In 2012, the National Conference of State Legislatures (NCSL) formed a new public/private partnership to examine the role of state policymakers in job creation and innovation through the NCSL Foundation. The partnership supports NCSL’s ongoing efforts to improve the quality of information available to state policymakers.

A key goal of the partnership is to improve the dialogue among state legislators, business representatives and other organizations interested in state policy decisions. The partnership convened a National Jobs Summit in September, 2013 and is publishing a series of issue briefs on state policies related to job creation and innovation.

This brief is one of three.

Other briefs in this series include:

- Workforce Development Initiatives: Collaborating to Prepare for Jobs of the Future
- Innovations in State Entrepreneurship Policy

These works could not have been accomplished without the invaluable assistance and expertise of our partners.

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Manufacturing has long been considered the backbone of the United States economy. Throughout the 20th century, manufacturing contributed to a strong American middle class by creating relatively high-paying jobs. Manufacturing employment has steadily decreased since its peak in the late 1970’s, however, going from 22 percent of non-farm employment down to 9 percent in 2012, according to data from the U.S. Bureau of Labor.

There are many reasons for the decline in U.S. manufacturing, but three factors emerge as primary causes: globalization, recessions and technology. Beginning in the 1990s, widespread use of the Internet and other advances in global communications, along with new trade agreements, allowed many manufacturers to move production to developing countries, particularly China, where wages were significantly lower than in the United States. Recessions in 2001 and 2008, dramatically accelerated the number of manufacturing job losses. Finally, innovations in technology and automation have allowed manufacturers to increase production without the need for more workers.

Manufacturing employment in the United States, however, is making a slow recovery: more than 500,000 manufacturing jobs were created from January 2010 through February 2013. One of the most interesting developments during this period was the movement of some overseas manufacturing operations back to the United States. This trend, known as “insourcing” or “reshoring,” has started a debate on whether or not American manufacturing employment is poised to make a comeback. There is some evidence to support that notion.

The United States is becoming more competitive as labor costs in other parts of the world rise. China no longer provides the cost advantage in manufacturing that it did a decade ago. Wages and benefits in China have been steadily rising. By 2015, the gap in labor costs between China and the United States could shrink to as little as $7 per hour. After factoring transportation and other costs, many companies are finding that manufacturing products in the United States is more economical than making products in Asia that are destined for American consumers. Apple, Caterpillar, Ford, General Electric and Whirlpool are just some of the companies that have recently announced plans to bring manufacturing operations back to the United States.
The Role of States
As states work to rebuild their economies in the wake of the Great Recession, lawmakers frequently talk about manufacturing as a way to create new jobs. To encourage manufacturing, legislators need to understand what manufacturing in their state looks like so they can address the challenges that must be met to strengthen the industry. It’s not just about offering incentives to manufacturers and simplifying regulations, but also about providing adequate infrastructure, promoting innovation and the use of technology and training workers.

To learn more about how to capitalize on new manufacturing opportunities, several state legislatures have created commissions to study manufacturing in their states. These commissions are often bipartisan and comprehensive in studying all issues related to the industry. Some common purposes of these commissions include:
- Understanding the strengths and challenges that manufacturers face; Interacting with manufacturers through discussions and touring facilities;
- Recommending how to strengthen existing manufacturing operations while encouraging the sector’s growth; and
- Supporting manufacturing-related legislation.

Financial Incentives
To attract or expand businesses and create jobs, states frequently offer financial incentives, usually in the form of tax breaks. Some states also use special funds or grants that can be applied to manufacturing. For example, the One North Carolina Fund was established by the General Assembly as a special revenue fund in the Department of Commerce and has been used to award grants to high-tech manufacturing companies for expansion.

Other states have grant programs specifically for manufacturing. The New York Manufacturing Assistance Program (MAP) helps manufacturers invest in capital projects that improve production, productivity and competitiveness. The Connecticut Department of Labor offers training grants for manufacturers as part of the legislature’s Manufacturer’s Assistance Act (MAA).

