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Mr. Rosaen's Magical Thinking
A Short Evaluation of Alex Rosaen's 2013 Prevailing Wage Methodology

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Abstract

This paper critically reviews Alex L. Rosaen, *The Impact of Michigan's Prevailing Wage Law on Education Construction Expenditures*, Anderson Economic Group, LLC, Commissioned by the Associated Builders and Contractors of Michigan, 2013. It is shown that Rosaen's estimates of the prevailing wage regulatory impact on Michigan educational capital outlays swing widely from negative to positive based on the assumptions used in his model. Further it is shown that the bases for Rosaen's assumptions are outdated and miscalculated. An alternative methodology using statistical tests is suggested that provides more stable results. Two alternative examples are presented. This critique concludes that Rosaen's estimates are unreliable.

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Mr. Rosaen's Magical Thinking

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Executive Summary

On November 13, 2013, Mr. Alex L. Rosaen, Senior Consultant for the Anderson Economic Group (AEG) released a report estimating that Michigan would save \$225 million per year or \$2.25 billion over ten years in K-12 and higher education capital outlays by repealing the state prevailing wage law.¹ Mr. Rosaen's estimate is based on a simple back-of-the-envelope calculation. Mr. Rosaen assumes that 1) blue-collar labor costs on public education construction in Michigan are 30% of total capital outlays for Michigan public education; 2) wages and benefits on public education construction would fall 25% after repeal of prevailing wage requirements, and 3) a drop of wages and benefits would have no effect on construction worker productivity. With these assumptions in hand, Mr. Rosaen's calculation is simple. If labor costs are 30% of total capital outlays and wages fall by 25% then total capital outlays will fall by 7.5%. (30% times 25% = 7.5%). If total capital outlays covered by prevailing wages is \$3 billion per year and prevailing wages cut total costs by 7.5%, then Michigan will save \$225 million per year. QED²

But Mr. Rosaen's assumptions are wrong and worse, his method is inappropriate for the task he has set himself. To begin with, currently, blue-collar labor costs in Michigan today are around 20% of total payments to contractors. Mr. Rosaen relies upon my work in the 1990's and Fraundorf's work in the 1970's to estimate labor costs as a percent of total payments to contractors but fails to realize that blue-collar labor as a percent of contractor employment has been falling for four decades. (Prevailing wage requirements do not apply to white collar labor). While Mr. Rosaen carefully updates his older data on educational outlays to 2013 dollars, he fails to update his estimate of labor costs at all.

Second, Mr. Rosaen mistakes "total capital outlays" for "payments to contractors." Total capital outlays consist not only of payment to contractors but also land purchases, the purchase of buildings including portable classrooms and capitalized interest payments. While contractor blue-collar labor costs are 20% of total payment to contractors, they are only 16% of total educational capital outlays in Michigan. Based on all of Mr. Rosaen's assumptions but inputting this 16% labor costs as a percent of total capital outlays, Mr. Rosaen's calculation misses the mark by over \$1 billion.

Third, the key assumption Mr. Rosaen got wrong he, in fact, *knew* was wrong. In a small section called "Limitations," Mr. Rosaen admits that he does not consider any effect on labor productivity or the mix of skilled to unskilled labor due to dropping wages and benefits by 25% after repealing Michigan's prevailing wage. States with prevailing wages have construction labor forces that, on average, have 10% higher output per worker and 16% higher value added per worker compared to states without prevailing wage regulations. Assuming labor productivity on Michigan's schools were to drop by 10% to 16% and plugging that hypothetical into Mr. Rosaen's back-of-the-envelope calculation would wipe out all of his estimated cost-savings and turn the estimated effect of repeal into an actual *increase* in Michigan public school construction costs. There is nothing in Mr. Rosaen's formulations that precludes things going very differently from his reported estimates.

For instance, following Mr. Rosaen's methodology, if labor costs are 16% of total capital outlays, and wages fall by 25%, then labor costs fall by 4%. But if output per worker falls by 10%, then that hypothetical 4% drop in total costs would correspond to 10% fewer schools built.

¹ Alex L. Rosaen, *The Impact of Michigan's Prevailing Wage Law on Education Construction Expenditures*, Anderson Economic Group, LLC, Commissioned by the Associated Builders and Contractors of Michigan, 2013.

<http://www.prevailingwagetruth.com/wp-content/uploads/2013/11/AEG-Report-MI-PW-Law-and-Education-Construction-2.pdf> (accessed November 18, 2013).

² QED is an acronym for the Latin, "quod erat demonstrandum," translated as "which had to be demonstrated" and is traditionally used to signal the successful completion of a mathematical proof. <http://en.wikipedia.org/wiki/Q.E.D.>

What these hypothetical examples illustrate is that back-of-the-envelope calculations are unreliable. A better way to examine this problem is to look directly at reality. In a natural experiment in the 1990's, in 1996 Kentucky enacted a prevailing wage law. In 1997, Ohio exempted public schools from prevailing wage requirements. From late 1995 to early 1997, Michigan's prevailing wage law was suspended due to a court decision that was subsequently overturned. Thus history provides us with a relevant natural experiment allowing for both before-and-after and here-and-there comparisons of school construction costs. This analysis, which I did in 2001 and Mr. Rosaen cited on page 9 of his report showed that there were not statistically measurable differences in square-foot school construction costs comparing times when prevailing wage requirements were in place and when they were lifted. This result should have given Mr. Rosaen pause before placing faith in his back-of-the-envelope calculation.

In 2013, Professor Alan Atalah, Dean for Graduate Affairs and graduate coordinator for the Construction Management Department at Bowling Green University published his study the impact of Ohio's prevailing wage exemption on Ohio's public school construction costs.

Professor Atalah summarized the results of his study as follows:

In 1997, the Ohio senate passed Senate Bill 102 which established the Ohio School Facilities Commission as a separate agency to oversee the rebuilding projects of the public schools in Ohio. To lower the construction cost, the bill exempted construction contractors from paying prevailing wages on these projects based on the hypothesis that this exemption would save the Ohio tax payer 10.7%. Many other studies concluded that these savings would range from 1.5 to 26%. The purpose of this research was to investigate this hypothesis through the statistical analysis of 8093 bids received for the schools' construction from the years 2000 through 2007. Union contractors-who paid their workers union wages-and non-union contractors-who did not pay prevailing wages bid these projects. By comparing the bids/SF [bid price per square foot] from both groups (union and nonunion), the hypothesis was tested. The research indicated that there was no significant difference between the bids/SF for union contractors and the bids/SF for non-union contractors.¹

As will be shown below, using Mr. Rosaen's back-of-the-envelope calculation yields wildly different results based on the assumptions that drive his calculation. Because results from his calculations can vary from billions saved to billions lost, they are just not reliable.

