An Analysis of Davis-Bacon Prevailing Wage Requirements:

Evidence from Highway Resurfacing Projects in Colorado.

Submitted to:

Gus Bieber,
Engineering Estimates and Market Analysis Unit of
Contracts and Market Analysis Branch, Colorado Department of Transportation

John Soper,
Colorado State Representative, District 34

June 2011

By
Kevin C. Duncan, Ph.D.
Professor and Senior Economist,
Healy Center for Business and Economic Research,
Hasan School of Business
Colorado State University-Pueblo

About the Author: Kevin Duncan, Ph.D.

Kevin Duncan is Professor and Senior Economist, Healy Center for Business and Economic Research, Hasan School of Business, Colorado State University-Pueblo where he specializes in labor and regional economics. He received his Ph.D. from the University of Utah in 1987 and his B.A. from the University of California, Riverside in 1981. Duncan is the author of over 50 academic papers and applied regional projects and is the winner of several honors and awards including the Provost

Table of Contents

Executive Summary	Page 4
Introduction to the Study	Page 6
The Basics of Statistical Analysis	Page 7
Outline of the Report	Page 8
Review of Research on Prevailing Wage Laws and Construction Costs	Page 8
CDOT Highway Resurfacing Project Data and Statistical Methods	Page 14
Results of Statistical Analysis	Page 19
Do Prevailing Wage Laws Limit Bid Competition and Favor Union Signatory Contractors?	Page 29
Conclusion	Page 36
References	Page 38

Executive Summary

This summary provides a brief review of the main findings of the study. A complete technical report is attached that provides detailed explanations of the data and methods used, a review of the research on prevailing wage laws and a complete explanation of the results.

The Davis-Bacon Act of 1931 requires the payment of locally prevailing wages and benefits to construction workers employed on projects funded by the federal government. This study examines the effect of prevailing wage requirements on the relative cost of state and federally funded highway resurfacing projects in Colorado. The regulatory standards of highway projects funded by the State of Colorado are the same as federal standards with the exception of the payment of prevailing wages. Colorado

higher on projects that pay prevailing wage rates. Therefore, when construction worker wages rise on prevailing wage projects, productivity also increases in a way that stabilizes the total cost of the project. Additionally, data from the Economic Census of Construction indicates that construction labor costs are a low percentage (averaging between 25 to 30 percent) of total construction costs. Given that labor costs are a low percentage of total costs in the construction industry, productivity does not need to increase substantially to offset the effect of prevailing wage rates. The results of the study are also consistent with observations of CDOT employees who are experienced with the estimation of project costs. During interviews conducted by the author, two experienced employees independently confirmed that material costs and contractor productivity rates are major determinants of project costs. However, prevailing wage requirements do not

Introduction to the Study

The Davis-Bacon Act of 1931 requires that construction workers, employed on federal projects, receive wages and benefits that prevail for similar work in the locality of the project. This report uses data from highway resurfacing projects in Colorado to examine implications associated with the payment of Davis-Bacon prevailing wages on projects funded by the federal government. Projects funded by the State of Colorado do not require the payment of prevailing wages and benefits. Other than the prevailing wage requirement, regulatory standards are the same for state and federal highway projects in Colorado. Therefore, the comparison between state and federal projects allows for an examination of the effect of prevailing wage requirements on the level of project winning bids, a measure of the cost of a project. The data also allows for an examination of the effects of prevailing wage requirements on the level of bid competition and the likelihood that a union signatory contractor will win a bid.

The use of highway resurfacing projects was recommended by a CDOT official to provide for an

taken into consideration, the residual difference between state and federal projects may be attributed to the effect of prevailing wage requirements.

