Measuring the Cost of Project Labor Agreements on School Construction in California

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EXECUTIVE SUMMARY

Project Labor Agreements (PLAs) are collectively bargained contracts that establish working conditions and management rights. They have been used by both public and private entities since the 1930s. In the debate over the use of PLAs, one of the most prominent areas of disagreement is whether these contracts effect construction costs[1]. Supporters argue that PLAs save public dollars because contractors with highly skilled workers are more likely to participate in construction projects, resulting in higher worker productivity and fewer change orders[2]. Proponents also contend that special provisions in PLAs enhance job site cooperation and ensure quick and effective resolution of labor disputes that would otherwise result in delays that could either increase costs or create severe operational disruptions.

Opponents argue that PLAs increase costs. They claim that the requirements imposed by PLAs discourage nonunion contractors from bidding on projects and subcontractors from participating. This reduced competition, it is claimed, results in overall higher bids. Opponents also claim that the work condition rules required in PLAs increase labor costs and that these are passed onto the project's developer.

This study examines the relationship between the adoption of PLAs and public school construction costs in California. We examine the inflation-adjusted square foot construction costs for 551 school projects in California built between 1995 and 2009. Sixty-five of these projects were built using PLAs in eight separate school districts.

Our research shows that PLAs are associated with higher construction costs. We found that costs are 13 to 15 percent higher when school districts construct a school under a PLA. In inflation-adjusted dollars, we found that the presence of a PLA is associated with costs that are $28.90 to $32.49 per square foot higher.

The relationship between the presence of a PLA and higher school construction costs was found when controlling for other factors that previous study in this field found to effect the costs of construction. We conducted three sensitivity tests, including and excluding projects known to have extraordinary costs and employing statistical tests that neutralize the impact of outliers on results. In each case, we found that school construction costs were higher when PLAs were used.

PROJECT LABOR AGREEMENTS

Project Labor Agreements (PLAs) are contracts signed between construction trade unions and project owners (in this research, school district officials) to establish working site conditions and management rights prior to the start of project construction.[3] On federal projects, PLA use dates back to at least 1938 when a PLA was signed for the construction of the Grand Coulee Dam in Washington State. In 1940, a similar agreement was used during the construction of the Shasta Dam in Northern California. Other major public infrastructure projects built under PLAs include atomic facilities in Oak Ridge, Tennessee; Hanford, Washington; the Nevada Test Site; NASA's Cape Canaveral Launch Operations Center (now known as the Kennedy Space Center), and Mississippi Test Facility (now known as the John C. Stennis Space Center).

There is variation among the provisions in PLAs, but generally they contain two key components. The first involves how labor disputes will be handled. Contractors who are party to PLAs agree not to lock out workers from worksites. In turn, the construction trade unions agree to refrain from strikes. Both parties consent to a process where disputes are resolved without labor disruptions, usually under some form of accelerated arbitration.

The second core component found within PLAs involves who will be hired and the conditions of their employment. Signatories to these agreements recognize labor unions as the exclusive bargaining representative for all project workers. Common to most PLAs is a requirement that contractors use a centralized union job referral system or "hiring hall" as a source of workers.[4] Most PLAs require workers on the project to pay union dues, regardless of their membership status. Also common are requirements that contractors make payments on behalf of their workers to union-affiliated fringe benefit trust funds during the course of the project.

Debates about the efficiency and effectiveness of these agreements are intense. Supporters of PLAs argue that they keep costs down and ensure timely construction (and create ancillary benefits beyond the construction of the project).[5] By agreeing to predetermined wages and benefits by mandating the use of union hiring halls, proponents argue that labor markets are more effective and the supply is more certain. Proponents also argue that worker grievances and alleged contract violations can be resolved quickly and more efficiently under PLAs. As

THIS STUDY, WE BELIEVE, BREAKS NEW GROUND IN SIX IMPORTANT WAYS:

1) The data set examined is more than four times larger than the next largest data set used in similar studies.

2) By confining the study to a single state with a highly detailed and prescriptive education-construction code, we partially controlled for factors like architectural requirements and construction regulations.

3) We have richness in the data. Projects ranged from small school additions in rural school districts to large high school facilities built in densely populated urban areas.

4) The data obtained relate to the final cost of construction.

5) NUSIPR took into consideration how some isolated school construction projects were exceptionally costly for reasons unrelated to labor practices. We did this in several ways, including the use of robust regression tests and respecifying the model, excluding projects like the Los Angeles Unified School District's Belmont Learning Center (now known as the Edward R. Roybal Learning Center).

6) We cross-referenced data obtained from districts via public records access laws with data obtained from the California Division of the State Architect. When there were discrepancies, we contacted the school districts to resolve differences in the data, sometimes utilizing the state's public records access laws for a second time. This approach refined data to a much higher degree than in prior studies and offers a way for future researchers to duplicate our methods and confirm our findings.

In each case, we found that school construction costs were higher when Project Labor Agreements were used.

noted, strikes and lockouts are explicitly prohibited. Proponents also claim that PLA requirements involving apprenticeship programs and improved workplace safety lower workers' compensation claims. In total, proponents argue that these provisions create stability and predictability that reduce delays, cost overruns, and change orders, thus increasing the likelihood that projects will be completed on-schedule and on-budget.

PLA critics argue that the provisions within labor agreements are onerous, discriminatory, and unnecessary. They claim that construction projects under PLAs are less likely to receive interest from nonunionized contractors and subcontractors. This results in fewer bidders and less competition, which in turn, leads to higher costs. Mandatory contributions to union trusts for worker benefits (healthcare, pension, etc.) mean some nonunion contractors and subcontractors will have higher labor costs, some of which will be passed through to the project's owner.

PREVIOUS PLA RESEARCH ON COSTS OF NEW SCHOOL CONSTRUCTION

There is an increasing body of empirical research in both mainstream economics and public policy studies that has looked at costs of new school construction. Many studies focused on a single case. For example, the Pasadena City Council re-bid a contract to build a power plant in 2003, amending the contract and adding a PLA. The lowest bidder, Sermatech Power Solutions, increased its bid by 15 percent, from $14.9 million to $17.2 million, to complete the work. In a local newspaper, the vice president, Nathen Howard, stated that "the additional cost is '100 percent' due to the PLA, and that the city actually removed several work items from the contract."[6] Similarly, Oakland Unified School District retroactively added a PLA to a contract to renovate Burckhalter Elementary School in 2004. The original contract winner (and lowest bidder), M. A. Davies Builders, competed against seven other bidders and offered to complete the job for $1.8 million. After Oakland Unified rebid the contract under a PLA, only three companies placed bids, and the lowest bid came in at $2.2 million, a 22 percent increase.[7]

A handful of studies have gone beyond the case study approach and employed comparative techniques. For example, a 2001 UCLA report examined three utility projects in California built under a PLA and featured the testimony of project managers who broadly reject the criticisms of PLA opponents.[8] In 2010, a report from New Jersey's Department of Labor examined the award costs

of new school construction for forty PLA projects and thirty-five non-PLA projects.[9] They found that the inflation-adjusted cost per square foot for PLA projects was 30.5 percent higher than for non-PLA projects. The report also concluded that PLA project costs were higher than non-PLA project costs even when controlling for other variables, such as region and type of school.

These anecdotes and narrow approaches have limited value because they are unable to control for other important variables, such site conditions or the complexity of construction (both of which impact costs). These studies also can exhibit selection bias, as proponents and opponents seek out the best cases with which to illustrate their respective points. Often, the projects examined are so unique as to be of limited utility to those trying to understand the general impact of PLAs across geographic and temporal boundaries.

Two groups of researchers have used statistical techniques and larger data sets to better understand construction costs. The first, the Beacon Hill Institute at Suffolk University, published a study in 2003 comparing school construction costs in the Boston area. Written by Paul Bachman, Darlene C. Chisholm, Jonathan Haughton, and David G. Tuerck (Bachman et al.), the study examined a relatively large sample of 126 school construction projects in the greater Boston metropolitan area, 21 of which were built under a PLA.[10] Comparing the preliminary project bid amounts of their sample across five different models, Bachman et al. determined that PLAs increased the cost of projects by $12 to $20 per square foot, or nine percent to 15 percent more than the average cost of a non-PLA project. The researchers were then able to obtain actual construction cost information for 62 projects, and of these, PLA projects cost $16.51 more per square foot than non-PLA projects, a 12 percent premium.

Bachman et al. analyzed their data using regression analysis, a class of statistical techniques used to test relationships between a dependent variable and one or more independent variables. The authors constructed several models, each containing three to seven independent variables. Factors Bachman et al. examined included the number of floors in the construction project, whether the project was new construction or a renovation, and whether the school was an elementary or high school. The researchers consistently found a statistically significant relationship between the presence of a PLA and higher construction costs across all their models.