And Mr. Rosaen readily admits his calculations are also incomplete with regards to any analysis of labor responses to lower wages or consumer responses to changes in costs. He also does not consider construction quality associated with a lower-skilled labor force or the effects of a cut in wages on the skills and work ethic of the labor force. He does not consider downstream maintenance costs on capital facilities built by a substantially lower-paid, less-skilled labor force. He does not consider the spillover effects on private local construction labor standards impacted by a 25% wage cut on public works. He does not consider the effect of a less-skilled labor force on injury rates or worker compensation insurance costs. He does not consider the negative multiplier effects on local Michigan communities of a substantial loss of income for local construction workers. He does not consider the impact of out-of-state contractors exploiting a prevailing wage repeal to bring in low-wage workers from elsewhere who will, in turn, take their construction earnings elsewhere. He does not consider these factors because to do so would require more than a back-of-the-envelope calculation based on a simple and restricted set of doubtful hypothetical assumptions. It would require a careful examination of how the construction labor market actually works, and how prevailing wage regulations may serve as a protector of local labor standards, a stimulus to apprenticeship training, a preserver of experienced construction workers, a guard against unsafe work practices, a promoter of local hire, and a level playing field for local contractors. These issues are not covered in Mr. Rosaen's report.

About the Author

Peter Philips is a Professor of Economics at the University of Utah. He received his BA from Pomona College and his MA and Ph.D. from Stanford University. Philips is one of the country's leading experts on the construction labor market. He is the coauthor/editor of several books including *The Economics of Prevailing Wage Laws*, (2005) co-edited with Hamid Azari-Rad and Mark Prus, Ashgate Publishers, and *Building Chaos: An International Comparison of the Effects of Deregulation on the Construction*, (2003) co-edited with Gerhard Bosch) Routledge Press, London. Philips is also the author of over 60 scholarly articles; included among his recent peer-reviewed academic publications are:

- JaeWhan Kim, Kuo-Liang Chang and Peter Philips, "The Effect of Prevailing Wage Regulations on Contractor Bid Participation and Behavior: A Comparison of Palo Alto, California with Four Nearby Prevailing Wage Municipalities" *Industrial Relations*, Vol. 51, Issue 4, pp. 874-891, October, 2012
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- Sheng Li and Peter Philips, "Analysis of the Impacts of the Number of Bidders upon Bid Values: Implications for Contractor Prequalification and Project Timing & Bundling," *Journal of Public Works Management & Policy*, Vol. 12, No. 3, 503-514 (2008)
- *Construction Research at NIOSH: Reviews of Research Programs of the National Institute for Occupational Safety and Health*, The National Academies Press, Washington, DC, 2008 (16 co-authors). Published, 12/01/2008.

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Photo front cover: North Mackinac Bridge tower. Placing steel section, 2nd tier, west leg. Source: MDOT, Mackinac Bridge Authority, Mackinac Bridge, Michigan, Spanning the Straits for over 50 years, Historical Construction Album, <http://www.mackinacbridge.org/historical-construction-album-31/>

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Mr. Rosaen's Report Summarized

His Wage Differential Methodology

Mr. Rosaen's approach to evaluating Michigan's prevailing wage law is simple:

- He begins by assuming that blue-collar labor costs in construction are 30% of total costs.
 - Total costs, in turn, are total construction contractor costs charged to owners. They do not include land purchases, the purchase of buildings, capitalized interest rates, legal, engineering, architectural or other costs that are not payments to construction contractors.
- Mr. Rosaen then assumes that a repeal of prevailing wage requirements would lower wages and benefits on public construction by 25%.
- Based on these two assumptions, Mr. Rosaen multiplies a hypothetical drop in wages of 25% times a hypothetical blue-collar labor costs of 30% to yield a drop in total construction costs of 7.5%.

Mr. Rosaen then multiplies this hypothetical savings times the education capital outlay expenditures for Michigan over the period 2002 to 2011 to generate annual and total hypothetical savings in school construction expenditures. Mr. Rosaen translates all past dollars into 2013 dollars using the consumer price index. He notices that the average annual expenditures on education capital outlays in Michigan covered by the state prevailing wage are \$3 billion dollars. Multiplying \$3 billion times 10 yields a total expenditure of \$30 billion. Multiplying this times 7.5% generates a total savings of \$2.25 billion over ten years. Nothing could be simpler. Indeed, alter Mr. Rosaen's assumptions and even more money could be saved.

Hypothetical Savings: Games Assumptions Play

Mr. Rosaen's approach can be easily summarized in [Table 1](#):

Table 1: Mr. Rosaen's method with various assumed labor costs as a percent of total costs but only his one hypothetical wage drop

Assumed Cost Structure					Hypothetical Savings
Total Capital Outlays	Labor Costs as a Percent of Total Blue-Collar Costs	Blue Collar Labor Cost: Columns A times B	Hypothetical Decline in Wages and Benefits	Columns D times E	
A	B	C	D	E	
1	\$30,000,000,000	50%	\$15,000,000,000	25%	\$3,750,000,000
2	\$30,000,000,000	45%	\$13,500,000,000	25%	\$3,375,000,000
3	\$30,000,000,000	40%	\$12,000,000,000	25%	\$3,000,000,000
4	\$30,000,000,000	35%	\$10,500,000,000	25%	\$2,625,000,000
5	\$30,000,000,000	30%	\$9,000,000,000	25%	\$2,250,000,000
6	\$30,000,000,000	25%	\$7,500,000,000	25%	\$1,875,000,000
7	\$30,000,000,000	20%	\$6,000,000,000	25%	\$1,500,000,000
8	\$30,000,000,000	15%	\$4,500,000,000	25%	\$1,125,000,000

Mr. Rosaen's analysis is presented in row 5 of **Table 1**. \$30 billion in capital outlays with an assumed 30% blue-collar labor costs as a percent of total costs yields \$9 billion in labor costs and if those costs fell by a hypothetical 25%, then the taxpayers of Michigan would save \$2.25 billion on public school construction. But, taxpayers could save even more, if Mr. Rosaen had assumed that blue-collar labor cost were a higher percent of total costs. For instance, in row 1 of **Table 1**, all Mr. Rosaen would have to assume is that blue-collar labor costs were 50% of total capital outlays for public education construction and Michigan taxpayers would save \$3.75 billion by eliminating prevailing wages. Less optimistically, if Mr. Rosaen assumed that blue-collar labor costs were only 25% of total educational capital outlays in Michigan, then taxpayers would have to settle for less savings, \$1.875 billion (row 6 **Table 1**). And if, labor costs as a percent of total construction costs were but 15%, then Mr. Rosaen's hypothetical savings would be \$1.2 billion row 8 (**Table 1**).

Well as Everett Dirksen once said: "A billion here, a billion there, pretty soon, you're talking real money."³ However, in Mr. Rosaen's case, the money depends upon assumptions. To see this more clearly, **Table 2** reverses the game by adopting Mr. Rosaen's assumed 30% labor costs as a percent of total education outlays in Michigan; but **Table 2** adopts a variety of assumed declines in wages and benefits with the repeal of prevailing wages.