Most of the analysis for this report is based on a sample of 122 highway resurfacing projects (68 are federal projects and 54 projects are funded by the State of Colorado). Data was collected from 2000 to the third quarter of 2010 and extends over two business cycles. A CDOT official knowledgeable of the department

measure the cost of prevailing wage requirements, we need to also take into account other factors that contribute to construction costs. This study uses the statistical technique of regression analysis to do what common sense suggests. This method allows for the measurement of cost differences between state and federal projects, taking into account many of the complexities and other characteristics that contribute to differences in building costs. With regression analysis we are interested in measuring the differences between the two types of projects. But, this type of statistical analysis also allows us to determine if a measured result is likely to have occurred due to chance. Throughout the report, measured differences will be referred to as

The research that examines the cost implications of prevailing wage laws has evolved over time as new data and statistical methods have been applied to this issue. This section traces out the development of this research. The preponderance of the most recent studies, using the best methods and data, indicate that prevailing wage laws are not associated with higher construction costs.

First Generation, or Labor Cost Studies of the Cost Implications of Prevailing Wage Laws.

Early studies of the cost effects of prevailing wage laws focused on wage comparisons between projects that were covered by the national prevailing wage law (the Davis-Bacon Act) and projects that were not covered by the wage policy (see Gujarati 1967; GAO 1979, 1981; Goldfarb and Morrall 1978, 1981; Gould 1971; Gould and Bittingmayer 1980; and for a more resent example, Keller and Hartman 2001).[3] Bilginsoy and Philips (2000) indicate that the bulk of these studies suggest that the Davis-Bacon wage requirements increase construction costs from 1.5 to 3 percent. However, the study by Bourden and Levitt (1980), which employs that same labor cost method, fails to find any cost effect of this law.

These studies are based on an intuitive approach where the difference between prevailing wage rates and open shop rates are used to calculate the increase in project labor costs on a prevailing wage project, keeping the number of construction workers employed on the project the same. Labor costs are then adjusted to reflect the ratio of labor costs to total construction costs to arrive at the final estimate of the percentage increase attributed to the prevailing wage

[3] The following early studies are exceptions to this method. Allen (1983) adjusts his cost estimate for factor substitution, he still finds a modest Davis-Bacon cost impact of 0.3 to 0.4 percent. Thieblot (1975) pursues a unique approach by taking advantage of President Nixon

policy. This is an intuitive approach and is consistent with the notion that if wage rates increase, so will the total construction costs.

While this methodology provides a measure of the impact of a prevailing wage law on labor costs (given fixed labor usage), it does not provide an accurate measure of the total cost of such a policy because it ignores any changes in labor hours that might result from increased productivity due to managerial efficiency, the substitution of equipment for labor, or employing labor with more training. Standard economic theory suggests that as wages rise, the utilization of labor will change as other inputs are substituted for more expensive workers. So, it is not appropriate to assume that labor utilization will remain the same when wage rates rise. If labor utilization or productivity is different, or changes on prevailing wage projects, the labor cost method described above will provide a cost estimate that is too high. Because prevailing wage laws may alter the utilization of labor and the total wage bill, it is important to examine the effect of prevailing wage laws on total construction costs since total costs include any adjustments management has made when wage rates change. An examination of total costs separates second generation studies from earlier analysis.

Second Generation or Statistical Estimates of the Cost Implications of Prevailing Wage Laws.

Second generation studies use more advanced statistical methods (regression analysis) to estimate the effect of prevailing wage laws on the total costs of construction. The preponderance of these studies fails to find a statistically significant prevailing wage cost effect (see for examples Prus 1996, Philips 2003, Azari-Rad, Philips and Prus 2002, 2003, Bilginsoy and Philips 2000, Duncan and Prus 2005, and Duncan, Philips, and Prus forthcoming). The exceptions to the majority of this research are the studies by Sarah Dunn, John Quigley and

Larry Rosenthal (2005) and Martha Fraundorf, John Farrell and Robert Mason (1983). Both of these studies suffer from serious methodological and data errors that limit the ability to draw meaningful conclusions about the effect of prevailing wage laws on construction costs.

