# Road and Bridge Construction Workers in the Midwest

*Productive, High-Skilled, and Well-Paid*

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A Higher Road for a Better Tomorrow

Midwest Economic Policy Institute

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# Executive Summary

Construction workers who specialize in road and bridge infrastructure projects are productive, high-skilled, and well-paid in America's "Great Lakes" region– which comprises Illinois, Indiana, Michigan, Ohio, and Wisconsin. Key findings from this report include:

- Employment in construction jobs is expected to increase by 21.4 percent over the next decade, the second-fastest growing occupation. The majority of these new employment opportunities will require the completion of a three- to five-year apprenticeship program.
- In 2013, three out of every five new construction jobs in the Great Lakes region were filled by a candidate with an associate's or apprenticeship degree.
- Road and bridge construction workers each produce an average of $155,100 in economic value for the Great Lakes region, second only to their counterparts in the Far West states ($162,461 per worker). Wisconsin's street, highway, and bridge construction workers were the most productive in the Great Lakes region, annually contributing an average of $184,592 to the economy.
- Construction workers in the Great Lakes region build highways in a cost-effective manner, constructing each lane-mile up to 43 percent cheaper than the national average.
- The apprenticeship share– the ratio of active apprentices to total workers in construction occupations– is higher in states with a prevailing wage law (7.7 percent) than in states without a prevailing wage law (5.4 percent). Additionally, 10 percentage-point increase in a state's construction industry unionization rate is associated with a 3.2 percentage-point average increase in its apprenticeship share.

Construction workers across the Great Lakes region are well-compensated and can support a middle-class family. Road and bridge construction workers receive significant training in the Great Lakes states and, in turn, translate their increased human capital into higher levels of productivity for employers. Unfortunately, there are threats across the Midwest to weaken the institutions that are statistically correlated with increased worker efficiency, including prevailing wage laws and trades unions. If the Great Lakes region is to remain one of the nation's leaders in worker productivity on public construction projects, these institutions must be both defended and strengthened.

# Introduction

The Midwest's road network is indispensable to the regional economy. Highways, roads, and bridges connect workers to jobs, reduce the business cost of transporting materials, and raise productivity for all workers. At the heart of the nation's transportation infrastructure is the "Great Lakes" economic region, comprising Illinois, Indiana, Michigan, Ohio, and Wisconsin. These five states cumulatively operate and maintain nearly 98,000 bridges (16 percent of the national inventory) and over 513,000 miles of public roads (13 percent of all the nation's roads). Despite having such a large network, the quality of the road and bridge infrastructure in the Great Lakes region exceeds the national average. Fully 79.5 percent of all bridges, for instance, are at an acceptable quality throughout the region compared to just 74.3 percent in the rest of the nation (ASCE, 2013). Also serving as the rail hub of America, the trucking industry in the Great Lakes region is robust. With significant demand from both commuters and freight companies, and generally unfavorable seasonal weather, how has the region managed to maintain a high-quality system of roads and bridges? The answer lies in the resilience, skill-level, and efficiency of the region's workers and construction firms.

By being responsible for the primary spatial transport of people and cargos, road and bridge infrastructure has been recognized as the "the blood circulatory system" of the country's economy (Childress, 2013). Development of road infrastructure not only facilitates commercial product and passenger flows, but it provides incentives to create new companies and expand public sector services. As a nation, America's road density is comparatively high (second only to Germany), and the U.S. had 4,083,768 miles of public road in 2014 (FHWA, 2014). Traversing the nation's roads were approximately 253,000,000 automobiles and trucks.

A large body of research, originating shortly after the building of the country's interstate system, has been conducted to assess the relationship between road infrastructure and economic development. Analysis and discussion has been largely divided into two conceptual frameworks. One "school of thought" argues that highways should be primarily evaluated based on the transportation services they provide, rather than on economic impacts. A second viewpoint, however, places greater emphasis on promoting highways as engines of economic growth (Boarnet, 1999).


Economic studies analyzing the effects of highway capital expenditures on commercial sector economic performance and job growth have provided substantial empirical evidence of positive impacts (Jacoby, 1999;

Beshers, 1999; Aschauer, 1989; Bhatta & Drennan, 2003; Blum, 1982; Boarnet; 1997). Researchers have also examined road development as it applies to different geographical regions (Weisbrod & Beckwith, 1992; Boarnet & Haughwout, 2000; Chandra & Thompson, 2000). In addition, studies have addressed the value-added impact of road and highway infrastructure on specific industries, like manufacturing (Nadiri & Mamuneas, 1994). Finally, in 2014, a comparative study measuring the economic impact of road, air, transit, and water transportation, revealed that road stock delivers the "highest contribution to the growth of gross domestic product (GDP) and levels of social welfare" (Chen & Haynes, 2014). While some economists have questioned the economic boosts that public infrastructure spending provides (Holtz-Eakin & Schwartz, 1995), according to other experts, road construction is the "quintessential form of productive public spending" (Barro & Sala-i-Martin, 1992).

This Policy Brief, conducted jointly by the Midwest Economic Policy Institute (MEPI) and the Labor Education Program (LEP) at the University of Illinois School of Labor and Employment Relations, investigates how workers employed on road and bridge construction projects are productive, high-skilled, and well-compensated in the five states which make up the Great Lakes region. The report consists of three sections. First, the larger construction labor market in America is examined to understand the growing demand for high-skilled construction workers by employers. Second, the efficiency of road and bridge construction workers in the Great Lakes region is analyzed from the perspectives of both productivity and cost-effectiveness. The section also notes that high productivity offsets high labor costs, resulting in no discernible impact on total construction costs. Then, regional threats to apprenticeship training and per-worker productivity are detailed. A concluding section recaps key findings.

Throughout the report, the "Great Lakes" region is compared and contrasted with other economic areas in the United States. MEPI and LEP employ the regional definitions used by the Bureau of Economic Analysis at the U.S. Department of Commerce (BEA, 2014). These economic regions are as follows:

- **Great Lakes region:** Illinois, Indiana, Michigan, Ohio, and Wisconsin
- **New England region:** Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont
- **Mideast region:** Delaware, District of Columbia, Maryland, New Jersey, New York, and Pennsylvania
- **Plains region:** Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota
- **Southeast region:** Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia
- **Southwest region:** Arizona, New Mexico, Oklahoma, and Texas
- **Rocky Mountain region:** Colorado, Idaho, Montana, Utah, and Wyoming
- **Far West region:** Alaska, California, Hawaii, Nevada, Oregon, and Washington

## The Larger Construction Labor Market in America: The Rebound

### Projected Growth of Skilled Construction Jobs

Demand for road and bridge construction workers is expected to rise in tandem with a fast-growing construction industry across America. From 2012 to 2022, the U.S. economy is expected to add 15.6 million jobs, a growth of 10.8 percent. Occupations related to healthcare and social assistance– the fastest growing sector of employment in the American economy– are projected to account for 5.0 million of these new jobs, with employment in healthcare support occupations (e.g., nursing assistants, aides, and veterinary technicians) increasing by 28.1 percent and healthcare practitioner and technical occupations (e.g. doctors, dentists, and registered nurses) growing by 21.5 percent (BLS, 2013). The surge in health care jobs is fueled by a growing and aging population.

Behind health care jobs, construction occupations are projected to be the second-fastest growing sector of employment (BLS, 2013). The demand for construction jobs is fueled by the nation's aging *infrastructure* in addition to the new housing, transportation, and interconnectivity needs of the growing population. From 2012 to 2022, construction and extraction employment is projected to increase by 21.4 percent, adding 1.3 million new jobs (Figure 1). These new jobs will account for 8.3 percent of the nation's 15.6 million new jobs. According to the Bureau of Labor Statistics at the U.S. Department of Labor, the typical worker in a construction or extraction occupation earned a base wage of $21.94 per hour in May 2013, slightly lower than the median hourly wage of $22.33 for all U.S. occupations (BLS, 2014).

The construction occupations that will add the most jobs over the next decade require well-trained, skilled workers (Figure 1). Carpenters and electricians, the two fastest growing construction occupations, are both expected to add over 100,000 new jobs in America over the next decade, increases of around 30 percent. The typical carpenter job requires the completion of a three- or a four-year year apprenticeship program while electricians need four- or five-years of training. First-line supervisors of construction workers, which generally necessitate a bachelor's degree, will also add over 100,000 new jobs– positions which currently pay $30.70 per hour. While the 62,700 new construction helpers will only need on-the-job training, the rest of the fastest-growing construction occupations all typically require three to five years as an apprentice: pipelayers, plumbers, pipefitters, and steamfitters; operating engineers; cement masons and concrete finishers; painters; and brickmasons, blockmasons, and stonemasons (Figure 1).

