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PREVAILING WAGE REGULATIONS AND SCHOOL CONSTRUCTION COSTS: EVIDENCE FROM BRITISH COLUMBIA

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The stock of public school buildings constructed during the baby boom is aging along with that generation of Americans. Soon much of this building stock will have to be replaced.[1] The financing of this rebuilding of America's schools is an emergent political issue of considerable importance. Given these pressures on school construction financing, any proposal that promises to substantially lower the price tag for this reconstruction garners considerable public interest and potential support. One such proposal is the elimination of prevailing wage regulations that in 31 states and the District of Columbia govern the payment of wage rates on public school construction.[2] Prevailing wage laws require that state mandated wage rates be paid on public road and building construction. The purpose of these laws is to encourage collective bargaining in construction and to discourage the payment on public works of wages below those prevailing locally. Critics of prevailing wage laws assert that these laws raise public construction costs and discourage nonunion contractors from bidding on public works.

Some politicians and school officials believe that the elimination of prevailing wage regulations could cut public school construction costs by 10 to 40 percent. For instance, Gary Johnson, the Governor of New Mexico, in his 1997 address to the New Mexico state legislature foretold a 33 percent reduction in total state school construction costs from the elimination of the state's prevailing wage law.[3] In Ohio in 1997 the state legislature held hearings on the possible elimination of prevailing wage regulations for school construction. School officials foresaw substantial cost savings from such an exemption. For instance, Rick Savors, Deputy Director of Legislative Networks for the Ohio School Boards Association (OSBA) testified that

> The OSBA believes that the state's current prevailing wage law adds significant costs to a project and limits the number of contractors willing to offer bids on school contracts…The cost savings for districts, taxpayers and the state can be significant…those savings could reach perhaps as high as 30-40 percent in some instances.[4]

In the same hearings, Richard Maxwell, Deputy Executive Director for Government Relations for the Buckeye Association of School Administrators (BASA) testified:

> BASA supports the exclusion of the prevailing wage provision for school construction and facility improvements. This exclusion will benefit Ohio's schools by extending the scarce taxpayer's dollars to improve facilities. As a superintendent of schools for 23 years in districts I managed many school buildings built in 1912 through 1964. We had an extensive program of renovation and improvement of these buildings…BASA members tell us they believe they can do 10-15 percent more construction and renovation if the prevailing wage provisions did not apply to school construction and renovations.[5]

The primary basis for asserting that the elimination of prevailing wage regulations on school construction will substantially lower total school construction costs is the proposition that absent these regulations, wage rates on school construction would be substantially lower. In consideration of Ohio Senate Bill 102, Jim Shirey, Legislative Liaison for the Athens Ohio City Schools Board of Education made this argument explicit.

> "Prevailing Wage" is *nothing less* than price fixing perpetrated by state government. Prevailing Wage sets the price of construction labor at union scale, *regardless* if the local labor market. One of the contractors who testified on this bill before the Senate Finance Committee did a study of *actual* construction costs and he showed *very clearly* that Prevailing Wage can inflate the cost of construction labor by as much as 60 percent.[6]

There are no academic studies on the relationship between prevailing wage regulations and school construction costs. This paper attempts to inform the ongoing debate over the impact of the prevailing wage laws on school construction costs by using a unique dataset from Canada. Wages including benefits constitute about 30 percent of the total construction cost, excluding land acquisition and architectural costs.[7] The province of British Columbia (B.C.) established the Skill Development and Fair Wage Policy (SDFWP) on March 30, 1992. It mandated payment of the prevailing wage on public construction projects and determined "fair" wage schedules for each occupation within the building trades. The fair wage was set at about 90 percent of the collectively bargained wage rate for each construction occupation in B.C. The B.C. experiment with prevailing wages provides a new opportunity to make an empirical assessment of the debated question of whether or not prevailing wage regulations measurably increase school construction costs. The objective of this paper is to compare final construction costs before and after the SDFWP was implemented in order to determine whether legislated wages resulted in higher school construction cost in British Columbia. For this purpose we will use final cost data from new elementary and secondary public school construction projects from six school districts in B.C. tendered between 1989 and 1995.

