

**Incentivizing an Increasingly Automated
Manufacturing Sector:
A Descriptive Analysis of U.S. States' Manufacturing
Investment Promotion Programs**

Prepared for Smart Incentives by:

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Executive Summary

In less than two decades, manufacturing jobs in the United States declined by more than 37 per cent, dropping from its peak of 19,553,000 in 1979 to an all-time low of 11,500,000 in 2010. As the economy makes its recovery from the Great Recession, manufacturing jobs have bumped up slightly to 12.3 million in 2014, but growth remains nearly stagnant as competition increases and the world becomes ever more globalized.

The decline of manufacturing jobs, particularly in the U.S. Midwest, has become a national political issue and was a prominent theme of the 2016 presidential election. Previously, attracting and maintaining specific manufacturing plants and jobs has been seen as the responsibility of state and local officials. The proliferation of state and local investment promotion agencies and programs underscores local priorities to entice and retain increasingly mobile corporations in local jurisdictions. However, President-elect Trump's widely publicized excoriation of manufacturing offshoring, and his high-profile negotiations with Carrier Corporation to keep approximately 800 jobs in Indiana that had previously been slated to move to a Mexico plant indicates localities may feel increasing pressure from both their residents and the federal government to incentivize local manufacturing in the coming years.¹

This white paper catalogs the varied incentive tools and rationales of individual states toward attracting and maintaining manufacturing operations within their jurisdictions as the manufacturing industry struggles to regain its foothold in the American economy. We use observations from cross-sectional data to answer the following questions: What tools do states use to incentivize manufacturing investment and on what grounds do they justify these programs? How, if at all, do observable differences in states' economies, demographics, and partisan environments influence the frequency and categories of incentive programs on offer?

This assessment serves as an important first step in identifying best practices by establishing a baseline for operations and current offerings and will go a long way in analyzing how states' manufacturing incentives can create globally competitive manufacturing hubs. By analyzing programs against their stated goals and incentive tools, particular trends across regions, state income level, and partisanship appear. We identified the following key findings and produced meaningful suggestions for the investment promotion agencies moving forward.

Key findings

- Tax incentives (147) were used in an overwhelming majority of programs (210 total) while training programs were the minority (11 programs), despite skills mismatch as the most commonly cited problem for high tech manufacturers.
- Capital formation is the most cited primary rationale for incentive program offerings, despite common claims for increases in local employment. Only 26 programs target supply chain and trade integration; just 18 programs emphasize the development of clusters; and only 44 target green technology. Incentives for agglomeration economies are the least prevalent.

- Analysis with states grouped by per capita income in 2015 revealed that wealthier states prioritized capital formation and offered incentives that included initial fiscal outlays, while less-well-off states opted for tax incentives and prioritized increasing employment.

Moving forward

- A mere 5.7% of observed programs have clearly defined impact assessment criteria or easily identifiable evaluation programs available to the public. With calls for more stringent policy analysis and taxpayer accountability, states must make impact assessments an urgent priority.
- Training programs can expand the capabilities of employees in the manufacturing sector and should be strongly considered as automation displaces increasingly more employees. New Mexico's *Job Training Incentive Program*, Oklahoma's *Training for Industry Program*, and Connecticut's *Manufacturing Apprenticeship Tax Credit* are noteworthy examples.
- The Venture Capital phase of investment is an underused alternative to traditional opportunities. 'Angel' investment can be a successful alternative to growing in-state firms and bypass the need to attract a large outside firm.
- Green technology is the fastest growing incentive type and is the third most preferred incentive by Democratic legislatures (after employment and capital formation) and the second most preferred by Republican legislatures (after capital formation and tied with employment).

Incentivizing Manufacturing in an Automated Era

“While many have been quick to write the obituary on American manufacturing, President Obama and his Administration understands that we must continue to be a country that continues to advance manufacturing communities.”

Assistant Secretary Jay William, Economic Development Administration

As the world's economy becomes increasingly globalized, changes in the American economy, and its manufacturing sector, have been robust. Since its peak in 1979, the United States has shed 7,231,000 manufacturing jobs according to the Bureau of Labor Statistics.ⁱⁱ In June 1979, the apex of the U.S. manufacturing sector, employment hit 19,553,000, but by April 2015 there were just 12,322,000 employed-- a 37 per cent drop in less than two decades.ⁱⁱⁱ

Manufacturing employment figures remained relatively stable from 1970 to 2000, averaging roughly 17.5 million jobs and ranging between 16.8 million and 19.6 million.^{iv} But the sector began to collapse in the early 2000s and fell to an all-time low in February 2010 when it dropped to just 11.5 million jobs. While some of the Great Recession jobs have been recovered – hitting 12.3 million by December 2014 – the sector has lost more than 5 million jobs between January 2000 and December 2014 alone.^v

Thus, communities have sought to recover jobs lost to globalization, trade, and economic plight. The manufacturing community has coalesced its efforts, maintain its assertion as the backbone of the U.S. economy, and is encouraging regional collaboration and linkages to promote economic development. These efforts have been matched by equal commitment from federal, state, and local governments who are offering special incentives to attract, secure, and foster manufacturing opportunities. The nature of said incentives range from tax credits and exemptions to financial offerings to industry targeting. The purpose of these incentives is not simply to attract a singular investment, but to help transform American states into globally competitive manufacturing hubs.

Yet, with a seemingly ever-decreasing number of jobs that the manufacturing sector could support, an increasingly competitive environment, and little literature on the actual effectiveness of incentive programs, states continue to search for best practices to secure these investments. Alfie Kohn, organizational development theorist, told Harvard Business Review flatly that individual incentive plans “cannot work” and that they merely change, temporarily, what corporations do.^{vi} This, of course, raises the questions Can incentive programs attract manufacturing jobs to states? If so, what are the available tools and approaches? Do they provide insights to best practices?

In a Wall Street Journal Leadership Report, Brookings Institution senior fellow Mark Muro stated location-specific industry incentives look “old time” if not aptly partnered with cluster initiatives for workforce development and R&D capabilities.^{vii} Industry leaders Robert Howell of Howell Group LLC and Eric Spiegel of Siemens USA report location incentives can be helpful, but are just “one piece of the puzzle.” They suggest of equal and likely greater consideration is the market access a location provides and the human capital to support the operations.

As the manufacturing industry struggles to regain its foothold in the American economy and states compete for limited jobs, what incentive programs are being offered? This assessment serves as an important first step in identifying best practices by establishing a baseline for operations and current offerings. This identification will go a long way in analyzing how states’ manufacturing incentives can help create the globally competitive manufacturing hubs they so desire.

