transformed into innovative new products. There is no way traded sector firms in the United States will be able to compete with low-wage economies specializing in high-volume, commodity-based production unless those U.S.-based firms can sustainably achieve high levels of productivity growth and consistently produce high-tech, high-value-added products and services. The United States needs to be producing things other countries cannot (or producing the same things more efficiently) and the only way to achieve that is through high levels of innovation in product and process technology.

It's not enough to simply invent new technologies in America; the United States must also invest in the ability to manufacture in America products based on those technologies.

Unfortunately, the U.S. manufacturing economy is increasingly less high-tech than its major competitors. For example, in 2009, 42 percent of U.S. manufacturing occurred in medium-high-tech or high-tech industries—industries in which R&D intensity (R&D as a percentage of sales) is greater than 3 percent—whereas 58 percent of German, 52 percent of Korean, and 48 percent of Japanese manufacturing occurred in such industries.[33] And not only do Germany, Korea, and Japan each have more R&D-intensive manufacturing sectors than the United States, they each export a greater share of technology-intensive products. Thus, one objective of the strategy should be to promote the technological upgrading of U.S. manufacturing, not only through cutting-edge new products like electric cars or rechargeable batteries, but by infusing new technology into "legacy" industries such as textiles, materials, paper, steel, ceramics, or numerous others.[34] The United States should also promote "smart manufacturing"—the fusion of information and communications technology (ICT) and manufacturing.

Another key objective of the strategy should be to support public-private partnerships designed to help strengthen the connection between scientific research and technology commercialization in order to assist firms in "bridging the gap" between transforming technologies developed in universities and federal laboratories into commercializable products and efficient production processes. In other words, it is not enough to simply invent new technologies in America; the United States must also invest in the ability to manufacture those technologies in America as well.[35]

To achieve these aims, the United States will have to become much more of an engineering-based economy that embraces a real engineering culture. At least since World War II, the United States has led the world in science-based innovation, as research from U.S. corporate, academic, and government laboratories contributed to a series of transformative innovations, in everything from transistors and mobile phones, to lasers, graphical user interfaces, search engines, the Internet, and genetic sequencing. That approach worked well when few nations had the capacity to leverage U.S. scientific

discoveries for their competitive advantage. But now U.S. federal R&D dollars for basic science generate knowledge that is essentially a non-rival, non-appropriable public goods that can be quickly picked up and leveraged by foreign competitors. That's why many nations invest much less in basic research and more in applied research.[36] Instead, these countries often rely on the basic research discoveries coming out of U.S. universities and national laboratories, which allows them to concentrate their efforts on turning U.S. scientific discoveries into their own innovative technologies and products which they sell to other nations, including the United States.[37] In other words, investments in science create essential new knowledge that is freely traded around the world, but it is the application of that knowledge (e.g., through engineering) that creates wealth through new products and processes.

That's why science-based discoveries aren't enough anymore. The United States must also be able to make things here. And that requires engineering-based innovation, an appropriable activity through which U.S. establishments can add and capture value. But the United States faces an engineering gap compared to its manufacturing competitors in countries like Germany, Japan, and Korea. Thus, the core thrust of this report's technology policy recommendations is to transform the United States into much more of an engineering-based economy. This includes everything from getting engineering into high schools and graduating more engineering BS degrees, to creating manufacturing universities, to re-envisioning the National Science Foundation's Engineering Research Center program, to creating a nationwide network of manufacturing and engineering institutes.

Ultimately, the United States should create a National Engineering Foundation that absorbs the functional parts of the National Institute of Standards and Technology (NIST), NSF's engineering divisions, the Department of Defense's Manufacturing Technology (ManTech) program, and the Department of Energy's Advanced Manufacturing office into a single entity with an engineering focus. In the interim, the following recommendations will move the United States closer to embracing an engineering-based economy that bolsters the competitiveness of its traded sector firms.

A1. Create a nationwide network of at least 25 "Engineering and Manufacturing Institutes" performing applied R&D across a range of advanced technologies

If the United States wishes to more consistently "bridge the gap" to transform basic scientific discoveries into useful technologies and on into commercializable products that can be manufactured at scale, it needs to provide a much stronger institutional platform through which universities and industry can enter into public-private partnerships to conduct applied (or "translational") R&D activity. Germany's 60 Fraunhofer Institutes have long provided a compelling model for performing applied research of direct utility to industry by helping to translate research into commercializable products.[38] The Fraunhofers bring together cutting-edge research in an industrially relevant way across a number of sectors and technology platforms (such as advanced machining, optics, photonics, nanotechnology, robotics, advanced materials and surfaces, wireless technologies, and many others) by providing a platform for joint pre-competitive research, bilateral applied research with individual firms, prototype manufacturing, and pre-production and cooperative technology transfer arrangements with companies.[39] The

German federal and Länder (state) governments supply almost 30 percent of the Fraunhofers' budget, about $700 million, while most of the remainder is contributed by industry.[40]

To be sure, the United States does have a few sector- or technology-oriented, Fraunhofer-like centers scattered throughout the country that specialize in R&D, prototyping, and training and education around specific technologies. A good example is the Commonwealth Center for Advanced Manufacturing (CCAM) in Virginia, a public-private partnership focused on advanced aerospace and aviation R&D and education.[41] In Minnesota, Saugus 2 is trying to form as a cooperative research institute for the U.S. foundry industry (developing castings from molten metals) that seeks to reinvent manufacturing processes with the goal of recapitalizing the American foundry industry with new advanced manufacturing processes and facilities. Other such centers include the National Textile Center at North Carolina State University and the Northern Iowa Metal Casting Center. Many governors, including both Republicans and Democrats, have supported similar kinds of institutes. Yet, historically, these institutes have tended to both be under-funded (relative to their return on investment) and be isolated in scope to their state and region and therefore not easily replicable or scalable across the nation.

What the United States lacks is an integrated and well-funded national network of industry-led, sector- or technology-based centers performing advanced product and process R&D. Therefore, ITIF proposes creating a nationwide network of at least 25 manufacturing institutes across a range of advanced technologies. The institutes would bring together industry, universities, community colleges, federal agencies, and states to accelerate innovation by investing in industrially relevant manufacturing technologies with broad applications. The network would help bridge the gap between basic research and product development, provide shared assets to help companies (including small- to medium-sized enterprises, or SMEs) access cutting-edge capabilities and equipment, and create a compelling environment in which to educate and train students and workers in advanced manufacturing skills.[42] Each institute would serve as a hub of manufacturing and engineering excellence and have a well-defined technology focus. They would address industrially relevant manufacturing challenges on a large scale and provide the capabilities and facilities required to reduce the cost and risk of commercializing new technologies.

Such institutes should be formed around key manufacturing technologies or inputs, such as foundries, polymers, metal joining (e.g., welding) and cutting, coatings, advanced chemistry, advanced machining, robotics/automation technology, micro-electromechanical systems, advanced ceramics/advanced material composites, remote sensing/sensor-enabled devices, machine tooling, or other emerging technologies that can help create new industries. Engineering-focused institutes should also be created for the biotech, optics, wireless, software, cybersecurity, and other sectors as well. But rather than having a federal entity identify and select the institutes, industry consortia (ideally in partnership with universities) should come up with initial proposals to create the institutes, which would then be competitively selected. And while the institutes would leverage investments from federal, state, and regional governments, industry would be expected to put substantial skin in the game, providing at least 50 percent of the funding for each institute.

The federal government should invest $25 million annually in the ongoing operations of the 25 manufacturing institutes, which would bring the total annual federal investment in the manufacturing institutes to $625 million per year. States would be expected to provide at least a 50 percent match of federal dollars, thus contributing another $312 million. Given the required 50 percent industry match, industry would contribute $935 billion, thus bringing the total investment level to $1.9 billion. An investment on this level would not really represent all that much of a reach for the United States. Indeed, such an investment would be less than Germany's annual investment of $2.35 billion in its Fraunhofer system (though Germany would still be investing five times as much as a share of GDP since Germany's economy is roughly 25 percent of the size of the U.S. economy). But achieving co-investment by federal and state governments along with industry will be essential to the manufacturing institutes' success. In fact, having industry skin in the game is the best way to ensure that the centers are delivering on their promise. Nevertheless, the performance of the institutes should be evaluated every five years by an external review board to evaluate their impact and outcomes.

The United States needs to foster not just science-based discoveries, but also an engineering-based economy with a strong engineering culture.

There appears to be increased recognition of the need for an institutional platform for such a nationwide network of advanced manufacturing and engineering consortium performing applied R&D across a range of advanced technologies. In March 2012, the Obama Administration proposed investing $1 billion to create a National Network for Manufacturing Innovation (NNMI) comprised of 15 Institutes for Manufacturing Innovation that would serve as hubs of manufacturing excellence focused around specific technologies.[43] In August 2012, the Administration announced the creation of the first such institute, the National Additive Manufacturing Innovation Institute.[44] The Institute will demonstrate the value of a shared platform to conduct pre-competitive applied R&D, to train students and workers for careers in, and to deliver "production-ready" solutions in additive manufacturing—the process of "printing" objects layer-by-layer with various materials based on 3D model data.[45]

In Congress, on March 29, 2012, Senator Tom Harkin (D-IA) introduced the Rebuild America Act, which would create similar sector-based Technology Innovation Centers (TICs) across the country.[46]The legislation would authorize the Secretary of Commerce to provide grants to establish sector-specific technology and innovation centers, to help manufacturers bridge the gap between research and product development and manufacturing efficiency. While the exact structure remains to be fleshed out from the various proposals, the key is that policymakers recognize the need for a national network of advanced engineering and manufacturing institutes and be willing to allocate the funding and pass the legislation needed to make them a reality.

A2. Support the designation of at least 20 U.S. "manufacturing universities"

If the United States wants to win in the advanced manufacturing economy of tomorrow, it must transform university culture away from its "research for the sake of research and knowledge accumulation" approach and align it much more with industry's knowledge needs. The United States needs to forge more and stronger industry-university research collaborations and incentivize universities to focus more on training students with the requisite skills to support U.S. engineering-based industries. Unfortunately, university

engineering programs have evolved in two troubling directions over the past several decades. First, the focus on "engineering as a science" has increasingly moved university engineering education away from a focus on real problem solving toward more abstract engineering science. Second, this focus on "engineering as a science" has left university engineering departments more concerned with producing pure knowledge than working with industry to help them solve real problems.

To address this, the United States should create a core of at least 20 universities that brand themselves as leading manufacturing universities. These universities would revamp their engineering programs and focus much more on manufacturing engineering and in particular work that is more relevant to industry. This would include more joint industry-university research projects, more student training that incorporates manufacturing experiences through co-ops or other programs, and a Ph.D. education program focused on turning out more engineering grads who work in industry. These universities would view Ph.D.s as akin to high-level apprenticeships (as they often are in Germany), where industry experience is required as part of the degree. Likewise, criteria for faculty tenure would consider professors' work with and/or in industry as much as their number of scholarly publications. In addition, these universities' business schools would integrate closely with engineering and focus on manufacturing issues, including management of production. As part of this designation, academic institutions would receive an annual award from the National Science Foundation—ideally at least $25 million—plus priority on their applications for NSF grants. One can imagine a number of leading engineering universities—CalTech, Carnegie Mellon, Georgia Tech, Lehigh, the Massachusetts Institute of Technology (MIT), Michigan, Purdue, Stanford, and others—readily transforming themselves to embrace this designation.

One model for these manufacturing universities is the Olin College of Engineering in Massachusetts, which reimagined engineering education and curriculum to prepare students "to become exemplary engineering innovators who recognize needs, design solutions, and engage in creative enterprises for the good of the world." Olin's results have been impressive. Its new method of teaching engineering has been widely praised among engineering firms, and on a per-student-graduated basis, Olin graduates start more new businesses than even MIT graduates.[47] Olin is a good model for how the United States can transform its colleges into entrepreneurial factories while encouraging the development of completely new schools based on the needs of the current workforce.[48]

In 1862, Congress passed the Morrill Act, establishing land-grant colleges whose mission was to promote learning in agriculture and the mechanic arts. These colleges played a key role in enabling the United States to later lead in the mechanization of agriculture and the industrialization of the economy. Today, the challenge is even greater as America is competing against a wide array of nations seeking to win the race for global innovation advantage, including in manufacturing. The United States needs a 21st-century Morrill Act vision, reconnecting land-grant colleges to the nation's economy and requiring their commitment to driving the nation's global innovation advantage in wealth-creating industries like advanced manufacturing and energy. A new cadre of "manufacturing universities" can be an important part of the solution.