Bachman et al. have expanded upon their Massachusetts PLA

work in several subsequent studies. In 2004, they published a study with Jonathan Haughton and David G. Tuerck analyzing 71 public schools in the state of Connecticut, of which 14 were built under a PLA. That study found a significant cost increase related to school district requirements that contractors sign PLAs with unions—an 18 percent premium over the average cost of non-PLA projects.[11] In 2006, Paul Bachman and David G. Tuerck examined a sample of 117 public school construction projects in New York State, of which 19 (16 percent) were PLA projects. Bachman and Tuerck found that PLA projects added approximately $27 more per square foot (in 2004 dollars) to the bid cost of construction, which is a 20 percent increase over the average bid cost per square foot for non-PLA projects.[12]

The other principal group examining this issue is Dr. Dale Belman and Russell Ormiston of Michigan State University and William Schriver and Richard Kelso of the University of Tennessee (Belman et al.). In 2005, they distributed a paper examining 92 school construction projects, 70 of which were in Massachusetts and 22 of which were in Rhode Island and Connecticut.[13] Of these, 10 school projects (10.8 percent) were built under a PLA. Belman et al. gradually increased the number of variables tested from three to 30 across six different models.[14] In the first two more leanly specified models, PLA projects in Massachusetts were initially found to be statistically significant, raising the cost of construction by an additional $28.57 to $32.31 per square foot, or 16.6 percent to 20.2 percent more than non-PLA projects. Belman et al. argued, however, that since contractors were often required to sign PLAs for the most complex, largest projects, a robust test would include additional explanatory variables that were likely to impact costs. The authors wrote, "Our research also indicates that schools built under PLAs are often more complex projects than those built without PLAs and that, absent appropriate controls for the nature of the construction, the increased costs associated with complexity are erroneously attributed to PLAs."[15] This expanded analysis found that while the schools built under PLAs had higher costs, this increase was not statistically significant. Belman et al. concluded that while "simple" statistical tests may find that PLAs raise the cost of school construction, "this is not found in more complete specifications that better fit the data."[16]

An updated 2006 brief from Bachman et al. took issue with the Belman et al. analysis, stating that "a cautious conclusion would be that the sample used is not large enough to permit one to conclude that PLAs have no significant effect on costs."[17] As Bachman points out, the Belman study failed to find any support

for the proposition that PLAs actually lower construction costs. More recently, in 2010, Belman et al. reexamined their original 2005 data to determine whether it is possible to distinguish between the cost effect of PLAs and the effects of project characteristics commonly found in schools built under PLAs.[18] Looking at seventy school projects from Massachusetts, Belman et al. ran a series of statistical models that attempted to sift through the impact of variables, such as whether a project was built in Boston, within the Boston Public School District, and under a PLA.[19] Ultimately, the authors conclude that there is significant conflation between the presence of PLAs and characteristics commonly associated with PLA projects, and that, absent of a larger data set, it is not possible to statistically isolate their individual explanatory power over project costs. Belman et al. also found that "PLA and non-PLA schools have different and largely non-comparable characteristics" that impair researchers' ability to use advanced statistical techniques that could provide answers in the PLA debate.[20]

CALIFORNIA SCHOOL CONSTRUCTION AND PLAs

This research seeks to expand upon prior work by looking at the effects of PLAs in California. The Belman et al. and Bachman et al. studies provide valuable insight into the fiscal impact of PLAs in general. However, both sides have insufficient sample sizes, which make it difficult to isolate the impact of PLAs from the myriad of other factors that can impact costs, especially in the urban settings where they are frequently employed. The National University System Institute for Policy Research (NUSIPR) set out in May 2010 to assess the impact of PLAs on the cost of public school construction projects in California. The timing for this research is particularly appropriate, as debates over the use of PLAs in school construction are becoming increasingly pronounced.

To date, 24 California K–12 school districts have adopted PLAs covering school construction. In the course of our research, we were ultimately successful in making contact with eight of these school districts: Los Angeles Unified, West Contra Costa Unified, San Leandro Unified, Roseville City Elementary,[21] Pittsburg Unified, Oakland Unified, Sacramento City Unified, and Santa Ana Unified. This allowed us to initially identify 127 PLA projects with significant variation on several independent variables that prior research suggested affect school construction costs.[22] These variables include total square footage; the start and end date of project construction; whether demolition was required prior

to construction; the number of stories; and whether a gym or swimming pool was built under the project.

In addition, California has an education code that is highly prescriptive with respect to construction standards and requirements. Through the Division of the State Architect (DSA), the State of California enforces minimum statewide standards for school design, structural safety, construction, and planning.[23] We believe this highly prescriptive code creates greater uniformity and reduces regulatory variance among different school projects. This isn't to say there are no differences or outliers, but, compared to the areas examined by previous studies, California schools look remarkably similar with respect to design, construction specifications, and the kind of features that are or are not included.[24]

Finally, this study benefits from two factors unique to California that facilitated data collection. First, the State of California has a comprehensive public records disclosure law for state and local governments. Rather than depending on interviews or voluntary data from project architects or subcontractors, we were able to gather data about costs and project characteristics directly from school districts. (For a copy of our Public Record Act requests, see appendix B.)

Secondly, data on final construction costs for California public schools completed over the last 10 years are available in a searchable database located on the California Division of the State Architect website. This database was an invaluable tool for confirming the data provided by districts and identifying the presence of discrepancies that required follow up, refinement, and confirmation.

METHODOLOGY

As with the Bachman et al. and Belman et al. studies, we first gathered school construction information from McGraw Hill Construction/Dodge reports. This data source, which is used by general contractors to prepare work bids, lists numerous features about construction projects, including the school district, site location, square footage, estimated project value, and construction start date. In many cases, it also contains contact information for the district, including in most cases a mailing address and, occasionally, the names of actual individual employees.

We began by identifying all California school construction projects built from 1996 through 2008, which yielded almost

11,000 projects. To reduce this number to a workable set of cases, we limited our analysis by square footage and project value, similar to other studies. For example, Bachman et al. 2003 limited their Dodge data to school projects from the greater Boston area that ranged between 40,000 and 400,000 square feet, were valued at $5 million or more, and were built between 1995 and 2003.[25] The Belman et al. study limited its scope to the years 1996–2002, with no specified size range. With an interest in obtaining both current data and historical data, NUSIPR targeted new construction projects between 40,000 and 400,000 square feet, with a valuation of $5 million or more, and which Dodge identified as being built between 1996 and 2008.[26] These parameters reduced our data set to 1,023 school construction projects.

Both Belman et al. and Bachman et al. verified Dodge data with surveys of architects and contractors involved in the projects and directly obtained final construction data from school district officials. Faced with a significantly larger sample size, we chose a different approach, soliciting data from individual school districts via a California Public Records Act request.[27]

We requested information from 319 different California school districts. The letters listed the school construction projects of interest and requested information or documentation on the following:

- The project's total square footage
- The project's total construction cost
- The start date and end date of construction
- The type of school project built (elementary, high school, etc.)
- Whether the project was built under a PLA
- Whether the project was new construction or a modernization of an existing facility
- The number of stories built
- Whether the project included an HVAC system
- Whether the project included the construction of a gym
- Whether the project included the construction of a swimming pool
- Whether the project required demolition of existing structures[28]

This request generated complete data from approximately 50 percent of schools. Subsequently, NUSIPR followed up at least three times with school officials to obtain missing or incomplete data or to refine the parameters of our request. Over the course of seven months of active data collection, we made telephone

In addition, California has an education
code that is highly prescriptive with respect to
construction standards and requirements.

calls at least twice to school districts that failed to respond to the initial request or did not provide the data requested in their response. If we still did not receive data, the projects were eliminated from the sample.

We then verified the data from a second source, the California Division of the State Architect's (DSA) online Project Tracking System.[29] The data comes from a form submitted by the districts to the DSA when the construction contract is awarded and the change order documents are submitted to the DSA during the final review process.

We found it necessary to use both information sources. The DSA database contains neither information about construction site characteristics nor uniform information about the square footage of projects. In several instances, a new construction project is reported out in phases or aggregated with other projects undertaken by the district. Ultimately, the greatest value of the DSA database was in identifying discrepancies in the PRA information provided or in helping us to identify those school districts that required follow-up and refinement.