*Figure 1: Projected Growth in Construction Occupations Employment, 2012-2022*

| New Construction Jobs from 2012 to 2022 | | | | |
|---|---|---|---|---|
| Construction Occupation | Job Growth | Percent Growth | Typical Training Required | May 2013 Median Hourly Base Wage (No Benefits) |
| Carpenters | 160,400 | 33.8% | 3- or 4-year apprenticeship | $21.62 |
| Electricians | 106,100 | 27.3% | 4- or 5-year apprenticeship | $24.28 |
| First-line supervisors | 105,300 | 31.3% | Bachelor's degree | $30.70 |
| Pipelayers, plumbers, pipefitters, & steamfitters | 76,100 | 27.7% | 4- or 5-year apprenticeship | $23.31 |
| Helpers | 62,700 | 32.4% | On-the-job | $12.97 |
| Operating engineers | 39,600 | 30.5% | 3- or 4-year apprenticeship | $20.45 |
| Cement masons & concrete finishers | 38,900 | 30.7% | 3-year apprenticeship | $17.37 |
| Painters | 34,200 | 23.4% | 3- or 4-year apprenticeship | $18.89 |
| Brickmasons, blockmasons, & stonemasons | 27,600 | 43.7% | 3- or 4-year apprenticeship | $21.67 |
| **All construction and extraction workers** | **1,301,900** | **21.4%** | ----- | $21.94 |

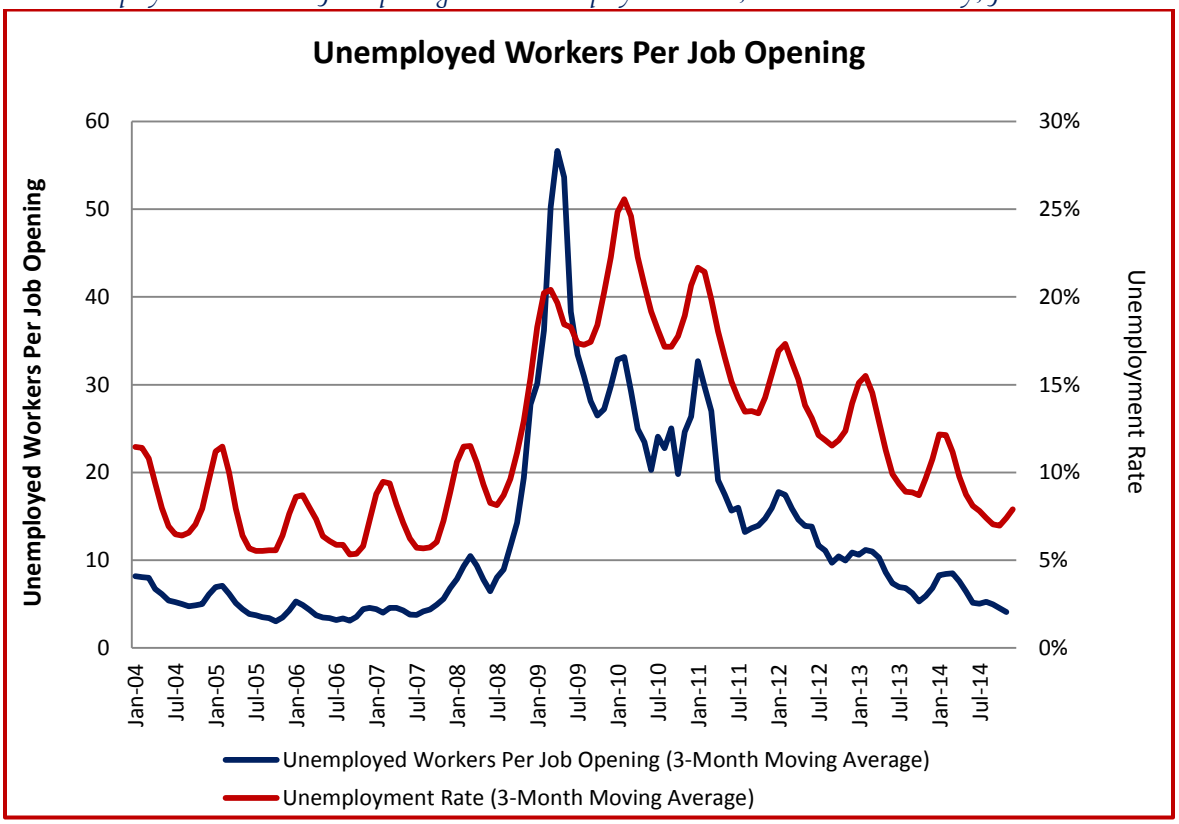
*Source(s): Bureau of Labor Statistics (December 2013), "Employment Projections – 2012-2022," U.S. Department of Labor, available at http://www.bls.gov/news.release/pdf/ecopro.pdf.*

## Unemployed Construction Workers and New Hires

The unemployment rate for construction workers in America– once around 25 percent– has receded back to pre-recession levels (Figure 2). Figure 2 reports the unemployment rate of construction workers and the ratio of unemployed workers per job opening in construction from January 2004 through December 2014. The data are smoothed out as three-month averages, but clearly demonstrate the seasonal nature of construction work nevertheless. Prior to 2009, the construction worker unemployment rate fluctuated around 7 or 8 percent, with peaks around 10 percent in the winter months and valleys near 5 percent during the summer months. For 58 consecutive months from October 2008 through July 2013, the construction unemployment rate remained above 10 percent. Finally, in August 2014, the smoothed unemployment rate for construction workers fell below 8 percent.

The ratio of unemployed construction workers per job opening has also returned to levels last seen prior to the Great Recession. From January 2004 to October 2008, there were 5.4 construction workers for every job opening on average. That ratio skyrocketed during the economic downturn, peaking at 56.6 unemployed construction workers per available job opening in April 2009. Since the beginning of 2012, the ratio has annually declined by an average of 3.8 unemployed workers per job. As of December 2014, there are now 4.8 unemployed construction workers per construction job opening. After years of significant distress for *workers* seeking employment, the declining supply of available labor is finally putting pressure back on *employers* to find skilled men and women to fill positions (Figure 2).

*Figure 2: Unemployed Workers Per Job Opening vs. the Unemployment Rate, Construction Industry, Jan. 2004-Dec. 2014*




*Source(s): Department of Labor (January 2015), Job Openings and Labor Turnover Survey and the Labor Force Statistics from the Current Population Survey, U.S. Department of Labor, available at http://www.bls.gov/data/.*

To understand the skill level of readily available construction workers, Figure 3 presents educational attainment information for the unemployment pool using data from the Bureau of Labor Statistics' Current Population

Survey. In 2013, there were almost 880,000 unemployed construction workers across the country. More than seven-in-ten (71.1 percent) had a high school degree or less and about one-in-five (22.3 percent) had at least a bachelor's degree. About 58,000 unemployed construction workers, or 6.6 percent of the unemployment pool, were recipients of an associate's degree (Figure 3). Note that most workers in the construction industry who hold an associate's degree received the degree or its equivalent through a three to five year apprenticeship program.

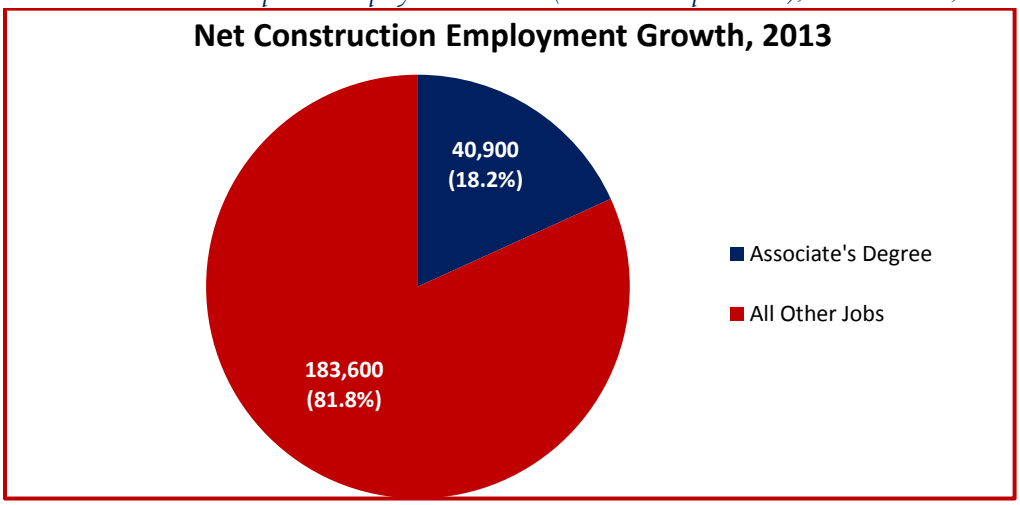
*Figure 3: The Supply of Unemployed Construction Occupation Workers, United States, 2013*

| Who Are the Unemployed? (Entire US Labor Market) | Estimate of Unemployed Construction Workers | Share of Unemployed Construction Workers |
|---|---|---|
| High School Degree or Less | 629,000 | 71.1% |
| Associate's (or Apprentice) Degree | 58,200 | 6.6% |
| Bachelor's Degree or More | 197,100 | 22.3% |
| Number of Unemployed | 884,300 | 100.0% |

*Source(s): Author's analysis of the Current Population Survey – Outgoing Rotation Groups using weighted estimates, Bureau of Labor Statistics, U.S. Department of Labor, available at http://ceprdata.org/cps-uniform-data-extracts/cps-outgoing-rotation-group/cps-org-data/*

The problem, as portrayed in Figure 4, is that demand for higher-skilled construction workers is rising. In the same year that 6.6 percent of the unemployed construction labor force had an associate's degree, individuals with associate's degrees accounted for 18.2 percent of net construction employment (i.e., new hires minus all job separations). Fully 40,900 of the 224,500 net construction jobs were filled by workers with associate's or apprenticeship degrees. This means that one in every five workers who employers *want* must have associate's or apprenticeship degrees, but these workers comprise just one in every fifteen unemployed worker (Figure 4).