Table 2: Mr. Rosaen's method with various assumed wage drops but only his one assumed labor costs as a percent of total costs

Assumed Cost Structure					Hypothetical Savings
Total Capital Outlays	Labor Costs as a Percent of Total Blue-Collar Costs	Blue Collar Labor Cost: Columns A times B	Hypothetical Decline in Wages and Benefits	Columns D times E	
A	B	C	D	E	
1	\$30,000,000,000	30%	\$9,000,000,000	50%	\$4,500,000,000
2	\$30,000,000,000	30%	\$9,000,000,000	45%	\$4,050,000,000
3	\$30,000,000,000	30%	\$9,000,000,000	40%	\$3,600,000,000
4	\$30,000,000,000	30%	\$9,000,000,000	35%	\$3,150,000,000
5	\$30,000,000,000	30%	\$9,000,000,000	30%	\$2,700,000,000
6	\$30,000,000,000	30%	\$9,000,000,000	25%	\$2,250,000,000
7	\$30,000,000,000	30%	\$9,000,000,000	20%	\$1,800,000,000

In **Table 2**, Mr. Rosaen's assumptions of 30% labor costs and 25% wage drop is found in row 6. Here again, the taxpayers of Michigan save a hypothetical \$2.25 billion by eliminating prevailing wages. However, if Mr. Rosaen had only assumed that wages and benefits would fall by 50% instead of 25%, the taxpayers of Michigan could have doubled their savings from \$2.25 billion to \$4.5 billion. On the other hand, if Mr. Rosaen had assumed wages and benefits would fall after repeal by only 20%, Michigan taxpayers would have to settle for a \$1.8 billion in savings.

The foregoing demonstrates that Mr. Rosaen's conclusions are dependent upon what he assumes. However, his key assumption is neither 1) his assumed 30% labor costs as a percent of total outlays nor 2) his assumed 25% drop in wages and benefits. In fact, he states his key assumption at the beginning of his report under the heading "Limitations."

³ http://en.wikipedia.org/wiki/Everett_Dirksen

"We model a scenario of construction costs that are due to prevailing wage rates, and assume that those costs are passed on to the client, who in this case are state and local governments in Michigan. Our analysis does not consider changes in worker productivity, material costs, or labor share due to the absence of a prevailing wage."

Table 3 presents Mr. Rosaen's "scenario" in row 1. Here again are his two assumptions—that labor costs are 30% of total capital outlays in Michigan education—and that the drop in wages and benefits on public works is 25% after the elimination of Michigan's prevailing wage law. Also in row 1 is Mr. Rosaen's "limitation"—namely that there is no effect on labor productivity when workers experience a 25% drop in their wages and benefits. This assumption shows up in row 1 column E with a zero percent hypothetical loss in labor productivity. And this assumption reappears in row 1 column G with a \$0 loss in output due to lower productivity. The rest of the rows in Table 3 provide alternative assumptions regarding labor productivity losses due to wage and benefit losses.

Table 3: Mr. Rosaen's scenario (row 1) under varying assumptions regarding loss of productivity due to lower wages

Mr. Rosaen's Assumed Cost Structure				Adding Productivity Effect			Hypothetical Savings	
Total Capital Outlays under Prevailing Wage Regulations	Labor Costs as a Percent of Total Blue-Collar Costs	Blue Collar Labor Cost: Columns A times B	Hypothetical Decline in Wages and Benefits	Hypothetical Loss of Productivity Due to Lower Wages	Construction Work Done without Prevailing Wages	Loss of Output Due to Lower Wages	Hypothetical Savings without Considering Productivity Loss	Hypothetical Savings and Losses Due to Productivity Loss
A	B	C	D	E	F	G	H	I
\$30,000,000,000	30%	\$9,000,000,000	25%	0%	\$30,000,000,000	\$0	\$2,250,000,000	\$2,250,000,000
\$30,000,000,000	30%	\$9,000,000,000	25%	5%	\$28,500,000,000	\$1,500,000,000	\$2,250,000,000	\$750,000,000
\$30,000,000,000	30%	\$9,000,000,000	25%	10%	\$27,000,000,000	\$3,000,000,000	\$2,250,000,000	-\$750,000,000
\$30,000,000,000	30%	\$9,000,000,000	25%	15%	\$25,500,000,000	\$4,500,000,000	\$2,250,000,000	-\$2,250,000,000
\$30,000,000,000	30%	\$9,000,000,000	25%	20%	\$24,000,000,000	\$6,000,000,000	\$2,250,000,000	-\$3,750,000,000
\$30,000,000,000	30%	\$9,000,000,000	25%	25%	\$22,500,000,000	\$7,500,000,000	\$2,250,000,000	-\$5,250,000,000
\$30,000,000,000	30%	\$9,000,000,000	25%	30%	\$21,000,000,000	\$9,000,000,000	\$2,250,000,000	-\$6,750,000,000

Column E, rows 2 through 7 in Table 3 provide increasingly higher hypothetical assumptions regarding the loss in total output due to lower labor productivity after the decline in prevailing wages. Row 2 presumes a 5% loss in total productivity due to the various negative effects on labor productivity tied to 25% lower wages. In this case, there is a 5% drop in the value of construction from \$30 billion to \$28.5 billion (column F). This loss of \$1.5 billion in output has to be put to account by subtracting it from Mr. Rosaen's hypothetical savings of \$2.25 billion yielding a net savings to Michigan taxpayers of \$0.75 billion over 10 years. But in row 3, we assume that there is a 10% loss in total output associated with a 25% drop in wages (with labor costs being 30% of total costs). If this hypothetical were in fact true, then Michigan taxpayers would lose rather than gain from the repeal of prevailing wages with the lower wages being offset by lower productivity and Michigan taxpayers on the hook for \$0.75 billion in lost output. Should labor productivity decline more than 10%, then the hypothetical losses to Michigan taxpayers would be even greater.

Is it plausible that labor productivity would fall by 10% or more with the elimination of Michigan's prevailing wage?

Figure 1 below shows average construction labor productivity in prevailing wage law states compared to no-law states in 2007. Here labor productivity is measured as the value of output per blue-collar construction worker and the value added per blue-collar construction worker. Based on these measures, blue-collar construction labor productivity is from 9.6% to 16.1% higher in prevailing wage law states. Should Michigan repeal its prevailing wage law, it is hypothetically plausible that based on Mr. Rosaen's assumptions regarding 1) blue-collar labor costs as a percent of total costs being 30% and 2) wages and benefits dropping by 25% plus an altered hypothetical assumption that lower wages drop labor productivity by 10% to 15%, then prevailing wage repeal would actually cost the Michigan taxpayer between minus \$0.75 billion and minus \$2.25 billion in taxpayer money (rows 3 and 4, Table 3) as opposed to the savings of \$+2.25 billion touted in Mr. Rosaen's report.

So which is it? Do Michigan taxpayers gain \$2.25 billion with prevailing wage law repeal or lose \$2.25 billion? One way to try to answer this question is by playing the game: who has the best assumptions?