The study by Dunn, Quigley, and Rosenthal (2005) is based an examination of residential projects subsidized by the California Low Income Housing Tax Credit and covered by the state prevailing wage law. These authors find that prevailing wage requirements increased costs from 9 to 37 percent. However, there are several problems with this study. First, data from the Economic Census of Construction indicates that construction labor costs range from 25 to 30 percent of total construction costs. Consequently, it is unlikely that the total cost of construction would fall by up to 37 percent from a regulatory change that primarily affects a cost component that accounts for only 25 to 30 percent of total costs.[4] Additionally, the Office of the Legislative Auditor, State of Minnesota (2007) has criticized this report on the basis that the cost of the publicly funded projects included in this study may have been influenced by prevailing wage laws and by other factors such as more exacting HUD construction standards that may also affect construction costs. However, these additional factors are not considered separately from prevailing wage effects. Finally, the study is based on a sample of 205 residential projects, yet the authors can only identify if the prevailing wage law applies, or does not apply to 175 of the projects. Yet, 30 unidentified projects are included in the sample. An appropriate statistical test would be based on the sample of 175 projects because the inclusion of the unidentified projects may bias the cost estimate.

[4] The authors provide

The study by Fraundorf et al. is based on the cost comparison between federally funded and privately funded construction projects (federally funded projects are covered by the Davis-Bacon Act, private projects are not). Results of this study indicate that federally funded projects cost from 26 to 35 percent more than privately funded projects. The authors ascribe this cost difference to the effect of prevailing wage requirements. There are several problems with this study and its conclusions. Like the cost estimates provided by Dunn, Quigley, and Rosenthal, this cost estimate is unrealistically too high given the data from the Economic Census of Construction indicating that labor costs range from 25 to 30 percent of total construction costs. This suggests that the Fraundorf estimate of the cost differential between federally and privately funded construction is too high to be entirely attributed to the wage changes required by the Davis-Bacon Act. A better explanation of the higher costs of federal projects is that many factors such as the prevailing wage law, federal regulations, and construction practices on federal projects influence the total construction cost of projects funded by the U.S. government. For example, the fittings and components in public buildings may be more expensive. Project life expectance may be higher on government projects. Or, quality and workmanship specifications may be higher. In general, the fact that public owners are under different economic and political pressures compared to private owners may lead to higher costs associated with public buildings, independent of prevailing wage regulations. Unfortunately, the data used by Fraundorf et al. do not allow for the kind of distinctions necessary to separate other influences from the effect of the prevailing wage law.

Numerous studies build on the work by Fraundorf by examining differences in the relative cost of publicly and privately funded projects between jurisdictions with and without prevailing wage laws (see for examples Prus 1996, Philips 2003, Azari-Rad, Philips and Prus

2002, 2003). Others compare total constructions costs for public projects, or the cost differential between public and private projects, before and after the introduction of prevailing wage laws (see for example, Bilginsoy and Philips 2000, Duncan and Prus 2005, and Duncan, Philips, and Prus forthcoming). All of these studies cited above employ different data sets and statistical tests to estimate the cost of these policies in Canada and the U.S. Despite these differences, these studies all share the common finding that prevailing wage laws are not associated with higher construction costs. An explanation of how wages can rise, yet costs remain stable on prevailing wage projects is the subject of current, or third generation research.

Third Generation Studies

As mentioned above, one possible reaction to prevailing wage policies is that there are concomitant changes in the crew mix, the substitution of equipment for labor, or other changes that alter the productivity and efficiency of construction. This is the focus of the current, third generation prevailing wage studies that apply a method of estimating production efficiency (stochastic frontier regression) to the topic of prevailing wage laws. For example, in an examination of the effect of prevailing wage laws on construction efficiency in British Columbia, Canada, Duncan, Philips, and Prus (2006) find that prior to the introduction of the wage legislation, public school projects were from 16% to 19% smaller, in terms of square feet, than comparable private structures. This size differential did not change after the policy was in effect. These results suggest that prevailing wage requirements do not alter labor or other input utilization in a way that significantly affects the relative size of covered and uncovered projects.

In a follow-up to this study the authors use data from public school projects in British Columbia to provide a more direct test of the effect of prevailing wage policies on the efficiency of construction (see Duncan, Philips, and Prus 2007 and 2009). Results indicate that average

technical efficiency for all construction projects included in the sample is 94.6 percent (100 percent is optimal efficiency in terms of maximizing output from inputs). Average efficiency for projects covered by the introductory stage of British Columbia

were selected for use in this study if the CDOT project description included such resurfacing work as overlay of hot mix asphalt, surface treatment, patching, chip seal, crack seal, replacement of concrete pavement, etc. The contract ID numbers for the projects included in the study are provided in Appendix 1. The projects included in the study involve the same group of contractors that specialize in highway resurfacing work.