To control for the rise in construction costs during the period of time in our sample, we adjusted for inflation using the California Construction Cost Index (CCCI), which averages the costs of industry labor wages and building materials in Los Angeles and the San Francisco Bay Area.[30] We adjusted the cost per square foot of construction using a constant of 2000 dollars. This adjustment is similar to the "deflation" techniques used by both Bachman et al. and Belman et al.[31]

RESULTS

Our final sample size consisted of 551 school construction projects (a 53.8 percent inclusion rate) originating from 180 school districts and spread across 37 counties.[32] Our sample size is four times larger than any other data sample featured in a published PLA study.[33] (Chart 1)

Overall, 25.7 percent of projects (142) in our sample were classified as urban schools, 44.6 percent (246) as suburban schools, and 29.5 percent (163) as rural schools. Of these, 333 were elementary schools, 248 were single story projects, and 259 had a gym or multi-purpose room. Few projects contained

CHART 1: PLA Statistical Study Comparison

Study Name, Author	Year of Study	Number of Schools	Dependent Variable	Data Independently Available?
"The Effect of Project Labor Agreements on the Cost of School Construction," Belman et al.	2005	92	inflation-adjusted final cost of construction per square foot; inflation-adjusted log of final cost per square foot	No
"Do Project Labor Agreements Raise Construction Costs?," Bachman et al.	2003	126	inflation-adjusted bid cost of construction per square foot	No
"Do Project Labor Agreements Raise Construction Costs?," Bachman et al.	2003	62	inflation-adjusted final cost of construction per square foot	No
"Project Labor Agreements and Public Construction Costs in New York State," Bachman and Tuerck	2006	117	inflation-adjusted bid cost of construction per square foot	No
"Project Labor Agreements and Public Construction Costs in Connecticut," Bachman et al.	2004	71	inflation-adjusted final cost of construction per square foot	No
"Measuring the Cost of Project Labor Agreements on School Construction in California," Vasquez et al.	2011	551	inflation-adjusted final cost of construction per square foot	Yes

CHART 2: Histogram of Square Footage Figures in Sample
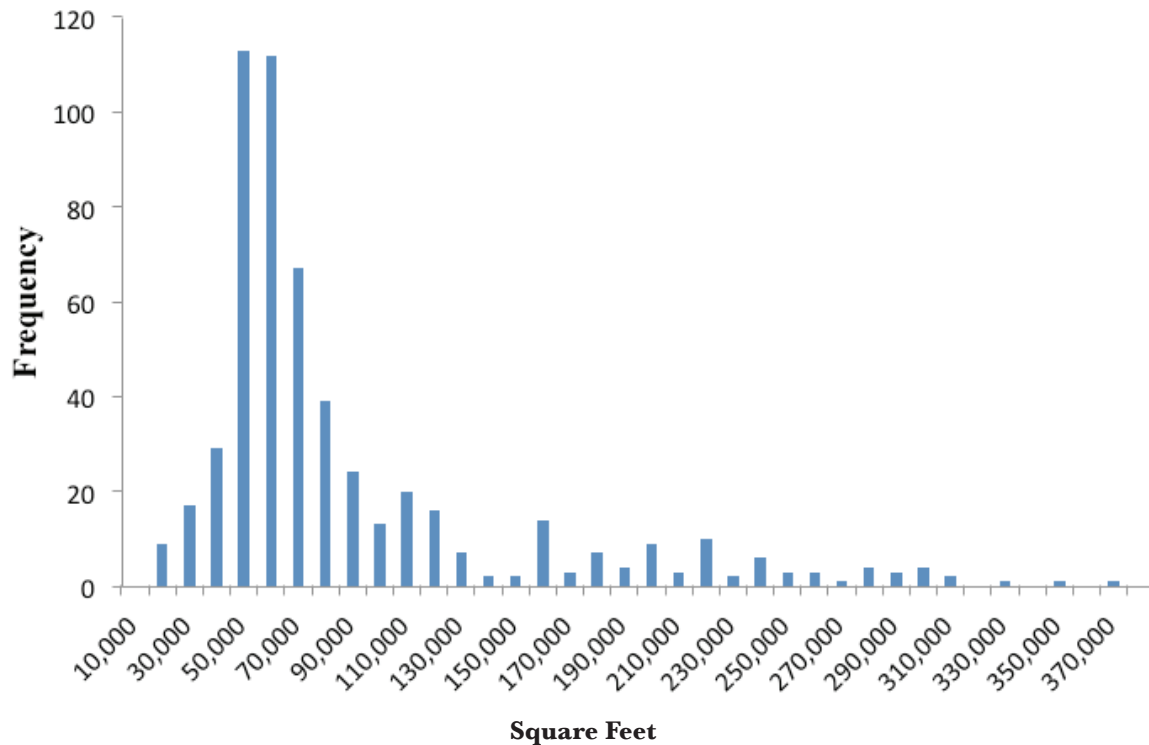
swimming pools (27), and less than a quarter required the demolition of existing structures on site (132). Within our sample, we were able to positively identify 486 school construction projects as non-PLA, while 65 (11.7 percent) were built under a PLA. This ratio is similar to the ones found in Belman et al. and Bachman et al. Most schools were built in Southern California and the Central Valley. As Charts 2 and 3 show, most school projects ranged from 50,000 to 70,000 square feet, and $10 to $20 million in total construction costs.

The average inflation-adjusted cost per square foot for these projects in California was $228.56 with a standard deviation of $78.08. Construction projects under PLAs were found to cost substantially more, with an average (mean) adjusted cost per square foot of $302.98, and a standard deviation of $102.21. In contrast, projects not built under PLAs had a mean cost of $218.61, with a standard deviation of $68.51.

This is not the whole story. If, for example, PLAs are principally found on projects in urban areas where the demolition of structures is necessary, or on multi-story projects, the observed cost differences may be a result of these project characteristics, not a PLA. Hence, we must isolate the impact of PLAs on adjusted square foot costs from other variables. To do so, we conducted a multiple linear regression analysis of the construction data. We utilized the ordinary least squares method,[34] conducting several sensitivity tests and specified models.

In our final model, we found a statistically significant relationship between PLAs and inflation-adjusted per square foot costs. Controlling for other factors that effect the costs of construction, this test indicated that new school construction projects built under a PLA cost $28.90 (13 percent) more per square foot than non-PLA projects. The following predictors also attained statistical significance: the presence of a gymnasium or pool, whether demolition of structures was required, the average date of construction, and the square footage.[35] (Chart 5)

The percentage of variability that can be explained by a statistical model is often reflected by the value of the model's r-squared value. For the full NUSIPR model, 27.9 percent of the variation in total cost was accounted for by the set of predictors. An r-squared value of 0.279 would generally be considered to be a large effect size for social science research. It is also within range of the r-squared estimates found in previous research.[36] Similar to Beacon Hill, NUSIPR conducted a weighted regression of the sample. This test found that

CHART 3: Histogram of Total Project Cost Figures in Sample in Present Dollars
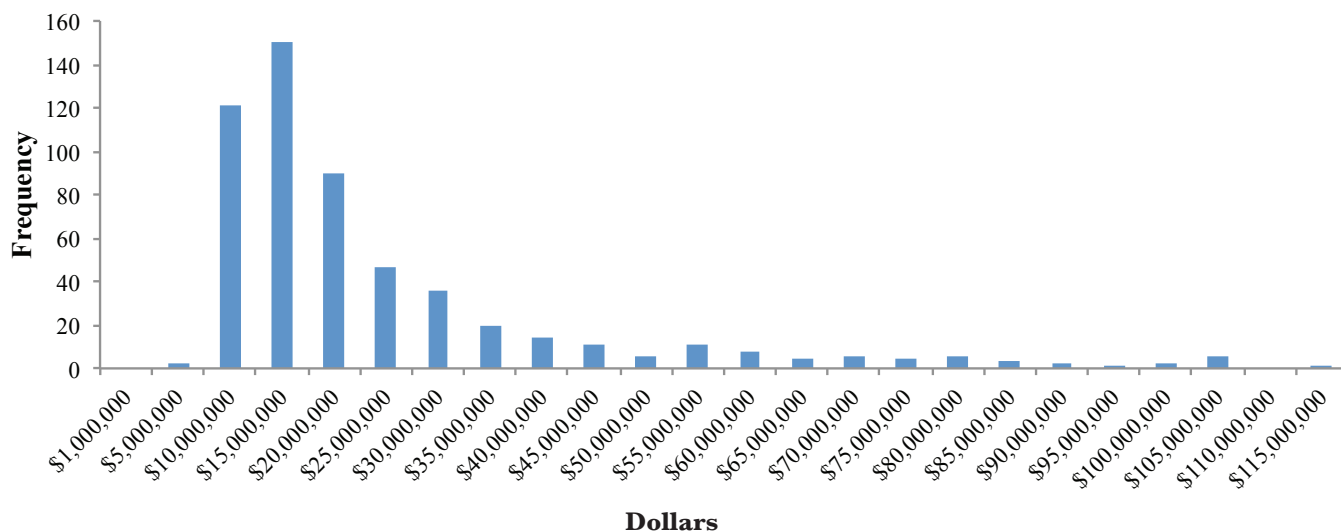
CHART 4: PLA Statistical Study Results Comparison

Study Name, Author	Year of Study	Number of Schools	Additional Cost per Square Foot	Percentage Increase Cost
"The Effect of Project Labor Agreements on the Cost of School Construction," Belman et al.	2005	92	$29-$32	17%-20% *
"Do Project Labor Agreements Raise Construction Costs?," Bachman et al.	2003	62	$12-$20	9%-15%
"Project Labor Agreements and Public Construction Costs in Connecticut," Bachman et al.	2004	71	$30	18%
"Measuring the Cost of Project Labor Agreements on School Construction in California," Vasquez et al.	2011	551	$29-$32	13%-15%

As noted on Page 5, the fully specified model did not find PLAs were significant.