The paper is organized as follows. Section 1 presents a brief review of the empirical studies on the impact of the prevailing wage laws on public construction, and states the contribution of this paper to that literature. Section 2 describes the data. Section 3 presents an empirical model to test for the impact of the SDFWP. The model is estimated and results are discussed in section 4. Section 5 concludes.

1. The Literature

In this section we will first outline the general features of the debate over the prevailing wage laws. In the last part of the section we will outline the specific findings concerning school construction.

The literature on the construction cost impact of prevailing wage laws focuses almost exclusively on the U.S. federal Davis Bacon Act. With one exception, the Davis-Bacon literature estimates cost savings from the elimination of the federal regulation to range from 1 to 3 percent of total federal construction costs. The one exception estimates a 26 percent savings in rural building construction from the elimination of federal prevailing wage regulations.

Because the Davis Bacon Act was passed in 1931, there is no possibility of comparing the cost of construction prior to and subsequent to the passage of this act. This leaves three avenues of research. The first estimates what wage rates would be paid on federal construction absent prevailing wage regulations and then tries to compute what total costs would be under two wage rate regimes. The second exploits a moment of time in 1971 when the Davis Bacon act was suspended for 34 days. The last compares the cost of construction on public works with comparable private construction projects.

The first and most common method in the literature tries to assess what wage rates would be paid on federal construction absent Davis-Bacon. With this calculation in hand, these studies then attempt to estimate theoretically what construction costs would be under these hypothetical wage rates. Finally, these studies then attempt to compare hypothetical construction costs under hypothetical wage payments. As expected, this line of research is fraught with debates over the methodology.

Most studies of this type conclude that the Davis-Bacon wage rate is biased upwards toward the union wage, and consequently predict that Davis Bacon raises the cost of construction.[8] The estimated cost inflation attributable to this wage differential is in the order of 1.5 to 3 percent of public construction expenditure (Gujarati, 1967; GAO, 1979, 1983; Goldfarb and Morrall, 1978, 1981; Gould, 1971; Gould and Bittlingmayer, 1980; GAO, 1979, 1983; Thieblot, 1986). On the other hand, Bourdon and Levitt (1980) found no such bias, and Allen (1983) argued that the Davis-Bacon effect is modest, raising construction costs merely by 0.3 to 0.4 percent.

Thieblot (1975) adopted a second, more direct approach by taking advantage of President Nixon's temporary suspension of the Davis-Bacon in 1971. Thieblot compared bid prices of projects tendered but not contracted in this period with their rebid prices in the following period. He concluded that in the absence of Davis-Bacon the lowest bid were lower by 0.63 percent. Thieblot's re-examination of the data leads him to the conclusion that savings, including administration and wage costs, would be as much as 4.74 percent if the Davis-Bacon were repealed (Thieblot, 1986, 105-106).

Fraundorf *et al*. (1983), followed a third methodology. They utilized multivariate methods to determine the impact of prevailing wage laws on construction costs directly. Fraundorf *et al*. compared 215 federal and private non-residential construction projects controlling for non-labor cost factors (such as the type of structure, technical characteristics, size, and geographic location). They found that federal projects were 26 percent more expensive than the private projects, and attributed this difference to the Federal Davis-Bacon Act.

The Fraundorf result is substantially higher than previous studies and may be the academic basis for claims by school officials that total construction costs can be cut by 10 to 40 percent through the elimination of prevailing wage regulations. However, the Fraundorf study has two weaknesses that the present study overcomes. First, the Fraundorf study is not a study of school construction costs. It may be that school construction is distinct from rural building construction. Second, the Fraundorf study derives its projected cost savings from a comparison of public building costs to private building costs. If private buildings differ from public buildings in ways that are not adequately controlled for, this may conflate cost differences derived from public-private building differences with cost differences derived from prevailing wage regulations. Our study attempts to overcome these potentially confounding factors by focusing only on public school construction.