This white paper describes and catalogs the varied investment incentive programs targeted toward manufacturing firms that are available at the state level in the U.S. As very few incentives exist at the national level apart from some renewable energy focused incentives from the Department of Energy, the majority of authority falls onto the states to develop and administer investment incentive programs. Our dataset includes the most common forms of incentives such as traditional tax incentives as well as grants, subsidies, training programs, and special financing. We also record the rationale state programs use to justify their incentive and facilitation schemes. Commonly cited rationale include: facilitating capital formation, generating employment, fostering supply chain integration, and supporting the development of local renewable energy manufacturing sectors. By cataloging these programs and their rationales, we can develop a more comprehensive assessment of the manufacturing-related investment promotion states engage in, and the language political leaders and administrators use to justify these

activities. Although there is a growing consensus that investment promotion activities should be more closely monitored and evaluated to ensure they are an effective use of state resources, this paper does not focus on the overall effectiveness but rather simply seeks to identify the rationale and types of programs states currently use.

Describing State Manufacturing Investment Promotion Programs

To identify patterns in the ways in which states seek to attract manufacturing investment, and the attributes of states that might drive these patterns of incentives, we analyze a dataset of state business incentives that specifically target the manufacturing sector.^{viii} Of the 1,823 incentive programs tracked in this dataset, 210 (11.5%) specifically target the manufacturing sector. Most states have at least one incentive program offered only to manufacturers, however 10 do not and are therefore excluded from the dataset.^{ix} Of the 210 programs in the dataset, only 12 (5.7%) have clearly defined impact assessment criteria and evaluation programs that are easily identifiable and make public their findings. Given an emerging consensus that states must be more attune to evaluating the success and failure of investment attraction activities, and to undertake rigorous cost-benefit analyses to facilitate sound policy and accountability to taxpayers, states clearly have to make impact assessment an urgent priority.

Figure 1 provides an overview of the tools states use to promote manufacturing investment. The vast majority of these programs – 147 – provide tax incentives to qualifying firms even though many evaluations of tax incentive programs find little evidence that they are effective.^x Incentivized financing options are the distant second-most used promotion tool; 48 programs offer such benefits. Despite widespread acknowledgement of a skill shortage for qualified workers in high-tech manufacturing, only 11 programs nationwide have a worker-training component.

Figure 1: U.S. State-Level Manufacturing-Targeted Incentive Program Tools

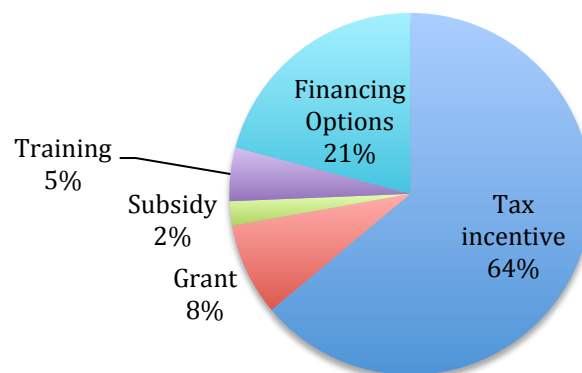


Figure 2 shows the *relative* use of different incentive tools remains mostly consistent across regions, though the Midwest uses financing options more frequently than other regions and Western States are least likely to employ strategies other than tax incentives.

In raw numbers, Southern States have the most investment incentive programs specific to manufacturing (79). The Northeast have the least number of manufacturing incentive programs (33) while the Midwest (40) and West (46) occupy intermediate positions.

Figure 2: Relative Use of Incentive Types Across Regions

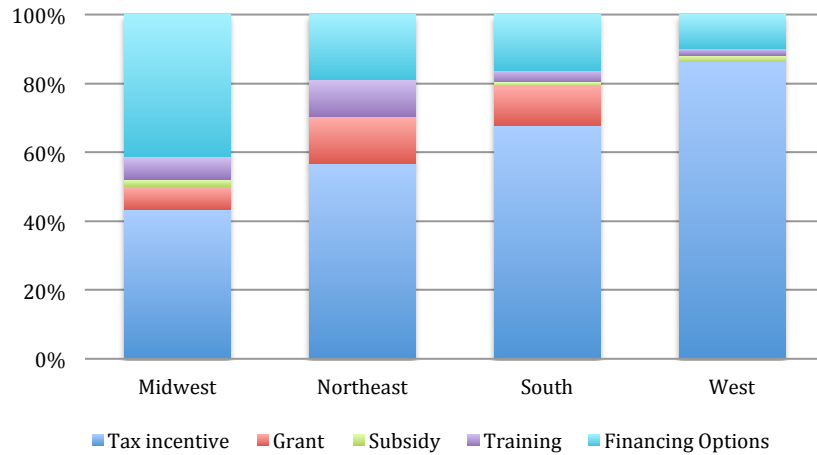
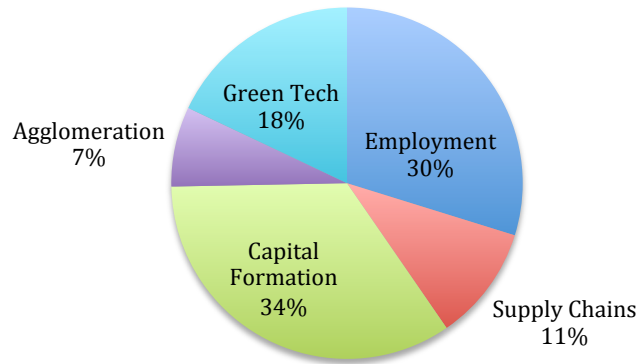


Figure 3 illustrates the distribution of rationale states use to justify and target their incentives. While incentive programs are often sold politically as tools for generating local employment, employment is only the second-most invoked goal of manufacturing incentives. Rather, the plurality of incentive programs identifies capital formation as a primary objective of promotion activities. This may reflect a growing reality that manufacturing techniques in the U.S. are increasingly capital- and skills- intensive. Advances in automation and robotics have substituted for workers on the shop floor. This process makes re-shoring from low-wage countries in Asia economically feasible for high-tech manufacturers, but also greatly circumscribes the employment generation potential of large investments in new plants.

Figure 3: U.S. State-Level Manufacturing-Targeted Incentive Program Rationales



Manufacturers' need for high-quality infrastructure, a pool of well trained workers, and physical proximity to suppliers suggests incentive programs that target the development of dense local supply chains and the development of high-tech clusters are likely to be particularly attractive to manufacturers. However, incentives designed to foster agglomeration economies are among the least prevalent incentive rationales; only 26 programs are designed incentives to promote supply chain and trade integration while just 18 programs emphasize the development of clusters. States seem to be increasingly targeting green technology in their investment promotion activities; 44 state programs exist that specifically target the manufacturing of green technology components or manufacturing procedures that use green technology to lower emissions and waste.