A3. Increase federal support for Engineering Research Center (ERC) and Industry/ University Cooperative Research Center (I/UCRC) programs, and require a higher industry match for ERC funding

Industry-university partnerships spur commercialization and innovation. The National Science Foundation's Engineering Directorate operates two kinds of industry-university partnerships: Engineering Research Centers and Industry/University Cooperative Research Centers. ERCs are a group of interdisciplinary centers located at universities, where academe and industry can collaborate in pursuing strategic advances in complex engineered systems and systems-level technologies that have the potential to spawn whole new industries or to radically transform the product lines, processing technologies, or service delivery methodologies of current industries.[49] The I/UCRC program forges partnerships between universities and industry, featuring industrially relevant fundamental research, industrial support of and collaboration in research and education, and direct transfer of university-developed ideas, research results, and technology to U.S. industry to improve its competitive posture in global markets.[50]

Unfortunately, both programs are quite small. Moreover, the ERCs engage with industry only weakly and too often conduct academic research of limited relevance to industry. Very few ERCs are truly engaged in engineering R&D and transitioning technologies to the marketplace as opposed to simply producing more journal papers. To ensure that ERCs represent a true joint university-industry research partnership, funding for all ERCs should have at least a 40 percent industry match by 2017 (within five years). ERCs failing to attract at least a 40 percent industry match within five years should lose their federal funding. This proposal would ensure more meaningful industry-university research partnerships. It would also bring the United States more closely in line with university research funding policy in countries like Germany, where most of the German government's extramural research funding to universities (outside of the German Research Foundation, Germany's equivalent of the NSF) requires a 50 percent industry match.[51]

At the same time, more ERCs need to have a dedicated focus on manufacturing. Currently, only 4 of the 17 ERCs are focused specifically on manufacturing. These include the Synthetic Biology ERC [SynBERC] at U.C. Berkeley, the Center for Biorenewable Chemicals [CBiRC] at Iowa State University, the ERC for Compact and Efficient Fluid Power [CCEFP] at the University of Minnesota, and the ERC for Structured Organic Particulate Systems [C-SOPS] at Rutgers University.[52] For its part, 7 of the 56 I/UCRCs are focused on advanced manufacturing.[53]

Congress should also increase funding for these programs by allocating a larger share of NSF funding to the ERC and I/UCRC programs.[54] Specifically, Congress should increase I/UCRC funding from its Fiscal Year (FY) 2010 level of $7.85 million to at least $50 million per year.[55] Likewise, Congress should double NSF's funding for ERCs from the FY 2010 level of $54.9 million to $110 million.[56] This would support the creation of additional ERCs and I/UCRCs and increase NSF support to each center.

Finally, current regulations perversely require that proposals for new ERCs include an international partner. This is in part a reflection of the NSF culture which views its mission as advocacy of science—because science is internationalized, NSF wants to fund

international collaborations. While certainly policy should not prohibit ERCs from including international partners, NSF should eliminate the requirement that an international partner must be involved, since the ERCs' main goal should be to strengthen U.S. engineering and manufacturing. The ERCs could also be more effective if they regularly developed strategic plans to transition technology advances into products made in the United States.

A4. Create a Spurring Commercialization of Our Nation's Research program (SCNR) to support university, state, and federal laboratory technology commercialization initiatives

The current federal system for funding research pays too little attention to the commercialization of technology, and is still based on the linear model of research that assumes that basic research is easily translated into commercial activity. But in reality, the process is choked with barriers, including institutional inertia, coordination and communication challenges, lack of funding for proof of concept research, and other "valley of death" hurdles.

It's time for federal policy to explicitly address these challenges and allocate more funding to commercialization activities. However, in an era of fiscal constraint, adequate new funding may be difficult to obtain. As a result, Congress should establish an automatic set-aside program that takes a modest percentage of federal research budgets and allocate this to a technology commercialization fund. Currently, the Small Business Innovation Research (SBIR) program allocates 2.5 percent of agency research budgets—about $2.25 billion—to small business research projects; the Small Business Technology Transfer (STTR) program allocates 0.3 percent to universities or nonprofit research institutions that work in partnership with small businesses. Congress should allocate 0.3 percent of agency research budgets—about $250 million per year—to fund university, federal laboratory, and state government technology commercialization and innovation efforts.

This program would be different than the STTR program, which funds small businesses working with universities, for the funds would go to match state technology-based economic development (TBED) programs.[57] Since the 1980s, when the United States first began to face global competitiveness challenges, all states have established TBED programs. Republican and Democratic governors and legislators support these programs because they recognize that businesses will not always create enough high-productivity jobs in their states without government support. This is why state and local governments invest approximately $1.9 billion per year in TBED activities.[58] But without assistance from the federal government, states will invest less in TBED activities than is in the national interest.

ITIF's SCNR proposal is similar to legislation proposed in The Startup Act 2.0 (S. 3217), sponsored by Senators Jerry Moran (R-KS), Mark Warner (D-VA), Marco Rubio (R-FL), and Chris Coons (D-DE), which would use existing federal R&D funding to support university initiatives designed to bring cutting-edge research to the market faster in order to propel economic growth.[59]

A5. Increase funding for the Hollings Manufacturing Extension Partnership (MEP)

The National Institute of Standards and Technology's Manufacturing Extension Partnership plays a vital role in enhancing the productivity, competitiveness, and innovation potential of U.S. SME manufacturers. MEP's field staff features over 1,300 technical experts, located in every state and serving as trusted business advisors focused on solving manufacturers' challenges and identifying opportunities for growth. MEP serves an essential role in sustaining and growing America's manufacturing base by placing technologies and innovations developed through research at federal laboratories, educational institutions, and corporations directly into the hands of U.S. manufacturers.

MEP has proven successful in helping manufacturers achieve new sales, leading to higher tax receipts and new, sustainable jobs in the high-paying advanced manufacturing sector. In fact, MEP has been one of the most impactful federal programs in terms of boosting employment and economic growth. For instance, a January 2012 report issued by the Manufacturing Extension Partnership found that every $1 of federal investment in MEP generates $30 of return in economic growth, translating into $3.6 billion in total new sales annually for U.S. SME manufacturers.[60] Moreover, client surveys indicate that MEP centers create or retain one manufacturing job for every $1,570 of federal investment, one of the highest job growth returns out of all federal funds.[61] 2010 impact data show that the MEP program created and retained over 60,000 jobs. These impressive returns mirror and even exceed those seen in other countries' manufacturing extension programs. For example, a 2010 review of Canada's Industrial Research Assistance Program (IRAP) found that each $1 of public investment in IRAP resulted in a $12 impact on the Canadian economy.[62] Moreover, a 1 percent increase in IRAP assistance led to an 11 percent increase in firm sales, a 14 percent increase in firm employment, and a 12 percent increase in firm productivity. Likewise, a 1 percent increase in IRAP funding to a firm led to a 13 percent increase in the firm's R&D spending and a 3 percent increase in its R&D staff.[63]

Other nations invest much more as a share of GDP in their respective manufacturing extension services than does the United States.

Despite these impressive returns, MEP funding as a share of U.S. GDP has decreased since 1998, when the program began. As a share of GDP, the federal government invested 1.28 times more in MEP in 1998 than in 2009.[64] Other nations invest much more as a share of GDP in their respective manufacturing extension services. Japan invests 30 times more than the United States, Germany approximately 20 times more, and Canada almost 10 times more in its principal SME manufacturing support program.[65] MEP could work with substantially more SME manufacturers and have even greater impact at enhancing their competitiveness, productivity, and innovation potential if its funding increased. Therefore, over an approximately three-year period, Congress should double MEP's budget, from about $110 million to at least $220 million annually.

A6. Create an "Innovation Voucher" program

Almost a dozen countries—including Austria, Canada, Belgium, Denmark, Germany, the Netherlands, Ireland, and Sweden—use innovation vouchers to spur R&D, new product development, and/or innovation activity in traded sector SME firms.[66] These vouchers, usually ranging in value from $5,000 to $30,000, enable SMEs to "buy" expertise from universities, national laboratories, or public research institutes regarding preparatory studies, analysis of technology transfer, analysis of the innovation potential of a new technology, etc. The intent of the vouchers is both to spur innovation in SMEs and to

stimulate knowledge transfer from universities and research institutions to SMEs. They also have an added benefit of more closely aligning the interests of industry and academia and giving universities and labs an incentive to be more responsive to industry needs. Evaluations of innovation voucher programs in several countries have found that the vouchers substantially stimulate innovation. Holland found that eight out of ten vouchers issued resulted in an innovation that would not have otherwise come to fruition.[67] Likewise, a 2011 review of the Austrian *Innovationsscheck* found it to be "a very useful program" that engendered positive networking effects between SMEs and research institutions and through which approximately 500 SMEs had started an R&D effort.[68] In the United States, innovation vouchers could be introduced at either the federal or state level, but Congress should facilitate their introduction by authorizing $20 million to NIST to fund a pilot program operated by select states that agree to match the funding dollar for dollar. As a potential source of funds to keep this option revenue-neutral, one option would be to take 0.5 percent of the current allocation to national laboratories to fund the vouchers.

Another way policymakers can spur innovation and entrepreneurship in manufacturing is by supporting the "maker movement." The maker movement involves individuals designing and sometimes manufacturing their own prototypes, inventions, tools, or other products using a variety of methods, including traditional manufacturing tools and more advanced technologies such as 3-D printers.[69] The movement recognizes that communities of hobbyists are often hotbeds of innovation.[70] Makers are increasingly becoming entrepreneurs, leading the development of industrial robots, 3-D printers, and smart devices that integrate hardware, software, sensors, and Internet connectivity, and attracting venture capital.[71] For instance, entrepreneurs are using the equipment in TechShops now located in many cities across the nation (including 3-D scanners, CNC machine tools, laser and water cutters, lathes, injection molding machines, vacuum forming systems, etc.) to launch their own businesses.[72]

Government can play several roles in supporting the maker movement. For instance, DARPA (the Defense Advanced Research Projects Agency) is investing heavily in the tools needed to democratize design and manufacturing.[73] The White House Office of Science and Technology Policy (OSTP) has encouraged all agencies to provide R&D funding for entrepreneurs with good ideas for low-cost instruments and kits for Makers and citizen-scientists.[74] In fact, OSTP has reached out to Small Business Innovation Research (SBIR) program managers about announcing solicitations supporting "development of a set of affordable tools, equipment and kits that will allow students to (1) engage in citizen science; and (2) design and build manufactured products." These tools have the ability to create opportunities for entrepreneurship in manufacturing, in the same way that the Web and cloud computing have made it less expensive for software entrepreneurs to launch a new business. To encourage maker innovation, the Administration should call on federal agencies to allocate a very small share of SBIR awards to fund maker projects related to agency needs. These awards can be much smaller than traditional SBIR awards, perhaps on the order of $20,000.

A7. Establish stronger university entrepreneurship metrics and use them to provide stronger incentives for universities to commercialize research

The federal government funds universities largely on the basis of the quality of the proposed scientific research. Whether or not the universities actually transfer the knowledge produced into job-creating innovation in the United States is largely irrelevant to the federal funding process. And unfortunately, there has been little effort to date to systemically collect measures of university innovation performance.

To address this, Congress should direct the National Science Foundation, working in partnership with NIST, to develop a metric by which universities report entrepreneurship and commercialization information annually.[75] The reports should include data on faculty new business starts, spin-offs of new companies from universities, license agreements and patenting, and industrial funding of research. Congress should further direct all major federal research funding agencies to factor these performance metrics into their decisions to award research funds to a university or university researcher. Applicants from universities that successfully promote entrepreneurial spinoffs/start-ups or that receive more in industry research funding would be more likely to have their principal investigator grants funded. This in turn would put pressure on universities that are underperforming to change their policies to become more effective at commercialization. The advantage of a performance-based approach is that it would be up to universities and colleges to figure out the best way to be more relevant to the U.S. economy. Universities might establish external advisory councils made up of industry leaders to provide insight into research trends and entrepreneurial activities. They might make it easier for faculty to work with industry or to start new companies, or they might streamline intellectual property procedures to make it easier to commercialize innovations. But the bottom line is that universities and colleges would have much stronger motivation to be more effective at helping spur innovation, particularly in firms in traded sector industries.

A8. Expand usage of Title III of the Defense Production Act and increase funding for the Department of Defense Manufacturing Technology program to help rebuild the defense industrial base

Manufacturing is vital to U.S. national security, but as the U.S. industrial base moves offshore, so too does the defense industrial base.[76] The mission of the Defense Production Act Title III is to target and bolster areas of high-tech manufacturing where the United States has diminishing or no capability. Title III gives authority to federal agencies, such as the Department of Defense, to provide incentives to ensure that viable industrial productive capacities exist in the United States. These incentives can include: purchase commitments or purchases made specifically to assist a company in establishing production capacity, the development of substitutes, or the use of loans or loan guarantees.

Unfortunately, the U.S. defense industrial base has experienced substantial erosion. There are numerous examples of defense-critical technologies where domestic sourcing is endangered, including in propellant chemicals, space-qualified electronics, power sources for space and military applications (especially batteries and photovoltaics), specialty metals, hard disk drives, and flat panel displays (LCDs).[77] Moreover, a May 2012 Senate report documented the extent to which counterfeit parts have entered the Department of Defense supply chain, finding 1,800 cases of suspected counterfeit electronic parts entering the

defense supply chain in 2009 and 2010 alone.[78] In several cases, the United States has had to rely on foreign components because they could not be or were no longer manufactured in the United States. In response to the country's inability to reliably manufacture key defense components and to the proliferation of foreign counterfeit parts in the defense supply chain, Congress should expand funding for and encourage federal agencies such as the Department of Defense and Department of Energy to make broader use of Title III of the Defense Production Act. Leveraging Title III authority would help expand U.S. production capabilities to promote national defense while addressing industrial production shortfall issues.[79]

Congress should also increase funding for the Department of Defense's Manufacturing Technology Program, which works with each military service branch to improve manufacturing efficiency by enhancing the technological processes and equipment used to produce weapons systems. Founded in 1968, ManTech's vision is to cultivate a responsive, world-class manufacturing capability to affordably meet warfighters' needs throughout the defense system life-cycle.[80] ManTech's responsibility to anticipate and close gaps in defense manufacturing capabilities makes the program a crucial link between technology invention and industrial applications—from system development through sustainment—giving ManTech a unique identity within the extended defense enterprise.[81] In fact, this unique position explains why ManTech "is sometimes looked to as the champion for not only defense manufacturing technologies, but for the entirety of the defense manufacturing enterprise or even for enhancing US global manufacturing competitiveness."[82] ManTech investments generate significant returns. For instance, ManTech's contributions to improving the wing design of the F-35 Joint Strike Fighter yielded a 32:1 return.[83] This is typical for ManTech investments, which over time have yielded on average a 30:1 return on every dollar invested.[84] In other words, investments made now save substantial money in the long run. Unfortunately, funding for ManTech has declined recently. The program received $283.2 billion in FY 2009, but just $214.9 billion in FY 2012 and is budgeted to receive $223.3 billion in FY 2013.[85] Given the critical need to rebuild the U.S. defense industrial base, to support the mission-critical needs of the U.S. military, and to get a better handle on long-term defense manufacturing costs, Congress should double the program's budget to approximately $450 million annually. This would restore ManTech funding to the levels it enjoyed in the early to mid-1990s, when the program received approximately $400 million annually (in constant FY 2008 dollars).[86] However, to restore ManTech funding to the same share of GDP the program received in the early 1990s, Congress would have to boost ManTech funding to $585 million.