Tax incentives come in the form of lower taxes, either by lowering rates or by providing tax credits and exemptions. Every state has at least one tax incentive program and most states have several. Incentives are frequently used as part of a bidding war between states over businesses that are seeking to relocate or expand. Manufacturing has been one of the primary beneficiaries of these packages. Types of incentives include:
- Lower corporate income tax rates
- Sales and use tax exemptions on purchases of equipment used in manufacturing
- Property tax exemptions for manufacturing facilities
- Tax credits against corporate and franchise income taxes for creating jobs
- Research and development tax credits
- Job training or apprenticeship tax credits
- Tax credits for manufacturers of specific products
- Designating economically disadvantaged areas as “enterprise zones” and offering incentives to businesses that decide to operate in these areas

Despite the popularity of tax incentives, many question their effectiveness. Critics argue the incentives take money away from vital public services and reallocate it to businesses that don’t need it and who do not create

The Texas House Interim Committee on Manufacturing
Texas Speaker Joe Straus created a 15-member, bipartisan House Interim Committee on Manufacturing in October 2012. Its goals were to compile and summarize committee findings on how to improve manufacturing in Texas, recommend ways to encourage manufacturing and determine how those recommendations interplay with other committees’ work on business growth and retention in the state. Its mission was to initiate a process in which solutions and strategies could be explored and collaboratively implemented. In January 2013, the committee issued a report with a comprehensive list of recommendations, including:
- **Finance and incentive recommendations** such as providing a research and development tax credit and conducting an “exit interview” with major manufacturing firms that choose locations outside of the state after considering locations within Texas.
- **Workforce recommendations** such as providing an alternative pathway for students who want to enter the workforce after graduating from high school and encouraging community colleges to partner with the private sector and school districts to develop programs to utilize internships that result in certificates or licenses upon graduation.
- **Adequately funding transportation infrastructure** and focusing on water conservation.
- **Recommendations for 12 different house committees**, largely centered on examining funding mechanisms, incentive programs and regulations.
a significant number of jobs. At the same time, many businesses expect them and no elected official wants to be responsible for losing a big manufacturer to another state or foreign country.

One of the biggest challenges of tax incentives is trying to measure their impact. Data on incentives, once implemented, is fairly sparse. Most states produce some sort of tax expenditure report in which they try to quantify the amount of foregone revenue as a result of tax breaks. For example, Connecticut law requires the General Assembly’s Office of Fiscal Analysis to issue biennial reports on the state’s tax expenditures. The reports must contain detailed information on every tax expenditure, including the estimated state and municipal fiscal impact during each fiscal year of the biennium covered in the report and an estimate of the revenue that would result from the repeal of the expenditure.

Tax expenditure reports help keep policymakers apprised about tax credits so that they can make informed policy decisions. However, data is not always collected regularly, nor is it always reliably reported. As a result, these reports vary widely in scope and usefulness. The Pew Charitable Trusts has conducted significant research into how states evaluate incentive programs. Researchers found that only nine states—Arizona, Arkansas, California, Connecticut, Delaware, Iowa, Nebraska, Oregon and Washington—regularly evaluate major tax incentives. Half the states have not even taken the basic steps needed to know whether their incentives are effective.

In 2009, Oregon lawmakers established a process to evaluate tax incentives. Brought on by a severe budget shortfall and a runaway tax credit, they enacted legislation that established sunset dates for all tax credits. They divided existing credits into three groups with staggered expiration dates of two years, four years and six years. As a result, one-third of all tax credits sunset every two years unless legislative action is taken. After the initial review, credits sunset every six years.

The Joint Committee on Tax Credits reviews all credits before they expire and conducts public hearings to get input from residents, businesses and state agencies about each credit and its intended policy goal. The credit is then considered during the budget process on its merits. Decisions are made about whether to keep the credit, change it or let it expire.

The first round of credits came up for review in 2011—also a period of ongoing fiscal difficulty—and resulted in significant cuts to the number and amount of state tax credits. After an exhaustive review, lawmakers identified $40 million in credits they wished to retain. The state’s budget allowance was only $10 million, however, which forced them to go back and re-evaluate each credit’s contribution to state policy goals in order to eliminate $30 million more.

The second batch of credits was reviewed in 2013—an easier process because the state budget was in better shape. Even so, policymakers must evaluate each credit and justify it as a good state investment with solid measurement data if it is to be retained. The final group of credits will be reviewed in 2015 and then the cycle repeats.

The state will still authorize new tax credits, but they all have a six-year life cycle and must include a stated policy goal upon which the credit can be evaluated.
Manufacturing is an industry that is highly regulated. Most of the regulations imposed on manufacturers are environmental in nature, although they also address workplace safety, employment, permitting, inspections and occupational licensing, among other issues. Regulations protect the health and well-being of workers and the general public, but they also add a level of complication for many businesses. As a result, the cost and complexity of regulatory compliance for manufacturers is a regular legislative agenda item. Some states are taking action.