PLAs remain statistically significant and increase costs by $32.49 per square foot of school construction, or 15 percent, compared to non-PLA projects. The r-squared value increased slightly to 0.2861, and all other predictors were determined to be significant. Based on the results from the weighted regression and ordinary least squares tests, we found overall that PLAs increase the adjusted square foot final costs of construction by 13%-15%, or approximately $29-$32 per square foot. These results are similar to those found from samples of school construction projects in other states, where final project costs were examined (See Chart 4).

ROBUST REGRESSION AND ROBUST ESTIMATOR RESULTS

In statistical science, probability theory suggests that random values will cluster fairly consistently around the mean or average value. This is known as normal distribution, and it typically takes the shape of a bell curve on an x and y axis. However, when the sequence of random data points lacks this

CHART 5: Ordinary Least Squares Analysis Results

Regression Technique	Variable	b[1]	t-statistic	p-value	Significant?[2]
Ordinary Least Squares	PLA	28.902	2.523	.012	Yes
$r2 = .279$	Elementary	-8.599	-1.186	.236	No
$F(8,542) = 26.42$	Stories	-10.299	-1.419	.157	No
$p < .05$	Gym	25.304	3.511	< .001	Yes
	Pool	38.141	2.585	.010	Yes
	Demolition	18.529	2.216	.027	Yes
	Square Footage	-0.0002	-3.922	< .001	Yes
	Average Date	7.852	8.367	< .001	Yes

[1] Unstandardized partial coefficient

[2] $\propto = 0.05$

predicted uniformity, the data are called "heteroscedastic." Special statistical tests can be used to adjust values in the event of heteroscedasticity in a data set, dampening the effects of outliers at the far extreme of the data. In an effort to provide a rigorous analysis of our data, NUSIPR used two special techniques to address heteroscedasticity as well as outliers: the robust standard errors test (using Huber-White standard errors) and a robust regression. Both are standard robustness techniques, and Bachman et al. also used a Huber-White test to verify robustness.

Robust regression is a statistical technique that is used in conjunction with predictive models when the data set lacks normal distribution, or when there are substantive outliers that may skew the results from a standard regression test. In a robust regression analysis, the influence of outliers is down-weighted, allowing more statistical relationships to appear in the results. A robust standard errors test gives a more precise estimate of relationships when there is heteroscedasticity, or takes it into account. Using Stata 11.0 statistical software, we ran both analyses. In both cases, the presence of PLAs was found to be statistically significant. The complete results of these two statistical tests are shown in chart 6.

ADDITIONAL RESEARCH QUESTIONS

When testing the model for the full sample of schools, 27.9 percent of the variation in the CCCI adjusted cost per square

footage was accounted for by the set of predictors. This is generally considered to be a large effect size. A sizeable amount of the variability in the outcome was accounted for in the model. Moreover, across the three alternative regression techniques (i.e., robust regression, regression with robust standard errors, and weighted regression), PLA and four other covariates (gym, pool, square footage, and average date) held as significant predictors with a similar pattern of results.

One issue that arose was that during this period, there were a handful of projects that had extraordinary circumstances that drove costs higher. Several of these were built under a PLA. So as not to bias the results, we eliminated from many of our initial statistical tests projects, such as the Edward R. Roybal Learning Center (formerly known as the Belmont Learning Center) and the Robert F. Kennedy Community Schools Complex.[37] We found that their inclusion or exclusion did not impact the results.

Furthermore, a peculiarity in our data set was the large number of PLA school projects that were built by a single school district, Los Angeles Unified (LAUSD). Part of the reason for this is that LAUSD is the largest school district in the state and has built projects using PLAs since 1999.

To address potential concerns about the disproportionate inclusion of projects from LAUSD, an alternative statistical

CHART 6: Robust Regression Analysis Results

Regression Technique	Variable	b[1]	t-statistic	p-value	Significant?[2]
Robust Regression	PLA	30.549	2.880	0.004	Yes
$r2 = .211$	Elementary	-12.095	-1.800	0.072	No
$F(8,542) = 28.56$	Stories	-4.416	-0.660	0.511	No
$p < .05$	Gym	15.437	2.320	0.021	Yes
	Pool	42.741	3.130	0.002	Yes
	Demolition	10.832	1.400	0.162	No
	Square Footage	-0.0002	-3.470	0.001	Yes
	Average Date	9.051	10.430	< .001	Yes
Robust Standard Errors	PLA	28.903	1.990	0.047	Yes
$r2 = .279$	Elementary	-8.599	-1.040	0.297	No
$F(8,542) = 20.49$	Stories	-10.299	-1.460	0.144	No
$p < .05$	Gym	25.303	3.380	0.001	Yes
	Pool	38.141	2.200	0.028	Yes
	Demolition	18.529	2.060	0.039	Yes
	Square Footage	-0.0002	-3.550	< .001	Yes
	Average Date	7.852	7.110	< .001	Yes
Weighted Regression (Sqr Foot)	PLA	32.498	2.980	0.003	Yes
$r2 = .286$	Elementary	-2.548	-0.320	0.746	No
$F(8,542) = 27.15$	Stories	-10.268	-1.550	0.122	No
$p < .05$	Gym	25.237	3.320	0.001	Yes
	Pool	29.949	3.160	0.002	Yes
	Demolition	20.948	2.580	0.010	Yes
	Square Footage	-0.0001	-2.680	0.008	Yes
	Average Date	7.420	8.190	< .001	Yes

[1] Unstandardized partial coefficient

[2] $\propto = 0.05$

model was examined that codes LAUSD as a dummy variable. PLAs did not yield statistical significance from these specialized tests. (Chart 7)

However, 47 out of 48 (97.92 percent) of the LAUSD school projects used PLAs, resulting in a large correlation effect with PLAs (correlation of LAUSD status and PLA is 0.825). This substantive overlap results in an inability to explain and identify the unique contribution of PLAs.[38] In fact, when the PLA variable was removed from the model and a new variable was

included that identified whether a project was built in LAUSD, there were starkly similar results. Both variables (PLA and LAUSD) yielded statistical significance, and 28.7 percent of the variation in cost was accounted for.

When we test an alternative statistical model that removes all LAUSD projects from our data set, and test for fewer variables including square footage (and its squared, nonlinear counterpart), whether the project was a modernization, type of school, and presence of PLA, the r-squared value decreases to 9.6 percent,

CHART 7: LAUSD Regression Analysis Results

Regression Technique	Variable	b[1]	t-statistic	p-value	Significant?[2]
Ordinary Least Squares	PLA	6.598	.395	.693	No
r2 = .284	Elementary	-10.038	-1.379	.168	No
F(9,541) = 23.81	Stories	-10.283	-1.420	.156	No
p < .05	Gym	25.545	3.551	< .001	Yes
	Pool	36.675	2.488	.013	Yes
	Demolition	15.088	1.764	.078	No
	Square Footage	-0.0002	-4.022	< .001	Yes
	Average Date	7.944	8.471	< .001	Yes
	LAUSD	33.718	1.830	.068	No
Robust Regression	PLA	11.021	0.71	0.478	No
r2 = .216	Elementary	-12.918	-1.91	0.057	No
F(9,541) = 27.05	Stories	-3.998	-0.59	0.553	No
p < .05	Gym	15.445	2.31	0.021	Yes
	Pool	40.623	2.96	0.003	Yes
	Demolition	7.625	0.96	0.338	No
	Square Footage	-0.0002	-3.45	0.001	Yes
	Average Date	9.265	10.63	< .001	Yes
	LAUSD	35.851	2.09	0.037	Yes
Robust Standard Errors	PLA	6.599	0.35	0.727	No
r2 = .288	Elementary	-10.039	-1.23	0.22	No
F(9,541) = 18.69	Stories	-10.283	-1.45	0.147	No
p < .05	Gym	25.544	3.41	0.001	Yes
	Pool	36.675	2.11	0.036	Yes
	Demolition	15.088	1.64	0.102	No
	Square Footage	-0.0002	-3.66	< .001	Yes
	Average Date	7.944	7.1	< .001	Yes
	LAUSD	33.719	1.48	0.138	No
Weighted Regression (Sqr Foot)	PLA	13.354	0.82	0.410	No
r2 = .289	Elementary	-3.493	-0.44	0.657	No
F(9,541) = 24.48	Stories	-10.322	-1.56	0.120	No
p < .05	Gym	25.482	3.35	0.001	Yes
	Pool	28.673	3.02	0.003	Yes
	Demolition	18.030	2.17	0.030	Yes
	Square Footage	-0.0001	-2.75	0.006	Yes
	Average Date	7.519	8.29	< .001	Yes
	LAUSD	28.447	1.59	0.111	No

[1] Unstandardized partial coefficient

[2] $\alpha = 0.05$

Our study, the largest and most comprehensive to date, provides new insight into the fiscal impact of Project Labor Agreements.

showing an appreciable decrement in model fit. PLA and all the other variables are still statistically significant. That said, the correlation of PLA and the price per square foot is only 0.163 and overall model fit is not impressive (r-squared = 0.096).