Federal resurface projects take place on interstate highways (I-25, I-70 and I-76) that are located in CDOT regions 1 through 4 and 6. Consequently, there are no federal resurfacing projects in CDOT region 5 (the southwest portion of Colorado). For balance, state-funded resurfacing projects that occurred in CDOT region 5 are not included in the results reported below. However, results with these projects included are discussed.

CDOT bid tabulations contain detailed information on the specifics of a project. The tabulations report the number and identity of the bidders on the project, the amount of each bid, the location, time frame and type of terrain involved with the project. The bid tabulations also contain an item description for each of the tasks required of the project as well as the

The CDOT engineer's estimate is based on the same standards and regulations regardless of whether the project is funded by the state or federal government. That is, the engineer's estimate is based on the same federal standards and regulations (including Davis-Bacon prevailing wage requirements), even if the project is funded by that State of Colorado. So, the labor cost portion of the engineer's estimate is based on the prevailing wages in a region, regardless of whether the state or federal government is funding the project. Returning to the illustration of the asphalt patching example above, the engineer

that data from 2005 to the present be used in the study. Starting in 2005 engineer

whether the project required the removal of asphalt or other materials and structures, blading of the road surface prior to resurfacing, etc. Z is a vector of broad project characteristics including the CDOT region the project is in, the type of terrain involved, the extent of the project over multiple counties and whether the project involves a fixed completion date, or specifies a number of working days. This vector also includes dummy year variables. The error term is μ. Dollar measures are adjusted with the CDOT construction cost index for resurfacing projects.[9] This specification allows for a test of the difference between federal and state projects, holding constant much of the detailed now-wage characteristics of projects that contribute to cost differentials.

The variables listed above are also used to estimate the following two additional models:

(2) $\ln_e [P_i/(1$

limit bid competition, controlling for the size (measured by the level of the winning bid) and other characteristics of the project (measured by vectors X and Z).

Results of Statistical Analysis

Summary statistics for the 54 state and 68 federal projects included in the study are reported in Table 1. These data indicate that winning bids are substantially higher on federal projects ($1.94 million for the average federal project, in 1987 dollars, versus less than $300,000 for the typical state resurfacing project). But, CDOT

Table 1
Summary Statistics for CDOT Highway Resurfacing Projects, 2000-2010

Variable	Federal Project Mean	State Project Mean
Real Low Bid	$1,939,695[a]	$298,104
	(1,373,638)	(269,705)
Log of Real Low Bid	14.247[a]	12.308
	(0.76)	(0.77)
Engineer		

Other data reported in Table 1 identify some of the specific differences between state and federal projects. For example, about 90 percent of federal projects require the removal of asphalt while only 35 percent of state projects require this type of additional work on resurfacing projects. Similarly, about 57 percent of federal projects require the removal of other materials and structures relative to 15 percent for state projects. Approximately 65 percent of federal projects involve the blading of the road surface while only two percent of state projects require this kind of work. While federal projects are more likely to involve seeding and mulching, state projects are more likely to involve concrete pavement.

The average number of bidders on a federal project is 4.2 and 3.7 for a state project. Other data indicate that state projects are more likely to require a fixed completion data (versus allowing for a given number of working days) and to extend over three or more counties. Federal projects are more likely to be in CDOT regions 1, 2 and 3, but less likely in regions 4 and 6, relative to state projects. Federal projects are more likely to take place in mountainous and rolling terrain, but state projects are more likely on the plains and in urban areas. All of the differences between state and federal projects are statistically significant at the 0.05 level.

