

U.S. Congress Joint Economic Committee

Manufacturing in America:
Challenges and Policy Solutions

A Report by the Joint Economic Committee Chairman's Staff
Senator Bob Casey, Chairman

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Manufacturing in America: Challenges and Policy Solutions

Introduction

The U.S. manufacturing sector is a critical part of the U.S. economy, totaling 11.5 percent of U.S. Gross Domestic Product (GDP).¹ In addition, manufacturing firms account for 70 percent of the research and development carried out by U.S. industries, and generate 90 percent of all patents.²

In 2011, the Joint Economic Committee held a series of hearings on “Manufacturing in the USA.” The first hearing discussed the need for a national manufacturing strategy built with input from small and large businesses, labor, and other key stakeholders.³ The second hearing examined the role of workforce training and specialized education in preparing workers for jobs in 21st century manufacturing, including advanced manufacturing.⁴ In particular, the hearing analyzed whether effective training programs could help lower the unemployment rate and considered examples of successful state and local programs. The third hearing focused on the impact on the economy of our current trade policy.⁵ A key issue addressed in the hearing was China’s ongoing currency manipulation and the central role this plays in China’s trade surplus with the United States. The final hearing in the manufacturing series focused on the impact that infrastructure investment has on job creation, particularly in the manufacturing sector.⁶ At this hearing, the Committee examined the interplay between effective transportation infrastructure and economic growth.

The Joint Economic Committee also released several reports in the 112th Congress related to American manufacturing. These included:

- “Addressing Long-Term Unemployment After the Great Recession: The Crucial Role of Workforce Training” (August 2011).⁷
- “The Importance of Trade Adjustment Assistance for America’s Workers” (September 2011).⁸
- “Nowhere to Go: Geographic and Occupational Immobility and Free Trade” (October 2011).⁹
- “STEM Education: Preparing for the Jobs of the Future” (April 2012).¹⁰
- “The Impact of Intellectual Property Theft on the Economy” (August 2012).¹¹
- “U.S. Trade with South Korea: Implications for the U.S. Economy” (September 2012).¹²

This report lays out policies that the United States can pursue in order to ensure U.S. global competitiveness. By addressing the ongoing skills mismatch in an evolving manufacturing sector, the nation’s deteriorating transportation infrastructure, research and development, and trade enforcement, policymakers can support the manufacturing industry in the United States.

Skills Mismatch for the Manufacturing Jobs of the Future

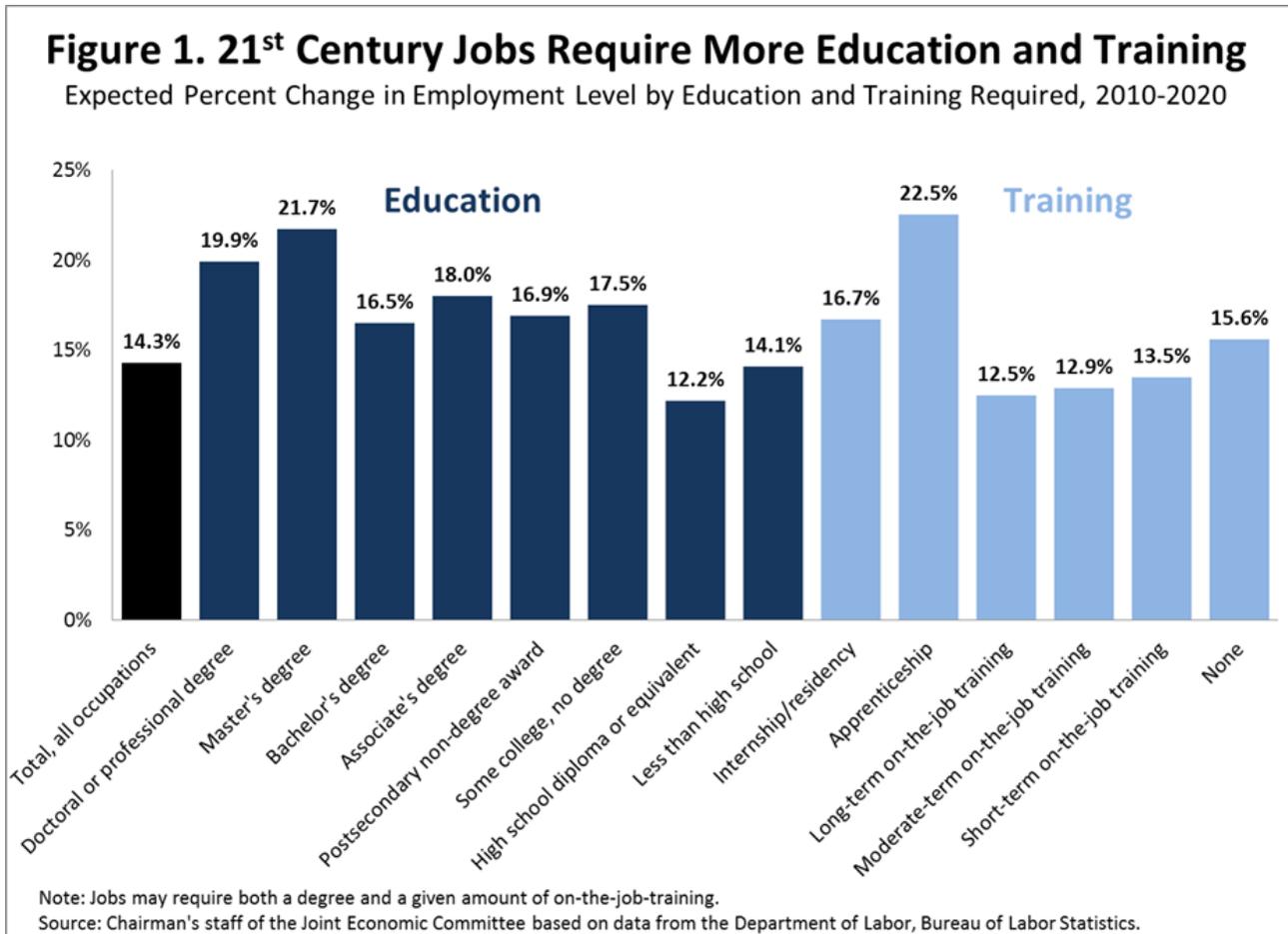
A competitive manufacturing sector requires an ample supply of skilled manufacturing workers. While unemployment, and in particular long-term unemployment, in the manufacturing sector remains high, many employers report shortages of qualified workers for available positions. A 2011 survey found that 83 percent of manufacturers were experiencing a serious shortage of skilled production labor, and that 600,000 manufacturing positions were unfilled because of a lack of appropriately trained workers.¹³ Even at the height of the recession, a survey of manufacturers found that over one-third were experiencing shortages of engineers and scientists—and most of them anticipated greater shortages in the future.¹⁴

Trends throughout the manufacturing sector suggest that future vacancies are more likely to be in high-tech fields and to be filled by workers with some education beyond high school. As a result, lower educational attainment may limit the ability of displaced or otherwise unemployed manufacturing workers to take advantage of new job openings.¹⁵ These trends were set in motion long before the Great Recession, but they persisted during the recession and continue to affect workers searching for jobs.

Over the past several decades, individuals with at least some college education have increased as a share of the manufacturing workforce. In 2007, the share of manufacturing workers with education beyond high school surpassed the share of workers with only a high school degree or less education for the first time.¹⁶

However, many manufacturing jobs still do not require a bachelor's or advanced degree; indeed, obtaining an associate's degree or gaining on-the-job experience through an apprenticeship is an increasingly common path to a career in 21st century manufacturing fields.¹⁷ Bureau of Labor Statistics data show that jobs that require such types of post-secondary experience short of a bachelor's degree are projected to grow at a faster rate over the course of the current decade than jobs that require only a high school degree or less, and even those that require a bachelor's degree (see **Figure 1**). The demand for occupations in which an apprenticeship is typically needed to attain competency is expected to expand by 23 percent from 2010 to 2020—a considerably quicker pace than the 14 percent projected growth for overall employment.¹⁸

Manufacturers' demand for workers with computing and software engineering skills is rising.¹⁹ Part of that rise can be explained by an increasing integration of software into manufactured products. In addition, the manufacturing sector in the United States has a large share of workers in service-related occupations, such as professionals and technicians.²⁰ This underscores the importance of additional education and training to prepare workers to fill jobs in the manufacturing sector.