Because state and provincial prevailing wage regulations differ in their specifications and implementations, and school construction is regulated at the state and provincial level, a variety of case studies are needed. Our study is limited to assessing the effect of one prevailing wage law in one province at one particular period of time.

2. The Data

The recent experience of B.C. with the SDFWP permits an assessment of the impact of wage regulation on us the school construction cost by controlling for many factors that confounded the results of the studies mentioned above. The empirical analysis of this paper is based on tender data compiled by the Construction Labour Relations Association of B.C. from six school districts (out of 18) for a study of the impact of the SDFWP on construction costs (Government of Canada, 1997). These school districts are all located in the southern Lower mainland education region of B.C. and are geographically in close proximity. The data cover 54 new school construction projects tendered and completed between 1989 and 1995. Of the 54 tenders, 25 were received before March 31, 1992 and 29 were received afterwards, allowing the comparison of costs before and after the establishment of the SDFWP. All projects cost more than $250,000[9] and were therefore covered by the Fair Wage Policy during the period it was in effect. In addition to the final cost, the raw data also provide information on the list of bidders and bid prices for all projects, the contract price, the type of school (elementary or secondary), and structural characteristics of projects, including gross area, construction type, foundations, and special features (e.g. remote location, difficult site). For many projects estimated and/or actual durations of construction are available. Thus, while the number of observations is relatively small, the data have the advantage of being appropriately detailed. In addition, we also collected information on the size of the general contractors to whom the contract was awarded.

Table 1 summarizes the distribution of school types across the two periods. The number and the type of schools are distributed approximately evenly across the two periods. Gross sizes of elementary schools range from 2,017 to 3,950 square-meters, while secondary school gross sizes range from 6,033 to 15,787 square-meters.

Table 2 reports summary statistics for the unit (square-meter) final cost (in 1989 prices). The average unit cost is $1,423 but there is a significant difference between the pre- and post-SDFWP periods. After the establishment of the Policy, the average unit final cost increases by $207, from $1,308 to $1,515. This 16 percent difference, which is statistically significant at the one percent level suggests that the SDFWP constitutes a serious burden on the public purse.

In the next section, we will address this question in a multi-variate context controlling for other potentially relevant factors that may impinge on the unit cost of construction.

3. The Empirical Model

The cost of construction, by definition, is equal to the sum of the bid price and change orders. The unit bid price, in turn, is equal to the sum of the estimated cost of production and the profit margin. Let *FP* stand for the unit final price, *m* be the mark-up rate, and *CO* be the total change orders cost, the latter including the mark-up on change orders.[10] Estimated total cost of construction, in turn, can be written as the sum of labor and non-labor costs. Letting *w* and *n* stand for the prices of labor and non-labor inputs, and *L* and *N* stand for the quantities of labor and non-labor inputs, the final cost can be written as:

$$FP = (1+m)(wL + nN) + CO. \qquad (1)$$

This equation is the basis of the empirical model to be used in predicting the cost of construction. Four sets of factors that potentially affect the independent variables are the physical features of the project, state of the construction business cycle and the degree of competition among contractors, regulatory environment in the labor market, and characteristics of the contractor.

Physical features of the project (including the size, the type of foundation and frame, location, number of stories, type of school) influence the quantity and the type of inputs.

Fraundorf *et al*., controlled for technical characteristics such as foundation, frame, exterior walls, floor finishing, and frame type. In our sample there is little, if any, variation in technical characteristics for which information is available. Structural specifications of all projects were reported in the cost estimation forms prepared by the architect prior to bidding. Almost all schools are steel frame structures with slab on grade foundation. The type of school -- elementary vs. secondary -- summarizes most of the other technical differences. Secondary schools are larger than elementary and require approximately twice as long to build. If there exist economies of scale to size or longer construction period, secondary schools are expected to have lower unit costs. Finally, secondary schools are more likely to include higher unit cost structures (e.g. laboratories) on the one hand, lower cost areas such as sports fields, on the other.[11] These considerations make it difficult to form an expectation on how the school type would affect the unit cost. In order to control for these technical features we introduce a dummy variable that takes the value of one for secondary schools and zero for the elementary. We also utilize dummies for school districts to control for any potential location effects.