Regression results of the winning bids are reported in Table 2. Models 1 through 3 are based on highway resurfacing that took place between 2001 and Q3 of 2010. These models report the estimated cost impact of federal projects as measures of project size and complexity are added. Model 4 is based on highway resurfacing projects that occurred between 2005 and the third quarter of 2010. Robust standard errors are reported for regression coefficients that provide for asymptotically valid standard errors to correct for hetereoskedaticity. [10] Results for

[10] The assumption of constant error variance does not hold in this cross-section sample of projects. For example, the Breusch-Pagan/ Cook Weisberg test statistics when models 3 and 4 are estimated with OLS are 10.00 (p-value = 0.0016) and 9.31 (p-value = 0.0023), respectively.

Model 1 indicate a coefficient for Federal Projects that is large (1.990) and statistically significant at the 0.01 level. According to Kennedy (1981) the correct interpretation of the percentage change for a coefficient for a dummy variable in a semi-log estimate is given by (e

Table 2
Regression Results for Winning Bids for CDOT Highway Resurfacing Projects, 2000-2010
Dependent Variable = Natural Log of Low (Winning) Bid

	Coefficients			
Variable	Model 1	Model 2	Model 3	Model 4
Federal Project	1.990***	1.131***	0.068	0.051
	(0.311)	(0.354)	(0.077)	(0.150)
Log of Engineer				

Model 2 includes more detailed measures of project characteristics. When these measures are included the cost impact of federal projects falls to approximately 200 percent ($e^{1.13}$

suggesting that the effect of this variable in not statistically significant at either the 0.05 or 0.10 level for a two or one-tailed test. The 95 percent confidence interval for Federal Project ranges from

project cost. Since the engineer

project extends over, or requires work on a bridge, some contractors may decide not to bid on the project. Contractors who are relatively unprepared for this additional work may expect higher costs and bids that are not competitive.[12] The results for Model 3 with respect to Federal Project are invariant to the use of the expected number of bidders (replacing the number of bidders). When Model 3 is estimated with the expected number of bidders, the coefficient for Federal Project is 0.119 with a t-value of 0.87. The main difference is that the expected number of bidders is not statistically significant in this estimate. The coefficient for the expected number of bidders is 0.015, t-value = 0.18 for Model 3.

Since both the winning bid and the engineer

Including the engineer

of material removal (other than asphalt) is statistically significant with the use of the smaller sample. The sample used for Model 4 fails to show statistically significant cost differences between regions. The year trend is now based on the reference year of 2004 and indicates lower real costs in 2005, 2009 and 2010. But, no statistical significance can be ascribed to these measured differences. The R-squared is similar to the level reported for Model 3.

In sum, the results of the regression analysis indicate the absence of statistically significant cost differentials between federal and state highway resurfacing projects when measures of project characteristics are included. This result persists regardless of the sample that is employed or which cost index is used. These results indicate that the prevailing wage requirements of federal projects do not add to the relative cost of these projects. This finding is consistent with the preponderance of empirical studies of prevailing wages that fails to find statistically significant cost effects.

Do Prevailing Wage Laws Limit Bid Competition and Favor Union Signatory Contractors?

A common impression is that union signatory contractors who employ unionized construction workers benefit from prevailing wage laws because these laws limit competition. Summary data from CDOT resurfacing projects provide support for the first claim, but not for the second. For example, union signatory contractors were awarded 35 percent of the federal projects, but only 26 percent of the state projects. On the other hand the average number of bids of a federally-funded project is 4.2 and 3.7 for a state project. While these data imply that the prevailing wage law favors union contractors, the average bid data do not imply that competition is lower on projects covered by the wage policy. The limitation of this analysis based on averages is that it does not take into consideration other factors that affect the award of a bid or the number of bidders. For example, the number of projects awarded to union contractors is

based on a state-wide comparison. However, awards may vary across regions where there are differences in union/nonunion contractor concentrations. Consequently, it is important to examine the effect of the federal wage policy on the likelihood that that a union contractor wins a bid, taking into account regional and other factors that influence the outcome of a bid. Similarly, the simple comparison between the average number of bids for federal and state projects ignores other factors such as the size, location and other characteristics of the project that also affect bid competition. Additional statistical analysis is presented below that explores these issues in more detail. For example, logistic regression analysis is used to determine if union signatory contractors are more likely to win federal resurfacing projects in Colorado, taking into account other project characteristics. Also, regression analysis is used to determine if the number of bidders is lower on federal projects, taking into account other relevant project characteristics.