Existing Education and Training Programs Are Falling Short

Consistent with trends in the economy more generally, manufacturing employers are seeking individuals equipped with science, technology, engineering, and math (STEM) skills; however, our education system is failing to produce an adequate supply of workers to meet the needs of these employers.²¹ The existing STEM pipeline leaves too many students without access to quality STEM education, and without the interest and ability to obtain a degree or work in STEM. Current statistics on STEM education in the U.S. highlight the challenge facing educators and policymakers, making it clear that the United States must do more to build a strong STEM workforce for jobs in 21st century manufacturing.²² Although community colleges can be vital pathways to training and employment opportunities, the curriculum currently taught in community colleges may be “inadequately connected to job market needs” of manufacturers and other employers.²³

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If employers are having difficulty finding workers with the appropriate skills, additional training for unemployed workers that matches the needs of expanding sectors and occupations could make those workers more attractive to hiring employers.²⁴ However, the United States spent less than other developed countries on labor market policies in 2010, including workforce training and job search programs.²⁵ The United States invested 0.9 percent of gross domestic product on labor market policies in 2010, compared to an average of nearly 1.7 percent of GDP among OECD countries. At the individual level, the United States invested only \$845 per labor market participant—\$369 dollars or 30.4 percent less than the average amount spent by other OECD countries.²⁶

One challenge is that several core sets of federal programs that support our education and workforce training pipeline are in need of reauthorization and modernization. The Elementary and Secondary Education Act, the Workforce Investment Act, and the Carl D. Perkins Career and Technical Education Act would all benefit from long-term reauthorizations that enhance the focus on preparing workers for the jobs of the future.²⁷ An additional challenge is that, for many young people, education and training may be cost-prohibitive, even though obtaining such education and training would be greatly beneficial in terms of improved career and salary prospects over their lifetimes.

Potential Solutions to Prepare Workers for the Jobs of the Future

Manufacturing jobs of the 21st century will require more technical skills and a different kind of know-how than the jobs of the past. Unfortunately, education budgets have been under severe stress in the aftermath of the recession, with “at least 23 states [having] enacted identifiable, deep cuts in pre-kindergarten and/or K-12 spending.”²⁸ Science programs may be more likely to be cut as funding becomes even tighter, since science skills are not tested under the Elementary and Secondary Education Act.²⁹ Specific legislation to improve our nation’s STEM skills deficit includes the Preparing Students for Success in the Global Economy Act (S. 1675) and the Computer Science Education Act (S. 1614).³⁰ Furthermore, policies to support STEM education should be included in legislation to reauthorize the Elementary and Secondary Education Act.

Improving STEM education at the K-12 level and beyond will also require a focus on career and technical education to provide young people with the opportunity to obtain STEM skills and certifications that prepare them for 21st century jobs, even if not culminating in a bachelor’s or higher degree. The Education for Tomorrow’s Jobs Act (S. 1686) would authorize grants to local educational agencies that would support partnerships across K-12 schools, institutions of higher learning, employers, and other local stakeholders to emphasize college and career readiness.

The Carl D. Perkins Career and Technical Education Act, which authorizes a variety of apprenticeship programs for students and young workers, will require reauthorization in 2013. An additional piece of legislation that would bolster apprenticeship programs is the Workforce Innovation for New Jobs and Applied Education Act (S. 1948). This legislation would allow

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employers to claim an apprenticeship program expenses tax credit, among other provisions. A similar tax credit program could be established to defray on-the-job training costs incurred by employers. Improving the transition from the classroom to the workplace also involves promoting tighter linkages between our nation's community colleges and employers so that young people are educated for jobs in expanding fields.

With regard to training older workers for jobs in 21st century manufacturing, reauthorization of the Workforce Investment Act would provide an opportunity to modernize and reform federal job training programs to ensure that the programs are as efficient and effective as possible and are delivering the greatest return on investment. Proven training programs deliver benefits to both workers, who gain new skills that lead to employment, and employers, who are able to find the skilled workers they need to operate and expand their businesses. The High-Tech Job Opportunities Between our Shores Act (S. 1329) would improve worker training by authorizing grants for education and training programs for jobs in advanced manufacturing. Additionally, the America WORKS Act (S. 1243) would create a registry of skill credentials that are required by federal or state law for an occupation, are from the Manufacturing Skills Certification System, and are industry-recognized and nationally portable credentials consistent with established industry competency models.

Trade Adjustment Assistance (TAA) is also important to limiting the extent to which the skills mismatch exacerbates issues facing American workers and manufacturing employers. TAA compensates those workers who, through no fault of their own, are adversely impacted by the effects of import competition on local production and helps those workers develop the skills necessary to compete in the global marketplace. Through training, relocation, and job search allowances, TAA aids the skills-matching process between an employer and the unemployed that is crucial to an efficient labor market in the manufacturing sector. Expanded eligibility for TAA benefits was enacted in 2009, but is scheduled to expire at end of 2013.

A promising approach to workforce training would focus resources on training for jobs in regionally strong industries. Sectoral programs identify those sectors that offer strong growth opportunities in a community and then work with non-profit organizations and private-sector employers to craft programs that build skills that will be in demand. Successful programs have been undertaken in manufacturing and other sectors and these programs have “emerged over the last decade as one of the most effective strategies for addressing the skill requirements of businesses.”³¹ Sectoral programs have shown positive outcomes, with participants more likely to get and retain employment than those who have not received such training.³² The Marcellus Shale On-the-Job Training Act (S. 588), for example, would establish a grant program to help prepare workers for positions in the exploration for, production of, and transportation of natural gas from the Marcellus Shale formation, another expanding sector of the economy.

The Role of Transportation Infrastructure in Manufacturing

The manufacturing sector relies on various modes of transportation to obtain raw materials and to transport end products to the marketplace. In addition to surface transportation, manufacturers rely on ports and airports to import raw materials and export products. Consequently, promoting a competitive American manufacturing sector requires ensuring that manufacturers have access to efficient and effective transportation infrastructure. Unfortunately, the United States risks falling behind international competitors in maintaining and developing critical infrastructure. Despite passage last summer of legislation reauthorizing surface transportation programs through FY 2014, projected long-term funding shortfalls in the Highway Trust Fund remain.

Infrastructure Investment Supports Growth in the Manufacturing Sector

Infrastructure produces positive spillover benefits for the economy.³³ Every dollar spent on infrastructure boosts private-sector productivity and hiring.³⁴ Investing in infrastructure in the current economic climate would pay a “double dividend,” boosting aggregate demand at a time when the economy is operating below capacity while laying the groundwork for long-term economic growth.³⁵ Moreover, unlike other forms of government spending, investing in infrastructure “crowds-in” private sector investment and employment even when the economy is near full employment.³⁶

The principal direct benefit of an effective transportation system is that it reduces transport costs for firms. Those reduced costs, in turn, allow firms easier access to new markets, enhance knowledge spillovers that result from an accumulation of economic activity in close proximity, foster competition, spur innovation, raise productivity, relieve price pressures, and lead to increases in living standards.³⁷ A well-functioning infrastructure system boosts exports and is necessary to maximize the gains from trade.³⁸

Several economic studies have determined that the economic benefits of infrastructure investment are particularly pronounced for the manufacturing sector.³⁹ That is to be expected given manufacturers’ heavy reliance on infrastructure networks to physically transport inputs to factories and outputs to markets in other regions and countries.