Tax Policy

An increasing number of countries recognize that tax policy is an indispensable tool in building traded sector competitiveness. Unfortunately, in comparison to peer countries, the United States increasingly offers a less supportive tax environment for traded sectors—including manufacturing—and a less attractive environment for globally mobile investment capital. Both Congress and the Administration should work toward effective corporate tax reform to make the United States a more supportive environment for businesses (whether in manufacturing or services) to operate. While comprehensive U.S. tax reform will have

many goals, high among them should be: 1) bolstering the competitiveness of the traded sectors of the U.S. economy; and 2) increasing incentives for investment.

B1. Lower the U.S. effective corporate tax rate

As of April 1, 2012 (when Japan lowered its corporate tax rate), the United States took the mantle of having the highest statutory corporate tax rate at almost 39 percent (when state and federal rates are combined) of any OECD nation.[87] And out of a broader set of 37 nations examined in ITIF's report *The Atlantic Century II* (using World Bank data), the United States was 35th highest in terms of overall effective corporate tax rate.[88] This dubious achievement continues a long trend of faltering U.S. tax competiveness among peer countries. In fact, the United States was the only country in the OECD in which the statutory corporate tax rate did not decline between 2000 and 2010.[89] Meanwhile, the average corporate tax rate among (non-U.S.) OECD countries has fallen from nearly 50 percent in the early 1980s to less than 35 percent in 2001 and to 25.1 percent by 2011, with international tax competition the principal driver behind those reductions.[90] Worse, of ten OECD nations with data going back to 1989, only the United States saw an *increase* in its effective corporate tax rate. The other nine, including nations like Canada, France, Switzerland, and the United Kingdom, all saw reductions.

While simplifying the tax code is important, any tax reform that reduces or eliminates key incentives for investing in R&D, innovation, or capital equipment in traded sectors like manufacturing will only reduce, not boost, U.S. growth and competitiveness.

It's therefore imperative that U.S. policymakers lower the effective U.S. corporate tax rate to bring it in line with international competitors. However, while simplifying and streamlining the tax code should be an important part of this process, any tax reform that reduces or eliminates key incentives for investing in research and development, innovation, or capital equipment in traded sectors like manufacturing will only reduce U.S. growth and competitiveness, not boost them. Indeed, these types of incentives must be retained and expanded amidst comprehensive U.S. tax reform.[91]

B2. Increase R&D tax credit generosity and make the R&D tax credit permanent

R&D tax incentives are one of the most effective policy instruments in spurring a nation's private sector R&D investment. Almost all scholarly studies conducted since the early 1990s find R&D tax incentives to be both effective and efficient. A cross-national study by Wolff and Reinthaler concludes that R&D tax subsidies stimulate at least one dollar of R&D for every dollar of tax expenditure.[92] Studies of the U.S. credit find even greater benefits, with the research investment to tax-cost ratio between 1.3 and 2.9.[93] But while the United States created the R&D tax credit in 1981, and had the world's most generous R&D tax credit as late as 1992, by 2012 the United States has slipped to offering the 27th most generous R&D tax credit out of 41 nations offering the credit.[94] France and Spain offer R&D tax credits over five times more generous than those of the United States, and even Brazil, China, and India have exceeded the United States in R&D tax credit generosity. Moreover, because Congress has historically only authorized the R&D tax credit in two-year increments, it has had to renew the credit 14 separate times in its existence. Thus, U.S. establishments have had difficulty relying on the R&D tax credit as a predictable instrument. To address this, Congress should make the R&D tax credit permanent (or at least authorize it for five-year increments) while increasing the generosity of the Alternative Simplified Credit (ASC) from 14 percent to at least 20 percent.

B3. Make clear that process R&D qualifies for the R&D tax credit

Congress should also broaden the credit's scope to make it clear that process R&D (R&D to develop better ways of making things) qualifies for the tax incentive. This is important because firms invest more in product R&D when they invest more in process R&D, meaning that spurring process R&D also spurs product R&D.[95] Unfortunately, while an increasing number of nations allow process R&D to qualify for the R&D tax credit, U.S. tax policy is at best vague about whether process R&D qualifies, with the IRS regularly denying firms' claims for process R&D.[96] Affirming that investments in process R&D are eligible for the tax credit will encourage more firms to invest in improving productivity while making the United States a more attractive place to expand manufacturing operations.

B4. Establish a 30 percent collaborative R&D tax credit for industry research undertaken in conjunction with universities, research institutes, national laboratories, or multi-firm consortia

Because recommended proposals in this report would ask industry to bear greater responsibility for supporting research at universities, it makes sense to provide more generous tax incentives for firms' collaborative-oriented research expenditures. Indeed, universities now conduct a growing share of research not only on the basis of strategic alliances and partnerships but also through ongoing networks of learning and innovation.[97] Moreover, participation in research consortia has a positive impact on firms' own R&D expenditures and research productivity.[98]

Yet most collaborative research, whether in partnership with a university, national laboratory, or industry consortium, is more basic and exploratory than research typically conducted by a single company. Moreover, the research results are usually shared, often through scientific publications. As a result, firms are less able to capture the benefits of collaborative research, leading them to underinvest in such research relative to societally optimal levels.[99] This risk of underinvestment is particularly pronounced as the economy becomes more competitive, and a reflection of this is the fact that for the first time since the data were collected in 1953, the percentage of U.S. academic R&D supported by industry declined every year from 1999 to 2006.[100] By 2008, funding of U.S. university research by business was just 0.02 percent of GDP, less than two-thirds of the average of 0.032 percent of GDP for 30 nations assessed in ITIF's report *University Research Funding: The United States is Behind and Falling*.[101] In fact, he United States ranks just 21st out of 30 nations in business-funded university research. In countries like Canada, China, Germany, Israel, Korea and the Netherlands, business invests more than twice as much in university research than does business in the United States.[102] One reason U.S. funding for university research has lagged is because university contracts are often undertaken as discretionary activities and are the first to be cut when revenues are down.[103]

Meanwhile, other countries, including Denmark, France, Hungary, Japan, Norway, Spain, and the United Kingdom, provide firms more generous tax incentives for collaborative R&D.[104] For example, Denmark and Hungary provide more generous tax deductions for collaborative R&D with public research institutions.[105] Japan's R&D incentive is almost twice as generous for research expenditures that companies make with universities and other research institutes.[106] France provides a 60 percent flat tax credit for business-funded

research conducted at national laboratories. Canada's Ontario province offers a 55 percent combined state-federal tax credit for R&D projects undertaken with a Canadian university or national laboratory.

The United States does offer an expanded R&D tax credit for industry research undertaken with universities or national laboratories in one field: energy. As part of the Energy Policy Act of 2005, Congress created an energy research credit that allowed companies to claim a credit equal to 20 percent of the payments to qualified research consortia (consisting of five or more firms, universities, and federal laboratories) for energy research. In 2006, legislators proposed several bills allowing all research consortia, not just energy-related ones, to become eligible for a 20 percent flat credit.[107] Congress should go further and allow firms to take a flat credit of 30 percent for collaborative research, in all fields, that is conducted at universities, federal laboratories, or as part of multi-firm research consortia.

B5. Expand the R&D tax credit to cover expenditures for workforce training

Congress can take one step further by transforming the R&D tax credit into a knowledge tax credit by making workforce development expenditures eligible for the R&D credit. The competitiveness of American industry depends in large part on the skills of American workers. Training and ongoing education are critical components of robust productivity growth and rising worker incomes, and training provided on the job by employers is a key way workers gain skills. However, U.S. companies are investing about half the amount in training today as a share of GDP compared to a decade ago, in part because the payoffs increasingly flow to other firms as workers switch jobs more frequently, and because companies are under increasing pressures for short-term profits.[108] Therefore, to spur greater workforce training while at the same time lowering the effective corporate tax rate, Congress should expand the R&D credit to allow expenditures on employee training to count as qualified expenditures.

B6. Strengthen the domestic production deduction

Beyond the R&D tax credit, Congress has an opportunity to reform the corporate tax code to explicitly promote the competitiveness of business establishments in America by expanding, not cutting, other incentives for investment, such as by retaining the domestic production deduction.

While some have called for eliminating the domestic production deduction (Section 199), in part by arguing that it has been applied to the production of hamburgers in restaurants, the fact is that the deduction is overwhelmingly targeted at traded sectors. Traded sectors (e.g., manufacturing, information, mining, etc.) claim about 83 percent of the value of the deductions claimed under this provision, while hamburgers (e.g., food service and accommodations) take just 0.2 percent of the total amount of the deduction. Moreover, at least one study has found that the Section 199 deduction for domestic production increases the incentive to invest domestically.[109] Eliminating this deduction would raise the effective tax rate on manufacturers and other exporting sectors, thereby at the margin leading to reduced exports, greater imports, fewer jobs in these sectors, and lower overall growth. Rather than eliminate it, Congress should expand it as President Obama has proposed for advanced manufacturing firms.

B7. Institute an investment tax credit on purchases of new capital equipment and software

An effective manufacturing strategy needs to be based in part on lower prices for equipment, machinery, and software since these drive productivity and competitiveness. One way Congress could achieve this would be to allow firms to expense, for tax purposes, all the cost of machinery and equipment in the first year instead of having to depreciate the costs over a number of years. This would make the U.S. corporate tax code and U.S. firms more globally competitive.[110]

An investment tax credit would reduce the after-tax price of investment, raising the level of domestic investment and the productivity of workers.

However, an even more effective incentive would be a permanent tax credit on investment in new capital equipment (e.g., machinery, equipment, and software). Some argue that because of the difference between book-tax earnings and accounting earnings that expensing and accelerated depreciation do not have as much of an incentive effect on companies as would an investment tax credit.[111] Moreover, given the decline in capital equipment investment by U.S. manufacturers over the last decade, the non-competitiveness of the U.S. corporate tax code, and the significant decline in U.S. manufacturing output and jobs (and corresponding chronic trade deficits), an investment tax credit can be an important tool in restoring American economic competitiveness.

An investment tax credit would reduce the after-tax price of investment, raising the level of domestic investment and the productivity of workers. This is why economic research has shown that an investment tax credit spurs more investment in new machinery, equipment, and software. Indeed, as Summers and Auerbach found in a seminal study, an investment tax credit will spur investment in equipment.[112] Likewise, in an article titled "The Determinants of Investment," Federal Reserve Bank Chairman Ben Bernanke found that "a one percentage point increase in the investment tax credit raises net equipment investment 1.9 percent…in the first year."[113]

Therefore, Congress should establish an investment tax credit modeled after the Alternative Simplified R&D Credit that provides a credit, but only on all expenditures made above 75 percent of the base level (where the base is the average expenditure on qualifying capital equipment over the last three years).[114]

B8. Implement "patent boxes" to promote R&D commercialization

While R&D tax credits encourage research and development, several countries have recently gone further by creating tax incentives designed explicitly to spur the commercialization of that R&D. These incentives, or "patent boxes" (so-called because there is a box to tick on the tax form), allow corporate income from the sale of patented products to be taxed at a lower rate than other income.[115] For example, Belgium taxes income received from patents at a rate of 0 to 6.8 percent and Ireland at 0 percent. Switzerland has reduced corporate taxes on income from all intellectual property to between 1 and 12 percent. In 2010, the Netherlands expanded this incentive such that income derived from patents or R&D is taxed at just 10 percent, instead of its normal 25 percent rate.[116] Congress should emulate what is working in other countries and allow companies in the United States to pay a rate of half the current statutory corporate rate on income from patented products. Not only would this spur the creation of more innovation-based jobs domestically but it would also lower the effective corporate tax rate

for knowledge-based firms located in the United States, making them more globally competitive.

B9. Expand foreign trade zones to include a value-added tax incentive

Congress should include a value-added tax incentive for investing in foreign trade zones. A large number of nations have reduced corporate income taxes and replaced these revenues with value-added taxes (VATs). In 1989, 48 countries, primarily located in Western Europe and Latin America, had adopted a VAT. By 2007, 143 countries had VATs.[117] One advantage of adopting a VAT is that it is border adjustable, meaning that exports are not taxed whereas imports are, thus improving U.S. competitive advantage. While it may not be politically feasible to replace the corporate tax system with a VAT anytime soon, one option would be to incorporate a VAT function in U.S. foreign trade zones as recommended by Gilbert Kaplan and John Taylor.[118] Foreign trade zones were created in the United States to provide special customs procedures to U.S. plants engaged in international trade-related activities. Duty-free treatment is accorded items that are processed in FTZs and then re-exported, and duty payment is deferred on items until they are brought out of the FTZ for sale in the U.S. market.[119] Establishments in the foreign trade zones would be eligible to pay VAT taxes instead of corporate income taxes and these taxes would be waived on all foreign exports.