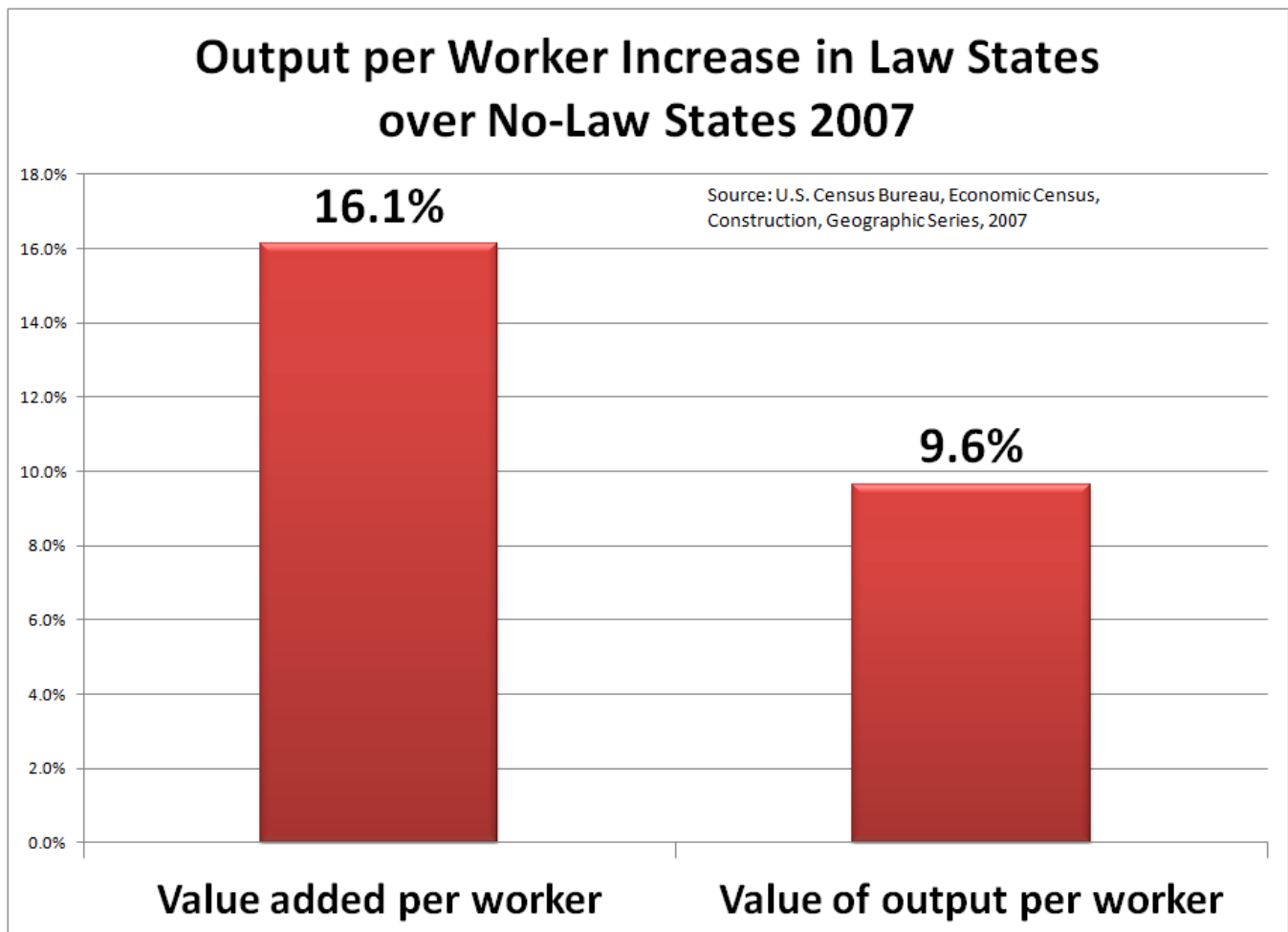


Figure 1: Increase in construction labor productivity in law states compared to no-law states

Playing the Game: Who Has the Best Assumptions?

Blue collar labor costs as a percent of total capital outlays

The game of battling assumptions references reality. Mr. Rosaen's assumption that blue collar labor costs are 30% of total educational capital outlays in Michigan is, in fact, based on my previous work on this subject. Mr. Rosaen states: "AEG found several studies with estimates of labor costs in terms of total construction costs."

He then refers to my 1998 paper:

"A study of school construction costs in the Great Plains states estimated labor costs to comprise roughly 20-30 percent of construction contracts, which was attributed to the Census of Construction. The total cost of construction contracts in this calculation excludes land acquisition, architectural design, or management fees."⁴

Mr. Rosaen then refers to a study in the 1970s:

"The first econometric study of federal construction costs related to Davis-Bacon estimated labor costs (including wages, benefits, and payroll taxes) to be no more than 30 percent of total construction costs. This study was based on construction data collected in 1977 and 1978."⁵

With my 1998 work and a piece from the 1970s, one of which said that blue-collar labor costs as a percent of total construction costs was "from 20% to 30%" in the 1990s and the other of which said that blue-collar labor costs as a percent of total costs was "no more than 30%" in the 1970s, Mr. Rosaen concluded:

Using professional judgment, we determined approximately 30 percent of total costs to be attributable to labor. We based our assumptions on the following empirical studies:

As we have seen in [Table 1](#), picking the high of the range from "20% to 30%" and "no more than 30%" has the result of increasing Mr. Rosaen's calculation of hypothetical savings. Is that a fair pick?

⁴ Philips, Peter. 1998. Kansas and Prevailing Wage Legislation. Report prepared for the Kansas Senate Labor Relations Committee

⁵ Rosaen, p. A-2. While Mr. Rosaen does not cite the source he refers to here, it appears he is referencing Fraundorf, Martha, and Mason Farell. 1984. "The Effect of Davis-Bacon Act on Construction in Rural Areas." *Review of Economics and Statistics*. Vol. 142, No. 6