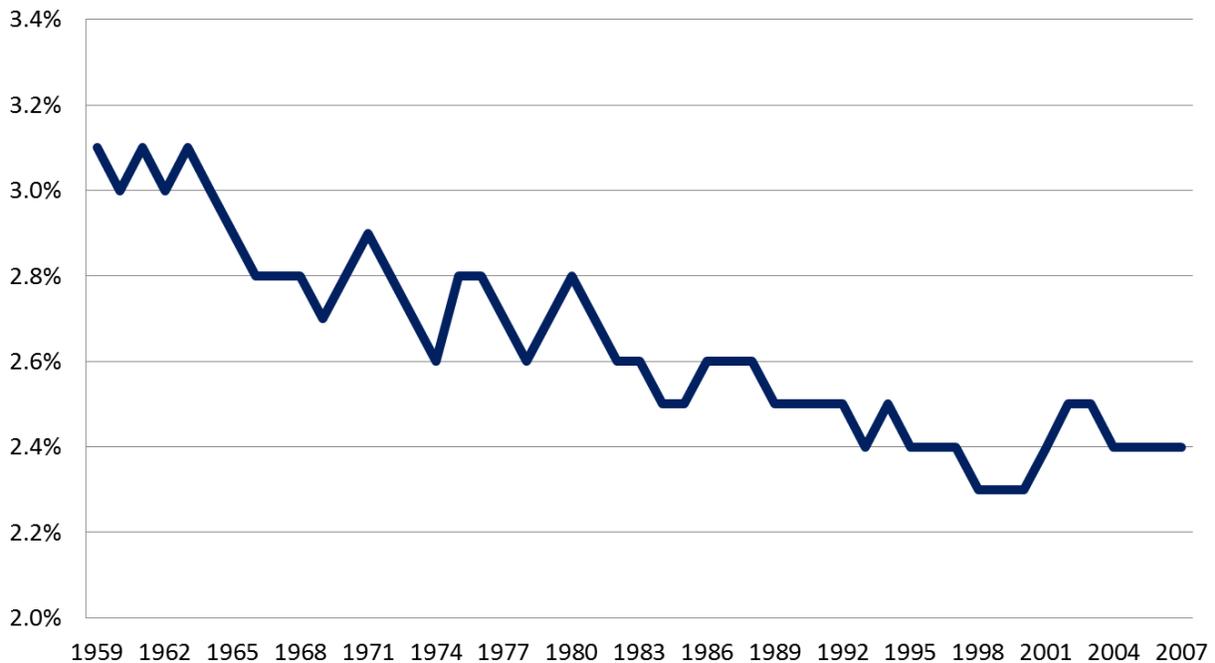
In addition, such investments would boost labor productivity and cut down the amount of time that Americans spend in traffic. According to one estimate, Americans in 439 urban areas spent some 4.8 billion hours sitting in traffic in 2010. This congestion (based on wasted time and fuel) cost about \$101 billion.⁴⁰ Infrastructure investments can also help to connect Americans with job opportunities in manufacturing. Studies show that many low-income individuals, in particular, could benefit from the enhanced ability to move around cities and regions that would come from improving access to reliable transportation.⁴¹

The United States Risks Falling Behind

Public spending on infrastructure in the United States is only about 2.4 percent of GDP.⁴² By contrast, China spends 9 percent of its GDP on infrastructure and Europe spends 5 percent.⁴³ Moreover, U.S. spending is down from the approximately 3.1 percent of GDP invested in infrastructure in 1963, the most recent peak (see **Figure 2**), a difference that would equate to more than \$100 billion in additional infrastructure investment per year based on current GDP.⁴⁴ Moreover, the United States is not investing in the highest quality infrastructure when compared with other nations. According to the World Economic Forum, the United States ranks 25th overall in the world for infrastructure quality, with its roads, railways, ports, and air-transport infrastructure all failing to match up to systems in northern Europe.⁴⁵ Relative to countries in Europe, the United States directs a lower share of its infrastructure spending to maintaining roads than to new construction;⁴⁶ however, there is a particularly high return on investment to maintaining existing transportation infrastructure.⁴⁷

Figure 2. Infrastructure Spending Has Declined as a Share of GDP

Total Public Investment in Transportation and Water Infrastructure as a Share of GDP
Fiscal Years 1959 to 2007



Note: Total public spending is the sum of federal, state, and local government expenditures.

Source: Chairman's staff of the Joint Economic Committee based on data from the Congressional Budget Office.

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CBO has determined that “tens of billions of dollars of additional infrastructure spending each year could be justified on an economic basis.”⁴⁸ The American Society of Civil Engineers (ASCE) gives our infrastructure a grade of D, arguing that even more infrastructure spending is necessary. The ASCE has determined that the United States needs to spend \$2.2 trillion over the next 5 years to bring our infrastructure “up to a good condition.”⁴⁹ Other reports demonstrate that sustained and increased funding is needed to bring our infrastructure, including surface transportation networks, up to par.⁵⁰ To the extent that the United States falls short in repairing and replacing existing infrastructure, the net stock of transportation infrastructure deteriorates.

Federal Government Support is Essential, Particularly Given Currently Tight State and Local Budgets

Government support for infrastructure is necessary. Although public-private partnerships would attract new private capital to transportation infrastructure, the scale of such capital flows would be modest compared with what is needed.⁵¹ Moreover, relying on the private provision of highway infrastructure could result in a patchwork of tolled and non-tolled roads, undermining national uniformity in highway operation, increasing travel costs, and impeding passenger travel and interstate commerce.⁵² Conversely, by planning strategically, coordinating with states and localities, and partnering with private-sector entities when appropriate to fund worthy infrastructure investments, the federal government can facilitate commerce and exports and give a boost to U.S. manufacturers.⁵³

Federal support for infrastructure is even more critical at the moment because state and local governments are facing serious budget challenges and lack the financial flexibility of the federal government to borrow cheaply to invest in economic growth. In recent decades, three-quarters of public infrastructure spending has been done by state and local governments, and infrastructure has been considered their domain.⁵⁴ The federal government has supplemented that spending in the form of matching grants to states.

Further, states and localities generally turn to the bond market to finance long-term infrastructure projects. But recently states have faced higher borrowing costs and more difficulty than usual in financing investments through this mechanism, because of turmoil in the financial markets and declining ratings for some state and local debt instruments.⁵⁵ Thus, a boost in federal infrastructure investment is particularly valuable during and in the aftermath of economic downturns, when states cannot maintain adequate funding.

The Transportation Infrastructure Funding Process Fails to Meet Current Needs

Federal funding for surface transportation projects comes from the Highway Trust Fund, which is funded primarily through the 18.3 cent per gallon tax on gasoline and 24.3 cent per gallon tax on diesel fuel.⁵⁶

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Through the mid-1990s, the trust fund's level remained generally stable. However, increased fuel efficiency and the emergence of hybrid vehicles have caused a dramatic drop in the revenue stream for the trust fund, leading to several transfers from the General Fund of the Treasury since 2008 to ensure the trust fund could meet its obligations. According to the Congressional Budget Office, those transfers have totaled \$29.7 billion.⁵⁷ The recently enacted Moving Ahead for Progress in the 21st Century Act (MAP-21) transfers an additional \$21.2 billion from other funds to the Highway Trust Fund to cover the shortfall through 2014, while not addressing its underlying causes.⁵⁸

That shortfall in funding has led to an ongoing policy debate over the future of transportation funding in the United States, including cuts to programs or alternative financing methods for surface transportation. Currently, highway, mass transit, and surface transportation safety programs are authorized and funded through the end of FY 2014 through the MAP-21 Act. To be sure, that is an improvement over the series of temporary extensions that lasted from the end of FY 2009 until July 2012, which created uncertainty for public and private sector actors alike. Even so, the relatively short-term nature of the MAP-21 Act may continue to prevent the United States from realizing the full gains to be had from an effective, sufficiently funded transportation infrastructure system. Moreover, the political nature of selecting infrastructure projects may lead to an inefficient use of resources.⁵⁹

Potential Solutions for a 21st Century Transportation Infrastructure Network

Persistent shortfalls in funding for surface transportation projects, shortcomings in the infrastructure project selection process, and uncertainty regarding the status of authorizations and funding beyond the next two years keep U.S. manufacturers from receiving the full benefits of a healthy infrastructure system. This includes the benefits that stem from spillovers among manufacturers that exist in close proximity to suppliers, customers, innovators, and skilled labor.

Beyond extending and strengthening existing infrastructure programs, including programs to maintain locks, dams, ports, and waterway infrastructure, it is important to promote innovative approaches that pair public and private capital in order to build and maintain a 21st century infrastructure network. Currently, the United States lags behind international competitors in developing public-private partnerships in infrastructure,⁶⁰ and more could be done at the federal level to support states and localities in assessing the costs and benefits of entering into public-private agreements.⁶¹ Establishing a national infrastructure bank could improve infrastructure project selection, since projects would be selected based on expected returns on investment rather than formulas or earmarking. Pieces of legislation that would establish such an entity include the Building and Upgrading Infrastructure for Long-Term Development Act (S. 652), the American Infrastructure Investment Fund Act (S. 936), the American Jobs Act of 2011 (S. 1660), and the Rebuild America Jobs Act (S. 1769).

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Supporting the development of regional industry clusters in tandem with strengthening infrastructure networks can enhance economic gains. Just as infrastructure can help move goods, it can also connect people working in similar industries in close proximity, facilitating the transfer of knowledge and ideas. The Strengthening Employment Clusters to Organize Regional Success (SECTORS) Act (S. 665) and the Building a Stronger America Act of 2012 (S. 3479) would establish a new grant program administered by the Department of Labor to expand industry or sector partnerships that lead to collaborative planning, resource alignment, and training efforts across multiple firms for current and potential workers within the industry cluster.