- North Carolina enacted the Regulatory Reform Act of 2013, which is the most comprehensive review ever of the state’s regulations. Over 10 years, all North Carolina regulations not required by federal law will be subject to review and potential amendment or repeal. The rules will be reviewed under a three-step process involving state agencies, the Rules Review Commission and the Joint Legislative Administrative Procedure Oversight Committee.
- In 2013, New York lawmakers conducted a series of public hearings across the state as part of an effort to identify and eliminate the most costly government regulations and mandates that impede business and job growth. The forums were hosted by the Administrative Regulations Review Commission and the Senate Committee on Commerce, Economic Development and Small Business.
- In 2012, Massachusetts launched a four-part regulatory reform initiative that included:
  - comprehensive review and reevaluation of existing regulations;
  - systematic and coordinated process for regulators to consider economic impacts for newly proposed regulations;
  - public reporting of small business impacts for all regulatory changes to improve transparency during the public rule-making process; and
  - partnerships with the regulated community to share responsibility for creating a balanced regulatory environment.

Other states have attempted to reduce the burden of regulations by requiring state agencies to prepare a job impact or a fiscal impact analysis of all proposed new regulations.

Opinions diverge on the need and appropriate level of manufacturing regulations. Most agree, however, that the best regulatory system is one where governments and industry act in partnership rather than as adversaries, to improve state competitiveness.

Infrastructure

Manufacturers rely on sound infrastructure. Power and water are necessary for production and once manufactured, goods must be transported to their final destination. Yet, America’s core infrastructure is in poor shape.

The American Society of Civil Engineers (ASCE) prepares a report card every four years that provides a comprehensive assessment and assigns grades to the nation’s major infrastructure categories. Since 1998, the grades have been near failing, averaging only Ds, due to

Working Together to Lower River Temperature: A Wastewater Treatment Partnership

In 2012, the city of Albany, Oregon opened the Albany-Millersburg Talking Water Gardens to the public. It is the first public/private engineering project of its kind in the United States: a constructed treatment wetland designed to provide an additional level of natural treatment for a combined municipal and industrial wastewater flow. The gardens began construction in 2010, and include a series of ponds and plant life optimized to treat wastewater. The gardens provide a natural means of cooling and purifying the treated wastewater from Albany and Millersburg. The cleaned water is then discharged into the Willamette River.

The 37 acres of constructed wetlands remove nutrients via microbial conversion, absorption and deposition. Waterfalls are used to mix the water, and plants are used to provide cooling shade. In addition, the wetlands increase biodiversity, create habitats for native bird species, and protect fish habitats in the Willamette River.

The project was successful due to a public-private partnership between the two cities and the nearby ATI Wah Chang facility, a local metal manufacturer and the Oregon Department of Environmental Quality. It was awarded $8 million in funding through the American Recovery and Reinvestment Act.
delayed maintenance and underinvestment across most categories. The grades in 2013 ranged from a high of B- for solid waste to a low of D- for inland waterways and levees. Rail saw the biggest improvement and jumped from a C- to a C+, due in part to greater private investment. Solid waste, drinking water, wastewater, roads and bridges all saw incremental improvements as cities and states renewed efforts to fix some of the most vulnerable bridges; and several categories benefited from short-term boosts in federal funding.

Investments in infrastructure are major expenditures and many state and local governments are forming public-private partnerships to help offset some of the costs. Virginia, for example, recently teamed up with the private sector to address growing congestion problems on the Capital Beltway. The original state proposal was for a traditional road expansion that was not only expensive, but would have required taking more than 350 homes and businesses along the Beltway. In addition, it did not provide any incentives for bus service or carpooling. Instead, Fluor Enterprises proposed a better idea – build four new high occupancy toll (HOT) lanes. The streamlined HOT lanes require much less space, which reduced the home removal for the project from 350 to just eight. And the HOT lanes add new capacity to the Beltway, while also creating a network for buses and carpools to travel. A private vendor manages the toll operation, while the state of Virginia still owns and oversees the road.

Manufacturers frequently list infrastructure as a factor in their facility location decisions, and solid infrastructure is critical for a thriving manufacturing sector. State and local governments seeking to boost industry investment may benefit from a comprehensive evaluation of current infrastructure needs and then work together with the private sector to improve the most pressing of them.