Trade Policy

U.S. traded sector firms can thrive when they compete on a level playing field in global markets, but unfortunately the deck is often stacked against them through distortive and discriminatory mercantilist trade practices implemented by scores of nations.[120] Thus, more effective trade policy, especially trade policy more focused on enforcement, is vital so that U.S. traded sector firms can compete on fair terms in global markets. U.S. trade policy should have three central components: 1) trade promotion; 2) trade enforcement; and 3) market opening.

Trade promotion

C1. Better support and align programs to boost U.S. exports

The Obama Administration's National Export Initiative, announced in 2010, seeks to double U.S. exports to $3.14 trillion by 2015.[121] The initiative identifies SMEs that can begin or expand exporting, prepares SMEs to export successfully by increasing training opportunities for both SMEs and SME counselors, connects SMEs to export opportunities by expanding access to programs and events that can unite U.S. sellers and foreign buyers, and improves SME awareness of export finance programs. But these efforts can go further, in part by expanding the Manufacturing Extension Partnership's export assistance program, ExporTech, which is carried out in partnership with the U.S. Commercial Service and other local export resources. The ExporTech program assists participating companies in developing an international growth plan, provides experts who will vet their plans, and connects the companies with organizations that will help them move quickly beyond planning to actual export sales. Doing so is particularly important because MEP is in direct touch with SME manufacturers and thus has a unique perspective into their particular challenges and needs when it comes to exporting.

C2. Promote reshoring

While boosting U.S. traded sector exports (particularly from manufacturing firms) is certainly a desirable goal, it's easier to import less than to export more, and therefore reshoring—bringing the offshored manufacturing operations of U.S.-headquartered manufacturing firms back to the United States—is one of the quickest and most cost-effective ways to stimulate U.S. manufacturing. In fact, one recent study found that 61 percent of U.S. companies offshored more manufacturing than was in their self-interest.[122] This is partly due to the fact that businesses often decide to offshore on the basis of price instead of on total cost, often failing to factor in 20 to 30 percent of the cost of offshoring. In reality, research finds that while U.S. companies have a 30 percent cost disadvantage exporting to China, they have a 20 percent advantage competing against Chinese imports here.[123] Thus, businesses need to stop looking at their unit costs over the last ten years, and instead look ahead at the total cost of production over the next ten years. Tools such as *The Reshoring Initiative's* Total Cost of Ownership (TCO) Estimator provide a Web-based calculation application to help businesses understand the complete costs involved in a decision to offshore manufacturing.[124] NIST's Manufacturing Extension Partnership already encourages SMEs to use tools such as the Total Cost of Ownership Estimator, but the Department of Commerce should work with all manufacturing trade associations to educate their members on this issue and encourage use of the TCO Estimator.

C3. Create global knowledge investment zones to attract foreign direct investment

The federal government should identify a limited number of global knowledge investment zones (about 20) as a key mechanism for attracting high-value-added foreign direct investment. Communities (in partnership with states and universities) would compete to be eligible for designation as a Global Knowledge Investment Zone (GKIZ) by offering various incentives, such as property tax waivers. The zones would be selected through a competitive process and would be located in and around both urban and rural research agglomerations (e.g., Research Triangle, NC; Rochester, NY; or Ames, Iowa). Firms eligible to relocate to the GKIZs would be those moving jobs into the United States—including foreign firms establishing greenfield operations, U.S. firms repatriating jobs back to the United States, or U.S. firms creating new greenfield operations in the United States that otherwise could have been located outside the United States.

Firms located in these zones would be eligible to receive a number of benefits, including: 1) The ability to write off (on federal taxes) all capital expenditures in the first year, including building costs (provided that the employer creates a certain number of jobs and that those jobs pay above the county's median wage); 2) A collaborative R&D tax credit of 25 percent on all expenditures on research made at the associated universities in the GKIZ. For companies that are not yet profitable, tax benefits could be applied against payroll taxes; 3) Streamlined access to university technology, with university zone participants agreeing to implement leading-edge intellectual property and technology transfer practices, including "standardized" licensing agreements and policies to encourage faculty entrepreneurship, industry engagement, and technology commercialization; 4) Access to better-funded NSF I/UCRCs; and 5) Visa preferences by tapping into the unused portion of existing EB-5 visas.

C4. Provide forgivable loans to companies supporting repatriated jobs to distressed/rural areas

Some companies with facilities both in the United States and offshore may shift work back to the United States given modest incentives to do so. If they shift work back to areas with above average unemployment rates, they can play a key role in helping to lower unemployment. Toward that end, as called for by Senator Mark Warner's (D-VA) America Recruits Act of 2011 (S. 1247), Congress should authorize the Economic Development Administration to provide forgivable loans for companies that expand by bringing back jobs from overseas.[125] Eligible companies would have to employ at least 50 full-time equivalent employees (FTEs) in high-value manufacturing jobs, and pay an hourly wage higher than the mean in the county where the company is located. Each company would receive a $5,000 loan per eligible job, with the loan fully forgivable if the employee is employed for at least five years, or else principal and interest would have to be repaid. States would have to match the federal funding on a dollar-for-dollar basis. It's important to note that the difference between this kind of proposal and simple job creation tax credits is that this proposal is targeted at influencing the location of a job that has already been created, rather than at getting a firm to create a new job.

Because the threat to both the U.S. defense industrial base and the U.S. industrial base overall is systemic, the charter of CFIUS needs to be updated to address the realities of modern-age state capitalism—particularly the threat from SOEs.

As further called for in the America Recruits Act of 2011 (S. 1247), Congress should direct the Commerce Secretary to establish a Repatriation Taskforce comprised of a cross-section of relevant government agencies and private sector enterprises that would identify U.S. corporations with production or services located in a foreign country that are interested in repatriating goods or services production to the United States.[126] The taskforce would further help identify the unique needs of each corporation that are necessary to facilitate repatriation and advise state and local governments to promote the facilitation of repatriation opportunities. It would also work with federal agencies to provide technical assistance to companies to facilitate the repatriation of jobs or facilities to the United States.

C5. Update the charter of the Committee on Foreign Investment in the United States (CFIUS) to address the realities of modern-age state capitalism

CFIUS is an inter-agency committee authorized to review transactions that could result in control of a U.S. business by a foreign entity ("covered transactions"), in order to determine the effect of such transactions on the national security of the United States.[127] While the CFIUS process has been the subject of significant reforms over the past several years, including numerous improvements in internal CFIUS procedures, revision of the CFIUS regulations in November 2008, and publication of guidance on CFIUS's national security considerations in December 2008, more needs to be done.[128] In particular, current CFIUS regulations state that examiners must review covered transactions on a case-by-case basis. But in reality, other nations, particularly China, have put in place coordinated strategies to systemically target key defense and industrial technologies resident in U.S. enterprises and attempt to acquire them by having state-owned or-directed enterprises (SOEs) purchase the U.S. entity, using the veneer that these are "market-based" transactions. Yet in many cases, foreign owned- or directed-enterprises can spend sums well beyond what free markets can support in such transactions, with funds flowing surreptitiously from the directing government. Because the threat to both the U.S. defense industrial base and the U.S. industrial base overall is systemic, the charter of CFIUS needs to be updated to address the realities of modern-age state capitalism—particularly the

threat from SOEs—and allow reviewers to move beyond solely case-by-case examinations to allow them to assess and gauge systemic threats and examine covered transactions in a broader context. Moreover, CFIUS reviewers often do not have adequate time to complete a serious analysis, having only 30 calendar days to approve transactions or move them to a second-stage investigation. Therefore, Congress should increase the time period permitted for an initial CFIUS review and also better equip CFIUS with additional personnel and financial resources to support more thorough reviews.

C6. Review export control policies that inhibit U.S. exports

The Obama Administration's Export Control Reform Initiative has begun the effort to implement common sense reforms to streamline and improve the nation's export control system.[129] For example, in March 2012, the Administration opened two new national, multi-agency centers to improve how the U.S. government administers its export control system. However, more can be done. For example, the government should remove outdated U.S. export control restrictions, especially unilateral burdens placed on widely available ICT products or software. For instance, the United States could remove performance-based controls on commercial scalar computers and associated technology, because access to computing power is so widely available that U.S. export controls on commercial computers are no longer effective and undermine U.S. technology competitiveness and national security. The United States could also remove encryption controls on products and components that are, or will be, widely available or deployed, do not contain encryption as their primary function, or are not peculiarly responsible for creating a military- or intelligence-related advantage.

Trade enforcement

C7. Develop a national trade strategy and increase funding for U.S. trade policymaking and enforcement agencies

For too many years, the U.S. trade policymaking environment has suffered from underfunding and a lack of strategic direction. The U.S. Trade Representative's Office (USTR) too often engages in fighting the last wars—the tariff war and the war to sign one more trade agreement, even when the agreement fails to strongly protect U.S. economic interests. It isn't set up to fight the current war—the war against rampant innovation mercantilism fueled by a wide array of non-tariff barriers. As such, the Administration should establish strategic trade priorities and policies designed to provide a fair playing field on which U.S. manufacturers can compete. Ultimately, U.S. trade policy should measure success not by the number of deals signed (although this remains important), but by the overall results achieved.

But to achieve this, U.S. trade agencies need more resources in terms of funding and personnel. Currently, much of the U.S. Trade Representative Office's budget is devoted to negotiating new trade agreements as opposed to vigorously enforcing existing agreements. Therefore, Congress should increase USTR's budget for new resources devoted to enforcement and the fight against unfair foreign trade practices. In particular, Congress should authorize and appropriate $5 million to create an Office of Globalization Strategy within USTR, run by a Deputy for Globalization Strategy. An interdisciplinary team of about 20 individuals, including economists, policy analysts, and attorneys, would staff the

office. They would offer a diverse skill set and have experience in a variety of realms such as competition policy, regulatory policy, standards, and technology policy. This group would be charged with *systems thinking* about the design of U.S. trade policy in the context of globalization to ensure renewed U.S. competitiveness. One of the Office's objectives would be to develop a framework for addressing state capitalism as part of a U.S. national trade strategy. In addition, it would focus on key strategic industries critical to the economic future of the U.S. economy (e.g., ICT, life sciences, aviation, etc.) and monitor foreign trade practices with an eye toward understanding their impacts on these key industries.

Congress should create within USTR an ambassador-level U.S. trade enforcement chief and also fully fund the $26 million requested by the Obama Administration in the FY 2013 budget to create an Interagency Trade Enforcement Center.[130] Beyond USTR, Congress should also increase funding for customs and border protection agencies focused on trade enforcement—including those engaged in combatting IP theft, counterfeiting, dumping, etc.—while heightening focus on particular countries, such as China, which continue to implement egregious mercantilist practices.

C8. Exclude mercantilists from the Generalized System of Preferences (GSP)

In 1976, in the midst of the Cold War, the United States launched a new development assistance program called the Generalized System of Preferences. It eliminated duties on thousands of products from developing countries, intending to promote economic growth through a "trade, not aid" approach. In 2010, $22.5 billion of imports from the 129 GSP-beneficiary countries entered the United States duty-free, saving the exporting countries $682 million in import duties.[131] While the goal of promoting economic growth in these countries is admirable, some of the top GSP beneficiaries are counties like Argentina, Brazil, Russia, and Venezuela which restrict many U.S. exports to their markets, have long failed to maintain adequate intellectual property rights protections and engage in rampant mercantilism. In fact, of the top 20 GSP-beneficiary countries, 12—Argentina, Brazil, Bolivia, Colombia, India, Indonesia, Pakistan, the Philippines, Russia, Thailand, Turkey, and Venezuela—are on the U.S. Trade Representative's Special 301 Watch List (which documents countries that fail to adequately protect U.S. companies' or individuals' intellectual property rights). Congress should amend the GSP authorizing legislation such that any country on USTR's Special 301 Watch List becomes ineligible to receive GSP status.

C9. Ensure U.S. and multilateral foreign aid policies don't act as mercantilist enablers

The Administration should charter an inter-agency taskforce that includes the State Department, the U.S. Agency for International Development (U.S. AID), Commerce, USTR, Justice, Labor, and other agencies to identify cases where U.S. foreign aid policy acts as a mercantilist enabler. For example, the Obama administration has promised to help China develop commercial jetliners, despite commercial jet aircraft being one of the precious few manufacturing industries in which the United States is a strong exporter.[132] Such a taskforce should recommend specific actions, including tying U.S. foreign aid to a reduction in other countries' mercantilist practices using formal and informal diplomacy, and pursuing trade enforcement actions. The taskforce should also issue an annual notice of inquiry to allow interested parties to report foreign mercantilist practices adversely affecting U.S. economic competitiveness. Likewise, the taskforce should pressure

institutions such as the World Bank, the International Monetary Fund, and the Inter-American Development Bank to make a firm commitment that it will stop encouraging policies designed to support countries' export-led growth strategies and that it will cease supporting countries that field innovation mercantilist strategies such as currency manipulation, IP theft, or forced technology transfer as a condition of market access.

C10. Combat foreign currency manipulation

Market forces, not government intervention, should set currency markets (as is true for virtually all markets). Yet, too many nations manipulate their currencies for competitive advantage.[133] In fact, trade analysts at the Peterson Institute for International Economics have found that, between May and October 2010, no less than 17 nations—Argentina, Brazil, China, Chinese Taipei, Hong Kong, India, Indonesia, Israel, Japan, Korea, Malaysia, the Philippines, Singapore, South Africa, Switzerland, Thailand, and Turkey—intervened in currency markets to prevent their currency from appreciating.[134] China is the linchpin to the system of currency undervaluation that compels other nations to also intervene in markets to manipulate the value of their currencies. This practice hurts the American economy in particular, especially since the dollar is not manipulated for competitive advantage. It's made worse by the Treasury Department's persistence in defending a strong dollar even as the nation runs massive trade deficits.