*Figure 4: Net Construction Occupation Employment Growth (Hires Less Separations), United States, 2012-2013*




*Source(s): Author's analysis of the Current Population Survey – Outgoing Rotation Groups using weighted estimates, Bureau of Labor Statistics, U.S. Department of Labor, available at http://ceprdata.org/cps-uniform-data-extracts/cps-outgoing-rotation-group/cps-org-data/*

The supply of unemployed construction workers is *less* skilled in the Great Lakes region– Illinois, Indiana, Michigan, Ohio, and Wisconsin– compared to national construction labor market (Figure 5). In 2013, there were nearly 57,000 unemployed construction workers in the region. Nine-in-ten (89.6 percent) had only a high school degree or less and just 3.7 percent had at least a bachelor's degree. About 4,000 unemployed construction workers, or 6.7 percent of the unemployment pool, had earned an associate's or apprentice degree in the Great Lakes region. The data imply that contractors requiring workers with an associate's or apprentice degree or higher in these five states may have already mined the qualified unemployed.

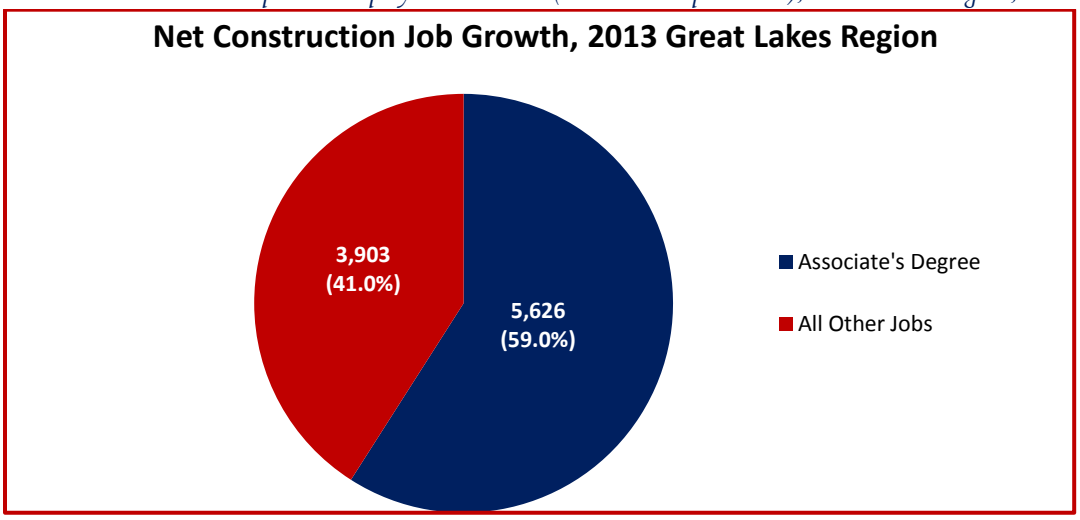
*Figure 5: The Supply of Unemployed Construction Occupation Workers, Great Lakes Region, 2013*

| Who Are the Unemployed? | Estimate of Unemployed Construction Workers | Share of Unemployed Construction Workers |
|---|---|---|
| High School Degree or Less | 51,000 | 89.6% |
| Associate's (or Apprentice) Degree | 3,800 | 6.7% |
| Bachelor's Degree or More | 2,100 | 3.7% |
| Number of Unemployed | 56,900 | 100.0% |

*Source(s): Author's analysis of the Current Population Survey – Outgoing Rotation Groups using weighted estimates, Bureau of Labor Statistics, U.S. Department of Labor, available at http://ceprdata.org/cps-uniform-data-extracts/cps-outgoing-rotation-group/cps-org-data/*

There is a particularly acute skills mismatch in the Great Lakes region's construction labor market (Figure 6). Net construction job growth in 2013 equaled only 9,529 new workers. This very limited growth could actually be *the result of* the skills mismatch, as employers may not be able to find the high-skilled workers they demand and may decide to keep open positions vacant. In the same year that 6.7 percent of the unemployed construction labor force had an associate's or apprentice degree, individuals with such degrees accounted for 59.0 percent of net construction employment (i.e., new hires minus all job separations). A total of 5,625 of the 9,529 net construction jobs were filled by workers with associate's or apprenticeship degrees. This means that three in every five construction workers who Great Lakes contractors *want* must have associate's or apprenticeship degrees, but these individuals comprise just one in every fifteen unemployed construction worker.

*Figure 6: Net Construction Occupation Employment Growth (Hires Less Separations), Great Lakes Region, 2012-2013*



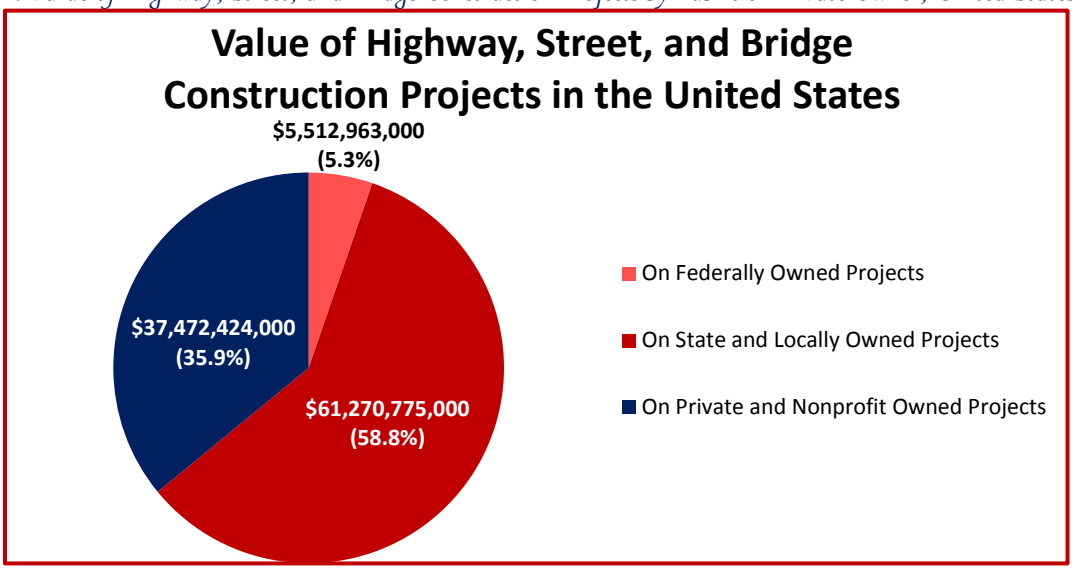

*Source(s): Author's analysis of the Current Population Survey – Outgoing Rotation Groups using weighted estimates, Bureau of Labor Statistics, U.S. Department of Labor, available at http://ceprdata.org/cps-uniform-data-extracts/cps-outgoing-rotation-group/cps-org-data/*

## Road and Bridge Construction Is Efficient in the Great Lakes Region

Road and bridge construction is primarily financed by public sector bodies (Figure 7). According to the 2007 Economic Census, the latest year for which data is available, the value of construction work on "highway, street, and bridge construction" projects was $104.3 billion across America. Government projects accounted for 64.1 percent of total construction costs in this sector, with $5.5 billion owned by the federal government (5.3 percent) and $61.3 billion owned by state and local governments (58.8 percent). Note that a portion of the remaining

$37.5 billion worth of projects owned by private and nonprofit organizations (35.9 percent) is also likely to have been financed at least in part by a government agency through a public-private partnership or a quasi-public economic development venture or educational institution. Thus, road and bridge construction serves as an effective proxy to study the productivity of workers on publicly-financed construction projects.