Input prices vary with the state of the economy, reflecting relative abundance of the labor, capital and intermediate goods. Hence the unit cost is expected to be pro-cyclical. The impact of the cycle on the mark-up is indeterminate. During the expansion of the economic activity, for instance, the firm may raise the profit margins taking advantage of rising demand. It is also conceivable that the firm shaves the mark-up in order to protect its market share from potential entrants attracted to the industry. In order to capture the construction industry business cycle effects we fitted a linear annual trend to the values of non-residential building permits (in constant prices) over the 1989-1995 period by ordinary least squares. We then measured the cyclical fluctuation in the construction sector activity as the percentage deviations of actual values of permits from the trend values. It should be borne in mind that this measurement of the cycle based on the annual experience of only seven year is crude. Quarterly data would probably yield a more precise profile of the cycles, but they are not yet available.

The immediate effect of the SDFWP on the construction cost is via the wage rate. If the legislated wage is higher than the market wage, then labor costs increase. This anticipation is the basis of most of the empirical studies on the cost effect of the prevailing wage laws. It should be kept in mind that this cost effect would be tempered by substitution between different qualities of labor as well as between labor and capital. Total cost is not expected to rise proportionately because contractors facing higher labor costs would alter techniques of production, employing more capital and skilled labor intensive techniques.

In addition, the SDFWP may also affect the final cost by changing the type of uncertainty facing the bidders. Assuming that there is a monotonic relationship between the accepted bid price and the final cost of construction, the final cost would be influenced by the degree of competition because each contractor takes into consideration the number of bidders its competing against in determining the mark-up. The auction theory predicts that if the "independent private values" model applies then bidders lower their mark-ups in the face of higher competition in order to maximize their chances of winning the contract.[12] This "competition effect" implies that the mark-up and the bid price are inversely related to the number of bidders. When the "common values" model applies, however, bidders would be subject to the so-called "winner's curse." The winner's curse refers to the fact that in a first-price sealed-bid auction, although expected value of each bidder's bid is unbiased, the winning bid will be biased downward, or that the winner is the one who underestimated the construction cost the most. Consequently, the winner is likely to make less than anticipated profits or may even lose money (Thaler, 1988). Since rational bidders do not make consistent errors, the optimum bidding requires experienced bidders protect themselves from the winner's curse by adding a surcharge to the estimated cost. Optimal behavior under the common values model requires this surcharge to rise with the number of competing bidders, offsetting the competition effect. To the extent that the SDFWP reduces uncertainty over labor costs, the relationship between the bid price and the degree of competition measured in terms of the number of bidders would change from more to less positive or from less to more negative following the implementation of the Law. In the extreme case where introduction of the law results in a switch from common to private values model, the degree of competition would influence bid prices positively before the passage of the Law and negatively afterwards. Bilginsoy (1999) uses the B.C school tender data of the projects considered in this paper to provide evidence for such a switch in the response of bid prices to the degree of competition.

The cost of construction also depends on the capital stock and capacity utilization of the contractor. If there are economies of scale associated with larger size, final cost should decline with the size of the firm. If the contractor faces diminishing returns as it approaches full capacity, final cost would increase. Ideally, one should be able to control for the capital and the level of activity separately, but the data do not allow this. Instead, it is possible to build a dataset for the "size" of the contractor, defined as the average annual volume of sales. The obvious shortcoming of this variable is that it cannot distinguish between the capital stock and capacity utilization, and therefore its impact on the final cost is indeterminate. In the absence of data that can make finer distinctions, we used this as a proxy to control for the firm characteristics. We constructed data series on size from the *Canadata* database and the *Journal of Commerce*'s "Substantial Performers" and "Leaders" reports of the leading contractors for 1992, 1995 and 1996.[13]