There is much that can and should be done. After its next review of China's currency, the Treasury Secretary should publicly acknowledge what everyone knows: China manipulates its currency for competitive advantage. Moreover, administration officials and Members of Congress should stop arguing that a strong dollar is in America's interest. In fact, what is in America's interest is a dollar whose value is set by market forces, not U.S. or foreign government action. If the market is calling for a lower value of the dollar—which any well-functioning market would given America's massive trade deficit—then a lower value of the dollar is in America's national interest. More proactively, the House of Representatives, like the Senate, should pass and the President should sign legislation that would require retaliatory tariffs on nations found to have misaligned currency.[135] Further, to help address unfair currency manipulation, Congress should amend countervailing duty law so that unfair currency manipulation will be taken into consideration when calculating countervailing duties. In addition, the U.S. Trade Representative's Office should bring a currency manipulation case against China before the World Trade Organization, ideally in partnership with the European Union.

C11. Encourage companies to bring WTO cases by allowing them to take a 25 percent tax credit for expenditures related to bringing WTO cases

Even if Congress gives the USTR more resources, government alone cannot investigate all potential WTO cases. The private sector is deeply engaged in the problems caused by unfair trade practices, while the government is a step away. Why don't companies do more? It's in part because they have an incentive to be "free riders"—to take advantage of cases filed by the government. Companies that do bring cases to the USTR are acting on behalf of Americans as a whole. Congress should help companies do so by giving them a 25 percent tax credit for expenditures related to bringing a WTO case.[136]

C12. Forge new trade agreements, including a high-standard Trans-Pacific Partnership (TPP) and a Trans-Atlantic Partnership (TAP)

While the United States needs to invest more resources in robustly enforcing existing trade agreements, continuing to liberalize trade and to open up new markets for U.S. exports remains important. The United States has free trade agreements (FTAs) in effect with 18 countries.[137] This includes recently passed free trade agreements with Colombia, Korea, and Panama.

A transatlantic economic and trade pact could increase combined U.S.-EU GDP by $180 billion in just five years.

But the Administration and Congress should not stop there. To be sure, the Administration is currently negotiating U.S. entrance into the Trans-Pacific Partnership, an FTA that would promote increased regional economic integration across eleven Asia-Pacific nations: Australia, Brunei Darussalam, Canada, Chile, Malaysia, Mexico, New Zealand, Peru, Singapore, Vietnam, and the United States.[138] As ITIF has argued, it's vital that the TPP represent a true model for 21st century free trade agreements, holding nations who sign it to the very highest standards regarding intellectual property rights protections, transparency and openness in government procurement practices, restrictions on preferential treatment toward state-owned enterprises (SOEs), transparent standards-setting processes, comprehensive tariff reductions, elimination of a host of non-tariff barriers, elimination of currency manipulation, and at least an equal, if not greater, emphasis on enforcement as on market access.[139]

But whereas the United States currently has only one new trade agreement under negotiation in the TPP, the European Union is actively negotiating free trade agreements with Canada, India, Malaysia, Singapore, and the Ukraine, as well as with the ten ASEAN (Association of Southeast Asian Nations) countries of Brunei, Burma, Cambodia, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, and Vietnam and the six GCC (Gulf Co-operation Council) member countries of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.[140]

The United States needs to be more aggressive in pursuing bilateral and multilateral free trade agreements, and one way to do so would be by pursuing a Trans-Atlantic Partnership. The United States should take the lead in working with Canada and other commonwealth nations, the European Union countries, and possibly Japan to create a new trade zone, but one involving only those countries genuinely committed to adhering to the principles of open, free, and fair trade.[141] While Europe and the United States certainly engage in occasional disputes over trade, by and large they both respect intellectual property rights, the rule of law, the primacy of markets in setting currency prices, the primacy of private investors in determining the location and nature of their investments, and other free trade principles. Not only would a TAP provide a true model free trade agreement, studies estimate that a transatlantic economic and trade pact could increase combined U.S.-EU GDP by $180 billion in just five years.[142] Moreover, by demonstrating that the United States and the European Union stand shoulder to shoulder in defense of a global trading system grounded in market forces and the rule of law, they would put pressure on mercantilist nations like China (and increasingly Brazil and India) to play by the rules or risk being left behind.

Talent Policy

For traded sector establishments in the United States to effectively compete, they need access to a highly skilled workforce. For example, Deloitte's Manufacturing Competitiveness Index survey of manufacturing executives found that access to high-quality talent, including scientists and engineers, was those executives' top-ranked factor for manufacturing competitiveness.[143] U.S. manufacturing jobs increasingly require individuals possessing higher skill levels.[144] In fact, 51 percent of the workforce demand in manufacturing is currently for skilled production workers, 46 percent for scientists and engineers, and only 7 percent for unskilled production workers.[145] Therefore, ensuring the U.S. workforce possesses requisite skills is vital to ensuring traded sector competitiveness. An effective national strategy should include a range of talent policies that: 1) equips the workforce with requisite technical skills; 2) supports high-skill talent development; 3) promotes entrepreneurship; and 4) attracts high-skill foreign-born talent.

D1. Fully fund a nationwide manufacturing skills standards initiative

The National Skill Standards Act of 1994 created a National Skill Standards Board (NSSB) responsible for supporting voluntary partnerships in each economic sector that would establish industry-defined national standards leading to industry-recognized, nationally portable certifications. The vision was that each industry define and validate national standards for the skills it was seeking and credential individuals against those skills. One key reason for doing this was so that companies would have a better way to assess the skills of prospective and current workers and so that workers would have a better way to identify and gain the skills they need to be successful.

But while manufacturers stepped up to the plate to organize such a system through the Manufacturing Skill Standards Council (MSSC), the federal government failed to provide matching funding to establish this standards-based system. Moreover, in the 2000s, the national approach was abandoned in favor of a regional approach (embodied in programs such as the Department of Labor's Employment and Training Administration's WIRED—Workforce Innovation for Regional Economic Development—initiative) which contributed to an uncoordinated proliferation of certifications at the regional and state levels. What's really needed is a national approach, so that employers can more readily find workers with the right skills for advanced manufacturing and workers can be confident their skills will be recognized similarly by employers across the entire country.

Therefore, Congress and the Administration should work to increase credentialing for the manufacturing and the closely related logistics industry workforce members by expanding the use of standards-based, nationally portable, industry-recognized certifications specifically designed for specific manufacturing and logistics sectors, such as those developed by the MSSC and supported by the National Association of Manufacturers-endorsed Manufacturing Skills Certification System.[146] As the nation's only national certification body accredited by ANSI under globally applicable ISO-17024 (Personnel Certification) standards in manufacturing and logistics, the MSSC can provide both the leadership and expertise to support the build-out of the national standards and certification model originally envisioned by NSSB.

In particular, the Secretary of Labor and the Secretary of Education, in conjunction with the Secretary of Commerce, should ensure that industry-approved certification standards are established and available nationwide to providers of manufacturing and logistics education and training programs by providing the funding needed to fully establish and disseminate this initiative. Further, Congress should support the America Works Act, which would tie federal funding for workforce development to industry-recognized, nationally portable skills credentials.

D2. Expand manufacturing vocational education programs at community colleges

The community college system is a critical partner in training the current and future workforce. Community colleges play a vital role in training job seekers with the skills to obtain a good job while simultaneously helping manufacturers obtain the workers they need to stay competitive. In fact, more than half (55 percent) of the 1,600 community colleges in the United States offer specialized training in manufacturing skills.[147] Congress should boost support for community colleges, in part by increasing funding for Perkins vocational education and training programs. One way Congress can do this is to support the Obama Administration's FY 2013 budget request for $8 billion to fund a "Community College to Career Fund" for community colleges to partner with businesses to train two million workers in a range of high-growth areas such as advanced manufacturing, while earning industry-recognized credentials.[148] These funds should go in part toward expanding manufacturing technology development and training programs at community colleges. Congress should also reform the Workforce Investment Act system to allow more funds now going to Workforce Investment Boards to instead go to industry-led regional skills alliances.

D3. Expand funding for NSF's Advanced Technological Education program

Skilled technicians are a key component of the traded sector workforce. One highly successful program designed to build technician skills is NSF's Advanced Technological Education (ATE) program, which supports community colleges working in partnership with industry, economic development agencies, workforce investment boards, and secondary and other higher education institutions. Since its inception in 1994, the program has made 265 manufacturing awards totaling $205 million.[149] ATE projects and centers are educating technicians in a range of fields, including nanotechnologies and microtechnologies, rapid prototyping, biomanufacturing, logistics, and alternative fuel automobiles. Notwithstanding this, ATE funding is quite small, at around $50 million per year. Congress should expand funding for the ATE program to at least $100 million per year.

D4. Provide federal funding for more science, technology, engineering, and mathematics (STEM) high schools

The manufacturing sector needs more college graduates with science, engineering, computer science, and math degrees. There are efforts at the K-8 level to encourage developments in these areas, but more can and should be done at the high school level. Congress should provide more funding for math and science high schools, also called "STEM" high schools. STEM high schools are publicly funded schools that offer more extensive, in-depth math and science coursework than is available in traditional public schools.[150] There are approximately 100 math and science high schools in the United

States, enrolling around 47,000 students.[151] These schools are highly effective at producing STEM talent, with 99 percent of math and science high school graduates enrolling in college, and 80 percent of those graduates intending to earn a master's or doctorate degree.[152] But because STEM graduates are national resources, local school boards have little incentive to create STEM-focused schools. Congress should allocate $200 million a year for 10 years to the Department of Education, to be supplemented by states, local school districts, and industry, toward the goal of quintupling the number of STEM high schools to 500 and increasing enrollment to around 235,000 by 2015.[153]

D5. Create an NSF-Industry Ph.D. Fellows program

Increasing linkages with industry for doctoral STEM students can improve the quality of research and education. To increase these linkages, Congress should appropriate $21 million per year for the establishment of an NSF-Industry Ph.D. Fellows Program, to support an additional 1,000 Ph.D. students in STEM fields. The new NSF-industry program would work by enabling industry to contribute $20,250 toward each fellowship, in whatever field(s) the company chooses. NSF would match industry funds dollar-for-dollar.[154]

Industry sponsorship of science and engineering doctoral students is a proven model for establishing lasting ties between industry and university research.

With such a program, individual companies could commit to supporting American residents in any fields of interest to the companies. Students would of course be under the supervision of their university faculty, and ultimately their dissertation advisor, but the company would be able to build a relationship with the student. For example, the company might offer the student a summer internship at one of its company's laboratories, helping the student get a better sense of the actual research challenges the company faces. This approach would have two advantages over the regular NSF fellows program. First, by leveraging industry funds, federal dollars would go twice as far. Instead of having to appropriate $42 million to fund 1,000 additional fellowships, NSF could appropriate $21 million instead. Second, and more important, engaging industry as a partner would help selected graduate students better understand how research is conducted in industry and the interdisciplinary nature of today's innovation process.[155]

D6. Expand and modify NSF's Integrative Graduate Education and Research Training (IGERT) program

Industry sponsorship of science and engineering doctoral students is a proven model for establishing lasting ties between industry and university research. Better incorporation of educational experiences in design, innovation, entrepreneurship, and industrial research into graduate science and engineering programs is needed. One way to achieve this would be by expanding and modifying the NSF Integrative Graduate Education Research Training program to support cross-disciplinary graduate education and research in these areas.[156] A major new program similar to the IGERT program should also be established to support post-doctoral scholars whose work spans not only academic disciplines but also industry-university boundaries. Such a program should also encourage and assist universities to provide post-doctoral scholars with research experiences in industry.

D7. Provide support for recent Ph.D. graduates to work with SME manufacturers

A number of countries—including Australia, Canada, Germany, and Korea—have introduced programs that seek to facilitate the transfer of new knowledge from universities

to SMEs by co-financing the placement of recent Ph.D. graduates with SME manufacturers. For example, Australia's *Researchers in Business* grants allow businesses to bring a researcher from a university or public research agency into the business to help develop commercial ideas. Australian businesses selected to receive a *Researchers in Business* grant obtain funding for up to 50 percent of salary costs, to a maximum of $53,000, for each placement for between 2 and 12 months. In a similar program, Canada's IRAP provides direct financial support for Youth Employment in Canadian SMEs, funding up to $30,500 in salary for 12 months for recent college or university graduates employed by SMEs.[157] Congress should create a grant program to benefit SMEs that would defer the cost of (or perhaps provide an R&D credit for) hiring recent university master's or doctoral graduates for up to a 12-month period. These funds should go directly to students as fellowships, a cost-effective approach that would both target industry needs and students' passion in the field.

D8. Expand high-skill immigration, particularly that focused on the traded sector

High-skill immigration plays a key role in contributing to a country's knowledge and skills pool. The United States has benefitted immensely from attracting foreign-born talent. For example, Chinese and Indian-born entrepreneurs ran 29 percent of Silicon Valley companies started between 1995 and 1998,[158] and more than half of Silicon Valley's start-ups from 1997 to 2007 were founded by at least one foreign-born immigrant.[159] While many nations, such as Canada, have implemented explicit strategies to attract internationally mobile skilled workers,[160] the United States has a de facto low-skill immigration policy. To change that, Congress should provide automatic permanent residency status (green cards) for foreign students who graduate with a master's or Ph.D. degree in STEM fields, as proposed in the bi-partisan Startup Act 2.0. Further, Congress should create a "Start-up Visa": a temporary visa that can become permanent for foreign immigrants who start companies in the United States. Finally, the United States should also create a system whereby H-1B visa fees float directly with the unemployment rate, with fees for H-1B visas being low when unemployment rates are low and vice versa. Preference for awards of H1-B and EB-1 visas should also be given to traded sector firms and tied to the extent that immigrants will contribute to U.S. traded sector strengths. (There is little economic rationale to award H1-B visas to occupations such as nurses and teachers, as there are no real shortages in these fields that better working conditions and higher wages would not fix.)