*Figure 7: Value of Highway, Street, and Bridge Construction Projects by Public or Private Owner, United States, 2007*




*Source(s): 2007 Economic Census, Value of Construction Work, U.S. Department of Commerce, available at factfinder2.census.gov.*

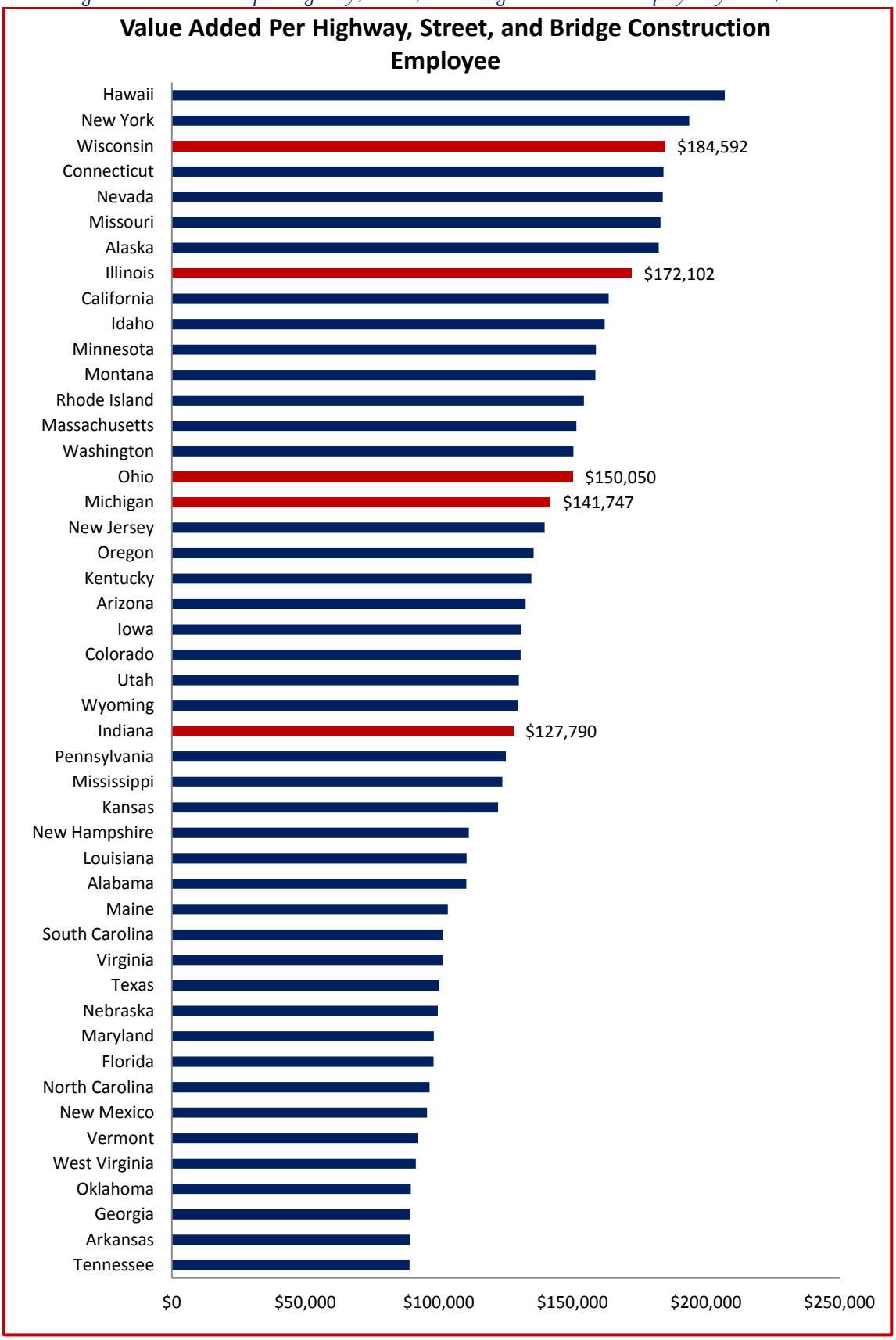
## High Per-Worker Productivity Compared to Other Regions

Construction employees working on road and bridge projects in the Great Lakes region are among the most-productive construction workers in the country (Figure 8). Figure 8 provides state-level data on the value added by workers in the "highway, street, and bridge construction" sector of the construction industry in America. "Value added"– which measures worker productivity over one year– is business revenues minus the costs for materials, components, supplies, fuels, and subcontracted work. Put differently, "value added" is the average worker's real contribution to a state's economy or gross domestic product (GDP). Information is from the 2007 Economic Census and includes 47 states (there was not enough data from Delaware, North Dakota, and South Dakota).

Four of the five Great Lakes states ranked in the top half of all states by average productivity of road and bridge construction workers. Out of the 47 states with available data, Wisconsin ranked 3rd in value added per worker ($184,592), Illinois ranked 8th ($172,102), Ohio ranked 16th ($150,050), and Michigan ranked 17th ($141,747). The only state to place in the bottom half of worker productivity was Indiana, which ranked 26th ($127,790) in value added per highway, street, and bridge construction employee. Midwest contractors are among the most efficient in the nation.

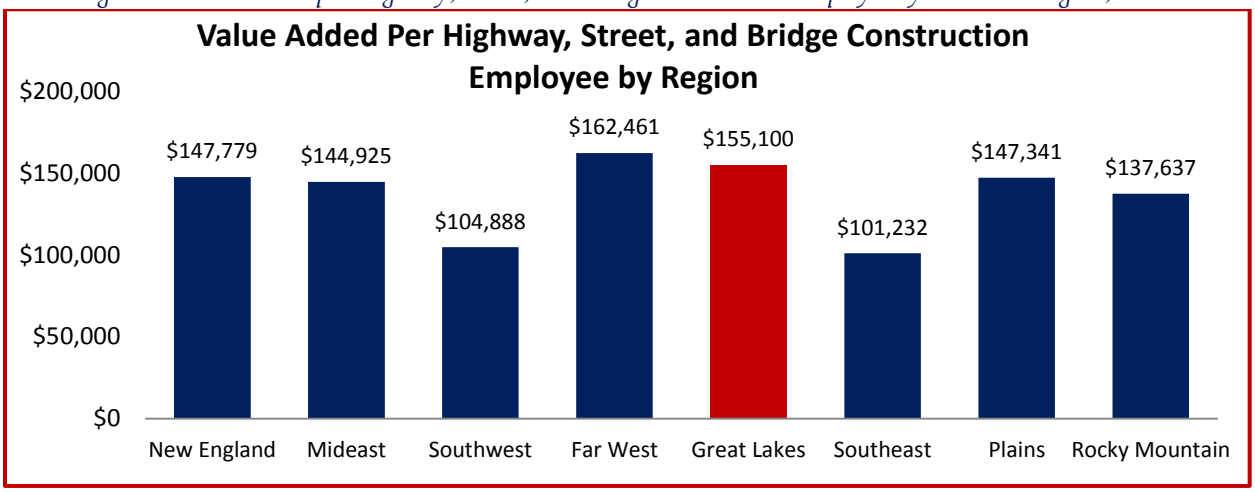
In the aggregate, only the Far West region has more productive road and bridge construction workers than the Great Lakes (Figure 9). Productivity in the Far West region– Alaska, California, Hawaii, Nevada, Oregon, and Washington– is $162,461 per worker compared to $155,100 for the Great Lakes region. The third-most productive area of the country for road and bridge construction was New England ($147,779 per employee) and the least productive labor market was the Southeast ($101,232 per employee). Note that the more productive regions are typically associated with higher rates of labor union membership for construction workers and the existence of a prevailing wage or common construction wage laws.

*Figure 8: Value Added per Highway, Street, and Bridge Construction Employee by State, 2007*




*Source(s): 2007 Economic Census, Value of Construction Work, U.S. Department of Commerce, available at factfinder2.census.gov.*

*Figure 9: Value Added per Highway, Street, and Bridge Construction Employee by Economic Region, 2007*

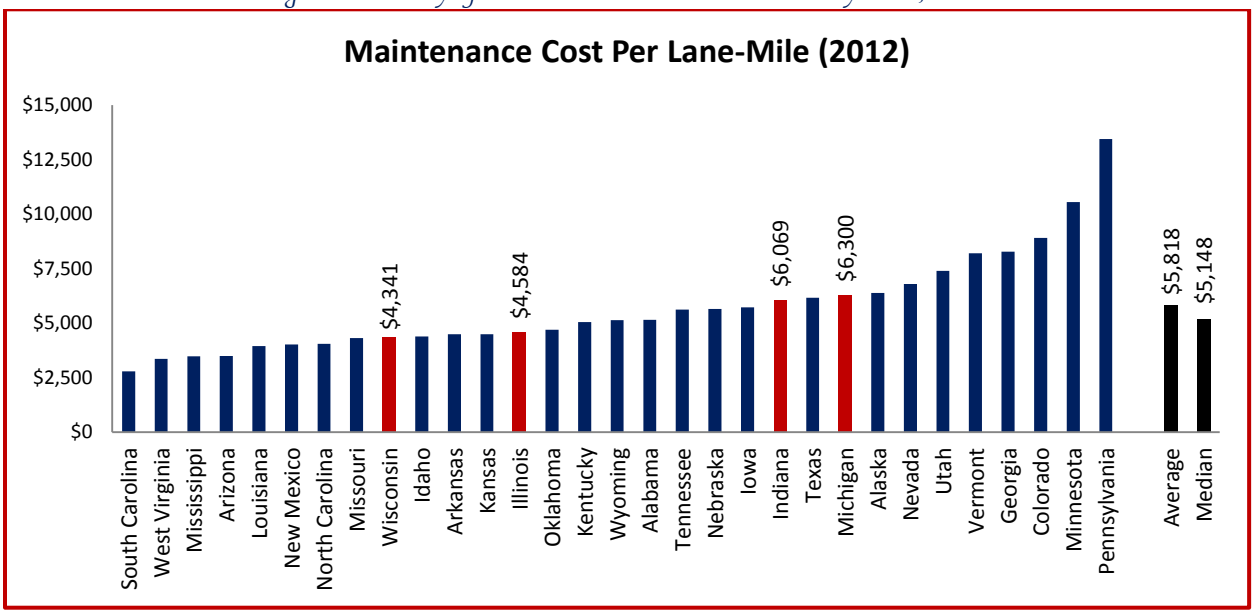



*Source(s): 2007 Economic Census, Value of Construction Work, U.S. Department of Commerce, available at factfinder2.census.gov.*