State Attributes and Incentive Programs

We also consider whether state attributes such as level of development, local job market, labor organization, educational attainment, and partisanship affect the development of manufacturing incentive programs.

We measure level of development by per capita income in 2015, and divide states into quintiles.^{xi} The first quintile includes the poorest states; the fifth contains the wealthiest. As figure 4 illustrates (following page), wealthier states provide more incentive programs overall and poorer states very rarely offer incentives that require initial fiscal outlays such as training programs, subsidies, or alternative financing options. This is perhaps unsurprising since wealthier states have greater resources to commit to capacity building around investment incentive programs, may be less reliant on the corporate tax receipts they choose to forgo through incentives, and have greater fiscal room to allocate budgets toward promotional programs that require upfront investment such as skill training. However, this also suggests that incentive programs may exacerbate interstate inequalities by providing wealthier states with more tools through which to attract investment. While less-well-off states tend to prioritize employment generation over capital formation compared to their wealthier peers, states in the lowest development quintile overwhelmingly identify capital formation as the primary rationale for their promotion efforts.

We measure local job market conditions in two ways. First, we include a measure of the percent manufacturing jobs lost in each state from 1994 to 2015, and divide states into quintiles to aid interpretation where the fifth quintile represents states with the largest manufacturing employment losses.^{xii} We believe this measure is more informative than contemporaneous unemployment rates that might mask persistent labor market slackness and the extent to which job losses accrue in the manufacturing sector. Figure 5 illustrates a few clear patterns. First, states with comparatively few manufacturing job losses incentivize manufacturing investment at roughly the same rate as states with the most manufacturing job losses in the last 20 years. Moreover, tax incentives dominate investment promotion across all states regardless of manufacturing job loss. States with high manufacturing job loss do not provide training programs as components of manufacturing incentives at greater rates than other states. Most surprisingly, states with comparatively few manufacturing job losses are far more likely to identify employment

creation as a primary goal of incentive programs than are states that suffer from the largest declines in manufacturing employment.

Figure 4: State Per Capita Income and Incentive Type/Rationale

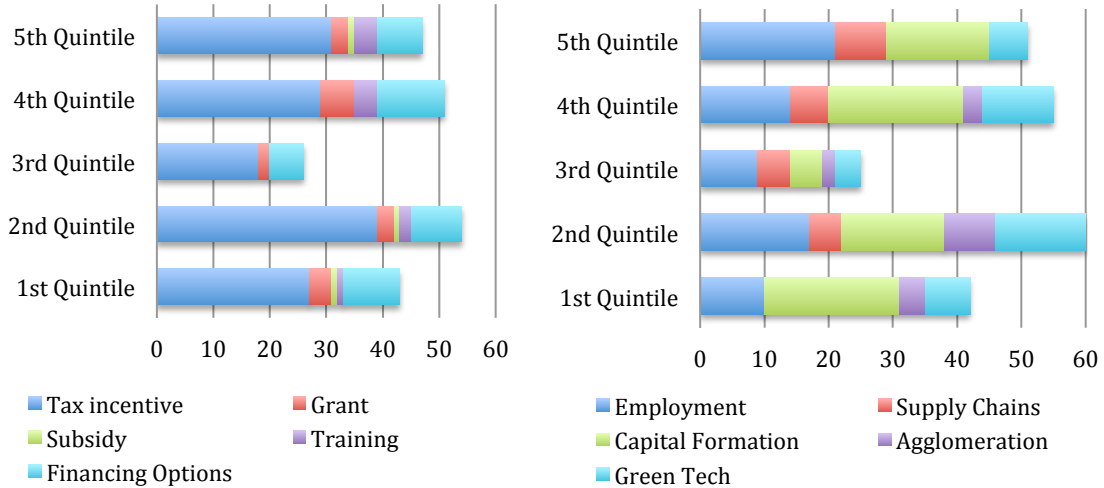
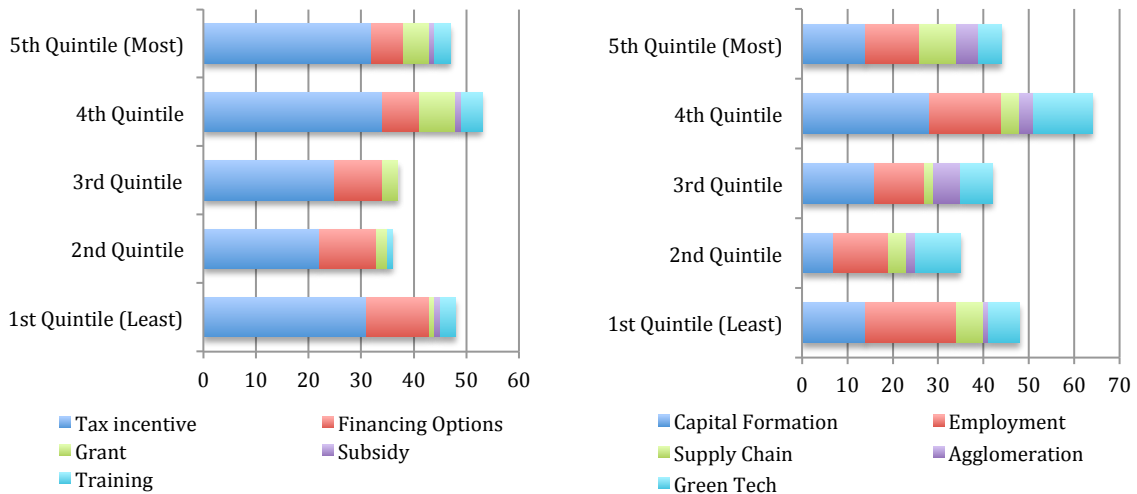