Tax Policy Should Better Support Research and Development

Seventy percent of research and development by U.S. industries is undertaken by manufacturers.⁶² A tax system that better supports research and development would help the manufacturing sector. The case for federal support for research and development expenditures is particularly strong. Studies show that half or more of economic growth in the United States over the past fifty years is attributable to improved productivity resulting from innovation.⁶³ However, as with capital investments, individual companies do not capture the full social benefits of R&D spending, because of knowledge and financial spillovers.⁶⁴

Despite evidence that each dollar of revenue foregone through the R&D tax credit boosts private sector R&D activity by more than a dollar—consequently boosting economic growth—the credit has not been made permanent.⁶⁵ Additionally, the calculation of the credit can be unwieldy and confusing for businesses, and its scope is relatively narrow; a variety of R&D-related activities that likewise have beneficial spillover effects for the economy are not eligible for the credit.⁶⁶ Tax credits designed to incentivize advanced energy manufacturing likewise have not been made permanent—complicating planning for businesses investing in this area.

Potential Solutions for a Competitive Tax Code for the Manufacturing Sector

A variety of steps can be taken through the tax code to improve the desirability of the United States as a location for manufacturers. First and foremost, the research and development tax credit should be made permanent. The Job Creation through Innovation Act (S. 825) would accomplish this, as well as (1) increase the tax credit for increasing research activities, (2) allow an increased research tax credit for manufacturers whose domestic production gross receipts are more than 50 percent of their total receipts, and (3) make the research tax credit refundable for businesses with an average number of employees of 500 or fewer. Portions of this legislation are included in the American Growth, Recovery, Empowerment, and Entrepreneurship (AGREE) Act (S. 1866).

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The Job Creation through Innovation Act would also expand the 48(c) Advanced Energy Manufacturing Tax Credit by allocating \$5 billion of grants or tax credit amounts to manufacturers of goods and components in the United States that are used in alternative energy projects. Another piece of legislation that would extend and strengthen the 48(c) tax credit is the Make It in America Act (S. 1764).

More general steps that would support domestic manufacturing include accelerated depreciation schedules and bolstering the section 199 domestic production tax credit for manufacturers. Short-term steps could also be taken to support the manufacturing sector as the economy continues to recover from the Great Recession. Congress could provide tax relief to manufacturers by extending bonus depreciation for equipment investment through 2013. Under current law, full depreciation expired at the end of 2011, and 50 percent depreciation expired at the end of 2012. The Bring Jobs Home Act (S. 3364) would establish a tax credit to defray costs associated with onshoring production and moving jobs from foreign countries back to the United States, and eliminate the deductibility of expenses incurred when moving operations overseas.

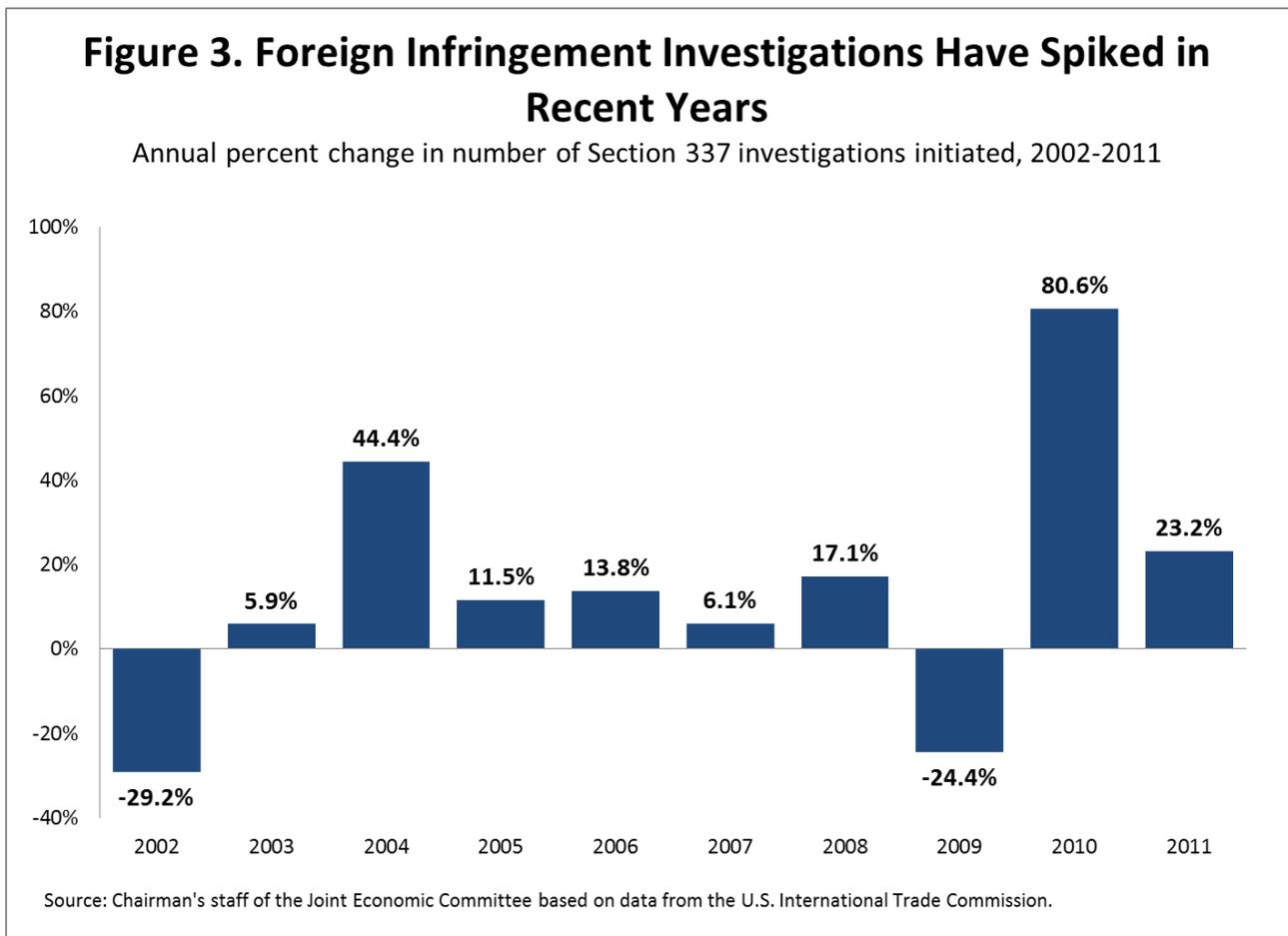
The Global Economy Presents Challenges for the U.S. Manufacturing Industry

U.S. manufacturers compete in markets supplied by competitors from across the globe, both domestically and abroad. However, while U.S. firms are known for innovation, intellectual property theft and currency manipulation undercut its competitive advantage.

Intellectual Property Theft Hurts U.S. Manufacturers

Intellectual property (IP) is at the core of U.S. competitiveness, productivity gains, and economic growth. Indeed, IP-intensive industries accounted for nearly 20 percent of all jobs in 2010 and over one-third of GDP.⁶⁷ Conversely, IP theft slows economic growth and threatens job creation. While precise estimates of the magnitude of counterfeiting and piracy are difficult to come by because of the complexities associated with measuring a secret, illegal activity, there is broad agreement that IP theft has increased in recent years. IP theft has negative impacts on consumers, who can face health and safety hazards from counterfeit goods, governments that lose tax revenue, and companies (including U.S. manufacturers) that face higher costs, lower revenues, and reduced profits.

Investigations of foreign infringement of domestic intellectual property rights have risen in eight of the last ten years.⁶⁸ Moreover, there has been a dramatic rise in the number of cases investigated by the United States International Trade Commission (U.S. ITC), with the caseload rising by 80.6 percent and 23.2 percent in 2010 and 2011, respectively (see **Figure 3**). Goods from China accounted for more than three-fourths of the value of counterfeit products seized in the United States from 2004 to 2009.⁶⁹



Piracy has become increasingly pervasive in international trade. Estimates show that trade in counterfeit and pirated products as a share of all globally traded commodities increased by 7.6 percent between 2000 and 2007.⁷⁰ However, these figures underestimate the full extent of the problem since electronic piracy is excluded. In 2011, the U.S. Customs and Border Protection seized 24,792 counterfeit or pirated goods, representing more than \$1.1 billion in lost sales.⁷¹

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Businesses lose revenue and experience lower profits when sales are diverted from authentic goods to counterfeits. Profits are also adversely affected by the additional costs required to protect the firm from future episodes of intellectual property infringement.⁷² One estimate found that the average company lost \$101.9 million in revenues and incurred costs of \$1.4 million in identification and enforcement of intellectual property rights, leading to an average decline in profits of \$46.3 million.⁷³ Availability of a counterfeit good can also put downward pressure on the price of the authentic product, causing a further decline in a firm's revenue.