## Low Construction Costs Compared to Other Regions

While worker productivity is a critical part of the equation for taxpayers, the costs of highway construction and maintenance are perhaps most important. Road construction workers in the Great Lakes are relatively effective at maintaining highways (Figure 10). In 2012, the Indiana Department of Transportation (INDOT) conducted a state-to-state highway maintenance cost comparison survey. A total of 31 U.S. states responded to the survey and self-reported their estimated maintenance costs per lane-mile based on criteria provided by INDOT. Illinois, Indiana, Michigan, and Wisconsin were among the 31 states to provide information. The survey found that the national average cost to maintain a single lane-mile of highway was $5,818 and that the median cost was $5,148 per lane-mile.

*Figure 10: Survey of Maintenance Costs Per Lane-Mile by State, 2012*




*Source(s): Wisconsin Department of Transportation (2012), "State Highway Maintenance: Policy Issue Paper," citing INDOT, available at http://www.dot.wisconsin.gov/about/tfp/docs/state-highway-maint.pdf. Average and median are state-level and unweighted.*

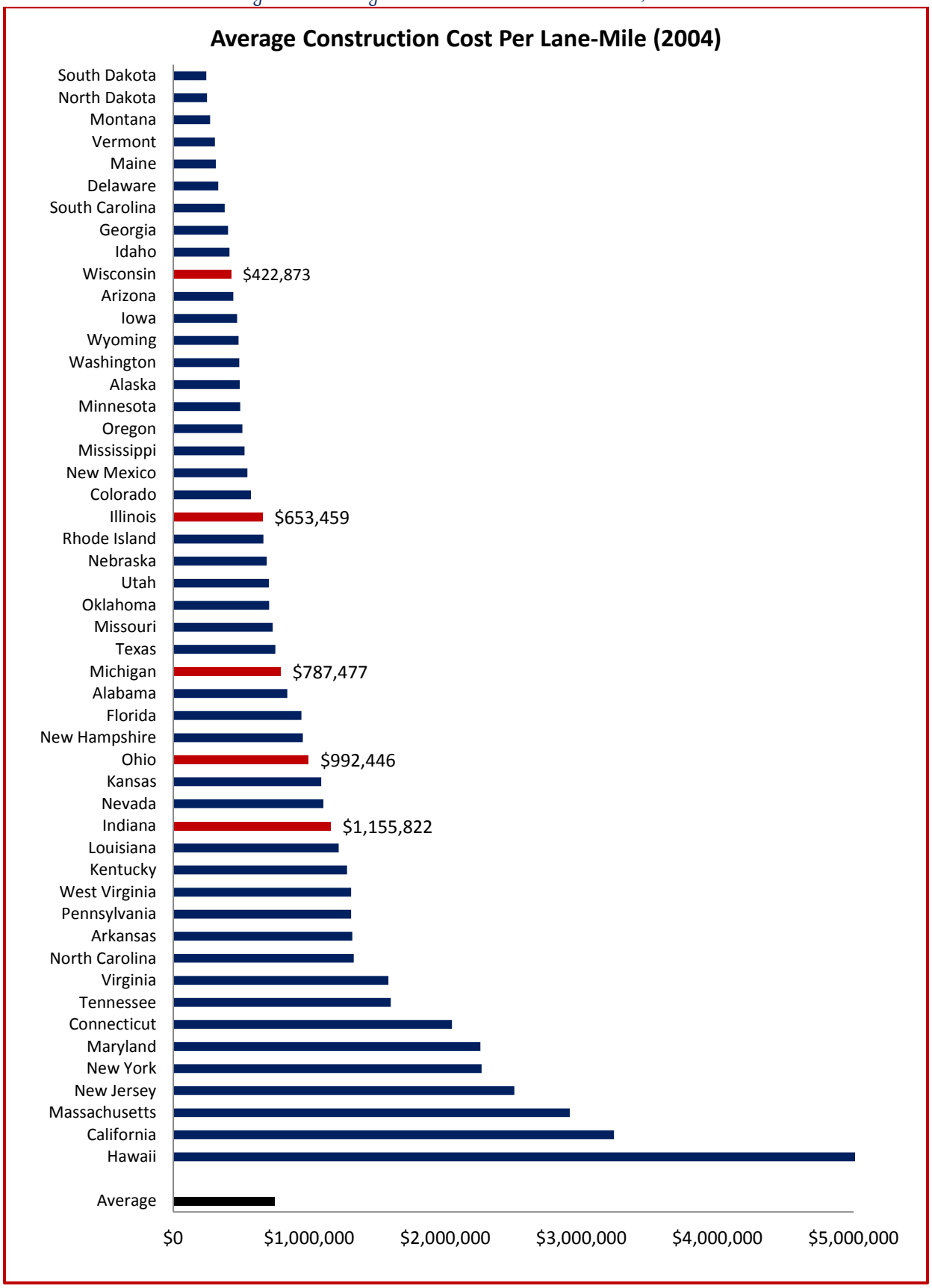
Two of the four Great Lakes states ranked in the top half by highway maintenance cost efficiency and all four placed above the bottom 25th percentile (Figure 10). At $4,341 per lane-mile, Wisconsin placed 9th out of 31. Wisconsin was followed by 13th-ranked Illinois ($4,584 per lane-mile), 21st-ranked Indiana ($6,069 per lane-mile), and 23rd-ranked Michigan ($6,300 per lane-mile). The four respondent Great Lakes states experienced maintenance costs that were between 25.4 percent lower and 8.3 percent higher than the unweighted national average. The cheapest state for highway maintenance was South Carolina ($2,796 per lane-mile) and the costliest state was Pennsylvania ($13,447 per lane-mile). Note that, compared to Wisconsin, all of the states with lower average lane-mile maintenance costs were warmer weather states.

Great Lakes states are also effective at constructing roads and bridges. A 2004 study, the most recent study to analyze the data, incorporated Federal Highway Administration data between 1994 and 2002 to analyze the average cost to construct a lane-mile of highway in each state (Poupore, 2004). The Federal Highway Administration data also included statistics for average hourly wages paid, total labor hours, and labor costs. The researchers found that the national average cost to construct a single lane-mile of highway was $746,361 (Figure 11).

In terms of cost-effectiveness, two Great Lakes states were among the top half and all five were above the bottom 25th percentile of states (Figure 11). Wisconsin ranked 10th ($422,873 per lane-mile) and Illinois placed 21st ($653,459 per lane-mile). Compared to the national average, road construction costs in the Great Lakes states ranged from 43.3 percent cheaper (Wisconsin) to 54.9 percent more expensive (Indiana). The most inexpensive place to construct a lane-mile of highway was South Dakota ($242,213 per lane-mile) and the most expensive location was Hawaii ($7.41 million per lane-mile). In addition, Illinois' per-mile total cost was significantly less than states containing comparably dense urban areas such as California ($3.24 million per lane-mile), New York ($2.27 million per lane mile), and Texas ($749,485 per-lane mile).