Figure 5: State-level Manufacturing Job Loss and Incentive Type/Rationale

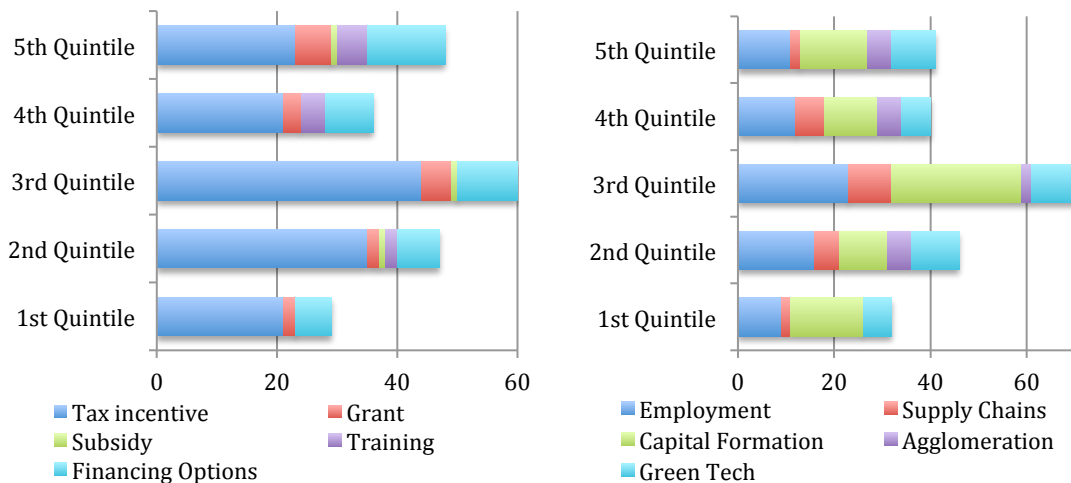


We interpret these findings in the following ways. First, it seems states incentivize investment prospectively rather than retrospectively; states that have experienced substantial job losses in the manufacturing sector do not incentivize this industry at greater rates than states that have not experienced large job losses in the sector. This may be because previously manufacturing intensive states use promotion strategies to develop new industry strengths rather than try to recover a manufacturing sector that is no longer viable in the state. Another possibility, however, is that states that developed effective incentive programs early were able to avoid job losses in the first place. Second, states that have faced substantial manufacturing job losses seem to view the primary challenge to revitalizing manufacturing in the U.S. to be one of capital formation and technological

upgrading. Indeed, as U.S. manufacturing practices become increasingly automated, investments in capital equipment, automated shop floors, and increasingly sophisticated technology become progressively important. When examining the types of incentive programs offered (mainly tax incentives and few training programs) and the primary rationales used to justify these programs (capital formation as more important than employment), it does seem states are aware that manufacturing will not generate substantial new employment.

Along with history of manufacturing job loss, we also measure local job market conditions by changes in private manufacturing unionization rates from 1983 to 2015, and divide states into quintiles from least unionization losses to most over the period.^{xiii} If incentive programs are driven in part by the policy influence of employee groups, we might expect states with small declines in unionization tend to use incentives that are more likely to directly benefit workers – such as training programs – at higher rates than states where unions have declined more substantially. In contrast, we find states with the smallest declines in manufacturing do not offer *any* training-based incentive programs. In fact, proportionally, these states use tax incentives at the same rate as do other states and are actually more likely to prioritize capital formation over employment in program rationale documentation. Above, we questioned the direction of causality in the relationship between incentives and job losses – mainly do states turn to incentive programs after they experience large declines in their manufacturing workforce or do some states use incentives prospectively to prevent decline? We see clearly that states with the smallest numbers of unionization losses provide less incentive programs than do other states, which suggests states turn to such programs after they sustain job losses in the sector.

Figure 6: State-level Unionization Change and Incentive Type/Rationale



One of the perversities of the state of the manufacturing industry in the U.S. is that while total employment has decline substantially, the number of available manufacturing jobs that go unfilled as been climbing since 2009.^{xiv} In 2016, average job openings in the manufacturing sector were 353,000 a month nation-wide. As U.S. factories upgrade

technology and equipment, many manufacturing jobs require advanced training; since 2000, the share of U.S. manufacturing workers without an education past high school declined by 9 percent and the percentage of factory workers with advanced degrees increased by almost the same amount.^{xv} Well-designed manufacturing promotion programs could be especially effective by emphasizing training programs, particularly in areas where educational attainment is low.

Figures 7 and 8 show incentive program tools and rationale across states grouped by level of high school and college attainment, where the first quintile includes the least educated states and the fifth includes the states with the most highly educated population.^{xvi} We can quickly see that states with very low levels of educational attainment use incentive programs at higher rates, but that states with higher educational attainment have more training programs. Interestingly, states with low and high levels of educational attainment use employment as a program rationale at roughly the same rate, while states with less educated populations are more likely to point to capital formation as a main goal of incentive programs. This is particularly puzzling since highly capital-intensive factories require a more highly educated workforce to staff them.

Figure 7: State-level High School Attainment and Incentive Type/Rationale

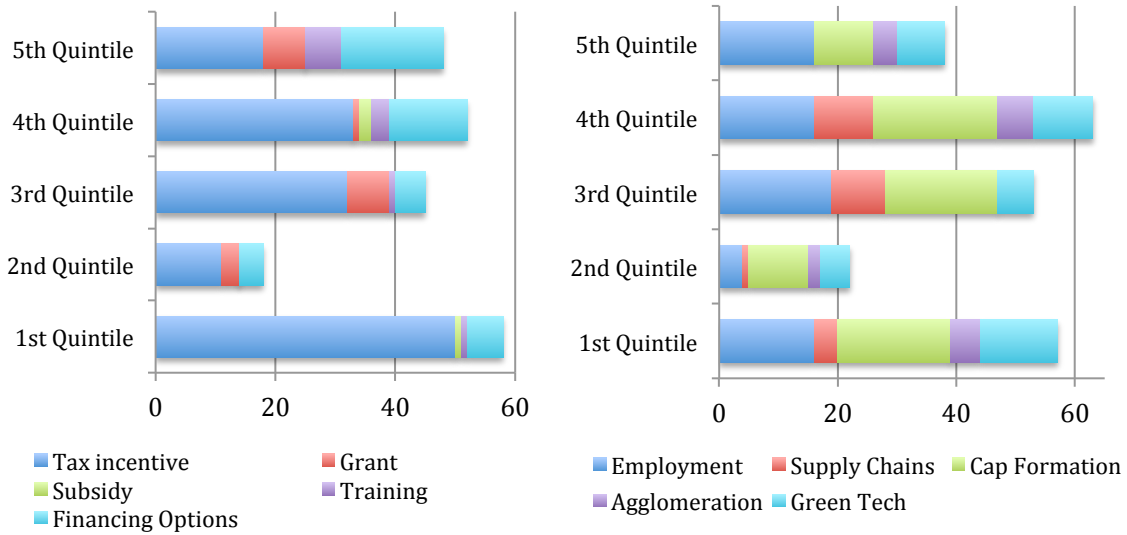
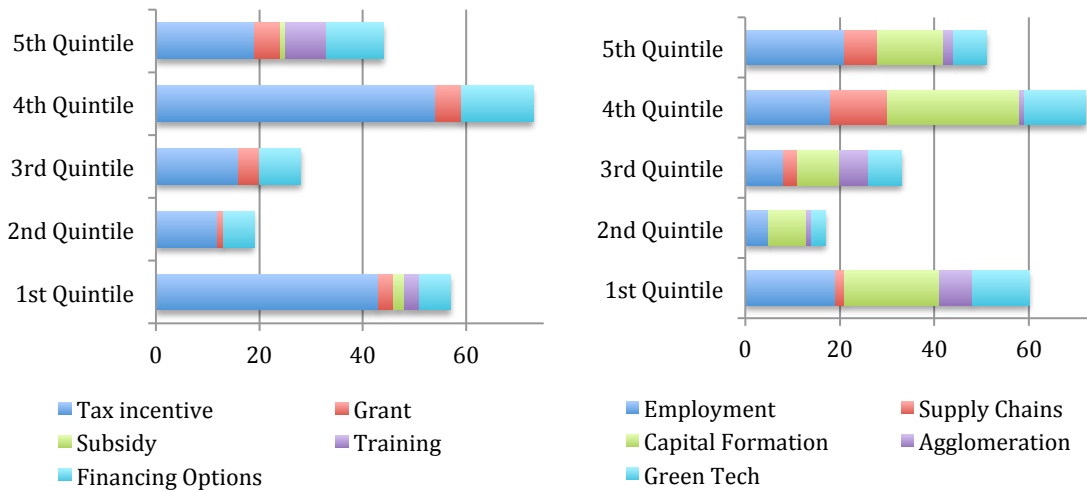