**New Opportunities for U.S. Manufacturing**

Manufacturing today bears little resemblance to the manufacturing jobs of the mid-20th century. The image of unskilled workers performing repetitive tasks in a large factory is outdated. Instead, today’s manufacturing landscape is filled with small factories, a lot of technology and more educated workers.

**The Role of Technology**

Technology is the underlying factor for almost all of the changes in today’s manufacturing sector. Advances in robotics have increased both productivity and reliability. Furthermore, the declining price of robots has made them much more accessible, and, most agree, robotics are the future of manufacturing.

The new generation of manufacturing uses sophisticated technology to improve products and processes.

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**Additive Manufacturing Helps Revive the Rust Belt**

Additive Manufacturing (AM) is a new type of manufacturing with many applications. Also termed 3D printing, the process uses digital 3D design to build up solid objects from small particles. For example, instead of milling a product from solid block, AM builds up components layer by layer using materials that are available in fine powder form. A range of different metals, plastics and composite materials may be used to fabricate end-use products such as aircraft parts, dental restorations, medical implants, automobiles and fashion products.

To increase domestic research and development in AM, President Obama announced a national network—made up of 15 manufacturing innovation institutes located throughout the country—in March 2012. That group then launched the National Additive Manufacturing Innovation Institute (NAMII) in Youngstown, Ohio, as a pilot project.

NAMII is managed by the National Center for Defense Manufacturing and Machining and operates as a public-private partnership with member organizations from industry, academia, government and workforce development resources. NAMII is working to transition AM technology to the mainstream manufacturing sector by training workers in this new technology.

Landing NAMII has helped fuel economic growth in the Cleveland-Youngstown-Pittsburgh corridor, causing some to refer to the region, formerly known as the “rust belt,” as the “tech belt.” As a result, area leaders in government, industry, academia and economic development have come together to form the TechBelt Initiative, which hopes to establish the region as a global center for public and private investment, research and manufacturing.

The pilot project was a big coup for the area and drew bipartisan support from lawmakers in Ohio and Pennsylvania. Now the hope is that additive manufacturing centers will succeed in locations throughout the country.
The transformation is so great, some have likened the change to the industrial revolution. Technological advances now allow manufacturers to invent new ways of fabricating things that represent an extreme departure from the classic production-line model. By far the most significant of these advanced manufacturing developments is additive manufacturing—a process of making a three-dimensional object of virtually any shape from a digital model.  

### Foreign Investment

U.S. manufacturing also benefits from foreign investment. Foreign manufacturing businesses are attracted to the United States because of its large consumer base, educated workforce, access to new technology and research and development institutions. The U.S. is currently the world’s largest recipient of foreign direct investment (FDI) and approximately 1.68 million Americans are employed by foreign-owned manufacturing firms.  

### Low Energy Costs

Another opportunity for U.S. manufacturing is low energy costs. The industry is generally a large energy consumer that stands to benefit from the recent boom in domestic natural gas and oil production and lower domestic energy prices. This is especially true for manufacturers of chemicals and plastics that tend to rely more heavily on natural gas.

### New Challenges for U.S. Manufacturing

Despite all the enthusiasm around advanced manufacturing, there are still several challenges facing the indu-

### Hoping to Capitalize on the Natural Gas Boom

The recent discovery of vast natural gas reserves in the Marcellus Shale formation, and the ability through new drilling and technology to extract cheap, homegrown energy, has spurred state officials in the region—Ohio, Pennsylvania and West Virginia—to consider a variety of proposals for new manufacturing development.  

In 2012, Pennsylvania took the plunge. In a highly publicized move, lawmakers approved an incentive package reported to be worth more than $1 billion, to attract investment by Shell Chemical LP in a new petrochemical complex. Shell signed a land option agreement to evaluate a site 25 miles outside Pittsburgh. It based its site decision on the following factors:

- Good access to liquids-rich natural gas resources and water
- Road and rail transportation infrastructure
- Power grids
- Economics
- Sufficient land to accommodate facilities for a world-scale petrochemical complex and potential future expansions.