PLA projects and LAUSD schools both so strongly co-vary that it hinders us from delineating to what extent each uniquely contributes to explaining the variability in cost. We do, however, control for factors, such as: urban location, demolition, and multiple stories in our fully specified model. It is unknown what additional factors might plausibly account for higher construction costs in LAUSD projects. However, as previously noted, we do see a reduction in model fit when the LAUSD projects are excluded from the analysis. Hence, they are a substantive contributor to the overall fit of our model.

NUSIPR took additional efforts to resolve the collinearity in our data set. Following the methodology explained in the Belman 2010 study, we created a two-step propensity scoring technique. We first performed a binary logistic regression model, using all of the predictors that were originally used to predict the CCI adjusted cost per square foot, with the exception that the grouping variable of interest (PLA vs. non-PLA) now served as the binary outcome. This was accomplished using a propensity score matching macro developed for statistical software (SPSS). Based on the regression solution (the partial logistic coefficients), a predicted probability of whether a project was built under a PLA or not was computed for each of the individual construction projects. This predicted probability served as the propensity score.

Unlike Belman et al., we were able to identify a region of common support, matching 65 PLA projects with 65 non-PLA projects that, but for the absence of a PLA, are similar with respect to other project characteristics, such as the use of demolition and total square footage. Propensity weights can be utilized as a covariate at the first stage of a hierarchical approach to multiple regression. In our second phase, we analyzed the matched set of 130 projects (incorporating a propensity weight covariate) using the ordinary least squares method. We found that PLAs were not statistically significant. Similar results were found when the propensity score was omitted from the model.

However, when PLAs were analyzed in isolation from the other covariates, using a one-way ANOVA test, we found them to be statistically significant. These results tell us that while there is evidence that PLAs are associated with higher project costs, collinearity is still present in the data set, hampering the ability to disentangle the unique contribution of the individual covariates on a wider scale. Interestingly, within our sub-sample of matched schools, we found the average CCI adjusted cost per square foot of non-PLA projects to be $244.69, which is significantly lower than the cost of PLA projects ($302.98/per square foot).

CONCLUSION

Our study, the largest and most comprehensive to date, provides new insight into the fiscal impact of PLAs. Our models suggest a significant positive relationship between PLAs and costs, and they hold true under a number of statistical tests and specifications.

Perhaps most definitively, our examination of the data found no support for the proposition that PLAs reduce costs. Even if one places great weight on the reduction of model fit when excluding LAUSD projects, ours is now the third statistical research project released since 2000 that failed to find evidence that these agreements help lower school construction costs.

Our findings are important for California. Over the last decade, state voters have passed more than $64 billion of school construction bonds (statewide and local) to build new classrooms and modernize existing facilities that have deteriorated over time.[39] In 2007–2008, California public elementary and secondary school districts spent more than $8.2 billion on construction.[40] With this expenditure of funds, the number of statewide school construction projects has swelled. One estimate has identified 21,399 new classrooms built in California from 2002 to 2010.[41] California's rapid pace of school construction activity is now matched by only a handful of other states.[42]

At the same time, several school districts have adopted PLAs and debates about their use rage on. It is our hope that our findings inform public debate when PLAs are advanced as a costless policy tool. Our research suggests that they are not, and should districts choose to adopt them, school construction is very likely to cost more.

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ABOUT THE AUTHORS

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Vince Vasquez is the senior policy analyst with the National University System Institute for Policy Research. He works on a wide variety of local and regional policy issues, including education, small business, government finance, and the Latino workforce.

Mr. Vasquez's opinion pieces have appeared in many publications, including the *Wall Street Journal, San Diego Union-Tribune, San Francisco Examiner, Silicon Valley-San Jose Business Journal,* and the *Los Angeles Business Journal*. He has also appeared on CNN and has been quoted in the *Los Angeles Times, Chicago Tribune, Christian Science Monitor, San Francisco Chronicle,* and *Investor's Business Daily*.

Prior to joining the National University System Institute for Policy Research, Mr. Vasquez worked at the Pacific Research Institute for Public Policy (PRI), an economic think tank based in San Francisco. He also worked at the Leadership Institute, a nonprofit educational foundation in Arlington, Virginia. Mr. Vasquez received a B.A. in Political Science at the University of California, San Diego (UCSD), and has earned a Master of Public Administration (MPA) at Keller Graduate School of Management.

DALE GLASER, PH.D., GLASER CONSULTING

Dr. Dale Glaser, principal of Glaser Consulting and adjunct professor of statistics for the School of Nursing at the University of San Diego, has accrued extensive experience in statistical analyses, psychometric testing, program evaluation, and organizational assessment and development within the healthcare, nursing, organizational, educational, and marketing research domains. He has published extensively in the area of nursing research and has furnished statistical and methodological consulting to many nursing faculty, practitioners, and students in regard to their research projects.

As a statistical consultant, he has been responsible for engaging in comprehensive assessment efforts from the formative stages of survey construction and experimental design, power analyses, psychometric assessment, and statistical analysis to presentation/implementation and the publishing of results. He also has extensive experience with advanced quantitative methods, including Structural Equation Modeling, multilevel modeling, and other multivariate and biostatistical techniques.

Dr. Glaser obtained his Ph.D. in Industrial-Organizational Psychology from the California School of Professional Psychology and his M.S. in Counseling Psychology from California State University–Fullerton. He also teaches at the graduate and undergraduate levels in courses such as: multivariate and univariate statistics, research methods, testing and measurement, psychometrics, and related industrial-organizational psychology courses, such as Decision Theory.

W. ERIK BRUVOLD, PRESIDENT AND CEO, NATIONAL UNIVERSITY SYSTEM INSTITUTE FOR POLICY RESEARCH

W. Erik Bruvold is the founding president of the National University System Institute for Policy Research. He has conducted several widely cited public policy and economic research reports on the San Diego region. Prior to joining NUSIPR, he was vice president of public policy for the San Diego Regional Economic Development Corporation (EDC), where he oversaw the organization's public policy efforts on a range of issues impacting San Diego's business climate.

Among Mr. Bruvold's achievements at the EDC were his leadership of the successful effort to extend the TransNet sales tax for transportation investment and his leadership of the successful regional response to the 2005 round of military base closures and realignments (BRAC 2005). Prior to joining EDC, Mr. Bruvold was executive director for the San Diego chapter of the American Electronics Association. He has served on several boards, including the North County Economic Development Corporation, the East County Economic Development Corporation, and the San Diego Association of Government's Transnet Citizens Advisory Committee.

Mr. Bruvold holds a Bachelor of Arts with Highest Honors from the University of Denver and a Master of Arts in Political Science with High Honors from the University of California, San Diego.

APPENDIX A:
FINAL LETTER OF REVIEW BY THE KESTON INSTITUTE FOR PUBLIC FINANCE AND INFRASTRUCTURE POLICY, UNIVERSITY OF SOUTHERN CALIFORNIA

USC
UNIVERSITY
OF SOUTHERN
CALIFORNIA

July 13, 2011

Keston Institute for
Public Finance and
Infrastructure Policy

Richard G. Little
Director

Direct: 213 740 4120
Cell: 703 582 0317
e-mail: rglittle@usc.edu

Mr. Kevin D. Korenthal
Executive Director
Associated Builders and Contractors of California Cooperation Committee
28005 Smyth Drive
Suite 129
Valencia, CA 91355

Dear Mr. Korenthal:

You have requested the Keston Institute for Public Finance and Infrastructure Policy to provide an independent review of the report "Measuring the Cost of Project Labor Agreements on School Construction in California" prepared by the Institute for Policy Research of the National University System. The review was to focus on the statistical analysis and associated conclusions described in "Measuring the Cost of Project Labor Agreements on School Construction in California" and consisted of an assessment of the analytical methodology employed and assumptions made in regard to the data set used in the analysis and which was provided to me on May 2, 2011 (This data set was not independently verified.). This review was conducted by myself and Professor Lisa Schweitzer, Ph.D., of the USC School of Policy, Planning and Development and undertaken in two parts; a review of the draft report and a review of the revised version that was prepared following a conference call on June 9, 2011 to discuss our initial findings.