U.S.-China Currency Misalignment Harms U.S. Manufacturing Firms and Workers

China's contribution to the U.S. trade deficit in goods dwarfs that of any other country. In 2011, the U.S. imported \$399.4 billion from China, \$84 billion more than from Canada, the next largest trade partner to the United States.⁷⁴ Unlike Canada, imports from China were not largely offset by U.S. exports to China. The large bilateral trade deficit between the U.S. and China partly reflects the undervaluation of the Chinese currency, the renminbi, relative to the U.S. dollar.⁷⁵ China's weaker currency boosts its domestic production by making exports less expensive and more attractive abroad. On the other hand, for the United States, a relatively stronger currency stifles domestic production by making domestically produced goods relatively more expensive to foreign consumers.

An undervalued Chinese currency places U.S. manufacturers at a competitive disadvantage and can hinder manufacturing job growth.⁷⁶ All else equal, an undervalued currency increases the penetration of manufactured goods from China to the United States. Higher levels of import penetration can lead to short-run job displacement in the U.S. as more intense competition from Chinese imports replaces domestic production.⁷⁷ Import competition may also lead to plant closures and lower revenue for manufacturing businesses producing in the United States.⁷⁸

Potential Policy Solutions for U.S. Manufacturers Competing in the Global Economy

A variety of steps can be taken by federal policymakers to address intellectual property theft, such as creating an international enforcement network or task force. An Intellectual Property Enforcement Network, consistent with legislation proposed in the 110th Congress, could establish policies concerning international IP rights protection and coordinate and facilitate implementation of these policies.⁷⁹ An international task force could also be created to protect American intellectual property abroad. The Congress could also direct the Comptroller General to review certain free trade agreements and report to the Congressional Trade Agreement Review Committee about the conclusions of the review, including how effectively particular trade partners protect IP rights. In addition, it could mandate that future free trade agreements include certain IP rights standards and require that the President submit a plan to bring existing free trade agreements into compliance with those standards.

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Federal policies such as the Currency Exchange Rate Oversight Reform Act (S. 1619) could stem the impact of currency manipulation by directing the Secretary of the Treasury to report biannually on currencies found to be fundamentally misaligned. In addition, if countries with misaligned currencies are found to be engaging in specific behavior, the Secretary could be instructed to designate them for priority action, including negotiations and consultations. Congress could also oppose any change in the governance of any international financial institution that would benefit any country designated for priority action regarding the management of their currency. Additionally, Congress could require the imposition of countervailing duties to counteract foreign subsidies provided by currency manipulation when possible.

Conclusion

As discussed in this report, a vibrant, growing manufacturing sector is critical to a strong, competitive U.S. economy. The manufacturing sector is not only a direct source of well-paying jobs, it supports a broad range of jobs across sectors of the economy. To ensure that U.S. manufacturing continues to remain globally competitive, Congress will need to pursue policies that strengthen education and workforce training, improve transportation infrastructure, promote research and development through the tax code, protect intellectual property, and ensure fair trade. Each of those elements is important to the success of U.S. manufacturing. Throughout this report, specific pieces of legislation that address one or more of these challenges have been mentioned. These proposals represent an illustrative rather than exhaustive list of policy options.

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Sources

- ¹ U.S. Department of Commerce, Bureau of Economic Analysis, “Revised Statistics of Gross Domestic Product by Industry for 2009-2011,” November 13, 2012 (<http://www.bea.gov/newsreleases/industry/gdpindustry/gdpindnewsrelease.htm>).
- ² U.S. Department of Commerce, The Commerce Blog, “R&D, Patents are Key Manufacturing Drivers,” May 31, 2012 (<http://www.commerce.gov/blog/2012/05/31/rd-patents-are-key-manufacturing-drivers-chief-economist-mark-doms-tells-national-as>); Raymond M. Wolfe, “U.S. Businesses Report 2008 Worldwide R&D Expense of \$330 Billion: Findings from New NSF Survey,” National Science Foundation, May 2010 (<http://www.nsf.gov/statistics/infbrief/nsf10322/nsf10322.pdf>).
- ³ U.S. Congress Joint Economic Committee, Hearing, “Manufacturing in the USA: Why We Need a National Manufacturing Strategy?” June 22, 2011 (www.jec.senate.gov/public/index.cfm?p=Hearings&ContentRecord_id=2f4d5dbf-12de-4548-b492-ad1519d48022&ContentType_id=14f995b9-dfa5-407a-9d35-56cc7152a7ed&Group_id=6d8935b0-4db8-4fc0-991e-3613943b7e4f).
- ⁴ U.S. Congress Joint Economic Committee, Hearing, “Manufacturing in the USA: Training America’s Workforce,” July 12, 2011 (www.jec.senate.gov/public/index.cfm?p=Hearings&ContentRecord_id=013a4555-c060-4e61-b787-db3b5f731e73&ContentType_id=14f995b9-dfa5-407a-9d35-56cc7152a7ed&Group_id=6d8935b0-4db8-4fc0-991e-3613943b7e4f).
- ⁵ U.S. Congress Joint Economic Committee, Hearing, “Manufacturing in the USA: How U.S. Trade Policy Offshores Jobs,” September 21, 2011 (www.jec.senate.gov/public/index.cfm?p=Hearings&ContentRecord_id=fa3854d3-f10d-4ab2-ba2c-db7bf1086035&ContentType_id=14f995b9-dfa5-407a-9d35-56cc7152a7ed&Group_id=6d8935b0-4db8-4fc0-991e-3613943b7e4f).
- ⁶ U.S. Congress Joint Economic Committee, Hearing, “Manufacturing in the USA: Paving the Road to Job Creation,” November 16, 2011 (www.jec.senate.gov/public/index.cfm?p=Hearings&ContentRecord_id=baba8dce-a6cd-4050-86d4-1dff47d00f6c&ContentType_id=14f995b9-dfa5-407a-9d35-56cc7152a7ed&Group_id=6d8935b0-4db8-4fc0-991e-3613943b7e4f).
- ⁷ U.S. Congress Joint Economic Committee, “Addressing Long-Term Unemployment after the Great Recession: The Crucial Role of Workforce Training,” August 2011 (www.jec.senate.gov/public/index.cfm?p=Reports1&ContentRecord_id=8f44208c-a04d-4d0f-b0c7-490625cb21ac&ContentType_id=efc78dac-24b1-4196-a730-d48568b9a5d7&Group_id=c120e658-3d60-470b-a8a1-6d2d8fc30132&YearDisplay=2011).
- ⁸ U.S. Congress Joint Economic Committee, “The Importance of Trade Adjustment Assistance for America’s Workers,” September 2011 (www.jec.senate.gov/public/index.cfm?p=Reports1&ContentRecord_id=19251787-8f18-4a5a-ad6d-c8dfad21137d&ContentType_id=efc78dac-24b1-4196-a730-d48568b9a5d7&Group_id=c120e658-3d60-470b-a8a1-6d2d8fc30132&YearDisplay=2011).
- ⁹ U.S. Congress Joint Economic Committee, “Nowhere to Go: Geographic and Occupational Immobility and Free Trade,” October 2011 (www.jec.senate.gov/public/index.cfm?p=Reports1&ContentRecord_id=576fd851-82fa-4297-ae45-b28af3e90a22&ContentType_id=efc78dac-24b1-4196-a730-d48568b9a5d7&Group_id=c120e658-3d60-470b-a8a1-6d2d8fc30132&YearDisplay=2011).
- ¹⁰ U.S. Congress Joint Economic Committee, “STEM Education: Preparing for the Jobs of the Future,” April 2012 (http://www.jec.senate.gov/public//index.cfm?a=Files.Serve&File_id=6aaa7e1f-9586-47be-82e7-326f47658320).

Manufacturing in America: Challenges and Policy Solutions

¹¹ U.S. Congress Joint Economic Committee, “The Impact of Intellectual Property Theft on the Economy,” August 2012 (www.jec.senate.gov/public/index.cfm?p=Reports1&ContentRecord_id=30bdd2ea-362c-40c6-a781-567924d95941&ContentType_id=efc78dac-24b1-4196-a730-d48568b9a5d7&Group_id=c120e658-3d60-470b-a8a1-6d2d8fc30132&YearDisplay=2012).

¹² U.S. Congress Joint Economic Committee, “U.S. Trade with South Korea: Implications for the U.S. Economy.” September 2012 (www.jec.senate.gov/public/index.cfm?p=Reports1&ContentRecord_id=c87be6df-f4ab-4676-a31f-906385866253&ContentType_id=efc78dac-24b1-4196-a730-d48568b9a5d7&Group_id=c120e658-3d60-470b-a8a1-6d2d8fc30132&YearDisplay=2012).