At the close of 2013, however, the deal was still under consideration by Shell, with a decision expected sometime in 2014.
try. One of the biggest is how it is perceived by potential workers. Negative perceptions of manufacturing present a major barrier to U.S. workforce competitiveness. In a 2011 survey conducted by Deloitte and the Manufacturing Institute, manufacturing ranked last among industries in which 18-24-year-olds said they would choose to start their careers. In a similar survey conducted in 2012, only 35 percent of respondents indicated they would encourage their children to pursue a career in the manufacturing industry and only 17 percent of respondents said their parents had encouraged them to pursue such a career, even though more than 90 percent of respondents indicated that manufacturing is “important” or “very important” to the American standard of living and economic prosperity.

There are many reasons that the general public has such a negative opinion of manufacturing. The idea of assembly line work and the tedium associated with it does not generally appeal to young people. While this may not be the reality of modern manufacturing, it is still the image that comes to mind for many Americans. Others have concerns about losing manufacturing jobs because they might get outsourced to another country. Furthermore, the belief that manufacturing jobs are low-skilled with low wages also contribute to negative perceptions of manufacturing. However, today’s manufacturing sector pays higher average compensation than many other sectors. In December 2011, manufacturing employers paid $32.93 per hour in wages and benefits.

Manufacturers are also among the leading private sector employers offering health benefits to workers.

The New Manufacturing Employee
Manufacturing has seen an increasing number of employees with some level of post-secondary education. Despite the general decline in manufacturing jobs over the past 30 years, the number of manufacturing workers with graduate degrees is increasing.

Most professional and semi-skilled employees work in the non-production side of manufacturing, which includes administrative support, transportation, architecture, engineering, management, installation, maintenance and repair. These occupations are growing, while jobs directly involved in production are falling. In 2012, fewer than 39 percent of manufacturing employees were directly involved in making goods, a 4.5 percentage drop from 2000 and a number that continues to decline.

Many production jobs have gone away with the demise of large factories. The U.S. Census Bureau counted nearly 300,000 manufacturing establishments in 2011. Of those, only 815 (far less than 1 percent) employed more than 1,000 workers. According to the National Association of Manufacturers, the vast majority of firms now employ less than 10 people. Smaller firms are generally better at adapting to market changes than large firms and they operate more effectively, largely because of advances in technology that do not require as many employees.
Fostering a Qualified Workforce

Finding qualified workers is another big challenge for manufacturers. CEO’s from around the world have identified talent-driven innovation as more important than any other single factor of manufacturing competitiveness.\(^{13}\)

While technology and production in manufacturing have advanced rapidly, workforce development has not kept up and employers face a shortage of qualified workers. The 2011 Deloitte-Manufacturing Institute survey found that U.S. manufacturing companies had as many as 600,000 jobs they could not fill because they could not find workers with the proper skills.\(^{14}\) Even though the manufacturing workforce has become more educated, it still falls behind the economy-wide average in workers with a B.A. degree or higher.\(^{15}\) A national shortage of engineering graduates also poses a major problem for the future of U.S. manufacturing. These challenges come at a time when manufacturers are dealing with an aging workforce that will see an estimated 2.7 million manufacturing employees retire by 2020.\(^{16}\)

Legislators are looking at ways to improve worker readiness. Specifically they are looking at programs that prepare students for the manufacturing sector and engaging in partnerships with higher education institutions and businesses to provide job training. For example, businesses are working directly with community colleges to develop training programs specific to their needs and agree to hire students upon course completion. These partnerships are often formed through executive branch agencies. Legislators, however, play an important role in sector strategies by embedding them into statute or by providing funding or incentives, such as tax credits for job training. The NCSL Foundation Partnership on Jobs and Innovation report on workforce development is devoted to this issue and contains several examples of state strategies to develop a trained workforce.\(^{17}\)

Summary

Manufacturing is an important sector in the American economy. While there is some debate about whether or not the country is on the verge of a manufacturing renaissance, there is little question that the manufacturing outlook has improved in recent years. Manufacturing still provides job opportunities and in many cases, is leading the way in innovative training methods.

Technological advances have increased manufacturing productivity without increasing the number of jobs. Manufacturers who are looking to hire frequently need employees with at least some post-high school education. To ensure that American manufacturing adapts to the 21st century, public and private sector leaders must work to change images of the industry, provide the right kind of education and job training and promote new technologies.

If states want to remain competitive in the global economy, it is important to develop a manufacturing strategy able to take advantage of new technologies. One that is both attractive to business and workers alike. The most effective strategies balance the cost of doing business with the need to promote innovation and develop talent with strong training programs. Policymakers can best secure a place in the world for American manufacturing by enacting thoughtful policies around economic development, education and workforce development.
Endnotes


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