Theory suggests little about determinants of change orders. There is some evidence indicating that cost overruns may be directly related to the size of the project, and that the cost overrun is more likely if the bid is below the owner's estimate (Jahren and Ashe, 1990). Although it is possible to control for the area of the school, data on owner's pre-tender estimate are far from complete in our sample and therefore not included as an explanatory variable. There may be a direct link between change orders and the SDFWP, however. Dyer and Kagel (1996, p.1470) identify negotiations over the change orders one method whereby a contractor who has underbid may recoup his/her losses. If we follow this argument, change orders are expected to be higher in the SDFWP period when contractors are more likely to be victims of the winner's curse. We calculated the change orders for the projects in the data set as a percentage of the accepted bid price. For all the projects in the dataset, the average change order was 2.08 percent of the lowest bid price. For the pre- and post-SDFWP periods, however, the mean values of change orders were 2.54 and 1.68 percent, respectively. The difference in means is statistically significant at the 10 percent level, providing some evidence for the hypothesis that change orders declined after the establishment of the Policy. Hence it may be hypothesized that the SDFWP affects the final cost directly by lowering the final unit cost.

Finally, the final cost of construction may change gradually over time for reasons other than those listed above. Such factors may include technological changes which raise productivity and lower cost over time, improving methods of cost estimation, gradual specification changes in construction,[14] or adjustment process of contractors to the new legal regime. In order to capture the effect of these gradual changes we add a monthly time index starting in January 1989 to the explanatory variables. Since it is impossible to distinguish between the separate effects of these secular factors on this monthly time trend we do not have any priors on the direction of its impact on the final cost.

The project size was excluded from the final regression equation because it was highly correlated with the school type and therefore introduced collinearity problems. The estimated regression equation is then:

$$\begin{aligned} ln(Final\ Cost) = \boldsymbol{b}_0 &+ \boldsymbol{b}_1 Secondary\ school + \boldsymbol{b}_2 Construction\ cycle \\ &+ \boldsymbol{b}_3 (1/Number\ of\ bidders) + \boldsymbol{b}_{4i} Contractor\ size_i \\ &+ \boldsymbol{b}_5 Time + \boldsymbol{b}_{6j} District_j + \boldsymbol{h}. \qquad (2) \end{aligned}$$

Final Cost is the square-meter final cost of construction deflated by the non-residential construction price index, *Number of bidders* is the number of bidders per tender, *Contractor size* is a vector of dummy variables for contractor size categories (indexed by *i*), *Time* is the monthly time trend starting in January 1989, and *District* is a vector of dummy variables for the six school districts (indexed by *j*). $\boldsymbol{h}$ is the error term.

4. Estimation

We estimated regression equation (2) for the whole period, as well as the pre- and post-SDFWP periods by the ordinary least squares method. This method not only shows how the SDFWP affected the final cost controlling for these variables, but also if and how the response of the final cost to these variables were altered after the establishment of the Policy. In estimation, contractor size turned out to be statistically insignificant in all regressions and, given degree of freedom constraints, we decided to exclude these from the final regressions results reported on Table 3.

Table 3 reports the parameter estimates of equation (2) for two specifications of the model. In the first specification, reported by columns (1) to (3) the time index is omitted. In column (1) the regression is run over the complete sample. According to the adjusted R2 of column (1) the equation explains 33 percent of the total variation of the variation in unit final costs for the whole sample Columns (2) and (3) apply the equation separately to the pre- and post-SDFWP sub-periods. We tested the hypothesis that the coefficients of explanatory variables are equal across the two sub-periods. This test yielded the F-value of 5.73, which is statistically significant at the one percent level. Rejection of the hypothesis of stability of coefficients across the periods indicates that it is inappropriate to pool the pre- and post-SDFWP periods in estimating the final cost regression equation.