¹³ Deloitte Consulting LLP and The Manufacturing Institute, “Boiling Point? The Skills Gap in American Manufacturing,” 2011 (www.themanufacturinginstitute.org/~ /media/A07730B2A798437D98501E798C2E13AA.ashx).

¹⁴ Deloitte Consulting LLP, The Manufacturing Institute, and Oracle Corporation, “People and Profitability: A Time for Change,” May 2009 (www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/us_pip_peoplemanagementreport_100509.pdf). This skills mismatch may lead to higher levels of structural unemployment, which is a concern in the broader economy but is particularly noteworthy in manufacturing and a handful of other industries. See Regis Barnichon, Michael Elsby, Bart Hobijn, and Aysegul Sahin, “Which Industries are Shifting the Beveridge Curve?” Federal Reserve Bank of San Francisco, Working Paper 2010-32, October 2011 (www.frbsf.org/publications/economics/papers/2010/wp10-32bk.pdf).

¹⁵ U.S. Congress Joint Economic Committee, “Nowhere to Go: Geographic and Occupational Immobility and Free Trade,” October 2011 (www.jec.senate.gov/public/index.cfm?p=Reports1&ContentRecord_id=576fd851-82fa-4297-ae45-b28af3e90a22&ContentType_id=efc78dac-24b1-4196-a730-d48568b9a5d7&Group_id=c120e658-3d60-470b-a8a1-6d2d8fc30132&YearDisplay=2011).

¹⁶ U.S. Department of Commerce, Economics and Statistics Administration, “The Benefits of Manufacturing Jobs,” May 2012 (www.esa.doc.gov/sites/default/files/reports/documents/thebenefitsofmanufacturingjobsfinal5812.pdf).

¹⁷ Harvard Graduate School of Education, “Pathways to Prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century,” February 2011 (www.gse.harvard.edu/news_events/features/2011/Pathways_to_Prosperty_Feb2011.pdf).

¹⁸ Department of Labor, Bureau of Labor Statistics, Employment Projections, “Employment by summary education and training assignment, 2010 and projected 2020,” February 2012 (http://www.bls.gov/emp/ep_table_education_summary.htm).

¹⁹ President’s Council on Jobs and Competitiveness, “Road Map to Renewal: Invest in Our Future, Build on Our Strengths, Play to Win,” 2011 Year-End Report (files.jobs-council.com/files/2012/01/Jobscouncil_2011YearEndReportWeb.pdf).

²⁰ Organisation for Economic Cooperation and Development, “OECD Science, Technology, and Industry Scoreboard 2011,” Services-Manufacturing Linkages (www.oecd-ilibrary.org/sites/sti_scoreboard-2011-en/06/02/index.html?jsessionid=3lqmcoicxirvw.delta?contentType=&itemId=/content/chapter/sti_scoreboard-2011-56-en&containerItemId=/content/serial/20725345&accessItemIds=/content/book/sti_scoreboard-2011-en&mimeType=text/html). Among OECD countries, the United States has the highest share of employees in the manufacturing sector who work in service-related occupations – over 50 percent.

²¹ U.S. Congress Joint Economic Committee, “STEM Education: Preparing Jobs of the Future,” April 2012 (www.jec.senate.gov/public/index.cfm?p=Reports1&ContentRecord_id=92c8daf4-47c8-416a-bfa4-984cc8b6525a&ContentType_id=efc78dac-24b1-4196-a730-d48568b9a5d7&Group_id=c120e658-3d60-470b-a8a1-6d2d8fc30132&YearDisplay=2012). The manufacturing sector may be experiencing particular challenges in recruiting STEM-capable workers because of a decline in the manufacturing wage premium over non-manufacturing

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jobs in recent years, and a self-reinforcing perception that the manufacturing sector will remain in decline in the years to come. See Britton Lombardi and William A. Testa, “Why are Manufacturers Struggling to Hire High-Skilled Workers,” The Federal Reserve Bank of Chicago, *Essays on Issues*, Number 289, August 2011 (www.chicagofed.org/digital_assets/publications/chicago_fed_letter/2011/cflaugust2011_289.pdf).

²² For a discussion of current statistics on STEM education, see U.S. Congress Joint Economic Committee, “STEM Education: Preparing Jobs of the Future,” April 2012 (www.jec.senate.gov/public/index.cfm?p=Reports1&ContentRecord_id=92c8daf4-47c8-416a-bfa4-984cc8b6525a&ContentType_id=efc78dac-24b1-4196-a730-d48568b9a5d7&Group_id=c120e658-3d60-470b-a8a1-6d2d8fc30132&YearDisplay=2012).

²³ American Association of Community Colleges, “Reclaiming the American Dream: Community Colleges and the Nation’s Future,” 2012 (www.aacc.nche.edu/AboutCC/21stcenturyreport/21stCenturyReport.pdf). For further discussion of the disconnect between curricula and skills in demand, see U.S. Congress Joint Economic Committee, “STEM Education: Preparing Jobs of the Future,” April 2012 (www.jec.senate.gov/public/index.cfm?p=Reports1&ContentRecord_id=92c8daf4-47c8-416a-bfa4-984cc8b6525a&ContentType_id=efc78dac-24b1-4196-a730-d48568b9a5d7&Group_id=c120e658-3d60-470b-a8a1-6d2d8fc30132&YearDisplay=2012). Community college enrollment increased from 3.1 million young adults in the fall of 2007 to 3.4 million in the fall of 2008, a 9.7 percent increase. See Richard Fry, “College Enrollment Hits All-Time High, Fueled by Community College Surge,” Pew Research Center, October 29, 2009 (www.pewsocialtrends.org/files/2010/10/college-enrollment.pdf).

²⁴ In some instances, the government may be better-positioned to support training workers than individual companies. For example, because employees are less likely to spend the duration of their careers with a given company, the company may be less willing to invest substantial resources in training the new employee. Moreover, because of the decline of assembly-line- and factory-floor-manufacturing jobs, it may be more difficult for firms to find the number of new employees with similar job responsibilities needed to make large-scale training cost effective. See Britton Lombardi and William A. Testa, “Why are Manufacturers Struggling to Hire High-Skilled Workers,” The Federal Reserve Bank of Chicago, *Essays on Issues*, Number 289, August 2011 (www.chicagofed.org/digital_assets/publications/chicago_fed_letter/2011/cflaugust2011_289.pdf).

²⁵ U.S. Congress Joint Economic Committee, “Addressing Long-Term Unemployment after the Great Recession: The Crucial Role of Workforce Training,” August 2011 (www.jec.senate.gov/public/index.cfm?p=Reports1&ContentRecord_id=8f44208c-a04d-4d0f-b0c7-490625cb21ac&ContentType_id=efc78dac-24b1-4196-a730-d48568b9a5d7&Group_id=c120e658-3d60-470b-a8a1-6d2d8fc30132&YearDisplay=2011).

²⁶ Joint Economic Committee Chairman’s Staff calculations based on data from the Organisation for Economic Co-operation and Development (OECD).

²⁷ For a discussion of programs currently authorized by these acts and issues surrounding their reauthorization, see Rebecca R. Skinner, Jeffrey J. Kuenzi, Cassandra Dortch, and Gail McCallion, “ESEA Reauthorization Proposals in the 112th Congress: Comparison of Major Features,” Congressional Research Service, November 6, 2012; David H. Bradley and Benjamin Collins, “Workforce Investment Act (WIA) Reauthorization Proposals in the 112th Congress: Comparison of Major Features of Current Law and H.R. 4297,” Congressional Research Service, August 10, 2012; Cassandra Dortch, “Carl D. Perkins Career and Technical Education Act of 2006: Implementation Issues,” Congressional Research Service, December 14, 2012.

²⁸ Erica Williams, Michael Leachman, and Nicholas Johnson, “State Budget Cuts in the New Fiscal Year Are Unnecessarily Harmful,” Center on Budget and Policy Priorities, July 28, 2011 (www.cbpp.org/files/7-26-11sfp.pdf).

Manufacturing in America: Challenges and Policy Solutions

²⁹ Jeff Bryant, “Starving America’s Public Schools: How Budget Cuts and Policy Mandates are Hurting our Nation’s Students,” Campaign for America’s Future and the National Education Association (www.ourfuture.org/files/documents/starving-schools-report.pdf?#).

³⁰ All names of legislation and bill numbers referenced in this report refer to bills introduced in the 112th Congress, unless otherwise noted.