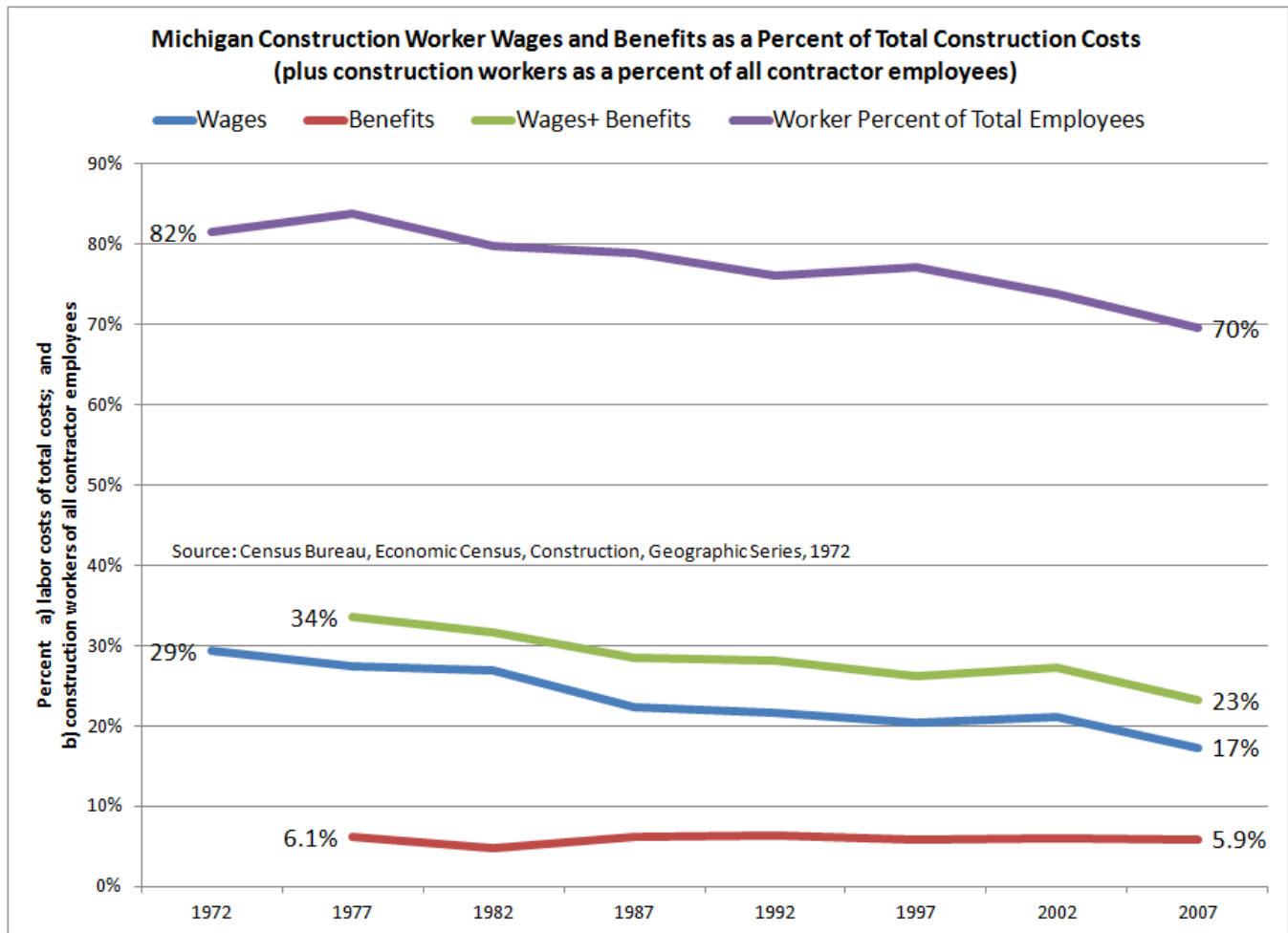


Figure 2: Michigan blue-collar labor costs as a percent of total construction costs (excluding land purchases, architectural, engineering, project management and other non-contractor services)

In short: No—Mr. Rosaen’s 30% labor cost assumption is misguided. Had he been more familiar with construction, his professional judgment would have alerted him to the fact that blue-collar workers have been an ever-declining percentage of total construction contractor employment for four decades. Figure 2 shows that in Michigan in 1972, 82% of construction contractor employees were blue-collar construction workers. By 2007, that percentage had fallen to 70%. Today, in 2013, it is likely to be around 65%. (We will know the actual percentage when the 2012 Economic Census for Construction Geographic Series is released). Along with a decline in blue-collar labor as a percent of construction contractor employees, in Michigan, blue-collar labor costs (both wages and benefits) as a percent of total construction costs has fallen from 34% in 1977 to 23% in 2007. Today, blue-collar labor costs as a percent of total construction costs may well be approximately 20% rather than the 30% hypothetical assumed by Mr. Rosaen. Assuming this hypothetical is true, then Mr. Rosaen’s calculation of taxpayer savings as shown in Table 1 would be off by \$750 million.

The difference between payments to contractors and total capital outlays

Alas, it appears that Mr. Rosaen’s professional judgment is off along a second dimension. In relying on my work and the work of Fraundorf, Mr. Rosaen carefully noted that our work excluded from construction cost the purchase of land, already constructed buildings, capitalized debt and other costs that may be considered capital outlays but not payments to contractors. In the US Department of Commerce, Survey of Local Government Finances, School Building Agencies, the

Commerce Department asks these agencies to separately report 1) payments to contractors, 2) purchases of land and buildings, and 3) capitalized interest payments.⁶ Unfortunately, while the Commerce Department breaks out construction expenses from other capital outlays for all government expenses, this table upon which Mr. Rosaen relies does not provide a similar breakdown for educational outlays.⁷ So Mr. Rosaen simply assumed that there were no land purchases, nor building purchases nor capitalized interest payments for Michigan education at any time from 2002 to 2011. Does this omission mean anything?

The Commerce Department *does* break out construction expenditures from all capital outlays (that is—educational combined with all other state and local capital outlays). For Michigan in 2010, payments to contractors accounted for 78% of all state and local capital outlays while land and building purchases and capitalized interest payments accounted for 22%.⁸

If this mixture of capital outlays held for educational expenditures in 2010, then labor costs as a percent of total educational capital outlays (not just payments to contractors) would not be 30% as Mr. Rosaen assumed nor 20% as data for Michigan from the Economic Census for Construction suggests but actually either 25% or 16% respectively. **Table 4** shows this.

Table 4: Hypothetical labor costs as a percent of total costs adjusting for the fact that Mr. Rosaen's total costs are all capital outlays in Michigan education and not just payments to contractors

	Total Capital Outlays	Payments to Contractors	Blue Collar Wages and Benefits	Blue Collar Labor Costs as a Percent of Payments to Contractors	Blue Collar Labor Costs as a Percent of Total Capital Outlays
	A	B	C	D	E
1	\$122	\$100	\$30	30%	25%
2	\$122	\$100	\$20	20%	16%

In row 1 of **Table 4**, we assume that payment to contractors is \$100 (column B). Based on the assumption that total capital outlays are 22% higher than payments to contractors, then total capital outlays are \$122 (column A). If wages and benefits are 30% of payments to contractors, they are \$30. Thus, row 1 reflects Mr. Rosaen’s assumption regarding labor costs as a percent of payments to contractors. But \$30 is not 30% of total capital outlays. Rather it is 25%. Based on this arithmetical error alone, and adopting all of Mr. Rosaen’s other assumptions, **Table 1** row 6 shows that Mr. Rosaen’s estimate of taxpayer savings from a repeal of prevailing wages is off by \$375 million.