Indeed the explanatory power of the regression increases significantly once the sample is divided on the basis of the legal regime. Adjusted coefficients of determination reported in columns (2) and (3) are 0.55 and 0.48, substantially higher than what is found in the case of the full sample. According to the second column of Table 3, before the establishment of the Policy, secondary school unit cost was on average 14.4 percent higher than that of the elementary schools. The negative coefficient of *Construction cycle* indicates countercyclical behavior for final cost but the parameter estimate is not statistically significantly different from zero. The final cost increases with the number of bidders for the project and this result is statistically highly significant (p=0.003). All else being constant, an increase in the number of bidders (at the mean) raises the square-meter final cost by 3.3 percent. This is consistent with the optimum bidding behavior of contractors who realize that they are susceptible to the "winner's curse." Contractors face collective uncertainty over the cost of the project prior to the SDFWP and, as economic theory suggests, they increase their bid prices in response to an increase in the number of bidders.

The third column shows that after the SDFWP secondary school unit cost was still higher than that of the elementary but now only by 5.6 percent and this result is not statistically significant. Final cost is pro-cyclical and, again, the result is statistically significant (p=0.03): a one percent increase above the trend growth raised the square-meter cost by approximately 0.7 percent. The most striking effect of the SDFWP concerns the impact of the number of bidders. The sign of the coefficient is now positive (p=0.03): a unit increase in the number of bidders (at the mean) now lowers the unit final cost by 1.8 percent. In comparison with the pre-SDFWP period, this finding suggests a change in the type of uncertainty facing the bidders. It is now private uncertainty, rather than collective, that is more relevant in the bidding process and rising competition induces contractors to lower their mark-ups (and consequently bids and final cost) in order to increase the probability of winning the contract.[15]

In order to compare average unit costs of the pre and post-SDFWP periods we predicted the construction cost of an elementary school in school district 6. We assumed that the building permits grow at the trend rate and that eight contractors make bids for the project. Under these assumptions, the predicted average construction cost is $1,238 before the SDFWP and $1,313 afterwards. This cost differential is not statistically significantly different from zero. The 95 percent confidence interval for the pre-SDFWP prediction ($1,097-$1,397) includes the post-SDFWP figure.

The remaining three columns of Table 3 report estimation results of the specification including the time index. Estimation of this specification yields results that are consistent with those reported earlier.Again the hypothesis of structural stability of coefficients across the two periods is rejected at the one percent level (F-value=5.20). In the pre-SDFWP period secondary schools are more expensive to build by 12.5 percent (p=0.02). The cost of construction is varies directly with the number of bidders. An increase in the number of bidders (at the mean) is estimated to raise the final cost by 2.0 percent (p=0.09). Unit construction cost is also estimated to rise at 0.6 percent per month (p=0.08). In the post-SDFWP period, the type of school no longer makes a difference on the cost of construction. Similar to the earlier finding reported on column (3), final cost is inversely related to the number of bidders. It declines by 2.27 percent in response to a unit rise in the number of bidders (at the mean). The final price also declines by 0.05 percent per month in the post-SDFWP period. Final cost is not responsive to the business cycle in either period. While the theory did not predict unambiguous sign for the coefficient of this variable, it should still be remembered that quarterly data on business cycles would have yielded more reliable assessment of the cyclical behavior of the final school construction costs.

We again predicted the average cost of construction under the assumptions stated above. These predictions do not indicate a significant change in the cost of construction following the establishment of the SDFWP. The predicted cost increased gradually between January 1989 and March 1992, reaching $1,347 just before the establishment of the SDFWP. At the end of March 1992, the SDFWP was established. On April 1992, the predicted price jumped to $1,474, and then it declined gradually. It took about 20 months for the price to decline to its March 1992 level.

5. Conclusion

A number of politicians and school officials proposed the elimination of prevailing wage regulations as a means to lower public school construction costs. The B.C. data, at first sight, seem to support this view. The bi-variate “before and after” comparison of final unit price indicate that the SDFWP caused the construction cost to increase by 16 percent, even higher than some of the figures estimated by the critiques of the U.S. prevailing wage law. This difference is also found to be statistically highly significant. However, when the same experiment is carried out controlling for other factors including the construction business cycle, number of competitors, type of school, district dummies, and the time trend, this result is no longer holds. There is indeed a structural break in the determination of the final cost after the SDFWP, but there is no evidence of significant changes in the unit costs before and after the establishment of the SDFWP. Instead, what is observed is a 6.1 percent increase in price, if the impact of the time trend is ignored. No statistical significance can be attached to this figure. If time trend is also included in the analysis, the price rises by 9.4 percent at the time of introduction of the Law followed by a steady decline afterwards. This steady decline, over time, offsets the immediate inflationary cost impact. These findings indicate that the appeal for the repeal of prevailing wage laws to reduce the school construction costs and the burden on the public budget is misguided.