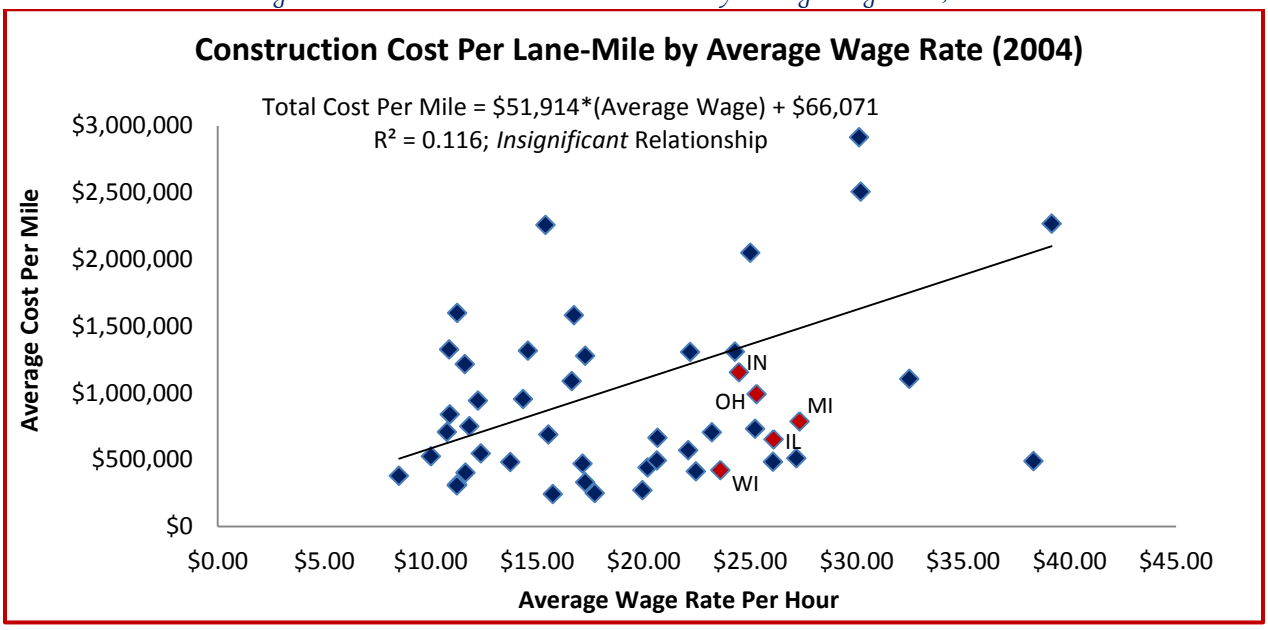

Figure 12 displays how increased worker productivity translates into low construction costs in the Great Lakes region. Construction workers on highway projects earned relatively high wages from 1994 to 2002, with average wage rates between $23.60 per hour (Wisconsin) and $27.32 per hour (Michigan) compared to the national average of $18.20 per hour. Despite higher wages, workers in Midwest made their states some of the cheapest in the country to construct a lane-mile of highway. The data from the Federal Highway Administration exhibit a *statistically insignificant* relationship between a state's average wage rate per hour and its average cost per mile. It is worth noting, however, that the cost to construct a lane-mile of highway was lower in every state in the Great Lakes region than the analysis "predicts," with each state below the linear relationship. This again indicates high productivity per worker in the Great Lakes region (Figure 12).

*Figure 11: Average Construction Cost Per Lane-Mile, 2004*




*Source(s): Poupore (2004), "The Impact of Wages on Highway Construction Costs: Updated Analysis," The Construction Labor Research Council.*

*Figure 12: Construction Cost Per Lane-Mile by Average Wage Rate, 2004*




*Source(s): Poupore (2004), "The Impact of Wages on Highway Construction Costs: Updated Analysis," The Construction Labor Research Council.*

Higher average hourly wages are *not* associated with higher construction costs. The aforementioned 2004 study that incorporated Federal Highway Administration statistics cut the data into "low wage" states and "high wage" states that all had annual road construction expenditures of at least $100 million per year over the nine-year period. Although the average hourly wage of road construction workers was higher in high wage states than in low wage states, the hours required to construct each mile were 35.2 lower in high wage states, indicating greater productivity. Higher labor costs did not translate into higher total construction expenditures per mile, as the total cost per mile was 3.9 percent *lower* in the high wage states. The takeaway is that labor costs are not the whole story: "Higher wage workers can build highways with no impact on total cost because of their superior skills. … '[P]roductivity is the key to calculating labor costs'" (Poupore, 2004). This finding is further substantiated by the economic research on prevailing wage laws which find that any increases in labor costs are offset by corresponding increases in labor productivity (Prus, 1996; Wial, 1999; Mahalia, 2008; Duncan, 2011; Philips, 2014).

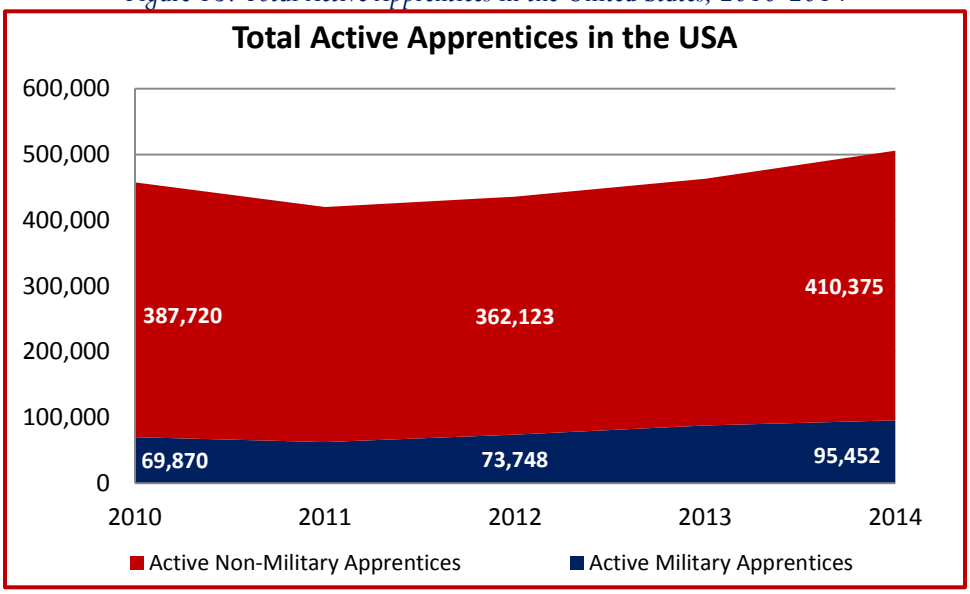
## Threats to High Productivity in Road and Bridge Construction Across the Great Lakes Region

Through registered apprenticeship programs, the construction industry "operates the largest privately financed system of higher education in the country" (Philips, 2014). According to data from the United States Department of Labor Employment and Training Administration, the number of registered apprentices is increasing across America (Figure 13). The quantity of active non-military apprentices totaled 410,375 workers in 2014, a gain of nearly 50,000 apprentices since the 2012 mark of 362,123. The United Services Military Apprenticeship Program (USMAP)– a formal military training program that provides activity duty Navy, Coast Guard, and Marine Corps service members the opportunity to improve their skills– has also grown by over 20,000 trainees, from 73,748 apprentices in 2012 to 95,452 apprentices in 2014. Prior to this new active enrollment, the Department of Labor spent $3.2 billion for training and employment services in 2012 (Olinsky & Ayres, 2013).

Unfortunately, the growth in active registered apprentices is not keeping pace with expanding employment in the industry. Nationwide, there are about 70,000 more apprentices active than there were in 2012. Employment in

the construction industry, meanwhile, has expanded by over 390,000 workers, from 5.65 million workers to 6.04 million workers. During this time, most employers hiring for positions, which primarily require apprenticeship training (Figures 4 and 6), have been able to turn to skilled applicants from the unemployment pool. Since the supply of unemployed workers is drying up, however, employers will now face a skills shortage as long as the number of active apprenticeships does not increase dramatically.

*Figure 13: Total Active Apprentices in the United States, 2010-2014*




*Source(s): Employment and Training Administration, "Data and Statistics: Registered Apprenticeship National Results" for 2010-2014, U.S. Department of Labor, available at http://www.doleta.gov/oa/data_statistics.cfm.*

The problem is that many Great Lakes states are enacting policies which limit worker training programs. For instance, there are movements and proposed bills across the region to repeal or weaken state prevailing wage laws. New Illinois Governor Bruce Rauner has said that the state's prevailing wage law "is costing taxpayers money" (*Wand17*, 2015) and lawmakers in the Indiana House of Representatives voted to repeal the state's common construction wage (LoBianco, 2015). The repeal movement has also "gain[ed] steam" in Wisconsin (Shaw, 2015) and Republican lawmakers in Michigan are seeking to repeal prevailing wage even though Republican Governor Rick Snyder opposes the move (Dickerson, 2015). Repeal could be devastating: Economic research has found that registered apprenticeship training declines by 38 percent after a state repeals its prevailing wage law (Philips et al., 1995; Philips, 2014).

On the other hand, trades unions have historically been at the forefront of worker apprenticeship programs. One report finds that, there has been an extremely strong correlation (0.87) between active apprenticeship programs and union membership rates since 2001 (Olinsky & Ayres, 2013). As union membership has dropped nationally, the number of joint labor-employer apprenticeship programs has also declined, the report finds. It is worth noting that many of the organizations across America that are warning of a skilled labor shortage are the same who are advocating "to weaken or destroy the building trades unions that actually train the greatest number of skilled tradesmen" (Eisenbrey, 2014).

Figure 14 explores the prevailing wage threat in greater detail. Fully 70.5 percent of all workers in construction occupations are employed in prevailing wage law states (including 100 percent of all workers in the Great Lakes region during the period of analysis). In comparison, 76.3 percent of all active apprentices are in states with a prevailing wage law. Non-prevailing wage law states, on the other hand, comprise 29.5 percent of all construction workers but just 23.7 percent of apprentices. The ratio of active registered apprentices to all workers employed in

construction occupations, or the *apprenticeship share*, is 7.7 percent in states with a prevailing wage law compared to 5.4 percent in states without a prevailing wage law. These broad 2013 statistics support the previous research that finds that prevailing wage laws promote worker training and allow contractors to find and hire the skilled workers they require.