Figure 8: State-level College Attainment and Incentive Type/Rationale



Finally, we consider whether states with distinctive partisan makeups approach manufacturing incentive programs differently. On the one hand, the decline of employment in the manufacturing sector has disproportionately disadvantaged citizens who have historically been consistent Democratic voters. Perhaps states controlled by Democratic legislatures and governors are more willing to exert effort and fiscal resources on generating manufacturing employment. On the other hand, the use of tax incentives to stimulate investment is a popular policy tool among Republicans who view small business owners as their natural constituents. And, given the potential to claim credit for any new investment made during partisan control of the state legislature and/or governorship, it is quite possible that Republican and Democrats alike employ manufacturing incentive programs at the state level.^{xvii}

We collect data from various sources on the partisan control of state legislatures and governorships since 2000. We calculate the percent time each state spent under Democratic or Republican control over this period. Any state under Democratic Party control for 55 percent or more of the time period was classified as Democratic. Any state under Republican Party control for 55 percent or more of the time period was classified as Republican. Any state for which one party failed to maintain control for at least 55 percent of the time period was classified as a split legislature or governorship.

We find that Republican and Democratic controlled legislatures behave similarly in terms of the number of programs they offer and the tools and rationales they employ. However, Democratic legislatures are more likely to use training programs and subsidies than are Republican legislatures. Perhaps surprisingly, both reference capital formation as a primary program rationale more frequently than they do employment. Partisanship is much more influential with respect to governorships and the use of incentives. Republican governors use incentive programs to stimulate manufacturing investment at much higher rates than do Democratic governors. This finding is most likely partially driven by the historically high number of Republican governorships in the U.S. today (38 versus 18 Democrats and one Independent in 2016). However, the size of this difference

warrants additional analysis. Do Republican governors tend to employ more incentive programs on the basis of partisan policy preferences, or are Republicans more likely to be voted into office in states suffering from large manufacturing job losses? The answer to that question is beyond the scope of this white paper. However, it is clear that states with Republican governors tend to have more manufacturing incentive programs than other states.

Figure 9: State Legislative Partisanship and Incentive Type/Rationale

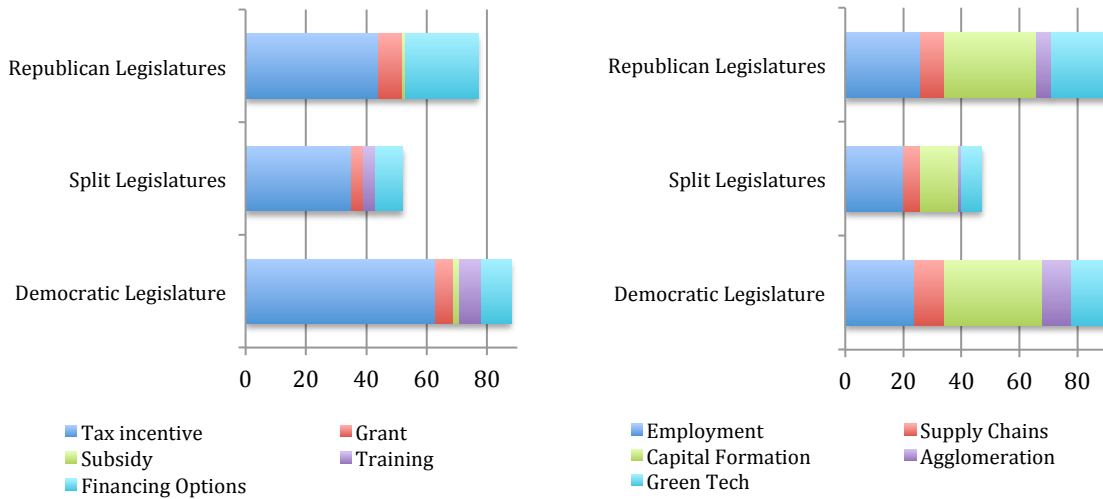
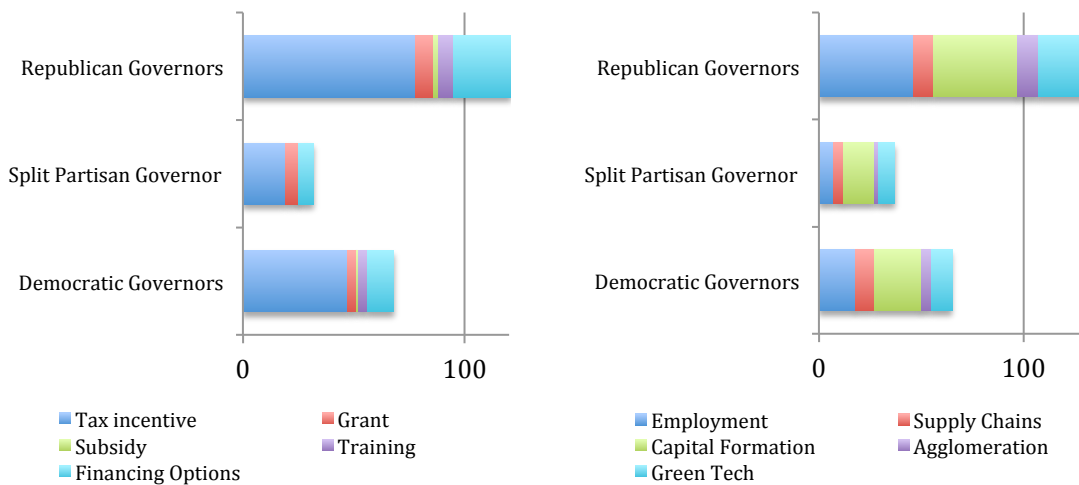