But if one simply assumes a 20% labor cost as a percent of payments to contractors, then **Table 4** shows that blue-collar labor costs as a percent of total educational capital outlays is 16%. **Table 1** row 8 shows that under these two assumptions, that labor costs are 20% of payments to contractors and that payment to contractors is 78% of total educational capital outlays in Michigan, then Mr. Rosaen misses the mark by over \$1 billion.

⁶ U.S. DEPARTMENT OF COMMERCE, Economics and Statistics Administration, U.S. CENSUS BUREAU FORM, F-42 (05-23-2013) OMB No

⁷ U.S. Census Bureau, Annual Surveys of State and Local Government Finances , Table 1. State and Local Government Finances by Level of Government and by State, <http://www.census.gov/govs/local/>

⁸ U.S. Census Bureau, Annual Surveys of State and Local Government Finances , Table 1. State and Local Government Finances by Level of Government and by State, 2009-10 <http://www.census.gov/govs/local/> (Michigan: State & local government amount, Direct expenditures, Capital outlay \$6,314,028; , Construction \$4,922,524 and Other capital outlay \$1,391,504

And if one imagines that cutting wages and benefits by 25% has any negative effect on labor productivity, then Mr. Rosean's savings could be off by an additional one or two billion dollars. As Senator Dirksen might say, "A billion dollar assumption here and a billion dollar assumption there, and pretty soon you're talking real mistakes."

A Reliable Alternative

What the foregoing shows is that back-of-the-envelope calculations regarding the effects of prevailing wages or their repeal are unreliable. "Estimates" of cost savings or indeed cost increases associated with prevailing wage enactment or repeal will swing like a wild pendulum. The pendulum will show cost savings or cost increases depending on the assumptions used to set up the calculation. The proper approach is to look at *reality* rather than make assumptions about it. And in the case of Michigan, reality suggests that 1) Mr. Rosaen overestimates labor costs as a percent of total capital outlays in Michigan education; and 2) he underestimates the costs incurred by reducing labor productivity through dropping wages and benefits on construction projects. We know this because a natural experiment has shown it.

A Natural Experiment: School Construction Costs in Kentucky, Ohio and Michigan

In the 1990s, a natural experiment occurred that can help us answer the question: how do prevailing wage regulations affect public construction costs? In 1996, Kentucky went from not having a prevailing wage law on public schools to implementing prevailing wages on all public school construction. In 1997, Ohio went from having prevailing wage regulations apply to public schools to removing the law. Due to a court decision, Michigan suspended its prevailing wage regulations on schools in late 1994 only to re-implement the regulation in the middle of 1997. So we have a natural experiment that employs both a before-and-after comparison in three adjoining states, and a here-and-there comparison of new school construction costs across these state. Furthermore, the type of construction, schools, is a relatively homogeneous set of construction projects and the time period is close together. So this natural experiment provides a close apples-to-apples comparison of public school construction with and without prevailing wage regulations. **Figure 3** shows the timing in the 1990s when each state had and did not have prevailing wage regulations in force.

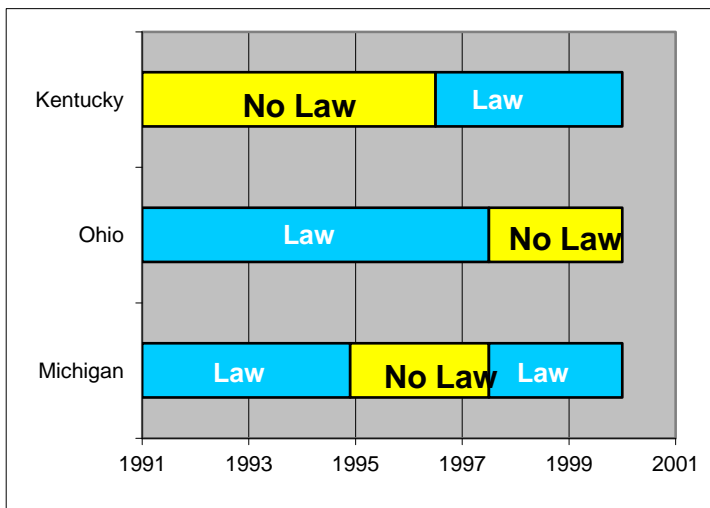


Figure 3: Prevailing wage policy by state, Kentucky, Ohio, Michigan, 1991-2000

Using FW Dodge data covering 391 new schools constructed in Kentucky, Ohio and Michigan over the period 1992 to 2000, analysis done by this author in 2001 showed that there was no measurable, statistically significant difference in the total cost of construction associated with the removal or prevailing wage regulations.ⁱⁱ

Table 5: Description of the new schools used in the study

Characteristic of Schools in Study	
Number of New Schools in Study	391
Average Square Foot Size of the School	86,415
Average Total Cost of the Project (Year 2000 dollars)	\$8,483,937
Percent of All Schools	
Michigan	38%
Ohio	36%
Kentucky	26%
Percent of School with a Gym-Pool Facility	7%
Percent of Urban Schools	32%
Percent of Schools Built Under Prevailing Wages	49%

Table 5 shows that of the 391 new schools with an average size of 86,415 feet, almost half (49%) were built under prevailing wages and half (51%) were not. Michigan, which had prevailing wages, dropped them and then took them up again, accounted for 38% of the schools in the sample. Ohio accounted for 36% and Kentucky accounted for 26% of the schools. Thirty-two percent of the schools were in urban areas while the rest were rural. All the monetary figures in the study were normalized in the year 2000 dollars and the average project cost was almost \$8.5 million. Before looking at all three states, we will start by looking at the adjacent states of Kentucky and Ohio.