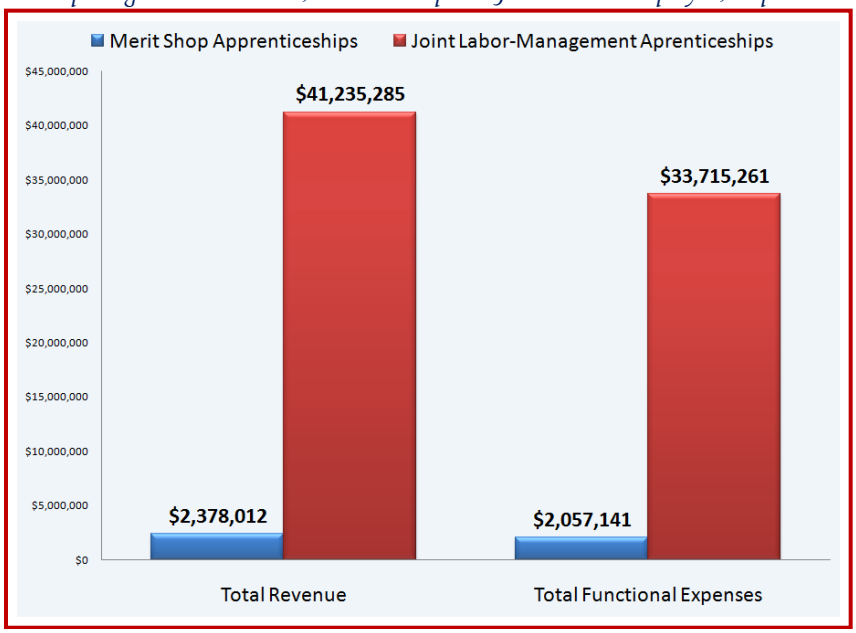
*Figure 14: Share of Apprentices to Total Construction Employment, by Prevailing Wage, 2013*

| Construction Occupations, 2013 | Construction Employment | Total Active Apprentices | Ratio of Apprentices to Construction Workers |
|---|---|---|---|
| Prevailing Wage Law States | 70.55% | 76.28% | 7.70% |
| Non-Prevailing Wage Law States | 29.45% | 23.72% | 5.43% |

*Source(s): Employment and Training Administration, "Data and Statistics: Registered Apprenticeship National Results" for 2013, U.S. Department of Labor, available at http://www.doleta.gov/oa/data_statistics.cfm; Author's analysis of the American Community Survey, 1% Sample for 2013, using weighted estimates, https://usa.ipums.org/usa/acs.shtml.*

Figure 15 presents data compiled by University of Utah economist Peter Philips, which demonstrates how trades unions invest significantly more into improving the human capital skills of workers (Philips, 2015). The graph contrasts revenues and expenses of joint labor-management apprenticeship programs with those in "merit shop" or non-union programs in Indiana. To choose the more conservative metric, labor-employer or unionized programs annually *expend* 16.4 times as much money to train construction workers ($33.7 million) as do "merit shops" ($2.1 million) (Figure 15).

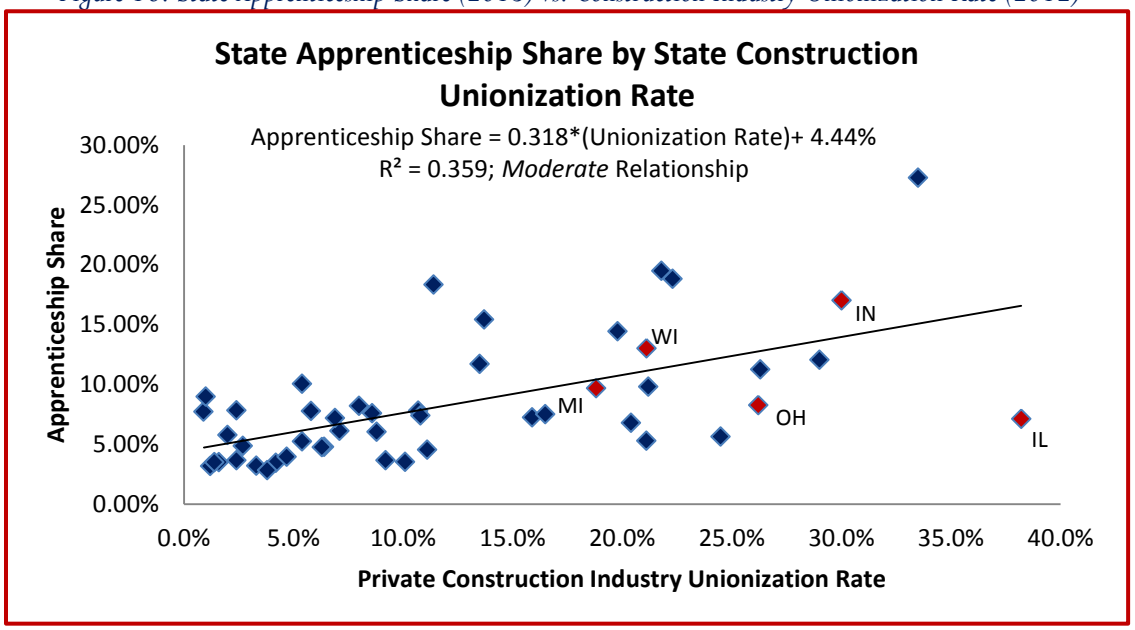
*Figure 15: Apprenticeship Programs in Indiana, "Merit" Shops vs. Joint Labor-Employer, Replication of Philips (2015)*




*Source(s): Philips (2015), Data from forthcoming project on apprenticeships in Indiana's construction labor market.*

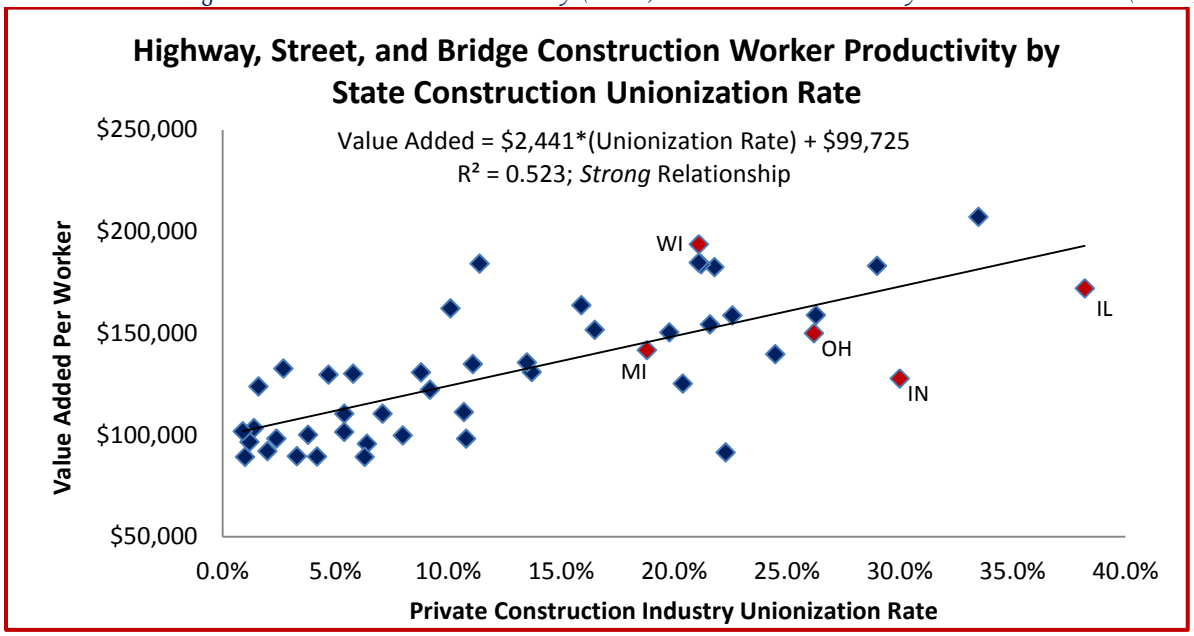
Similarly, the positive linear trend in Figure 16 shows that a 10 percentage-point increase in a state's private construction industry unionization rate is associated with a 3.2 percentage-point increase in its apprenticeship share on average. The relationship indicates that the higher rates of unionization in Great Lakes states have boosted apprenticeship training in the regional economy. Note that the apprenticeship share in Illinois is exceptionally low because funding for joint labor-management programs has not yet recovered to pre-recession levels in the state.