Figure 10: State Governor Partisanship and Incentive Type/Rationale



Trends in Targeted Incentive Programs

In order to attain a deeper qualitative understanding of the state incentive programs being offered, we provide descriptive analyses of several categories of investment promotion based on the trends that we observed in the data. These programs, which go beyond basic tax incentives, address the economic and societal shifts at play in the manufacturing

sector, and provide insight into the future of effective investment promotion. The incentive programs that we analyze are as follows:

- 1) Training Programs: As automation displaces increasingly more employees within the manufacturing sector, institutionalized training programs can play an important role in mitigating technology's adverse effects on employment.
- 2) Green Technology Incentive Programs: While the primary purpose of most green tech incentive programs is to reduce emissions, investment promotion in green technology can also bring more employment opportunities as well as increased capital formation.
- 3) High-tech Incentive Programs: Innovations in advanced technology carve out new job opportunities for highly skilled workers. Many of the high-tech incentive programs that we observed are concentrated in the aerospace industry and most focus on job creation.
- 4) Infrastructure Development Programs: Infrastructure development plays an important role in sustaining long-term investment. Only four incentive programs exist in this area, and all are grant-based.
- 5) Start-Ups: As is the case with advanced technology, start-ups bring in new job opportunities as well as new sources of revenue for the state. Most programs tend to incentivize capital formation in order to encourage medium-to-long-term investment.

As globalization and technological innovation play increasingly important roles in the manufacturing economy, we must consider the types of incentives that will be effective in attracting new investment. Oftentimes, despite tax incentives elsewhere, investment is concentrated in areas where human capital and infrastructural capacity are plentiful. Therefore, if the end-goal is long-term, sustainable investment, states should recognize the importance of capacity building, infrastructure development, and human capital formation.

Investment Promotion for Training Programs

Training programs that build employee skills and expand human capital can play an important role in managing unemployment in states that are heavily dependent on manufacturing.

Over the past decade, technological innovations have had an adverse effect on manufacturing employment in the United States. According to the Heritage Foundation, employment in this sector has fallen by a third in the last 10 years, while production has remained constant.^{xviii} This shift has resulted in cheaper manufactured goods, increased opportunities for highly skilled workers within the manufacturing field, and the elimination of millions of low-skilled assembly line positions.

In our research, we found a total of 11 state incentive programs that encourage training and apprenticeship opportunities within the manufacturing sector. Many of these

Incentivizing training programs is a core goal of 11 programs across 7 states. Iowa (3), Connecticut (2), and New Jersey (2) have the most incentive programs targeting training programs.	
Subcategories of Incentives for Training Programs	
Type	On-the-job training, apprenticeship programs, vocational training, support to community colleges, training for green technology practices
Outcome	Employment (11), Supply Chains & trade (1), Capital Formation (1), Green Technology (1).
Incentive	Tax exemptions, credits or deductions (3), Grants (3), Subsidies (1)

programs, which span every region of the country, seek to foster sustainable employment by providing technical training to encourage the development of skilled workers who would otherwise be displaced by automation. Some programs, such as New Mexico’s *Job Training Incentive Program* as well as Oklahoma’s *Training for Industry Program* incentivize structured on-the-job training that is tailored to the demands of each position within a manufacturing firm. Other programs, such as Connecticut’s *Manufacturing Apprenticeship Tax Credit* focus on

hiring apprentices in order to cultivate specific skillsets. Iowa has taken a particularly unique approach to job training through its *Accelerated Career Education*, which provides funds to community colleges in the state to expand programs that “train individuals in the occupations most needed by Iowa businesses.”^{xix} While all of these incentive programs are vastly different in their approach, each one seeks to broaden employment opportunities by expanding the capabilities of employees within the manufacturing sector.

In addition to standard job training programs, some states have sought to utilize training as a means of expanding high technology sectors and improved environmental practices. Maryland is one such example, where the *Maryland Save Energy Now* program incorporates training into their green technology initiatives with the goal of improving energy efficiency. The training programs are specifically targeted to “increase the awareness of industrial manufacturers.”

Investment Promotion Targeting the Use of Green Technology in Manufacturing

Investment incentives aimed at increasing the use and production of green technology or environmentally friendly practices in manufacturing and other sectors have generally increased in number and variety in recent years. In the United States, individual investment promotion agencies (IPAs) at the state and local levels have expanded their initiatives to attract green tech and the Department of Energy at the national level, including the Office of Energy Efficiency and Renewable Energy, continues to play an important role in the promotion of Green Tech. The Green Tech subcategory under investment promotion for manufacturing can be further broken down into categories based on the type of Green Tech being targeted, the specific outcome that is being pursued, and the type of incentive which is being offered. This breakdown can be seen in the table to the right on the next page.

One significant outlier among the incentives offered for investment in green tech at the state level is found in Michigan. This incentive program aims to encourage the establishment of energy plants that produce renewable energy anywhere within the state. Once those are established, officials from the parent company of the new plant and the community can work with the state government to establish a “Renewable Energy Renaissance Zone” which grants any manufacturing company within the zone a bundle of state tax exemptions, including but not limited to education, income, and real property taxes in order to encourage agglomeration effects.

A more typical program offered at the state level would be the Biodiesel Fuels Credit offered by the Virginia Department of Taxation. This tax credit encourages the production of biodiesel and green fuels. It allows qualifying producers to claim a tax credit against their liabilities of \$0.01 per gallon up to \$5000 for the first three years of production and credits may be held over for up to three years. Tax credits or exemptions in other programs may also apply based on income or the cost of new equipment.