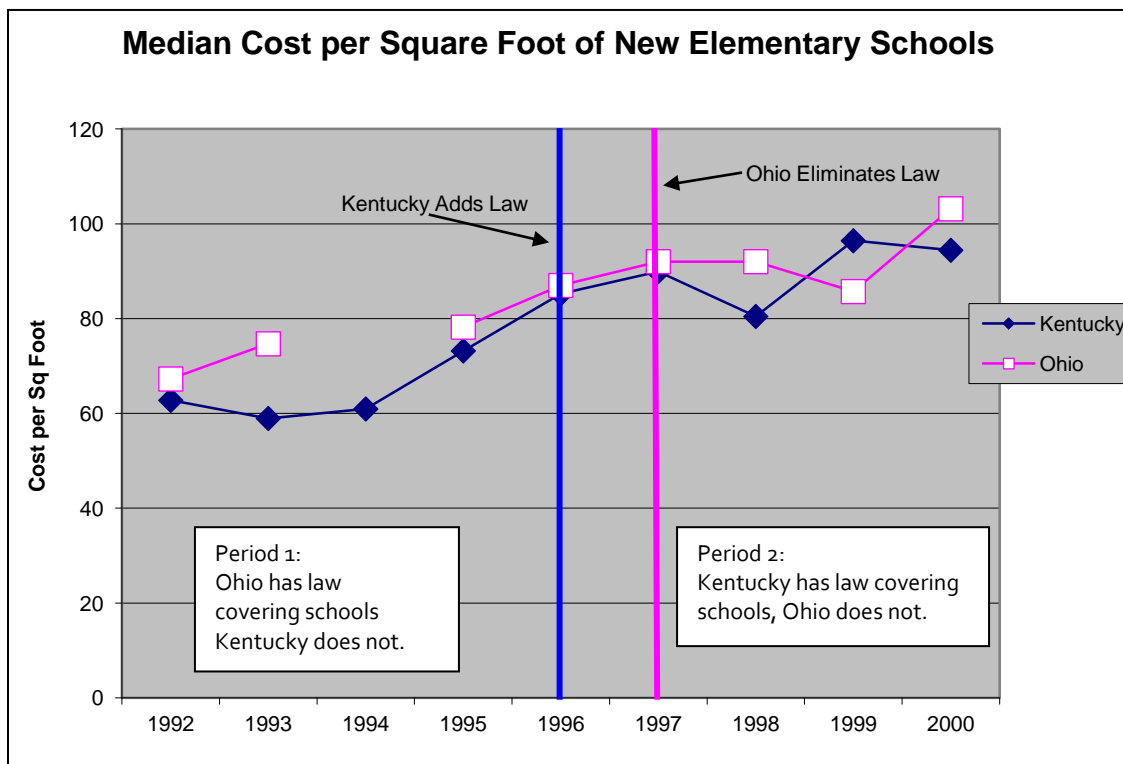


Figure 4: Median square foot cost of new elementary schools before and after law changes in Kentucky and Ohio, 1992-2000

A simple comparison in **Figure 4** of the median square foot cost of new school construction based on “start costs” (or accepted bid price) in Kentucky and Ohio over the 1992 to 2000 time period shows no discernible cost effect either of Kentucky implementing prevailing wages in 1996 nor Ohio removing prevailing wages for schools in 1997.ⁱⁱⁱ **Table 6** shows the mean square foot cost of rural schools in periods in which there was no law (\$96) compared to when there was a law (\$98). **Table 6** also shows for urban schools the mean square foot cost when there was no law (\$114) and when there was a law (\$114). **In both cases there is no statistically significant difference in these average square foot costs.**

Table 6: Real, inflation adjusted square-foot cost of new public school construction in Kentucky, Ohio and Michigan 1992-2000

New Public Schools							
Real (Inflation Adjusted) Square Foot Cost							
a	b	c	d	e	f	g	
1	Rural Schools			Urban Schools			
2	Mean	Standard Deviation	Number	Mean	Standard Deviation	Number	
3	No Law	\$96	\$26	161	\$114	\$36	40
4	Law	\$98	\$24	104	\$114	\$34	86
5	t-test	-0.76			0.05		
6	Statistically Significant Difference?	No			No		

This 2001 *Kentucky-Ohio-Michigan Study* goes on to apply a more sophisticated econometric model to these 391 new schools finding that there were statistically significant effects on total costs if ground were broken on a project at the onset of winter, and that rural schools were statistically less expensive compared to urban schools, and that Kentucky schools were less expensive compared to Ohio and Michigan, and if a school had a pool it was more expensive than if it did not. However, **there were no measurably or statistically significant effects of prevailing wages on total start costs.**

In subsequent peer-reviewed⁹ research on more than 4000 new schools built nationwide published in the *Journal of Education Finance*,^{iv} the results of the *Kentucky-Ohio-Michigan Study* were confirmed. **There was no measurably or statistically significant effect on start costs associated with the presence of prevailing wage regulations.** Additionally, it was found that substantial savings on school construction could be found if schools were built counter-cyclically. By avoiding building into what *Engineering News Record* calls “cost storms” when construction is booming, there is a measurably large and statistically significant savings that can accrue to the public. Such counter-cyclical spending can also benefit the construction industry and the local community by dampening the chronic boom-bust cycle of construction. Those who wish to save on public construction monies would be well advised to avoid breaking ground as winter hits and to seek breaking ground when the economy slumps. Repealing prevailing wages will result in lower wages, benefits, training and productivity, but does not promise substantial savings on total construction costs. Confirming this conclusion, we turn to a 2013 study of the effects in the decade of the 2000’s of Ohio exempting schools from their prevailing wage requirements in 1997.

⁹ Peer-review refers to the academic process whereby research proposed for publication is sent to a set of independent experts in the field for review. The research is only published after it passes the evaluation of these reviewers and the journal editor.

Ohio Exempts Schools from Prevailing Wage Requirements

A 2013 study of Ohio's exemption of schools from prevailing wage requirements finds no evidence that this exemption saved taxpayers money. In this study, we find that in Ohio, subsequent to the school exemption from prevailing wage requirements, union contractors continued to win public school jobs while still paying union wages. Indeed, we find that on average, union bids on public schools in Ohio in the decade of the 2000's were slightly lower than nonunion bids, although the difference was close enough to make the results not statistically significant. This is consistent with the findings in the previous section that Ohio school construction costs did not decline after the state exempted school construction from prevailing wages. The lesson from Ohio is that higher wage rates do not necessarily mean higher construction costs. And claiming that wage rates will fall after repealing prevailing wage laws does not really mean that public construction costs will decline.

In 1997, Ohio exempted public school construction from prevailing wage requirements. In 2013, Professor Alan Atalah, Dean for Graduate Affairs and graduate coordinator for the Construction Management Department at Bowling Green University published his study the impact of Ohio's prevailing wage exemption on Ohio's public school construction costs in Ohio. Dr. Atalah has a doctorate in Engineering with a specialization in Civil and Construction Engineering and teaches courses in Estimating and Bidding Strategies. This background led him to frame his study around the bids of union contractors paying what would have been Ohio's prevailing wage had the 1997 exemption not occurred compared to the bids or nonunion contractors on public schools who were free from prevailing wage requirements after the exemption took effect. Professor Atalah summarized the results of his study as follows:

In 1997, the Ohio senate passed Senate Bill 102 which established the Ohio School Facilities Commission as a separate agency to oversee the rebuilding projects of the public schools in Ohio. To lower the construction cost, the bill exempted construction contractors from paying prevailing wages on these projects based on the hypothesis that this exemption would save the Ohio tax payer 10.7%. Many other studies concluded that these savings would range from 1.5 to 26%. The purpose of this research was to investigate this hypothesis through the statistical analysis of 8093 bids received for the schools' construction from the years 2000 through 2007. Union contractors—who paid their workers union wages—and non-union contractors—who did not pay prevailing wages bid these projects. By comparing the bids/SF [bid price per square foot] from both groups (union and nonunion), the hypothesis was tested. The research indicated that there was no significant difference between the bids/SF for union contractors and the bids/SF for non-union contractors.^v

Atalah divided his sample of 8093 bids into two sets—1) all bids except the lowest bid and 2) the lowest bids only. The hypothesis is as follows: if prevailing wage regulations increase bid costs, then eliminating prevailing wages will free nonunion contractors to pay lower wages while union contractors constrained by their collective bargaining agreements will continue to pay wages at or higher than what prevailing wage regulations would have required them to pay. So the question is—did nonunion contractor bids come in lower than union contractor bids on Ohio public schools after prevailing wage requirements were eliminated? **Table 7** shows that on average, both for the lowest bids on projects and for the bids which were not the lowest, nonunion contractors bid higher. However, from a statistical standpoint, the difference between union and nonunion contractor bids on Ohio public schools was insignificant. Thus, Dr. Atalah rejected the hypothesis that the elimination of prevailing wage requirements on Ohio public schools led to lower bids.