Traded Sector Finance Policy

While the U.S. financial system has some strengths, particularly its ability to funnel capital to high-growth startups (although, even here, the system is not working as well as it did a decade ago), its ability to fund existing firms in traded sectors such as manufacturing is less robust. This is especially true in comparison to countries such as Germany, where the senior management and boards of companies have committed to long-term value creation as their governing objective, as Alfred Rappaport explains in *Saving Capitalism from Short-Termism*: *How to Build Long-term Value and Take Back Our Financial Future.*[161] The German system does a much better job of funding manufacturing, particularly for privately owned mid-sized companies (e.g., the *Mittelstand*). Germany's system appears to be better at enabling entrepreneurs and SMEs to build up their businesses over decades, rather than

requiring companies to generate superior returns in the next quarter, which limits their ability to invest for long-term competitiveness. However, compared to the American system, it is not as effective at funding high-growth startups. The ideal financing system does both well.

For the United States, the challenge is to have better access to more patient capital to fund, as former Intel CEO Andy Grove calls it, "scale up"—the process of taking innovations and bringing them to the market through production in the United States on a broad scale. As such, ensuring that U.S. traded sector firms have sufficient access to capital to support their operating, expansion, and exporting activities should be a key goal of a U.S. traded sector competitiveness strategy. While it's not clear exactly what the right answer is for the United States, there are several options Congress should explore and consider in greater detail:

E1. Create Manufacturing Reinvestment Accounts

To help SME manufacturers bootstrap themselves, Congress should establish a 401(k)-like "deferred investment" program for SME manufacturers allowing them to make tax-deferred investments into manufacturing reinvestment accounts, where the funds can be subsequently withdrawn tax-free if used for research and development, workforce training, or capital equipment investments. In 2011, Connecticut put such a program in place for its SME manufacturers.[162]

E2. Authorize the Ex-Im Bank to provide loan assistance to SMEs and to firms competing against subsidized foreign competitors

As Andy Grove has noted, while the United States excels at inventing new technologies (e.g., microprocessors, solar cells, rechargeable electric batteries, etc.), in many cases it has been less successful in scaling production of these technologies and capturing high levels of global market share (which is where the profits are made from new technologies).[163] While scaling can be challenging for all manufacturers, it can be particularly daunting for SMEs. Therefore, one option is to expand the remit of the U.S. Export-Import Bank and allow it to provide direct SME loan assistance to U.S. manufacturers, particularly for scale-up activities.

One model here is the KfW Bank in Germany. KfW is a government-owned development bank, established at the end of World War II at the urging of the Allies to help reconstruct the war-torn German economy. The bank raises funds in part through issuing government-backed bonds. While it does fund some housing, especially energy-efficient housing, it also provides export financing and funding for small and medium enterprises.

Further, Congress should authorize the Export-Import Bank to go beyond providing export credit financing by leveraging the resources of the Bank to help create domestic manufacturing jobs. In particular, Congress should allow the Bank to use $20 billion in unobligated authority to lend directly to domestic manufacturing companies that are in competition with subsidized foreign competitors (e.g., competitors who receive subsidies in the form of grants, subsidized loans, special tax treatment, beneficial land use, etc.). The loan recipients should be able to demonstrate how the funds would support expanded manufacturing activities and employment in the United States.

E3. Transform Fannie Mae into an industrial bank

A more radical proposal would be to repurpose Fannie Mae into an industrial support organization, not a housing finance organization. The very existence of Fannie Mae reflects the fact that America has put more emphasis on housing than on traded sectors such as manufacturing. And the results have been clear over the last 15 years, as manufacturing capital stock and investment growth was anemic while housing boomed (and, as we unfortunately know, went bust). There is little rationale for continuing to subsidize housing, but a strong rationale for supporting traded sectors. The new Fannie Mae (perhaps called the Federal National Industrial Mortgage Association) would buy loans made to traded sector firms from banks and other lenders and sell them on the secondary market.

E4. Shift the Small Business Administration's focus more toward traded-sector firms

The U.S. Small Business Administration (SBA) should focus more on traded-sector firms through its financing programs, including its 7(a) loan guarantee program. However, the SBA does not appear to give any special priority or focus to traded sector firms, treating all industries alike in its funding priorities, in large part because this is SBA's charge from Congress.[164] But there are significant differences for U.S. job creation and prosperity between a small manufacturer and a small retail firm, for example. The former plays a significantly more important role in driving economic growth and—through the multiplier effect—jobs. Moreover, the United States will anyway have all the retail firms it needs (e.g., that the market demands), since the sector isn't traded. As such, Congress should require the SBA to develop a report for Congress within six months on two items: an analysis of all SBA financing by sector (e.g., how much financing went to manufacturing, retail trade, personal services, information, etc.) and a plan for how SBA can significantly increase the share of SBA financing going to firms in traded sectors. Congress should then require that a significant share of SBA lending—both guarantee and direct lending—go to fund scale-up activities for SMEs in traded sectors. Moreover, the SBA should work with traded-sector firms in designing better programs, better credit vehicles, more outreach, and so forth.

E5. Assist SMEs in traded sectors in obtaining access to credit, in part by creating a loan guarantee program

Particularly in the wake of the recession, small manufacturers are having a difficult time accessing credit from financial institutions, and several policies could help remedy this. First, to help small manufacturers that have work orders in hand get credit, Congress should enact a 95 percent loan guarantee program for small manufacturers under the SBA 7(a) guarantee program. Second, the Federal Reserve should consider relaxing some of the stringent guidelines it has placed on local banks with regard to the liquidity ratios SME manufacturers must meet to be eligible for commercial loans. This would allow local banks to better understand and service SMEs' capital requirements, given their particular cash flow constraints.[165]

Smarter Regulations on Traded Sector Firms

Some manufacturing advocates assume that all that's needed to revitalize American manufacturing is to reduce taxes and regulations. It is clear that corporate taxes are too high relative to our competitors and should be reduced. But it would be a mistake to

believe that all the United States needs to do is cut taxes and regulations and that all will be well. Absent the other three "Ts"—technology, trade, and talent—the impacts of tax and regulatory reduction would be at the margin. Moreover, if, for example, the federal government eliminated all regulations regarding worker health and safety, perhaps some additional traded sector jobs would be created, but at a cost to worker well-being. This is not to say that we need more regulation. But rather than focus on a binary debate about more or less regulation, policymakers should be focusing on how to ensure that regulation is smarter.

The United States needs to move toward a regulatory system that treats all firms alike with regard to size. Where policy does need to make a distinction is on the basis of whether a firm is in an industry facing global competition or not.

Over the last quarter century, the principal way this has been achieved is through cost-benefit analysis of regulations that are estimated to have more than a *de minimis* economic effect.[166] But there are two key limitations with this approach. First, cost-benefit analysis is a static process and does not meaningfully take into account the impacts of regulation on innovation, which in some cases might be even greater than the impacts on statically measured costs. Second, it treats all industries as alike, even though added costs on traded sectors impact the economy more than added costs on non-traded sectors. In fact, recent reviews and recommendations regarding regulatory reform largely ignore both of these issues and focus more generally on reducing regulatory costs.[167] There are several key actions Congress and the Administration should take to more effectively measure the impact of regulations:

F1. Form an Office of Innovation Review in OMB (i.e., an Office of Information and Regulatory Affairs for Innovation)

All too often federal agencies propose regulations with little consideration given to their effect on innovation. The relative absence of innovation from the agenda of many relevant federal agencies—as well as from interagency processes such as the centralized cost-benefit review performed by the Office of Information and Regulatory Affairs (OIRA) within the Office of Management and Budget (OMB)—manifests the confluence of two regulatory challenges: first, the tendency of political actors to focus on short-term goals and consequences; and second, political actors' reluctance to threaten powerful incumbent actors. And while OMB could play this role, through OIRA it focuses largely on reviewing federal agencies' cost-benefit analyses.

To remedy these problems, Congress should create within OMB an Office of Innovation Review (OIR) that would have the specific mission of being the "innovation champion" within these processes.[168] OIR would have authority to push agencies to either affirmatively promote innovation or achieve a particular regulatory objective in a manner least damaging to innovation. OIR would be authorized both to propose new agency action and to respond to existing agency action. Federal agencies would be subject to a requirement that they consider and respond to OIR's analysis. Notably, OIR would not be designed to thwart federal regulation; as a matter of fact, in some cases, the existence of OIR might lead to increased federal regulation (e.g., more Environmental Protection Agency regulations might pass muster under cost-benefit analysis if innovation-related effects were calculated).

Some might question the significance of this proposal. Isn't creating an OIR a fairly small change to the system? Certainly adding OIR to the existing mix is a small change compared to jettisoning the existing substantive agencies in favor of a new agency with authority to

regulate and promote innovation across all government agencies. But implementing this proposal would significantly change the regulatory environment. First, an entity focused on innovation would add an important new voice to the regulatory conversation. There would now be an entity speaking clearly and forthrightly on the centrality of innovation. Second, and more importantly, OIR would have more than just a voice; it would be able to remand agency actions that harm innovation. It would also propose regulation that benefits innovation as part of its mission. This is no small matter. Indeed, it would change the regulatory playing field overnight.

To those who might oppose an OIR on the grounds that making predictions about the future is very difficult and that experts are often wrong when they make such predictions, the response is straightforward: Agencies are already making predictions about the future (whether consciously or not) when they interpret laws (e.g., make regulations) that affect innovation. But they are doing so in a manner that is unsystematic, haphazard, and subject to undue influence by well-funded incumbents. We can do better.

F2. Require OIRA to incorporate a "competitiveness screen" in its review of federal regulations

With the consumer and environmental movements that emerged in the 1960s, the federal government began to play a larger role in social and environmental regulation. The intent of these regulations was to protect consumers, workers, and the environment. In an era when global trade was minimal and the dominance of U.S. competitiveness was largely assured, the nation could afford to impose new regulatory requirements with little thought given to their impact on the competitiveness of traded sectors. Those days are gone.

In an era when global trade was minimal and the dominance of U.S. competitiveness was largely assured, the nation could afford to impose new regulatory requirements with little thought given to their impact on the competitiveness of traded sectors. Those days are gone.

Today, regulation can and does increase costs on industries in traded sectors that in turn make them less competitive globally. And while regulatory-based cost increases on non-traded sectors can represent a transfer payment—raising prices in some industries with offsetting benefits to society—with no net jobs impact, the same is not always true with regard to cost increases in traded sectors which can lead to net U.S. job losses. To the extent federal regulation makes distinctions between companies, it's on the basis of size, with the view that if a firm is small that somehow relieves it of regulatory burdens that larger firms face. In most cases, this just penalizes larger and usually more productive firms while protecting smaller and usually less productive firms. As a general rule, the United States needs to move toward a regulatory system that treats all firms alike with regard to size. Where policy does need to make a distinction is on the basis of whether a firm is in an industry facing global competition or not.

In many cases, agencies have choices with regard to how they meet the public interest goals such as worker safety and environmental protection, and these choices may have significantly different impacts on competiveness. According to one academic study that reviewed the impact of environmental regulations on competitiveness, "The form of regulation may be as important as its stringency in determining the nature of its relationship with competitiveness."[169] But regulatory bodies are often indifferent to these choices, seeking only to achieve their particular goal in the easiest and most straightforward way possible.

To address this, regulatory agencies seeking to impose regulations that affect traded sectors in non-trivial ways should be required to have these regulations undergo a review by OMB's OIRA for their first-order competitiveness impact. NIST's expanded Innovation and Industry Services division (see below) can play a key supportive role in this analytical process. For example, environmental regulations that might directly affect how semiconductors are produced would be required to undergo review. However, regulations affecting what local governments must do to treat wastewater would not. While this might have second-order impacts on traded sectors (e.g., municipalities' costs could increase, thereby requiring them to raise taxes on traded and non-traded sectors), it would not directly affect traded sectors. Given the limited amount of time and attention available for regulatory review, the highest priority should be placed on reviewing those regulations that directly impact traded sectors.

F3. Increase the participation of industry in the formal federal rule-making process

Business regulatory compliance costs U.S. businesses tens of billions of dollars annually.[170] Increasing industry's participation in the federal rule-making process would help reduce the complexity of regulatory compliance, emphasize cost/benefit analysis, and restrict the executive branch's impulse to "legislate by regulation."[171] In this regard, Congress should consider passing the "Regulations from the Executive in Need of Scrutiny" (REINS) Act, which would require both houses of Congress to affirmatively approve, and the president to sign, any "economically significant regulation," defined as any administrative rule with a projected impact to the U.S. economy exceeding $100 million, before it becomes law.

F4. Streamline regulatory compliance procedures for companies

The length of time and amount of money businesses must spend navigating the complex regulatory permitting process is a serious disincentive to invest in traded sector industries in the United States. The Department of Commerce should establish a one-stop shop to help companies navigate the complex U.S. regulatory framework and expedite the permitting process. It should also develop an online "Turbo Regulation" application that allows companies to complete the required "paperwork" in an easy to fill out Web form over the Internet.