Development and use of green technology is a core goal of 44 programs across 25 states and 2 territories. New Mexico (7) and Virginia (5) have the most incentive programs targeting green tech.	
Subcategories of Incentives for Green Technology	
Type	Production of alternative fuels; wind, solar, and nuclear energy; the use of recyclable materials in production; implementation of energy saving practices; assistance in compliance with environmental regulations.
Outcome	Capital formation (21), Production (8), Green Jobs (6), R&D (2)
Incentive	Tax exemptions, credits or deductions (32), grants or subsidies (19)

Investment Promotion Targeting High-tech Incentive Programs

State investment incentives for advanced technology manufacturing, a category dominated by the aerospace industry, largely focus on creating jobs and fostering corporate-university collaboration.

Many incentive programs are primarily focused on employment and job promotion. Washington State, where tech companies make up twenty-one percent of the state’s public companies, shows a growing trend towards proving tangible connections of investment promotion to job creation^{xx}. Both Washington’s *High-Tech B&O Credit for R&D Spending* and its *High-Tech Sales & Use Credit* expired January 1, 2015 after these programs could not be linked to strong job growth. The commission tasked with evaluating the benefits of the program estimated that the state would ultimately lose \$132 million in R&D incentives when the same incentives could not be linked directly to strong job creation.

Newer incentive programs have either made job creation an eligibility requirement or require annual updates on the progress of the program. Mississippi’s *Aerospace Initiative Incentive Program* provides a ten-year income and franchise tax exemption but in order to be eligible the business must invest a minimum of 30 million dollars and create 100 full-time jobs. *Colorado’s Aviation Development Zone Tax Credit* provides tax credits of

\$1,200 per full-time employee for businesses involved in aircraft manufacturing and/or

Development and use of high technology is a core goal of 27 programs across 16 states and Puerto Rico. Washington (7) has the most high-tech incentives of all states.	
Subcategories of Incentives for High Technology	
Type	Production and/or maintenance of avionics, aerospace, computer, or biotechnology; research and development; innovation development
Outcome	Employment (12), Supply Chain & Trade (4), Capital Formation (11), Green Tech (3), Agglomeration (1)
Incentive	Tax exemptions, credits or deductions (19), Grants (5), Training (1), Financing Options (2)

maintenance. While job growth is one of the most cited purposes of high technology incentives economic development usually in the form of research and development has tied many of these incentives to state universities.

For many state high-tech incentive programs there is a focus on developing the relationships of businesses with state universities particularly where R&D is concerned. Oklahoma's *Aerospace Industry Engineer Workforce Tax Credits* is a unique high-tech employment scheme because it incentivizes both business

and individual employees by providing either a 5% or 10% tax credit on engineer salaries depending on whether they graduated from a state university as well as a 50% reimbursement on tuition costs to the employee. Other programs focus more directly on incentivizing investment in universities such as the New Hampshire's *Granite State Technology Innovation Grant*. The program was created to improve collaboration among businesses and universities in high-tech research and development. The program designates \$500,000 annually to New Hampshire businesses and project awards are then matched 1:1 by the business to universities to fund research. Collaboration between these entities are thought to be beneficial to job linkages between businesses and educated state citizens.

Investment Promotion Targeting Infrastructure Development

Infrastructure development can play a crucial role in a state's investment promotion efforts. Infrastructure development is beneficial to a state in two key ways: direct job creation and improving infrastructure required to attract additional businesses to invest in the state. This is increasingly important in the age of globalization, where many Americans are unable to find jobs that they could once rely on, and lack the skills for jobs currently available.

There are four state investment programs directed at promoting manufacturing by incentivizing infrastructure development. All programs used grants as incentives. This was one reason for the North Carolina Chamber of Commerce's creation of the Economic Infrastructure Program. The program provides grants to local governments to assist with infrastructure development. Grants sizes are based on the number of new full time jobs created per project. There were additional requirements regarding health care coverage for the new jobs as well.

Two programs are quite similar to each other: Virginia's Rail Industrial Access Program and Alabama's Industrial Access Road and Bridge Program. Both programs seek to connect industrial sectors and manufacturers to markets. Both programs involve the state giving grants to local communities to assist with the construction of vital transportation infrastructure. The Virginia program allows for businesses to apply for the grant as well. There are requirements on the minimum number of long-term jobs created for both programs.

Development and use of infrastructure is a core goal of 74 state programs, of which 4 directly relate to manufacturing promotion	
Subcategories of Incentives for High Technology	
Type	Rail, Road & Bridge, Port Development
Outcome	Employment, Supply Chain & Trade
Incentive	Grants (4)

The Port of Virginia is a prime showcase of the benefits infrastructure development. Since the port's founding, over thirty companies have located near the port and 9.4% of Virginia's population works in port-related jobs. The Port's performance impacts the livelihoods of many, which why the Port's Economic and Infrastructure Development Grant was established: to incentivize companies to locate new or expanding employment centers near the port.

It is important to note that infrastructure promotion is popular in the U.S. In fact, out of all 1828 investment promotion programs, 72 are focused on infrastructure development. The four examined however, are the only programs directly connected to manufacturing promotion. This explains the relatively similar goals of each program: job creation, and connecting manufacturers to markets.

Investment Promotion Targeting Start-ups

State governments occasionally create incentive programs that specifically focus on the earliest stages of investment. This strategy is particularly connected to 'start-up' firms, for whom venture capital and other forms of early investment are crucial. In theory, if venture capital investment can be incentivized in-state, then entirely new firms will grow, contribute to the local high-tech sector, and develop the economy in the long term.

This approach has not yet been broadly replicated, and as a result the list of states that specifically incentivize start-ups through investment promotion programs is a short one. The Kentucky New Energy Ventures program offers a grant at a 1:1 ratio to match investments in young, small firms producing alternative fuel or renewable energy. Similarly, Maine's Tech Start Grant will match 1:1 investment in R&D for "early stage market analysis, business plan development and intellectual property protection activities."^{xxi} Michigan appears to be the heavyweight in venture capital incentives, with two distinct agencies offering assistance in the early investment phases. The first, the Michigan Accelerator Fund, invests in Michigan-based start-ups directly, and expects to invest in 10-15 firms during the program's lifetime. The second, the Venture Michigan fund, is part of the larger and more general 'Invest Michigan! Growth Capital Funds'

agency. It is notable for its publicly available

Development and support for state-ups is a core goal of 6 programs across all states. Only Kentucky, Maine, Michigan, New Mexico, and Wisconsin have such programs.	
Subcategories of Incentives for High Technology	
Type	Venture capital/Angel Investment, Energy products, High Technology
Outcome	Employment (2), Capital Formation (4), Green Tech (1), Agglomeration (1)
Incentive	Tax exemptions, credits or deductions; Grants; Direct investment fund. Timing is also an important consideration. Some programs provide incentives during the venture capital phase, some after.

metrics, which is a rarity for incentive programs in any state. New Mexico has the Angel Investment Credit, which supplies tax credits for any early investment made to high-tech start-ups in state. This tax credit can only be used once per investor per investment period, ostensibly to avoid its abuse as a loophole. Finally, Wisconsin’s Qualified New Business Venture program “gives up to a total of \$8 million in tax-eligible cash equity investment” and “up to \$2 million in tax credits for the investors,” clearly targeting young businesses with its eligibility requirements; only firms with less than 100 employees and less than 10 years of life may qualify.