Our review determined that the analysis of the school construction data conducted by the Institute for Policy Research employed proven and well-accepted statistical techniques and the conclusions drawn regarding project cost differentials between school projects that utilized Project Labor Agreements (PLAs) and those that did not follow logically from this analysis. In particular, we were impressed by the efforts of the research team to probe deeply into potentially confounding relationships among the variables such as the large number of outliers and the fact that the data points are not normally distributed (heteroscedasticity) through the use of robust regression and robust estimators and other techniques. The fact that the coefficients based on the Ordinary Least Squares Analysis (Chart 5) and the Robust Regression Analysis (Chart 6) do not change significantly supports the overall significance of the PLA variable on construction cost per square foot.

The LAUSD projects represent an unavoidable dilemma of covariance which hindered the ability of the research team to delineate to what extent it was the presence of PLAs or the LAUSD that explain the variability in cost. Despite laudable efforts by the research team to address this issue, they were not able to disentangle the two factors. Perhaps the only way to do so is empirically, with LAUSD undertaking a group of projects which do not utilize PLAs to serve as a control group.

Overall, we believe that the conclusion drawn in the report regarding the influence of PLAs on project cost are supported by the data set provided to us and the subsequent statistical analysis of that data. The research team appropriately utilized well-accepted statistical methods to arrive at this conclusion and it constitutes an important research finding. However, I would like to reiterate at this time that the results of our review should in no way be construed as the Keston Institute for Public Finance and Infrastructure Policy supporting any position relating to the use of Project Labor Agreements by any public or private entity.

Please let me know if you have any questions regarding this Letter Report or if I can provide additional information pertaining to the Keston Institute's review of "Measuring the Cost of Project Labor Agreements on School Construction in California". We appreciate this opportunity to be of service.

Cordially,

Richard G. Little, AICP
Director, The Keston Institute for Public
Finance and Infrastructure Policy

APPENDIX B:
COPY OF PUBLIC RECORDS REQUEST LETTER MAILED TO SCHOOL DISTRICTS

PUBLIC RECORD REQUEST

May 19, 2010
Public Information Officer
(School District)
(Street Address)
(City, State, Zip Code)

RE: PUBLIC RECORDS ACT REQUEST –
SCHOOL CONSTRUCTION DATA

Dear Public Information Officer,

The National University System Institute for Policy Research, an affiliate of the nation's largest, nonprofit higher education system, is conducting a major econometric project on public school construction costs in California and is collecting data statewide from school districts. Pursuant to my rights under the California Public Records Act (Government Code Section 6250 et seq.), I respectfully request information about the following school(s) in your district:

(School Construction Project Name), located at (Street Address), (City);

Specifically, I am seeking the following details related to the construction of the school(s):

• The total square footage of the construction project(s);
• The final cost(s) of the construction project(s);
• The approximate date on which construction started and the approximated date on which construction was completed;
• Whether the project(s) was constructed under a Project Labor Agreement (PLA);
• The type of school (Elementary or Secondary);
• Whether the project(s) is/are new construction or a rehabilitation of an existing building;
• Number of stories in the project(s);
• Inclusion of HVAC system(s) in the project(s);
• Inclusion of a gymnasium in the project(s);
• Inclusion of a swimming pool in the project(s);
• Whether construction required demolition of an existing structure(s).

I ask for a determination on this request within 10 working days of your receipt of it, and an even prompter reply if you can make that determination without having to review the information in question.

If you determine that any or all or the information qualifies for an exemption from disclosure, I ask you to note whether, as is normally the case under the California Public Records Act, the exemption is discretionary, and if so whether it is necessary in this case to exercise your discretion to withhold the information.

If you determine that some but not all of the information is exempt from disclosure and that you intend to withhold it, I ask that you redact it for the time being and make the rest available as requested.

If you determine that any or all of the information is exempt and will not be disclosed, please provide a signed notification citing the legal authorities on which you rely.

If I can provide any clarification that will help expedite your attention to my request, please contact me at (phone number), or (email address). I ask that you notify me of any duplication costs exceeding $10 before you duplicate the records so that I may decide which records I want copied.

Thank you for your time and attention to this matter.

Sincerely,

s/_____

Vince Vasquez
Senior Policy Analyst
National University System Institute for Policy Research