³¹ National Skills Coalition, “Letter to Senators Harkin, Murray, Enzi and Isakson on WIA Reauthorization,” June 17, 2011 (www.nationalskillscoalition.org/federal-policies/workforce-investment-act/wia-documents/nsc_wia_committeeletter_2011-06-17.pdf).

³² For more information, see Sheila Maguire, Joshua Freely, Carol Clymer, and Maureen Conway, “Job Training That Works: Findings from the Sectoral Employment Impact Study,” *Public/Private Ventures*, May 2009 (www.nationalskillscoalition.org/federal-policies/sector-partnerships/sectors-documents/ppv_sectorbrief_2009-05.pdf).

³³ For a review of literature on the economic impact of infrastructure investment, see Council of Economic Advisers, “A New Economic Analysis of Infrastructure Investment,” Department of the Treasury, March 23, 2012 (www.treasury.gov/resource-center/economic-policy/Documents/20120323InfrastructureReport.pdf); Congressional Budget Office, “Trends in Public Spending on Transportation and Water Infrastructure, 1956 to 2004,” August 2007 (www.cbo.gov/ftpdocs/85xx/doc8517/08-08-Infrastructure.pdf). In particular, see David Aschauer, “Is Public Expenditure Productive?” *Journal of Monetary Economics*, March 1989; David Aschauer, “Public Investment and Productivity Growth in the Group of Seven,” *Economic Perspectives*, 1989; David Aschauer, “Does Public Capital Crowd Out Private Capital?” *Journal of Monetary Economics*, 1989; Alicia H. Munnell, “Infrastructure Investment and Economic Growth,” *Journal of Economic Perspectives*, American Economic Association, 1992.

³⁴ Alfredo Marvao Pereira, “Is All Public Capital Created Equal?” *The Review of Economics and Statistics*, 2000, in Alfredo Marvao Pereira and Jorge M. Andraz, “On the Economic Effects of Public Infrastructure Investment: A Survey of International Evidence,” College of William and Mary, Department of Economics, Working Paper, Number 108, December 2010 (http://economics.wm.edu/wp/cwm_wp108.pdf).

³⁵ OECD, “Going for Growth 2009: Economic Policy Reforms,” 2009 (www.oecd.org/document/52/0,3746,en_2649_34117_41935009_1_1_1_1,00.html).

³⁶ Alfredo Marvao Pereira and Jorge M. Andraz, “On the Economic Effects of Public Infrastructure Investment: A Survey of International Evidence,” College of William and Mary, Department of Economics, Working Paper, Number 108, December 2010 (http://economics.wm.edu/wp/cwm_wp108.pdf).

³⁷ Timo Henckel and Warwick McKibbin, “The Economics of Infrastructure in the Globalized World: Issues, Lessons, and Future Challenges,” Brookings Institution, June 4, 2010 (www.brookings.edu/papers/2010/0604_infrastructure_economics_mckibbin.aspx).

³⁸ Robert Puentes, “Move It: How the U.S. Can Improve Transportation Policy,” *Wall Street Journal*, May 23, 2011 (www.brookings.edu/opinions/2011/0523_transportation_policy_puentes.aspx); Spiros Bougheas, Panicos O. Demetriades, and Edgar L.W. Morganroth, “Infrastructure, Transport Costs, and Trade,” *Journal of International Economics*, 47, 1997; Nuno Limao and Anthony J. Venables, “Infrastructure, Geographical Disadvantage, Transport Costs, and Trade,” *World Bank Economic Review*, 2001. The International Trade Administration has stressed the importance of maintaining “supply chain infrastructure” in good condition to facilitate manufacturing, transportation, trade, and, in general, to keep the United States competitive in the global economy. See Nicole Y. Lamb-Hale, “Doubling U.S. Exports: Are U.S. Sea Ports Ready for the Challenge?” Testimony Before the U.S. Senate Committee on Finance, Subcommittee on International Trade, Customs and Global Competitiveness, April 29, 2010 (<http://finance.senate.gov/imo/media/doc/042910nltest.pdf>).

Manufacturing in America: Challenges and Policy Solutions

³⁹ Catherine Morrison and Amy Ellen Schwartz, “State Infrastructure and Productive Performance,” National Bureau of Economic Research, January 1992, (www.nber.org/papers/w3981.pdf?new_window=1); Alfredo Marvao Pereira and Jorge M. Andraz, “On the Impact of Public Investment on the Performance of U.S. Industries,” *Public Finance Review*, Vol. 31, No. 1, 2003, cited in Alfredo Marvao Pereira and Jorge M. Andraz, “On the Economic Effects of Public Infrastructure Investment: A Survey of International Evidence,” College of William and Mary, Department of Economics, Working Paper, Number 108, December 2010 (http://economics.wm.edu/wp/cwm_wp108.pdf).

⁴⁰ Texas Transportation Institute, “2011 Urban Mobility Report,” September 2011 (<http://tti.tamu.edu/documents/mobility-report-2011.pdf>).

⁴¹ Adie Tomer, Elizabeth Kneebone, Robert Puentes, and Alan Berube, “Missed Opportunity: Transit and Jobs in Metropolitan America,” Brookings Institution, Metropolitan Policy Program, May 2011 (www.brookings.edu/~media/Files/Programs/Metro/jobs_transit/0512_jobs_transit.pdf).

⁴² Congressional Budget Office, “Public Spending on Transportation and Water Infrastructure,” Table A-1, November 2010 (www.cbo.gov/sites/default/files/cbofiles/ftpdocs/119xx/doc11940/11-17-infrastructure.pdf).

⁴³ Department of the Treasury with the Council of Economic Advisers, “A New Economic Analysis of Infrastructure Investment,” March 23, 2012 (www.treasury.gov/resource-center/economic-policy/Documents/20120323InfrastructureReport.pdf).

⁴⁴ Congressional Budget Office, “Public Spending on Transportation and Water Infrastructure,” Table A-1, November 2010 (www.cbo.gov/sites/default/files/cbofiles/ftpdocs/119xx/doc11940/11-17-infrastructure.pdf).

⁴⁵ World Economic Forum, “The Global Competitiveness Report 2012-2013,” 2012 (http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2012-13.pdf).

⁴⁶ “Life in the Slow Lane,” *The Economist*, April 28, 2011 (www.economist.com/node/18620944). Other studies discuss the extent to which the United States favors new construction over maintenance. See Barry Bosworth and Sveta Milusheva, “Innovations in U.S. Infrastructure Financing: An Evaluation,” The Brookings Institution, October 2011 (www.brookings.edu/~media/research/files/papers/2011/10/20%20infrastructure%20financing%20bosworth%20milusheva/1020_infrastructure_financing_bosworth_milusheva.pdf).

⁴⁷ Edward Gramlich, “Infrastructure Investment: A Review Essay,” *Journal of Economic Literature*, Vol. 32, No. 3, September 1993 (<http://www1.worldbank.org/publicsector/pe/pfma06/EdwardGramlich.pdf>).

⁴⁸ Peter R. Orszag, Director, Congressional Budget Office, “Investing in Infrastructure,” Testimony before the U.S. Senate Committee on Finance, July 10, 2008 (www.cbo.gov/ftpdocs/95xx/doc9534/7-10-Infrastructure.pdf).

⁴⁹ American Society of Civil Engineers, “2009 Report Card for America’s Infrastructure,” March 2009 (http://www.infrastructurereportcard.org/sites/default/files/RC2009_full_report.pdf).

⁵⁰ Transportation Research Board, National Cooperative Highway Research Program, *Future Financing Options to Meet Highway and Transit Needs*, NCHRP Web-Only Document 102, 2006 (http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_w102.pdf); U.S. Department of Transportation, Federal Highway Administration and Federal Transit Administration, *2008 Status of the Nation’s Highways, Bridges, and Transit: Conditions and Performance*, 2009 (www.fhwa.dot.gov/policy/2008cpr/index.htm); National Surface Transportation Policy and Revenue Study Commission, *Transportation for Tomorrow*, 2007 (http://transportationfortomorrow.com/final_report/pdf/final_report.pdf); National Surface Transportation Infrastructure Financing Commission, *Paying Our Way: A New Framework for Transportation Finance*, February 2009 (http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Mar09FNL.pdf).

⁵¹ Congressional Research Service, “Public-Private Partnerships (PPPs) in Highway and Transit Infrastructure Provision,” February 22, 2010, (<http://www.crs.gov/Products//rl/pdf/RL34567.pdf>).