These programs, while sharing a common target in start-ups, differ widely in incentive strategies. Michigan invests directly while New Mexico offers tax credits to investors. Maine intercedes at the R&D stage, but Wisconsin offers assistance much later at the equity investment phase. Only Kentucky specifically incentivizes start-up energy firms. This shows the diversity of not just how, but when in the process investment promotion officials must choose to offer their services to firms.

Lessons Learned and Policy Recommendations

The promotion of manufacturing in the United States has become an increasingly important task as employment in this sector has dropped significantly since its peak in June 1979. Blue collar communities in the United States are striving to boost employment after experiencing job loss due to increasingly globalized supply chains, innovations in technology, or economic slowdown.

Over 200 incentive programs at the subnational level across the United States and its territories have been identified as specifically targeting the manufacturing industry in order to alleviate low manufacturing employment levels and boost sector productivity. Through an analysis of these programs, trends across regions, state income level, and partisanship appear. These trends help to illuminate the current state of incentive programs and highlight key areas where incentives could fill gaps. Key patterns that emerged include the following:

- Tax incentives (147) were used in an overwhelming majority of programs (210 total).
- Training programs were in the minority (11 programs) even though skills mismatch is a commonly cited problem for high tech manufacturers.

- Although political leaders often defend incentive programs as necessary tools to promote local employment, this was only the second-most invoked goal behind capital formation.
- Analysis with states grouped by per capita income in 2015 revealed that wealthier states prioritized capital formation and were more likely to offer incentives that require initial fiscal outlays, while less-well-off states opted for tax incentives and prioritized increasing employment.

Incentive programs which targeting specific industries or projects including high tech, green tech, training, small and medium enterprises, and infrastructure were also analyzed, but most programs overall did not include reports on efficacy of the program which made impact evaluation beyond the scope of this white paper.

It is critical that going forward, state investment promotion agencies (IPAs) push for impact assessments following the implementation of incentive programs. It is unclear from the current data how much, if at all, these incentive programs contribute to a benefitting company's expansion or relocation to a given state or territory. Up to date outcome reports and subsequent evaluation would contribute significantly to the creation of new policy and help improve efficiencies.

Furthermore, the use of incentives to promote the viability of an investment region as a whole is the recommended approach to investment incentives. Programs which target agglomeration, training, and strong business infrastructure will benefit the business environment in the long run and attract strong business communities in place of one-off companies aiming to take advantage of a specific grant or tax incentive. This also will allow states to have clear guidelines and programs for incentivizing investment in business activities across all sectors, which may be increasingly important for generating high quality and high quantity jobs in an era marked by manufacturing automation.

ⁱ Schwartz, Nelson D. 29 November 2016. "Trump to announce Carrier plant will keep jobs in U.S." *The New York Times*. While initial reports suggested the deal would keep 1,100 in Indiana, follow up reporting corrected this figure downward to 800. See Paquette, Danielle. 6 December 2016. "He 'lied his a- off': Carrier union leader on Trump's big deal." *The Washington Post*.

ⁱⁱ Bureau of Labor Statistics. 2016. Data Retrieval: Employment, Hours, and Earnings (CES). Retrieved from: <http://www.bls.gov/webapps/legacy/cesbtab1.htm>

ⁱⁱⁱ Ibid. These numbers come from BLS's seasonally adjusted employment numbers.

^{iv} Bureau of Economic Analysis. 2015. Annual Industry Accounts: Gross Domestic Product (GDP) by Industry. Retrieved from: <http://bea.gov/industry/index.htm#annual>

^v Ibid.

^{vi} Kohn, A. 1993. Why Incentive Plans Cannot Work. *Harvard Business Review*. Retrieved from: <https://hbr.org/1993/09/why-incentive-plans-cannot-work>

^{vii} WSJ Reports: Leadership. 2013. The Experts: How Much Impact Do State and Local Incentives Have in Luring New Manufacturing Facilities? *Wall Street Journal*. Retrieved from: <http://www.wsj.com/articles/SB10001424127887324188604578545970331634046>

^{viii} The State Business Incentives Database compiles details on all investment incentive programs in the 50 U.S. states plus its territories: American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands. This database is maintained by the Council for Community and Economic Research. We thank them for providing access to their data.

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- ^{ix} These states include (number of incentives of any kind in parentheses): Delaware (21), Illinois (25), Indiana (31), Minnesota (34), Nevada (15), Ohio (45), Oregon (31), Pennsylvania (43), South Carolina (54), and South Dakota (17).
- ^x Nathan M. Jensen. 2014. "Evaluating Firm-Specific Location Incentives: An Application to the Kansas PEAK Program." Ewing Marion Kaufman Foundation White Paper.
- ^{xi} Data from Statista.
- ^{xii} Data from Public Citizen, underlying material from the U.S. Bureau of Labor Statistics. See <http://www.citizen.org/job-loss-map>
- ^{xiii} Data from Hirsch, Barry and David McPherson. 2015. *Union Membership and Coverage Database*. Available at: <http://www.unionstats.com/>
- ^{xiv} Sussman, Anna Louie. 1 September 2016. "As skill requirements increase, more manufacturing jobs go unfilled." *The Wall Street Journal*.
- ^{xv} Ibid.
- ^{xvi} Data from the U.S. Department of Education and the Current Population Survey. Available at: <http://www.ed.gov/news/press-releases/new-state-state-college-attainment-numbers-show-progress-toward-2020-goal>
- ^{xvii} See Jensen, Nathan M., Edmund Malesky, and Matthew Walsh. 2015. "Competing for Global Capital or Local Voters? The Politics of Business Location Incentives." *Public Choice* 163(3): 331-356.
- ^{xviii} <http://www.heritage.org/research/reports/2010/10/technology-explains-drop-in-manufacturing-jobs>
- ^{xix} See <http://www.iowaeconomicdevelopment.com/WorkforceTraining/employeetraining>
- ^{xx} Bass, Dina. 19 December 2013. "Microsoft, Amazon propel Washington to most innovative state." *Bloomberg.com*. Accessed 2 November 2016.
- ^{xxi} See <http://www.maineconomy.org/program/tech-start-grant/>