APPENDIX C:
SCHOOL DISTRICTS THAT PROVIDED COMPLETE SCHOOL CONSTRUCTION DATA

Alpine Union School District

Alta Loma School District

Alvord Unified School District

Anaheim City School District

Anaheim Union High School District

Antelope Valley Joint Union High School District

Antioch Unified School District

Arvin Union Elementary School District

Barstow Unified School District

Beardsley School District

Beaumont Unified School District

Bellevue Union Elementary School District

Beverly Hills Unified School District

Buckeye Union Elementary School District

Burbank Unified School District

Burton School District

Cabrillo Unified School District

Cajon Valley Union School District

Calexico Unified School District

Capistrano Unified School District

Center Unified School District

Chaffey Joint Union High School District

Chowchilla Elementary School District

Chula Vista Elementary School District

Coachella Valley Unified School District

Coalinga/Huron Joint Unified School District

Columbia Elementary School District

Conejo Valley Unified School District

Corona Norco Unified School District

Cottonwood Union Elementary School District

Cutler-Orosi Unified School District

Davis Joint Unified School District

Delano Joint Union High School District

Delano Union School District

Delhi Unified School District

Denair Unified School District

Desert Sands Unified School District

Downey Unified School District

Dry Creek Joint Elementary School District

Dublin Unified School District

East Side Union High School District

El Dorado Union High School District

Elk Grove Unified School District

Escondido Union High School District

Escondido Union School District

Etiwanda School District

Evergreen Elementary School District

Fairfield-Suisun Unified School District

Fallbrook Union Elementary School District

Fallbrook Union High School District

Farmersville Unified School District

Folsom Cordova Unified School District

Fowler Unified School District

Fresno Unified School District

Gilroy Unified School District

Golden Valley Unified School Dist

Greenfield Union School District

Hanford Elementary School District

Hanford Joint Union High School District

Hemet Unified School District

Hesperia Unified School District

Hillsborough City Unified School District

Huntington Beach City School District

Imperial County Office of Education

Imperial Unified School District

Irvine Unified School District

Jefferson School District

Kern County Superintendent of Schools

Kern High School District

King City Joint Union High School District

Kings Canyon Unified School District

Kingsburg Joint Union Elementary School District

Lake Elsinore Unified School District

Lammersville School District

Lancaster Elementary School District

Las Virgines Unified School District

Lawndale School District

Lemoore Union Elementary School District

Lennox School District

Liberty Union High School District

Long Beach Unified School District

Los Alamitos Unified School District

Los Angeles Unified School District

Los Banos Unified School District

Lucia Mar Unified School District

Madera Unified School District

Mammoth Unified School District

Manteca Unified School District

Marysville Joint Unified School District

Menifee Union School District

Merced City School District

Merced Union High School District

Milpitas Unified School District

Modesto City School District

Mojave Unified School District

Moreno Valley Unified School District

Morgan Hill Unified School District

Mountain View/Los Altos Union High School District

Murrieta Valley Unified School District

Natomas Unified School District

New Haven Unified School District

Newhall School District

Newport Mesa Unified School District

Norris School District

Norwalk La Mirada Unified School District

Oakdale Joint Unified School District

Oakland Unified School District

Oceanside Unified School District

Ontario Montclair School District

Oxnard School District

Pajaro Valley Unified School District

Palm Springs Unified School District

Palo Alto Unified School District

Palos Verdes Peninsula Unified School District

Panama Buena Vista Union School District

Paramount Unified School District

Paso Robles Joint Unified School District

Petaluma Joint Union High School District

Pioneer Union School District

Pittsburg Unified School District

Placentia-Yorba Linda Unified School District

Pleasant Valley School District

Plumas Elementary School District

Poway Unified School District

Redlands Unified School District

Reed Union School District

Rescue Union School District

Richland Unified School District

Rio School District

Ripon Unified School District

Riverbank Unified School District

Rocklin Unified School District

Rosedale Union Elementary School District

Roseville City Elementary School District

Roseville Joint Union High School District

Sacramento City Unified School District

Saddleback Valley Unified School District

Saint Helena Unified School District

Salida Elementary School District

Salinas Union High School District

San Bernardino County Superintendent of Schools

San Diego Unified School District

San Dieguito Union High School District

San Francisco Unified School District

San Jacinto Unified School District

San Leandro Unified School District

San Mateo Union High School District

San Ysidro School District

Sanger Unified School District

Santa Ana Unified School District

Santa Clara Unified School District

Santa Maria Joint Union High School District

Santee School District

Silver Valley Unified School District

Simi Valley Unified School District

Snowline Joint Unified School District

Solana Beach School District

Stockton Unified School District

Sulphur Springs Unified School District

Sweetwater Union High School District

Tehachapi Unified School District

Temecula Valley Unified School District

Tracy Unified School District

Tulare City Elementary School District

Tulare Joint Union High School District

Turlock Joint Union High/Elementary School District

Twin Rivers Unified School District

Ukiah Unified School District

Vallejo City Unified School District

Valley Center-Pauma Unified School District

Vista Unified School District

Wasco Union Elementary School District

Waterford School District

Weaver Union School District

West Contra Costa Unified School District

Western Placer Unified School District

Westside Union School District

Wiseburn School District

Yuba City Unified School District

Yucaipa-Calimesa Joint Unified School District

APPENDIX D:
SUPPLEMENTAL RESEARCH ON CALIFORNIA PROJECT LABOR AGREEMENTS

During the course of this project, NUSIPR was able to identify common provisions across California school construction PLAs.[43] A comparative analysis reveals many similarities. Most of the PLAs that were reviewed require construction firms to become signatories to master collective bargaining agreements (CBAs) with all applicable craft unions. Generally speaking, CBAs are detailed documents that identify the terms of employment and working conditions of unionized workers in a particular trade or industry. The majority of PLAs also require all subcontractors to sign both PLAs and CBAs prior to the start of construction.

Seven PLAs absolutely prohibit labor unions from strikes, work stoppages, picketing, and slowdowns of any kind at the worksite. However, five allow unions to withhold workers from contractors that are delinquent on payments to union trust funds. Similarly, seven PLAs prohibit contractors from conducting employee lockouts of any kind, but five make exceptions for laying off, suspending, and terminating employees in cases wholly unrelated to labor disputes.

Almost all (92 percent) PLAs required contractors to source workers from union halls, but with exceptions. The overwhelming majority allow firms to obtain workers from any source if union hiring halls are unable to provide workers within a forty-eight hour period. 100 percent of PLAs require construction workers to pay union dues.

All PLAs include language that suggests that contractors retain the exclusive authority, or responsibility for project operations; however, most contain strong restrictions on management rights. Less than half explicitly state that contractors can hire supervisors, apprentices, foremen, and subcontractors at their own discretion.

All of the PLAs restrict a contractor's ability to hire their own "core employees." Usually this is done by restricting who a contractor can classify as a core employee and when they can be employed (if at all) in a way that bypasses the union hall hiring queue.[44] Eight out of 12 PLAs do not allow contractors to discharge at-will employees — most require contractors to have just cause for doing so, or grant workers additional rights under a craft agreement. Seven out of 12 also do not allow contractors to discipline employees at will. All but one reviewed PLA required contractors to make supplemental contributions into separate union-controlled benefit trusts.

CHART 8: Major Provisions of California School PLAs
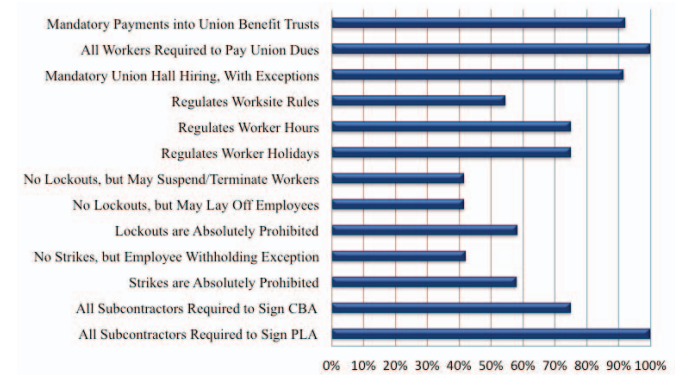
CHART 9: Management Rights Under California School PLAs
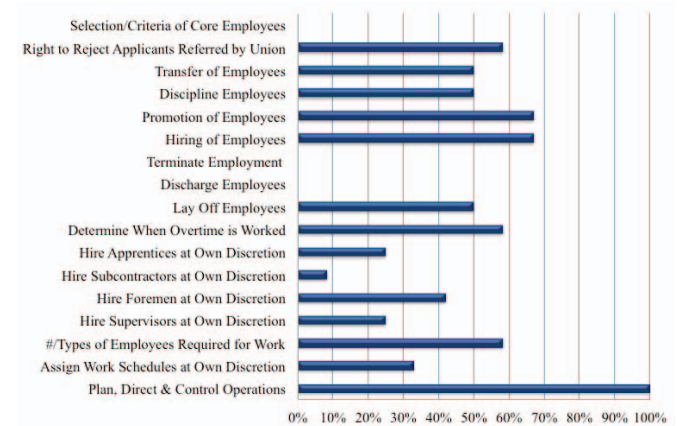
APPENDIX E:
NOTES BY THE AUTHORS

There are important aspects of NUSIPR's research efforts that deserve greater elaboration, which we do here.

WAGE RATES AS A NEUTRAL FACTOR

Unlike many states, the State of California requires contractors to pay state-mandated construction wage rates (known as "prevailing wages") to their construction trade workers on school construction projects.[45] Prevailing wage rates in California are almost always based on the wage rates and benefit payments indicated in collective bargaining agreements for construction trade unions. As a result, all contractors on the school construction projects researched in this study were paying a common wage rate for each specific trade in a defined geographic region, regardless of whether the contractors were signatory to a PLA or signatory to a union collective bargaining agreement for their employees. In addition, school districts using state funding for construction from the statewide bond measure Proposition 47 (approved by voters in 2002) were required to adopt a labor compliance program to ensure that contractors were paying proper wage rates and abiding by the state's other labor laws. We can assume that these conditions effectively neutralize wage rates as a variable and conclude that the difference in project cost between projects with a PLA and projects without a PLA was not due to differences in wage rates for construction trade workers.

GEOGRAPHIC DISTRIBUTION OF THE PROJECTS

To eliminate selection bias, our data sample sourced school construction projects at random. Nonetheless, 60 percent of the projects were built in districts located in the five highly populous counties located at the southern end of the state. These five counties comprise 54 percent of the population. Another 33 percent of the projects were built in districts located in the Central Valley, which was among the fastest growing parts of the state between 2000 and 2010.[46]

ENDNOTES:

1   The Building & Construction Trades Department's website says, "Critics of PLAs frequently claim that PLAs limit the pool of bidders . . . particularly non-union contractors . . . and as a result construction costs for a given project are higher. This is a fallacy that has been refuted through the work of many academic researchers . . . A similar public relations attack on project labor agreements that is frequently used by the open shop leads people to believe that the use of a higher-skill, and better paid, workforce will result in increased costs." See http://www.plaswork.org/CWA/media/Documents/PLA-PowerPoint.ppt. The Associated Builders and Contractors' website says, "PLAs drive up the cost of construction projects. By unnecessarily limiting bidders and following outdated and inefficient union work rules, PLAs consistently and unnecessarily drive up costs on projects. Numerous academic studies indicate PLAs increase the cost of construction between 10 percent and 20 percent when compared to similar projects not subject to union-only PLAs." See http://www.thetruthaboutplas.com/get-the-truth.

2   Benefits include increasing the number of apprentices entering into construction trades and increasing the level of health and retirement benefits available to construction workers. For a vigorous articulation of these supposed benefits, see Fred Kotler, "Project Labor Agreements in New York State: In the Public Interest," New York: Cornell University, 2009, http://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?article=1021&context=reports.

3   Alternate names for PLAs include Project Stabilization Agreements and Community Workforce Agreements.

4   Some PLAs have special exemptions for a small number of long-term "core" contractor employees.

5   Detailed arguments of PLA proponents can be found at the PLAs WORK website, a project of the Building & Construction Trades Department. See http://www.plaswork.org/Impact/Contractors-Owners-Developers-and-Construction-Use/Contractors,-Owners,-Developers---Construction-Use.aspx.

6   Gary Scott, "Power Plant Costs to Soar," *Pasadena Star-News*, March 21, 2003.

7   Phillip Matier and Andrew Ross, "School's Costs Skyrocket after Labor Pact," *San Francisco Chronicle*, April 28, 2004.

8   Daniel Rounds, "Project Labor Agreements: An Exploratory Study," Los Angeles: UCLA, 2001.

9   New Jersey Department of Labor, "Annual Report to the Governor and Legislature: Use of Project Labor Agreements in Public Works Building Projects in Fiscal Year 2008," Trenton: State of New Jersey, 2010, pp. 3–4, http://lwd.dol.state.nj.us/labor/forms_pdfs/legal/2010/PLAReportOct2010.pdf.