Table 7: Differences in the average bid price per square foot for Ohio public schools by union and nonunion contractor, 2000 to 2007^{vi}

	Union / Non-Union Contractor	Number of Bids on Public School Projects	Average Bid Cost per Square Foot	Standard Deviation	Probability You Would Be Wrong if You Thought the Averages Were Different	Accept / Reject Hypothesis that Average Squarefoot Bid Costs Are Different
All Bids Except Lowest	Union	2,307	19.22	25.31	0.1936	Reject
	Non-union	4,286	20.49	43.03		
Lowest Bids	Union	547	16.99	23.54	0.4199	Reject
	Non-union	949	18.49	39.57		

Conclusion

Mr. Rosaen's report is very much like a magician's top hat. Roll your sleeves up with one set of assumptions and you can pull out a bull. Roll your sleeves up with another set of assumptions and you can tug out a bear. Want to save big bucks in educational capital expenditures? No problem. Just assume that labor costs are 30% of payments to contractors and those payments to contractors are the same thing as total capital expenditures. Assume that wages and benefits fall by 25% with no effect on labor productivity, workmanship or downstream maintenance costs. Voila! You have just saved the Michigan taxpayer \$2.25 billion over 10 years.

Fearful that dropping wages and benefits by 25% might lead to a less-skilled labor force, lower productivity, shoddy work and increased downstream maintenance requirements? We've got you covered. Just assume that wages fall by 25% and labor costs are 20% of payments to contractors. But also notice that capital expenditures are 22% more than payments to contractors so labor costs as a percent of total capital expenditures are actually 16%. Total capital expenditures will fall by 4% when wages fall by 25% but we will simply assume that output per laborer falls by 10%. Alas this means that a 4% decline in total costs leads to 10% fewer schools being built. Almost anything is possible with Mr. Rosaen's light and flexible back-of-the-envelope methodology.

Mr. Rosaen's report is not so much an examination of the real operations of the construction labor market as it is an exercise in magical thinking. Happily it has been a very long time indeed since this type of analysis has been accepted in reputable, peer-reviewed academic journals. Sadly, Mr. Rosaen hopes that it will be considered seriously where it matters—in policy decisions that affect real people's lives and the efficient operation of one of our most important industries.

What is the alternative? Look at reality instead of assuming it. Not only has my work on the natural experiment that took place in the 1990s in Michigan, Ohio and Kentucky shown that there are no measureable, statistically meaningful savings from suspending or repealing prevailing wage requirements, but also Professor Atalah's 2013 study of the Ohio suspension of prevailing wage laws for school construction shows that there have been no measurable, statistically significant savings from that policy change.

Mr. Rosaen might argue that if there is no cost savings from repeal but also no clear cost penalties from eliminating prevailing wage laws, why not just repeal these regulations on an "it couldn't hurt" basis. This issue is beyond the scope of

this short critique, but there is an extensive literature on the costs of repealing prevailing wage regulations. These include reduced apprenticeship training, less retention of trained and experienced workers, higher injury rates and worker compensation costs, loss of quality workmanship, loss of benefits, loss of local income, loss of a level playing field for local contractors, loss of honest contractors paying their fair share of unemployment insurance and worker comp premiums, increase in under-the-table wage payments and other costs associated with driving wages down sharply and opening public construction to cutthroat bidding practices. A good place to begin exploring these and related issues is Azari-Rad H., Philips P., and Prus M. J. eds. (2005). *The Economics of Prevailing Wage Laws*. Aldershot, UK: Ashgate.

Endnotes

ⁱ Atalah, Alan, "Comparison of Union and Non-Union Bids on Ohio School Facilities Commission Construction Projects," *International Journal of Economics and Management Engineering*, Mar. 2013, Vol. 3 Iss. 1, pp. 29-35.

ⁱⁱ Peter Philips, "A Comparison of Public School Construction Costs In Three Midwestern States that Have Changed Their Prevailing Wage Laws in the 1990s," University of Utah, 2001. (Hereinafter the *Kentucky-Ohio-Michigan Study*).

ⁱⁱⁱ "Start costs" refer to the accepted bid price and do not include change orders, cost overruns, downstream maintenance costs, scheduling problems or other auxiliary aspects of construction costs.

^{iv} Hamid Azari-Rad, Peter Philips, and Mark Prus, "Making Hay When It Rains: The Effect Prevailing Wage Regulations, Scale Economies, Seasonal, Cyclical And Local Business Patterns Have On School Construction Costs," *Journal of Education Finance*, 27 (SPRING 2002). 997-1012. Similar results were found by the same authors in "Sate Prevailing Wage Laws and School Construction Costs," *Industrial Relations*, Vol. 42, No. 3 (July 2003). JaeWhan Kim, Kuo-Liang Chang and Peter Philips, "The Effect of Prevailing Wage Regulations on Contractor Bid Participation and Behavior: A Comparison of Palo Alto, California with Four Nearby Prevailing Wage Municipalities" *Industrial Relations*, Vol. 51, Issue 4, pp. 874-891, October, 2012; Kevin Duncan, Peter Philips and Mark Prus, "Using Stochastic Frontier Regression to Estimate the Construction Cost Inefficiency of Prevailing Wage Laws," *Engineering, Construction and Architectural Management*, Vol. 19 Iss: 3, pp.320 - 334. Published, 05/02/2012 ; Using Canadian data for British Columbia Cihan Bilginsoy and Peter Philips again found no measurably or statistically significant effect of the implementation of British Columbia's Fair Wage law: "Prevailing Wage Regulations and School Construction Costs: Evidence From British Columbia," *Journal of Education Finance* v25 no3 pp. 415-31 Winter 2000; Kevin Duncan, Peter Philips and Mark Prus, "The Effects of Prevailing Wage Regulations on Construction Efficiency in British Columbia," *International Journal of Construction Education and Research*, 1550-3984, Volume 5, Issue 2, April 2009

^v Atalah, Alan, "Comparison of Union and Non-Union Bids on Ohio School Facilities Commission Construction Projects," *International Journal of Economics and Management Engineering*, Mar. 2013, Vol. 3 Iss. 1, pp. 29-35.

^{vi} Atalah, Alan, "Comparison of Union and Non-Union Bids on Ohio School Facilities Commission Construction Projects," *International Journal of Economics and Management Engineering*, Mar. 2013, Vol. 3 Iss. 1, Tables III and IV, p. 33.