Enhancing Federal Government Capabilities to Analyze Traded Sector Competitiveness

Notwithstanding the hundreds of millions of dollars spent every year and the thousands of economists working for the federal government, the exact nature of U.S. capabilities and challenges with regard to the competitiveness of its traded sectors are only weakly understood. At least since after the Great Depression, the federal government has never felt the need to develop strategic economic intelligence to fully understand the competitive position of its traded sectors.[172]

As George Washington University scholar Andrew Reamer notes, the opaqueness and limitations of our national statistical system for measuring innovation, productivity, and competiveness makes achieving this insight daunting.[173] Established after World War II, the system was designed to help facilitate fiscal and monetary policy in order to avoid another Great Depression, and as such, measured things like the number of houses built

and cars manufactured. It did not measure the competitiveness of the wood products industry or innovation in the auto industry or any other number of important matters, for the assumption was that these things took care of themselves.[174] Besides, America was so dominant it didn't matter.

If governments (both federal and state) are going to develop more effective policies to spur traded sector competitiveness, including in manufacturing, they need to get much smarter. The very existence of government policies (tax, trade, regulation, spending, etc.) means that government inevitably influences innovation, sometimes for good, sometimes for ill, but almost always by happenstance. Government would be much better positioned to effectively support competitiveness if it were more strategic, knowledgeable, and coordinated. Several key steps need to be taken:

G1. Increase funding for key federal statistical agencies assessing traded sector competitiveness and create a national statistical agency

Years of budget constraints have meant that U.S. statistical agencies lack the resources needed to effectively measure key elements of the traded economy. There are numerous examples, many of which should be rectified through increased or restored funding:[175]

- The Census Bureau should do a better job of measuring data on imports and exports in its Annual Survey of Manufacturers.
- The Bureau of Economic Analysis (BEA) no longer measures manufacturing foreign direct investment specifically and can't distinguish between "greenfield" new plant investment in the United States and foreign purchases of existing U.S. establishments.[176]
- The International Labor Comparisons Program at the Bureau of Labor Statistics (BLS), which produces timely, high-quality international comparisons of labor force, productivity, hourly compensation, and prices for many industrialized countries, is slated for termination in the Administration's FY 2013 budget.
- BLS reporting of state level data on manufacturing property, plant, and equipment data ended in 2007.
- BLS lacks and needs to build an import price index so it can fix the productivity measurement problem with regard to imported manufacturing inputs.[177]
- NSF needs to produce industrial R&D data in a timelier manner, as the most recent data is from 2008. It would also be helpful if the NSF data reported on three distinct components: scientific research, engineering research, and development.
- BEA should improve its existing annual surveys and five-year benchmark surveys of companies with facilities overseas to identify the type of products manufactured abroad and the number of employees at these facilities.

But at the same time, it makes little sense to have separate economic statistical agencies. Other nations combine theirs into national statistical agencies, we should do the same.

NIST's Innovation and Industry Services division should develop strategic roadmaps and guide inter-departmental collaboration to ensure that the regulatory policies and activities of disparate government agencies, are, wherever possible, aligned to promote the global competitiveness of strategic sectors of the U.S. economy.

G2. Create a new traded sector analysis unit within the federal government

It's not enough for the federal government to just collect better data; it needs to analyze it and add value to it. Unfortunately, the federal statistical agencies, with perhaps the exception of the Center for Economic Statistics at the Census Bureau, do little to interpret their own data. The result is that needed competitiveness analyses do not get produced. One reason why is because there is no entity in the federal government tasked with performing competitiveness analysis. The statistical agencies see their job as reporting "just the facts, ma'am; analysis is not our job." To remedy this, Congress should task NIST with the creation of a new traded sector analysis unit which prioritizes interpretation and analysis over collection and aggregation.

Years of budget constraints have meant that U.S. statistical agencies lack the resources needed to effectively measure key elements of the traded economy.

This new entity should have two core functions. The first would be to regularly assess important aspects of overall U.S. traded sector competitiveness (e.g., trends in FDI, growth of traded sector jobs and output, changes in global market share of U.S. traded sectors, etc.). The second would be to focus on select traded sectors that are critical to the United States' economic future (sectors where the United States has some competitive edge and where value added and wages are higher than average) and develop strategic roadmaps (by coordinating with DoD, DoE, NSF, and industry leaders) of how the federal government can promote the competitiveness of these sectors.

With regard to the latter function, federal agencies currently work to advance their own particular missions and are largely unwilling to take into account the impact of their actions on innovation competitiveness or to coordinate with other agencies. Medical devices are a good example. The Food and Drug Administration reviews the safety and effectiveness of medical devices. The Department of Health and Human Services sets reimbursement schedules. The Department of Defense and the Veteran's Administration procure such devices. But there is little or no coordination across agencies to develop a unified strategy that would orient government policies to support the competitiveness of the U.S. medical device industry, despite the fact that it is a high-value-added sector in which the United States still retains competitive advantage, even though that position is at risk.[178] Accordingly, NIST's Innovation and Industry Services division should develop strategic roadmaps and guide inter-departmental collaboration to ensure that the regulatory policies and activities of disparate government agencies, are, wherever possible, aligned to promote the global competitiveness of strategic sectors of the U.S. economy.

G3. Create a United States Economic Competitiveness Commission

Another important step Congress should take to bolster U.S. traded sector competitiveness is to create a 13-member United States Economic Competitiveness Commission, which would release a report every other year providing an independent assessment of the competitiveness of the U.S. economy (particularly its traded sectors, including but not limited to manufacturing) in the global marketplace. The report would offer targeted recommendations to improve U.S. competitiveness across key economic sectors. Senate and House Republican and Democrat leaders would each appoint three members and the Administration one member. In addition, the National Academies of Science should develop recommendations for improving the competitive capabilities of U.S. industrial

facilities by identifying research areas that will best support the expansion of advanced manufacturing in the United States.

G4. Appoint at least one member of the Council of Economic Advisors whose background is in business or innovation, not economics

Finally, it's not enough just to create a new analytical unit; the country needs this traded sector orientation embedded in the White House. While the National Economic Council was created in 1993 in part for this purpose, additional efforts are needed. In particular, the next president should commit to appointing at least one member to the three-person Council of Economic Advisors (CEA) an individual whose scholarly background is in business management or innovation policy, instead of following the long tradition of appointing only Ph.D. neoclassical economists to the position. To better craft a traded sector competitiveness strategy, the U.S. government must rely on experts with a deep understanding of industries, firms, and innovation systems, something which almost all conventional academic economists lack.

STATE POLICIES

Beyond federal policies to support traded sector competitiveness, there are a number of policies states should implement to bolster their competitiveness—and therefore the competitiveness of the broader U.S. economy. This section adopts the "4Ts" framework for state policies. In the absence of a national strategy, states should have their own strategic objectives and plans for increasing the competitiveness of their traded sectors. However, we should be under no illusion that 50 state traded sector economic development policies, however sophisticated, will be able to be a substitute for a federal traded sector policy.

Technology Policy

SA1. Fully fund Manufacturing Extension Partnerships at the state level

Perhaps the best policy for manufacturing that states can implement is to fully fund their Manufacturing Extension Partnerships. Beyond funding, it is also critically important to connect the innovation and delivery aspects of the MEP program to the state's broader strategic objectives, plans, and key partners and stakeholders helping to achieve their vision.

SA2. Expand manufacturing technology programs at community colleges

States should expand manufacturing technology programs at community colleges. For example, in October 2011, Connecticut's legislature provided $20 million in bonds to establish or enhance manufacturing technology programs at three community colleges.[179] This was part of a broader jobs bill (HB 6801) that authorized $626 million in bonds to support high-tech entrepreneurship and workforce development and to incentivize manufacturers in Connecticut.

SA3. Develop a common university-firm technology licensing agreement

Several states, including North Carolina and Ohio, have developed standard university-firm technology licensing agreements in an effort to streamline and facilitate technology transfer from academia to industry. These should be short and simple one-page agreements including a non-exclusive, royalty-free license for three years if the resulting product is

manufactured in the United States. States should replicate this and seek to develop common agreements across state lines.

SA4. Create a statewide commercialization and entrepreneurship organization

Commercialization of new technology and entrepreneurship are key to success. Each state should have at least one organization committed to maximizing both commercialization and entrepreneurship as part of its mission. One model is Oklahoma's nonprofit i2E organization. Through its various programs, i2E helps Oklahoman companies with strategic planning assistance, networking opportunities, and access to capital. i2E's Oklahoma Technology Commercialization Center assists researchers, inventors, entrepreneurs, and companies in turning advanced technologies and high-tech startups into growing companies. It also runs an annual entrepreneurship competition open to all faculty and students at Oklahoma universities.[180] Likewise, Pennsylvania's Ben Franklin Technology Partners have, over their 25-year history, evolved to serve as a statewide resource for technology commercialization for entrepreneurs.

SA5. Catalyze and empower industry clusters, in part by creating peer learning networks

In many states, clusters of similar firms exist, but have little formal interaction with each other. States can facilitate collaboration by organizing roundtables to bring industry leaders together to talk about common challenges facing their industry. The roundtables can also identify steps the state can take to help boost the cluster's competitiveness. More formally, states can build peer learning networks, which provide a vehicle for manufacturing executives to exchange lessons learned, best practices, optimized manufacturing process techniques, how best to manage manufacturing workforces, etc. As Larry Keeley of Doblin has observed, "No one is as smart as everyone," and such networks offer an opportunity to learn from peers in the field experiencing similar challenges. Beyond this, states can provide small matching grants to help clusters establish industry self-help associations, either at the state level or regional level. For example, as part of its efforts to create a statewide strategic economic plan, the Rhode Island Economic Policy Council brought together leaders from the state's software companies. With the help of a small-state startup grant, the companies formed an industry association that works to help all firms in the cluster become more competitive.[181]

SA6. Implement innovation vouchers

While the federal government should implement innovation vouchers, this is also something states can pursue. In fact, Iowa has had a voucher-like program in place for the past ten years. The Iowa Industrial Incentives Act designated funds for Iowa manufacturing firms to solve small challenges (generally providing about $25,000 to $30,000, with a 1:1 in-kind match), with the College of Engineering at Iowa State University performing the bulk of assistance to manufacturers. Connecticut is currently evaluating implementing an innovation vouchers program.

BOX 2: STATE POLICIES TO STRENGTHEN TRADED SECTOR COMPETITIVENESS

Principal Actor	Cost?	
		Technology Policy
Congress	$	• Fully fund Manufacturing Extension Partnerships at the state level.
Congress	$	• Expand manufacturing technology programs at community colleges.
Governors	✓	• Develop a common university-firm technology licensing agreement.
Congress	$	• Create a statewide commercialization and entrepreneurship organization.
Governors	✓	• Catalyze and empower industry clusters, in part by creating peer learning networks.
Congress	$	• Implement innovation vouchers.
		Tax Policy
Congress	Tax Incentives	• Eliminate job creation tax credits and instead use those funds to implement investment tax credits.
Congress	Tax Incentives	• Align state R&D credits with the federal Alternative Simplified Credit (ASC).
Congress	Tax Incentives	• Extend sales tax parity for firms' purchases of computers and IT equipment.
Congress	Tax Incentives	• Enact more generous collaborative R&D tax credits.
		Talent Policy
Governors, Congress	✓	• Expand apprenticeship and co-op programs, school-to-work programs, industry-skills alliances, tax credits for employer-based training, and employer-community college partnerships.
Governors, Congress	$	• Create more math and science high schools.
		Competitiveness Assessment
Governors	✓	• Undertake state-level traded sector competitiveness assessments.

Actors:

- Congress (Legislative)
- Governors (Administrative Branch)

Cost:

- ✓ "Just do it" (revenue neutral policies)
- $ Requires Funding
- Tax Incentives

Tax Policy

States must get their tax environments right to be competitive. The following are a number of smart tax policy recommendations and examples for states to consider.

SB1. Eliminate job creation tax credits and instead use those funds to implement investment tax credits

Approximately 22 states have job creation tax credits, but evaluations of these programs suggest that they are relatively ineffective.[182] Job creation tax credits do little to induce firms to hire more workers. For example, when the state of North Carolina evaluated its William S. Lee Act job creation tax credits, it found that only about 4 percent of jobs claimed under the Act were actually induced by the tax credits.[183] Rather, firms hire more workers if they believe that the demand for their products or services is going to increase enough to create work for the added worker, not if the government offsets the cost of a new employee by a small percentage. Instead of implementing job creation tax credits, states should allocate those credits toward implementing investment tax credits for companies' expenditures on capital equipment. Doing so will make it more likely that firms will invest in productivity-enhancing technologies.

SB2. Align state R&D tax credits with the federal ASC R&D tax credit

State job creation tax credits do little to induce firms to hire more workers; funds should be used to implement investment tax credits instead.

Studies show that the research and development tax credit is an effective way of stimulating private-sector R&D.[184] Moreover, state R&D tax credits appear to be even more effective than the federal credit.[185] For example, a recent study of the California R&D tax credit found that it stimulated considerably more R&D than the federal credit did, in part because it induced firms to perform more R&D.[186] Approximately 38 states have R&D tax credits.[187] Approximately half of these states link to the federal R&D credit, which allows firms to take a credit of 20 percent on increases in R&D over a fixed-base period. However, due to limitations with the regular credit, in 2006 Congress created an Alternative Simplified Credit that is equal to 14 percent of the amount of qualified research expenses a company incurs in one year above 50 percent of its average qualified research expenses for the preceding three years. States that link to the federal credit may need to revise their statutes to let companies taking the ASC explicitly qualify for state R&D credits, the same way that some states (e.g., Delaware) let companies taking the Alternative Increment Research Credit (AIRC) explicitly qualify for state credits.