The logit regression results of the likelihood that a union contractor is awarded a federal project (versus a state project) are presented in Table 4. It is important to keep in mind that unionization in the Colorado construction industry is not high with 6.4 percent of construction workers covered by a collective bargaining agreement in 2010 (that national rate is 13.7 percent for the same year).[13] Only seven of the 89 contractors that submitted bids on resurfacing projects between 2000 and 2010 were union signatory contractors. Only 3 of these union contractors won bids over this time period.

[13] See http://www.unionstats.com/

Table 3
Logit Regression Results of the Probability that the Winning Bid is by a Union Signatory Contractor, CDOT Highway Resurfacing Projects, 2000-2010
Dependent Variable = 1 if the Project was Awarded to a Union Signatory Contractor.

Variable	Odds Ratio
Federal Project	3.742
	(0.95)
# Bid Items	0.951*
	(

The logit coefficients have been converted to odds ratios from logit coefficients for ease of presentation. If the odds ratio is greater than one, the odds of a union contractor winning the bid increases, given a unit change in the independent variable. If the odds ratio is less than one, the odds of a union contractor winning the bid decreases, given a unit change in the independent variables. The logit regression includes many of the project characteristics that are included in the cost estimates presented in Table 2 above. The sample size is smaller because there were no projects won by union contractors in 2008, nor were any projects involving concrete pavement awarded to union signatories. Consequently, 19 observations were dropped and 103 observations remain. The odds ratio for a federal project from Table 3 is 3.7 suggesting that a union contractor is about 3.7 times more likely to win a federal project than a nonunion contractor. However, no statistical significance can be ascribed to this effect (z statistic = 0.95). This result did not change with the estimate of a probit model (Federal Project coefficient = 0.311 with a z statistic = 0.41). The logit results for Federal Project did not vary, in terms of statistical significance when the model was estimated without measures of the real low bid, asphalt planning, removal of structures, blading of the road surface, seeding and mulching and the number of bidders. [14]

Other results reported in Table 3 indicate that the size of the project, indicated by the number of bid items, is associated with a decreased likelihood that a union contractor will win a project. This indicates that the union contractors included in the sample are not effective competitors on large highway resurfacing projects. This effect is statistically significant at the 0.10 level. Union contractors are also more likely in terms of statistical significance to win bids on projects that require asphalt planning and seeding and mulching, but, are no more likely to

[14] The logit coefficient for Federal Project in the estimate described above is 0.145 with a standard error of 0.75 (z score = 0.19). The chi-squared for this estimate has a p-value of 0.49.

win bids for projects that require blading of road surfaces or the removal of structures. An increase in the number of bidders decreases the likelihood that a union contractor will win the bid. This effect is statistically significant at the 0.10 level (one-tailed test). The terms of the contract with respect to completion date and projects extending over three counties does not have an effect on the likelihood of a union contractor winning a project. Union contractors are more likely to win bids in all the regions relative to region 6 (this region includes the greater Denver area). The regional differences are statistically significant at the 0.01 level or lower (for one and two-tailed test) and are quite large. For example, a union contractor is approximately 62 times more likely to win a contract in region 4 than in region 6. Union contractors are less likely to win bids in terrains outside of urban areas. These terrain effects are statistically significant. The likelihood that a union contractor wins an award does not seem to vary over the business cycle. The computed likelihood ratio chi-squared statistic is 39.17 indicating that the null hypothesis that all slope coefficients are equal to zero can be rejected at the 0.035 level.[15]

To address the issue of the endogeneity of the number of bidders, an instrumental variable probit model was estimated similar to the endogenous estimate of the number of bidders in Model 3 above. The results with respect to Federal Project are invariant to the use of the instrument for the number of bidders. The coefficient for Federal Project is