*Figure 16: State Apprenticeship Share (2013) vs. Construction Industry Unionization Rate (2012)*




*Source(s): Employment and Training Administration, "Data and Statistics: Registered Apprenticeship National Results" for 2013, U.S. Department of Labor, available at http://www.doleta.gov/oa/data_statistics.cfm; Author's analysis of the American Community Survey, 1% Sample for 2013, using weighted estimates, https://usa.ipums.org/usa/acs.shtml; Author's analysis of the Current Population Survey – Outgoing Rotation Groups using weighted estimates, Bureau of Labor Statistics, U.S. Department of Labor, available at http://ceprdata.org/cps-uniform-data-extracts/cps-outgoing-rotation-group/cps-org-data/.*

*Figure 17: Road and Bridge Construction Worker Productivity (2007) vs. Construction Industry Unionization Rate (2012)*



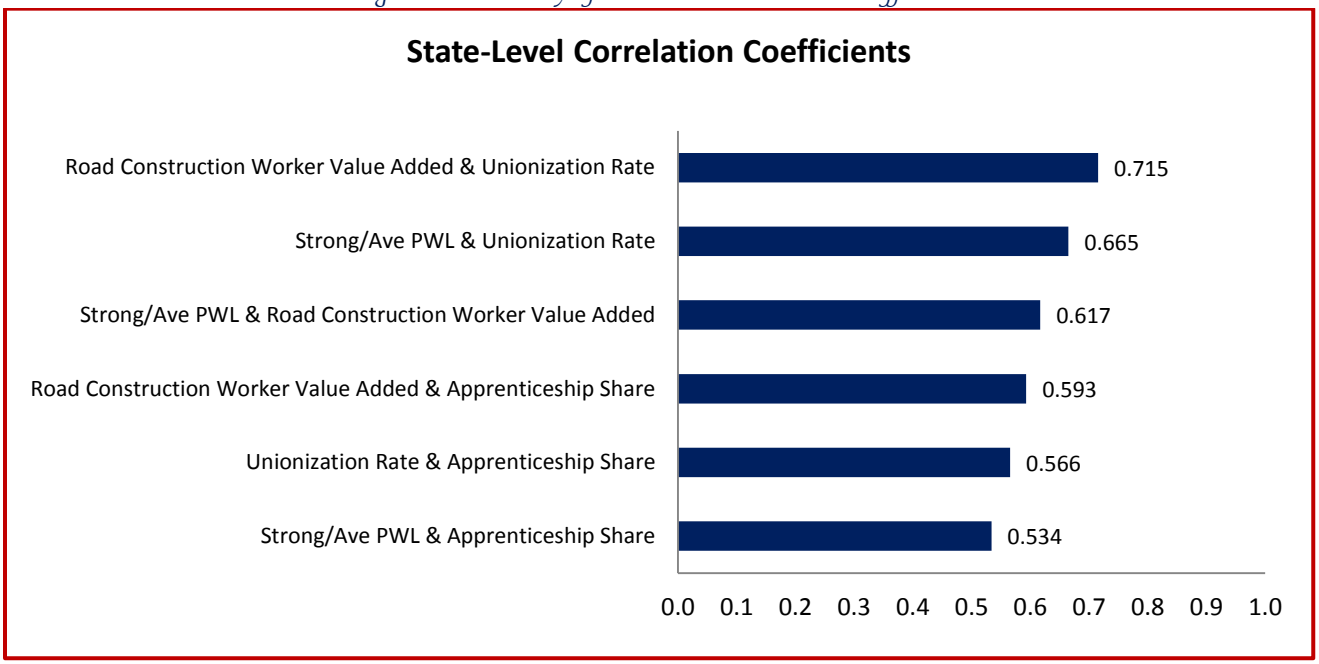

*Source(s): 2007 Economic Census, Value of Construction Work, U.S. Department of Commerce, available at factfinder2.census.gov; Author's analysis of the American Community Survey, 1% Sample for 2013, using weighted estimates, https://usa.ipums.org/usa/acs.shtml; Author's analysis of the Current Population Survey – Outgoing Rotation Groups using weighted estimates, Bureau of Labor Statistics, U.S. Department of Labor, available at http://ceprdata.org/cps-uniform-data-extracts/cps-outgoing-rotation-group/cps-org-data/.*

Labor union membership, by increasing the apprenticeship share, also raises the productivity of road and bridge construction workers (Figure 17). Union productivity has been found to be 17 to 22 percent higher than nonunion output (Allen, 1984). Figure 17 generally corroborates this finding. The linear trend reveals that a 10 percentage-point increase in a state's private construction industry unionization rate is positively correlated with a $24,410

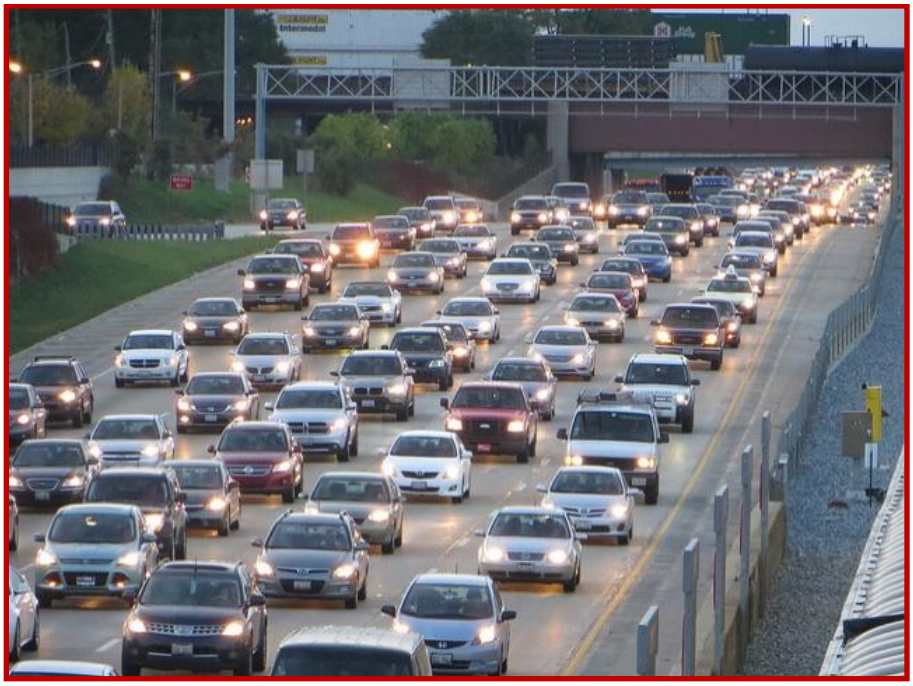
average increase in the value added of a road and bridge construction worker. Once again, the association provides evidence that the higher rates of unionization in Great Lakes states have enhanced productivity for construction employees working on highway, street, and bridge projects.

Finally, Figure 18 summarizes the key statistical relationships for the road and bridge construction industry. Data are presented as correlation coefficients, which measure the strength of each two-variable relationship. A correlation coefficient of 0.0 means that the two items are completely unrelated while a correlation coefficient closer to 1.0 means that the two variables are positively related to each other by a considerable amount. The strongest association is between a state's road and bridge construction worker productivity and its construction industry unionization rate (0.72). This is further evidence that unionization tends to raise individual worker productivity, including in the Great Lakes region. The presence of a prevailing wage law that is considered "strong" or "average" (Belman & Philips, 2014) is positively correlated with the state's construction worker unionization rate (0.67), worker productivity (0.62), and apprenticeship share (0.53). For completion, both a state's road construction worker productivity (0.59) and its unionization rate (0.57) are positively associated with higher apprenticeship shares in the construction industry. Prevailing wage laws and trades unions therefore increase both worker training *and* worker productivity. Efforts across Great Lakes states to constrain these institutions threaten the efficiency and vitality of private contractors that primarily do business in the public construction market.

*Figure 18: Summary of State-Level Correlation Coefficients*




*Source(s): Employment and Training Administration, "Data and Statistics: Registered Apprenticeship National Results" for 2013, U.S. Department of Labor, available at http://www.doleta.gov/oa/data_statistics.cfm; 2007 Economic Census, Value of Construction Work, U.S. Department of Commerce, available at factfinder2.census.gov; Author's analysis of the American Community Survey, 1% Sample for 2013, using weighted estimates, https://usa.ipums.org/usa/acs.shtml; Author's analysis of the Current Population Survey – Outgoing Rotation Groups using weighted estimates, Bureau of Labor Statistics, U.S. Department of Labor, available at http://ceprdata.org/cps-uniform-data-extracts/cps-outgoing-rotation-group/cps-org-data/; Strong/Ave PWL determined by Belman & Philips (2014).*



## Conclusions

Construction workers who specialize in road and bridge construction projects in the Midwest are productive, high-skilled, and well-paid for their efficiencies. As the Great Lakes region fully rebounds from the devastating impact of the Great Recession, the number of public and private projects is expected to increase, incentivizing contractors to expand employment opportunities. The workers who will be in greatest demand by employers are those with an associate's degree and/or those who have completed a registered apprenticeship program. Great Lakes contractors who build and maintain highways, streets, and bridges have become accustomed to each of their employees generating $155,100 in annual economic production and constructing a lane-mile of highway at a cost that up to 43 percent cheaper than the national average. In return, road and bridge construction workers across Illinois, Indiana, Michigan, Ohio, and Wisconsin are well-compensated due to their high levels of training and productivity. Unfortunately, there are threats across the Midwest to weaken the institutions that are statistically correlated with increased worker efficiency, including prevailing wage laws and trades unions. If the Great Lakes region is to remain one of the nation's leaders in worker productivity on public construction projects, these institutions should be both defended and strengthened.

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