SB3. Extend sales tax parity for manufacturers' purchases of computers and IT equipment

Many studies find that IT investments have a larger economic impact than investments in non-IT equipment.[188] Yet most states are still stuck in the old economy when it comes to providing tax incentives to manufacturers, meaning they place less emphasis on IT. Most states provide a sales tax exemption for manufacturers for equipment purchased in the manufacturing process, and some even provide tax credits for the purchase of manufacturing equipment. But few extend this exemption (or credit) to computer and other IT equipment used in the rest of the plant, even though, from a productivity and competitiveness standpoint, it can have an even bigger impact than a traditional piece of machinery. For example, Washington state's rules governing its manufacturing sales tax exemption state that manufacturing computers qualify only if the computers "direct or control machinery or equipment that acts upon or interacts with tangible personal property" or "if they act upon or interact with an item of tangible personal property."

Many other states have similar restrictions.[189] States should eliminate these kinds of requirements and allow any IT equipment, software, or devices purchased by manufacturers to be exempt from state sales taxes. For example, Wyoming now allows for a sales/use tax exemption on all manufacturing equipment.[190]

SB4. Enact collaborative R&D tax credits

Several states provide more generous collaborative R&D tax credits to SMEs working with state universities. For example, Virginia offers a 20 percent credit for research undertaken in partnership with a Virginia university.[191] Likewise, Louisiana offers a 40 percent refundable tax credit for R&D expenses and for investments involved in commercialization of Louisiana technology.[192] Other states should adopt similar policies.

Talent Policy

SC1. Expand apprenticeship and co-op programs, school-to-work programs, industry-skills alliances, tax credits for employer-based training, and employer-community college partnerships.

Instead of reflexively focusing on spurring more enrollment in higher education, states should focus more resources on programs that provide individuals with skills in demand by traded sector employers and that facilitate more on-the-job work experience. Indeed, higher education, as currently structured, may not be best positioned to provide work-related skills, at least for a significant share of the population. As Wharton Business School's Peter Capelli argues, "Beyond a basic level, well below what we typically think of as post-secondary education, what matters to job performance is not generic education, but education specific to the performance of particular jobs."[193]

A number of states have moved in this direction. Wisconsin and Georgia have strong youth apprenticeship programs. Some states and local school districts have established career academies within high schools. Several have established regional skills alliances—industry-led partnerships that address workforce needs in a specific region and industry sector.[194] Michigan has provided competitively awarded startup grants and technical assistance to 25 industry-led regional skills alliances. Pennsylvania's $15 million Industry Partnerships program brings together employers and workers (or worker representatives, when appropriate) in the same industry cluster to address overlapping human capital needs. In addition, Pennsylvania has supported a number of specialized industry-led training institutes, such as the Precision Manufacturing Institute,[195] the Advanced Skill Center, and New Century Careers.[196] Other states have established tax credits for company investments in workforce development. California has a deduction for training expenses if a company has spent a certain share of sales on training. Firms in Rhode Island can deduct up to 50 percent of training costs on their corporate income taxes.[197]

More states should fund engineering co-op programs between universities, community colleges, and local businesses that allow mechanical, electrical, and civil engineering students to spend six months working with a local business while acquiring their undergraduate, master's, or doctorate degrees. Students gain critical knowledge and companies benefit from a budding engineer.

SC2. Create more math and science high schools

A number of states have developed STEM high schools, such as the North Carolina School for Science and Mathematics, the Illinois Mathematics and Science Academy, and the Thomas Jefferson High School in Virginia. Texas' T-STEM initiative seeks to create specialty STEM high school academies throughout the state. These schools are a powerful tool for producing high school graduates with a strong passion for science and math that translates into much higher rates of college attendance and graduation in scientific fields.[198] Therefore, states should seek to create more STEM high schools. Further, all states should adopt the new standards laid out by the National Governors Association that recommend engineering curriculum in both middle schools and high schools.

Competitiveness Assessment

SC1. Undertake state-level traded sector competitiveness assessments

States can help their traded sectors firms, particularly manufacturers, export more, whether globally or just outside state lines. One option is to leverage industry/cluster road mapping methodologies like Ohio's "In Seven," which asks: "What do we want our economy to look like in seven years?" It then provides a framework for identifying the unique strengths of a region: it assesses the competitive landscape, characterizes global growth drivers, identifies the state's assets at the firm, industry, university, research, and workforce levels, and looks for expanded export opportunities for the state's key firms and industries. Another excellent example of this type of SWOT (strengths, weaknesses, opportunities, and threats) analysis is *The High-Tech Strategy of Germany*, which assesses Germany's competitive position regarding 17 advanced cross-cutting technologies (ranging from biotechnology, nanotechnology, and microsystems technology to optical, materials, production, and information and communications technologies) that are critical to the ability of German industries and its broader economy to compete.[199] All U.S. states should have a traded sector competitiveness strategy of their own, particularly in the absence of any such national strategy. This proposal is akin to the recommendations regarding enhancing federal capabilities to perform traded sector analysis.

BENEFITS OF IMPLEMENTING THESE POLICIES

As ITIF writes in *Innovation Economics: The Race for Global Advantage*, countries are competing fiercely to attract and to grow the highest-value-added economic activity they can: the high-wage, knowledge-intensive advanced manufacturing, research, and services jobs that power today's global, innovation-based economy. In this competition, nations have moved from being "price makers" to "price takers."[200] In other words, enterprises now shop the world to find the countries offering the most attractive markets—based on the most competitive corporate tax rates, most generous R&D tax credits, access to pools of skilled talent, availability of state-of-the-art digital and physical infrastructure, the best immigration policies, the presence of technology clusters, etc.—in which to locate their establishments performing manufacturing, R&D, design, and management activities. With nations competing to offer the most attractive investment environment for globally mobile establishments, competition among governments has become a critical factor in determining global market share among nations.[201] For the U.S. economy, the implication

is that the United States has become a large state—in the sense that a large share of its economy is now traded—and it competes against other nations, the way U.S. states have had to compete for investment since WWII.

Implementing the policies recommended in this report will make the United States a more attractive investment environment for traded sector enterprises and their establishments. The technology policies will help spur innovation in advanced manufacturing, upgrade the technology capacity of manufacturing and other traded sector firms, help restore America's industrial commons, and support the productivity, innovation, and competitiveness of traded sector SMEs. The tax policies will stimulate a favorable climate for private sector investment by making the overall U.S. corporate tax code more competitive with that of other nations and also by leveraging tax policy to incent private sector R&D and investment. Designed correctly, the U.S. corporate tax code can explicitly promote the international competitiveness of American businesses and encourage innovation by providing incentives for the drivers of productivity and innovation: investment in R&D, new capital equipment and software, and workforce education and training. A three-pronged trade policy focusing on trade promotion, trade enforcement, and market opening will open new markets to U.S. traded sector firms while ensuring they can compete on a level playing field in global markets. Effective talent policies will ensure that traded sector establishments have access to well-educated and trained pools of skilled talent while creating attractive employment opportunities for American workers. The finance recommendations will ensure that traded sector establishments, large or small, have access to the capital they need to conduct research and development, to innovate by introducing new products and services, to scale their business, or to enter new markets. Improvements to the regulatory landscape will differentiate between the impact regulations have on traded vs. non-traded establishments and their impact on innovation while streamlining compliance procedures. Finally, enhancing the federal government's (and U.S. states') ability to assess U.S. traded sector competitiveness will boost it both by producing better data and analysis and by helping to identifying strengths, threats, weaknesses, and opportunities for improvement faced by U.S. traded sector industries, enterprises, and establishments.

CONCLUSION

Policies that are effective in supporting the innovation and competitiveness of an economy's traded sectors can make a real difference. Take Germany, which laid out a traded sector competitiveness strategy in 2006 with its aforementioned *The High-Tech Strategy of Germany*. A 2009 study by the German Association of Chambers of Industry and Commerce confirms its impact, finding that about 30 percent of all German companies attributed their innovations "to improved research and innovation policies at the federal level."[202]

The message is clear: smart public policies significantly bolster the competitiveness of nations. The United States needs to articulate and implement a cogent and comprehensive traded sector competitiveness strategy. However, more than simply announcing a strategy, the United States must find a way to commit sustained financial investment as part of that strategy—whether it is to fund the Engineering and Manufacturing Institutes, to increase

funding for NSF's Engineering Research Centers or NIST's Manufacturing Extension Partnership, to create more math and science high schools, to better resource statistical analysis or trade enforcement agencies, or to not just maintain but increase tax credits that incent research and development, skills training, and investment in plant and equipment. Indeed, the recommendations proposed as part of this traded sector competitiveness strategy call for considerable investment. Some may ask how the federal government can afford such investments in the midst of a large budget deficit and a national debt topping $15 trillion.

The reality is that the United States cannot afford not to invest in programs that spur innovation, productivity, and competitiveness and therefore drive economic growth.

But the reality is that the United States cannot afford *not* to invest in programs that spur innovation, productivity, and competitiveness and therefore drive economic growth. In particular, policymakers need to distinguish between *productive investments*—expenditures that expand the productive capacity of the country, drive economic growth, and increase future incomes—and *consumptive spending*—government expenditures that finance present consumption of goods and services, but that do not position the country to create future wealth.[203] Indeed, if the United States wishes to reduce its budget deficit while also reducing its investment and trade deficits, it must increase targeted investments that spur innovation, productivity, and competitiveness while cutting budget deficits elsewhere. Increasing these productive public investments will close the investment deficit, boost U.S. competitiveness and exports, and generate higher economic growth—the single best way to close the budget deficit.[204]

In fact, the Congressional Budget Office (CBO) estimates that an increase of just 0.1 percent in the GDP growth rate should reduce the budget deficit by as much as $310 billion cumulatively over the next decade.[205] Thus, an increase in the real rate of GDP growth from the CBO projection of 2.8 percent over the next decade to 4 percent—the U.S. growth rate from 1993 to 2000—would, all else equal, cut the cumulative budget deficit in half, or by $6.8 trillion, over the next decade. Moreover, agencies, programs, and policies with some connection to productive investments—e.g., R&D, education, and infrastructure programs and policies—collectively take up a relatively small portion of the budget picture, likely less than 10 percent of all expenditures. It is therefore possible to increase high-impact productive investments, including pro-growth tax expenditures, without significantly adding to short-term debt. This can be accomplished while generating economic returns that reduce all three of America's deficits—the budget, investment, and trade deficits—over the medium to long term. Thus, the notion that the United States cannot afford to invest in promoting the competitiveness of its firms, industries, and people is faulty.

Another erroneous notion is that even if the United States were to implement a traded sector competitiveness strategy, it would have no impact on the U.S. trade deficit, because the trade deficit is simply a function of the national savings rate. The story most conventional economists tell is that the trade deficit is a simple accounting function: low U.S. savings require overseas borrowing, which by definition requires running a trade deficit. Economist Greg Mankiw echoes this conventional view when he writes, "My view is that the trade deficit is not a problem in itself but is a symptom of a problem. The problem is low national saving."[206] The Council on Competitiveness agrees, stating, "These

threats [e.g., the trade deficit] stem from global financial imbalances rather than from the inability of American companies or American workers to compete in global marketplaces."[207]

Yet the United States has one of the highest corporate tax rates among industrialized countries in the world. It fails to match many foreign nations in investment in research as a share of GDP, and it has a rapidly deteriorating infrastructure. However, by definition, these factors can have no effect on the ability of business establishments in the United States to thrive in international markets because that is determined by our savings rate. By this definition, there is no traded deficit of any size that can be evidence of competitiveness failure.

There is another view. As economist Robert Blecker states, "This identity does not prove causality, and is consistent with other causal stories about the trade deficit."[208] In other words, what the conventional story fails to recognize is that savings is a function of national competitiveness. If, for example, foreign countries abated certain mercantilist practices such as currency manipulation or restricting U.S. exports to their markets, the U.S. trade deficit would fall and countries like China would buy less U.S. government debt. The result would be a rise in both U.S. exports and interest rates. Both would spur more savings: higher interest rates would encourage more Americans to save, and more exports (and relatively fewer imports) would boost U.S. corporate savings. In addition, more jobs and higher wages through exports (jobs in exporting firms pay 9.1 percent more than jobs in firms that export less)[209] would boost individual savings and reduce the budget deficit. Thus, the $4.5 trillion trade deficit the United States accrued between 2000 and 2011 in manufactured products[210] is not simply a function of low U.S. saving rates; rather, it's a reflection of the competitiveness of the traded sectors of the U.S. economy in addition to unfair foreign trade practices. Both challenges can be addressed through a traded sector competitiveness strategy.

Finally, more than anything, U.S. policymakers need to understand that manufacturing is not some low-value-added industry to be cavalierly abandoned.[211] As a sector of the economy, manufacturing is vital to U.S. competitiveness. The United States has underperformed in traded sectors such as manufacturing over the past decade, but not because America can't compete in manufacturing, or because manufacturing doesn't matter anymore. It's because the United States hasn't implemented a competitiveness strategy for traded sectors, such as manufacturing, to put them in the most effective position to compete. Having a traded sector competitiveness strategy is not tantamount to picking winners and losers, which is the smokescreen often thrown up as the reason not to have a competitiveness strategy. Rather, it's an approach to level the playing field for all of our sectors, particularly traded sectors. As enumerated in this report and others like it, policymakers should enact a range of smart policies designed to put U.S. traded sectors on a much stronger global competitive footing.

ENDNOTES

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ABOUT ITIF

The Information Technology and Innovation Foundation (ITIF) is a Washington, D.C.-based think tank at the cutting edge of designing innovation strategies and technology policies to create economic opportunities and improve quality of life in the United States and around the world. Founded in 2006, ITIF is a 501(c) 3 nonprofit, non-partisan organization that documents the beneficial role technology plays in our lives and provides pragmatic ideas for improving technology-driven productivity, boosting competitiveness, and meeting today's global challenges through innovation.

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