The regression results for the estimate of the number of bids are reported in Table 4. The dependent variable is the log of the number of bids tendered for each of the highway resurfacing projects. The negative coefficient for Federal Project suggests a reduction in bids of about 16 percent on projects covered by the prevailing wage law. However, this coefficient fails to achieve conventional levels of statistical significance for a one, or two-tailed test (t-value =

Table 4
Regression Results for the Number of Bids Tendered on CDOT Highway Resurfacing Projects, 2000-2010
Dependent Variable = Natural Log of the Number of Bids

Variable	Coefficient
Federal Project	

Conclusion

The results of this study indicate that prevailing wage requirements on highway resurfacing projects in Colorado are not associated with statistically significant higher construction costs. At face value, this may appear to be a surprising result because we typically think that total costs rise when wages increase. However, this notion is not supported after a careful consideration of the relation between wages, labor productivity and total costs in the construction industry. For example, other research by the author of this report reveals that productivity and the efficiency of construction is higher on projects that pay prevailing wage rates. Therefore, when construction worker wages rise on prevailing wage projects, productivity also increases in a way that stabilizes the total cost of the project. Additionally, data from the Economic Census of Construction indicate that construction labor costs are a low percent (averaging between 25 to 30 percent) of total construction costs. Given that labor costs are a low percent of total costs in the construction industry, productivity does not need to increase substantially to offset the effect of prevailing wage rates.

The results of this study are also consistent with other studies that have examined the effect of prevailing wages on highway construction costs and the effect on bid completion and union contractor involvement with prevailing wage projects. For example, the Construction Labor Research Council (2004) finds that states with the highest wages for highway construction workers have the lowest total cost per mile (and vice versa). The underlying assumption is that high construction worker wages are associated with higher labor productivity that contributes to lower highway construction costs. In addition, the results presented above are consistent with a recent study of five northern California cities by Philips and Kim (2009). In an examination of public works projects in five northern California cities (Palo Alto, Mountain View, San Carlos,

San Jose, and Sunnyvale) with different municipal prevailing wage laws, these authors fail to find evidence suggesting that wage policies affect the bid process or outcome in a way that increases construction costs. For example, the results do not support the view that wage policies discourage bidding by nonunion contractors, reduce the number of bidders, or prevent nonunion contractors from winning bids on prevailing wage projects. Additionally, these authors fail to find statistically significant differences between the winning bid and two measures of project costs (the engineer

References

Allen, Steven. 1983.

Economics*, "Past, Present, and Future*

Kennedy, p. 1981.

Appendix 1: CDOT Contract ID numbers for projects included in the study

Contract ID	C13932	MM4042	MM5041	C15914
C12282R	C13982	MM4043	MM6059	C16060
C12731	C14002	MM4044	MM6050	C16312B
C13048	MM1014	MM4045	MM4061R	C15763
MM2003	MM1015	MM4046	C15160	C16172
MM5004	MM1016	MM5022	C15517	C16055
C12635	MM1017	MM5024	C14614	C16492
C13008	MM3010	MM6014	C15320R	C16629
C13433R	MM4019	MM6029	C15067RB	C16719
C13441	MM4021	C13535	C15195	C16537
C13498R	MM4022	C13977	C15290	C16466
MM1007R	MM4023	C14483	C15406	C16467
MM2004	MM5009	C14560	C14633	C16781
MM2006	MM5011	C14587	MM5048	C16813
MM3002	MM5013	C14613	MM5049	C16809
MM4004	MM5020	C14849	C15562	C16830
MM4005	MM6010	C14948	C15429	C16891
MM4006	MM6020	C15007	C14986	C16944
MM4007	C13978	M1040	MM1056	C17391
MM4008	C14215	M5034R	MM4066	C17746
MM5006	C14305	MM4049	MM5050	C17254R
MM5008	C14323	MM6045	MM6067	C17730R
MM6003R	M6033	MM6046	C15361	C17714
C12864	MM1023	C15039	M6072	
C13066	MM1024	C14950	C15746	
C13449	MM1025	C15032	C15832R	
C13534	MM1026	C14819	C15922B	
C13831	MM1030	C15053	C15927	
C13854	MM3014	C15028R	C15766	
C13931	MM4040	C14838	C16108	