10 Paul Bachman et al., "Project Labor Agreements and the Cost of School Construction in Massachusetts," Boston: Beacon Hill Institute, 2003, http://www.beaconhill.org/BHIStudies/PLApolicystudy12903.pdf.

11 Paul Bachman, Jonathan Haughton, and David G. Tuerck, "Project Labor Agreements and the Cost of Public School Construction Projects in Connecticut," Boston: Beacon Hill Institute, 2004, http://www.beaconhill.org/bhistudies/pla2004/plainct23nov2004.pdf.

12 Paul Bachman and David G. Tuerck, "Project Labor Agreements and Public Construction Costs in New York State," Boston: Beacon Hill Institute, 2006, http://www.beaconhill.org/BHIStudies/PLA2006/NYPLAReport0605.pdf.

13 Dale Belman et al., "The Effect of Project Labor Agreements on the Cost of School Construction," East Lansing: Michigan State University, 2005, http://isapapers.pitt.edu/57/1/2005-01_Belman.pdf.

14 Variables in the Belman study included minutia such as the presence/absence of tennis courts, band rooms, kitchens, and science labs.

15 Belman et al., "Effect of Project Labor Agreements," p. 3.

16 Ibid., p. 20.

17 Paul Bachman and Jonathan Haughton. "Do Project Labor Agreements Raise Construction Costs?" *Case Studies in Business, Industry and Government Statistics* 1, no. 1 (2006): 78.

18 Dale Belman et al., "Project Labor Agreements' Effect on School Construction Costs in Massachusetts," *Industrial Relations* 49, no. 1 (2010): 44–60.

19 Statistical tests used include three F-test models that examined the relationship between the construction cost per square foot and the effect of PLAs, the city of Boston, and the Boston Public School District. A two-stage propensity score technique was also used to analyze projects that, but for the presence/non-presence of a PLA, are fairly similar. Under this technique, projects were rated based on the probability that their characteristics could predict that they would be built under a PLA, and the resulting "region of common support" was to be examined with a regression test. However, Belman et al. did not complete its propensity score technique, as it failed to find many similar projects.

20 Belman et al., "Effect on School Construction Costs in Massachusetts," p. 57.

21 The Roseville PLA was for three unions in four subtrades and was directly signed with a private developer.

22 As noted below, a remaining limitation which we cannot overcome involves the large number of PLAs in Los Angeles Unified, a district that has had a PLA in place for much longer than other districts and, as one of the nation's largest school districts, has built a large number of schools.

23 The DSA website states, "The Division of the State Architect provides design and construction oversight for K–12 schools, community colleges, and various other state-owned and leased facilities. The Division also develops accessibility, structural safety, fire and life safety, and historical building codes and standards utilized in various public and private buildings throughout the state of California." www.dsa.dgs.ca.gov

24 For example, in Belman (2003), the authors found that the presence of a centralized air conditioner had a statistically significant impact on construction costs. We collected information on this variable, but found that all but one school project in our sample had air conditioning.

25 Bachman et al. noted that their sample size limit excluded abnormally small and larger projects as well as those projects whose valuation is "typically too small to be of interest to union contractors." NUSIPR adopted the same square footage range for project size within its sample in order to achieve similar objectives.

26   NUSIPR's final sample varied slightly from the initial bid estimates given by McGraw Hill. Of the 551 construction projects, 12 were modernization projects, five were built either before 1996 or after 2008, 52 were smaller than 40,000 square feet, and two cost less than $5 million.

27   California Government Code § 6250–6276.48.

28   The language used in the public records requests can be found in appendix B.

29   The California Division of the State Architect's online Project Tracking System is available at https://www.apps.dgs.ca.gov/tracker/default.aspx.

30   The California Construction Cost Index (CCCI) is developed from data featured in the Building Cost Index (BCI) published by Engineering News-Record (ENR). BCI estimates include costs for skilled industry labor, average fringe rates, and the cost of common construction materials.

31   Bachman created a construction cost index using state industry wage and salary data from the U.S. Bureau of Economic Analysis and the national producer price index for intermediate materials, supplies, and components. Belman deflated costs using ENR's construction cost index for Boston.

32   The complete list of complying school districts can be found in Appendix C.

33   The Belman study used a sample size of 92 school projects, and Beacon Hill's sample size was 126 projects.

34   The ordinary least squares method is a statistical technique used to analyze the relationship between a continuous dependent variable and categorical (or continuous) independent variables. It minimizes the "error," or the difference between the predicted outcome and the actual outcome, and optimizes the solution.

35   Both the Bachman et al. and Belman et al. regression tests included square feet squared as a co-variate. However, NUSIPR found that this co-variate did not substantively modify the model fit and declined to include it.

36   The sample used in the Bachman et al. study had an adjusted r-squared of 31 percent. The six models used in the Belman study to study Massachusetts school construction costs had an r-squared range of 19.79 percent to 65.12 percent.

37   For more on Belmont Learning Center see Alan Richard, "L.A. Chief Recommends Abandoning Belmont," *Education Week*, January 26, 2000, and Greg Gittrich, "Most of the Bond Money Blown on Belmont," *Los Angeles Daily News*, July 30, 1999.

38   NUSIPR took additional efforts to resolve the collinearity found in our data set. Following the methodology explained in the Belman 2010 study, we created a two-step scoring technique. We first used a logistic model, rating projects based on the probability that their characteristics could predict that they would be built under a PLA. Unlike Belman et al., we were able to identify a region of common support, matching 65 PLA projects with 65 non-PLA projects that, but for the absence of a Project Labor Agreement, are similar with respect to other project characteristics, such as the use of demolition and total square footage. Two subsequent regression tests (one which had the predicted score as an independent variable and one that excluded it) for the n=130 data set used the ordinary least squares method. These tests failed to find PLAs

to be statistically significant. However, a one-way ANOVA test on the sub-sample did find PLAs to be statistically significant. This tells us that though there is evidence that PLAs are associated with higher project costs, collinearity is still present in the data set, hindering further analysis. Interestingly, within our sub-sample, we found the average CCI adjusted cost per square foot of non-PLA projects to be $244.69, still significantly lower than the cost of PLA projects ($302.98/per square foot).

39   According to the Public Policy Institute of California, "Local facilities bonds totaling $36 billion have passed since 2001, and state facilities bonds totaling $28.7 billion have passed since 2002." See "Just the Facts: Education Facilities," September 2008, http://www.ppic.org/content/pubs/jtf/JTF_EducationFacilitiesJTF.pdf.

40   United States Census Bureau, Public Education Finances 2008, table 9, "Capital Outlay and Other Expenditure of Public School Systems by State: 2007–08," Washington, D.C., 2010, http://www2.census.gov/govs/school/07f33pub.pdf.

41   "California Department of Education Closes Out 2010 Noting Record of Accomplishment by State Superintendent Jack O'Connell," California Department of Education, December 28, 2010, http://www.cde.ca.gov/nr/ne/yr10/yr10rel150.asp.

42   National Clearinghouse for Educational Facilities, "State Capital Spending on PK–12 School Facilities," Washington, D.C., 2010, p. 4, http://www.edfacilities.org/pubs/state_capital_spending_on_school_facilities.pdf.

43   NUSIPR obtained PLAs for the following school districts: San Francisco Unified, San Diego Unified, Los Angeles Unified, Oakland Unified, Sacramento City Unified, Pittsburg Unified, West Contra Costa Unified, Rialto Unified, Santa Ana Unified, San Mateo Union High School District, San Gabriel Unified, and Roseville City School District. In some cases, the PLAs were silent as to provisions we examined, or were not explicit in the language of the contract. In other cases, the provisions were referenced as being present within a CBA, which the PLA requires all signatories to assent to. Our charts reflect these aspects of the PLAs.

44   For example, see the provisions of the Project Labor Agreement for the Oakland Unified School District, 2004, p. 19.

45   According to the United States Department of Labor, eighteen states do not have prevailing wage laws: Alabama, Arizona, Colorado, Florida, Georgia, Idaho, Iowa, Kansas, Louisiana, Mississippi, New Hampshire, North Carolina, North Dakota, Oklahoma, South Carolina, South Dakota, Utah, and Virginia. See "Dollar Threshold Amount for Contract Coverage Under State Prevailing Wage Laws," n. 1, http://www.dol.gov/whd/state/dollar.htm.

46   United States Census Bureau, table 1, "The Most Populous Counties and Incorporated Places in 2010 in California: 2000 and 2010," http://2010.census.gov/news/xls/cb11cn68_ca_2010redistr.xls.

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