Manufacturing in America: Challenges and Policy Solutions

⁵² *Ibid.*

⁵³ *Ibid.*; See also Robert Puentes, “Move It: How the U.S. Can Improve Transportation Policy,” *Wall Street Journal*, May 23, 2011 (www.brookings.edu/opinions/2011/0523_transportation_policy_puentes.aspx).

⁵⁴ Congressional Budget Office, “Trends in Public Spending on Transportation and Water Infrastructure, 1956 to 2004,” August 2007 (www.cbo.gov/ftpdocs/85xx/doc8517/08-08-Infrastructure.pdf).

⁵⁵ While current borrowing rates may be higher than is typical, in general local governments can obtain long-term financing at low rates of interest. They nonetheless face challenges in generating revenue streams to pay for the investment and maintenance costs. See Barry Bosworth and Sveta Milusheva, “Innovations in U.S. Infrastructure Financing: An Evaluation,” The Brookings Institution, October 2011 (www.brookings.edu/~media/research/files/papers/2011/10/20%20infrastructure%20financing%20bosworth%20milusheva/1020_infrastructure_financing_bosworth_milusheva.pdf).

⁵⁶ Congressional Research Service, “Surface Transportation Funding and Programs Under MAP-21: Moving Ahead for Progress in the 21st Century Act (P.L. 112-141),” September 27, 2012 (http://www.infrastructurereportcard.org/sites/default/files/RC2009_full_report.pdf).

⁵⁷ Joseph Kile, Assistant Director for Macroeconomic Studies, Congressional Budget Office, “The Highway Trust Fund and Paying for Highways,” Testimony before the U.S. Senate Committee on Finance, May 17, 2011 (www.cbo.gov/sites/default/files/cbofiles/ftpdocs/121xx/doc12173/05-17-highwayfunding.pdf).

⁵⁸ Congressional Research Service, “Surface Transportation Funding and Programs Under MAP-21: Moving Ahead for Progress in the 21st Century Act (P.L. 112-141),” September 27, 2012 (http://www.infrastructurereportcard.org/sites/default/files/RC2009_full_report.pdf).

⁵⁹ Department of the Treasury with the Council of Economic Advisers, “A New Economic Analysis of Infrastructure Investment,” March 23, 2012 (www.treasury.gov/resource-center/economic-policy/Documents/20120323InfrastructureReport.pdf); Barry Bosworth and Sveta Milusheva, “Innovations in U.S. Infrastructure Financing: An Evaluation,” The Brookings Institution, October 2011 (www.brookings.edu/~media/research/files/papers/2011/10/20%20infrastructure%20financing%20bosworth%20milusheva/1020_infrastructure_financing_bosworth_milusheva.pdf).

⁶⁰ Emilia Istrate and Robert Puentes, “Moving Forward on Public Private Partnerships: U.S. and International Experience with PPP Units,” Brookings-Rockefeller Project on State and Metropolitan Innovation, December 2011 (www.brookings.edu/~media/research/files/papers/2011/12/08%20transportation%20istrate%20puentes/1208_transportation_istrate_puentes).

⁶¹ U.S. Government Accountability Office, “Highway Public-Private Partnerships: More Rigorous Up-front Analysis Could Better Secure Potential Benefits and Protect the Public Interest,” GAO-08-44, February 2008 (www.gao.gov/new.items/d0844.pdf).

⁶² Raymond M. Wolfe, “U.S. Businesses Report 2008 Worldwide R&D Expense of \$330 Billion: Findings from New NSF Survey,” National Science Foundation, May 2010 (<http://www.nsf.gov/statistics/infbrief/nsf10322/nsf10322.pdf>).

⁶³ Moses Abramovitz, “Resource and Output Trends in the United States Since 1870,” National Bureau of Economic Research, 1956, (<http://nber.org/chapters/c5650.pdf>); Robert Solow, “A Contribution to the Theory of Economic Growth,” *The Quarterly Journal of Economics*, 70(1), February 1956 (<http://jstor.org/pss/1884513>); Paul A. Romer, “Increasing Returns and Long Run Growth,” Rochester Center for Economic Research, Working Paper No. 27, October 1985 (http://rcer.econ.rochester.edu/RCERPAPERS/rcer_27.pdf); Charles Jones, “Introduction: The Facts of Economic Growth,” *Introduction to Economic Growth 2nd Edition*, 2001 (<http://gdsnet.org/GDS/JonesChapter1B.pdf>); Charles Jones, “Sources of U.S. Economic Growth in a World of Ideas,” *The American Economic Review*, Vol. 92, No. 1, March 2002 (<http://stanford.edu/~chadj/SourcesAER2002.pdf>).

Manufacturing in America: Challenges and Policy Solutions

- ⁶⁴ Laura Tyson and Greg Linden, “The Corporate R&D Tax Credit and U.S. Innovation and Competitiveness,” Center for American Progress, January 2012 (www.americanprogress.org/issues/2012/01/pdf/corporate_r_and_d.pdf); Bronwyn Hall, Jacques Mairesse, and Pierre Mohnen, “Measuring the Returns to R&D,” National Bureau of Economic Research, December 2009 (www.nber.org/papers/w15622).
- ⁶⁵ Kenneth J. Klassen, Jeffrey A. Pittman, and Margaret P. Reed, “A Cross-National Comparison of R&D Expenditure Decisions: Tax Incentives and Financial Constraints,” *Contemporary Accounting Research*, 2004; Bronwyn Hall, “R&D Tax Policy During the Eighties: Success or Failure,” *Tax Policy & The Economy*, 1993.
- ⁶⁶ Robert D. Atkinson, President and Founder, Information Technology and Innovation Foundation, “Hearing on Tax Reform Options; Incentives for Capital Investment and Manufacturing,” Testimony before the U.S. Senate Committee on Finance, March 6, 2012 (<http://www2.itif.org/2012-senate-finance-manufacturing.pdf>).
- ⁶⁷ U.S. Department of Commerce, Economics and Statistics Administration and the United States Patent and Trademark Office, “Intellectual Property and the U.S. Economy: Industries in Focus,” March 2012.
- ⁶⁸ U.S. International Trade Commission, “Number of Section 337 Investigations Instituted by Calendar Year” (www.usitc.gov/intellectual_property/documents/cy_337_institutions.pdf).
- ⁶⁹ U.S. Government Accountability Office, “Intellectual Property: Observations on Efforts to Quantify the Economic Effects of Counterfeit and Pirated Goods,” GAO-10-423, April 2010 (www.gao.gov/assets/310/303057.pdf).
- ⁷⁰ OECD, “Magnitude of Counterfeiting and Piracy of Tangible Products: An Update,” November 2009 (<http://www.oecd.org/industry/industryandglobalisation/44088872.pdf>).
- ⁷¹ U.S. Customs and Border Protection and U.S. Immigration and Customs Enforcement, “Intellectual Property Rights: Fiscal Year 2011 Seizure Statistics” (www.ice.gov/doclib/iprcenter/pdf/ipr-fy-2011-seizure-report.pdf).
- ⁷² *Ibid.*
- ⁷³ Robert M. Feinberg and Donald J. Rousslang, “The Economic Effects of Intellectual Property Right Infringements,” *The Journal of Business*, Vol. 63, No. 1, Part 1, January 1990.
- ⁷⁴ U.S. Department of Commerce, Census Bureau, U.S. International Trade Data (Top Trading Partners: <http://www.census.gov/foreign-trade/statistics/highlights/top/top1112yr.html>; Canada: <http://www.census.gov/foreign-trade/balance/c1220.html>; China: <http://www.census.gov/foreign-trade/balance/c5700.html>).
- ⁷⁵ Arvind Subramanian, “New PPP-Based Estimates of Renminbi Undervaluation and Policy Implications,” Peterson Institute for International Economics, April 2010.
- ⁷⁶ Robert E. Scott “Growing U.S. Trade Deficit With China Cost 2.8 Million Jobs Between 2001 and 2010,” Economic Policy Institute, EPI Briefing Paper, Number 323, September 2011 (www.epi.org/publication/growing-trade-deficit-china-cost-2-8-million/).
- ⁷⁷ While an undervalued Chinese currency can harm U.S. manufacturers, it can also provide U.S. businesses and consumers with less-expensive foreign goods, including lower-cost raw materials.
- ⁷⁸ Andrew B. Bernard, J. Bradford Jensen, and Peter K. Schott, “Survival of the Best Fit: Exposure to Low-wage Countries and the (Uneven) Growth of U.S. Manufacturing Plants,” *Journal of International Economics*, 68 (1), pp. 219-237.
- ⁷⁹ Intellectual Property Rights Enforcement Act, S. 522, 110th Congress, 1st Session, 2007.