Regression results also indicate that the prevailing wage affects construction costs through a variety of subtle channels that are overlooked in the literature. Present findings suggest two factors playing important roles in cost determination. The first is the impact of competition on the final price. The final price is directly (inversely) related to the number of bidders before (after) the SDFWP. This finding supports the hypothesis that the SDFWP altered the nature of uncertainty facing the bidders and made bid surcharges to avoid the winner's curse unnecessary. The second factor is the trend change. We do not know exactly which factors lie behind the rising trend costs in the pre-SDFWP and declining trend of the post-SDFWP periods. Possible answers to this question may lie in the areas of technological and non-wage regulatory changes, as well as the learning behavior of contractors and their adjustment process to the changing regulatory environment. SDFWP may also affect costs by lowering the cost of change orders.

TABLES

Table 1: School Construction Projects in Six B.C. Districts: 1989-1995

	Pre-SDFWP	Post-SDFWP	Whole period
Elementary School	18	21	39
Secondary School	7	8	15
All Schools	25	29	54

Table 2: Final Square-meter School Construction Cost (in 1989 prices – Can.$)

	No. of Obs.	Mean	Median	Stan. Dev.	Range
All Tenders	54	$1,423	$1,440	$217	$968-1,811
Pre-SDFWP	25	1,308[a]	1,248	189	968-1,690
Post-SDFWP	29	1,515[a]	1,508	195	1,194-1,811

Note: We tested the hypotheses that means and standard deviations of the post-SDFWP periods are equal to their pre-SDFWP counterparts (one-tailed tests). Superscript a indicates that the hypothesis is rejected at the one percent level.

Table 3: Regression Model for Final Cost

(Dependent variable: natural log of square-meter cost)

	Specification 1			Specification 2		
	Whole Period	Pre-SDFWP	Post-SDFWP	Whole Period	Pre-SDFWP	Post-SDFWP
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	7.272	7.379	7.007	7.118	7.115	7.260
	(88.30)***	(81.84)***	(70.39)***	(76.11)***	(42.97)***	(49.28)***
School type	0.090	0.144	0.056	0.094	0.125	0.040
(=1 if secondary)	(1.94)*	(3.03)***	(1.26)	(2.56)**	(2.75)**	(0.97)
Construction	0.007	-0.008	0.007	0.008	-0.009	-0.002
Cycle	(1.94)**	(1.24)	(2.27)**	(2.47)**	(1.50)	(0.45)
1/(No. of bidders)	-0.646	-2.063	1.390	-0.380	-1.268	1.757
	(1.31)	(3.50)***	(2.36)**	(0.81)	(1.82)*	(3.11)***
Time				0.002	0.006	-0.005
				(2.85)***	(1.85)*	(2.18)**
District dummies	Included	Included	Included	Included	Included	Included
R^2	0.43	0.70	0.63	0.52	0.76	0.71
Adj. R^2	0.33	0.55	0.48	0.42	0.61	0.57
F	4.19***	4.74***	4.28***	5.21***	5.23***	5.05***
Observations	54	25	29	54	25	29

NOTE: t-statistics in parentheses. ***, ** and * indicate statistical significance at the 1 5, and 10 percent levels, respectively.

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ENDNOTES

[1] For instance, Thompson, *et al*. (1994, p. 553) state "…it is truly startling to recognize that almost half of all school buildings in the nation have only marginal future utility, and another 20%-30% are candidates for reconstruction or abandonment because they are more than 50 years old."

[2] The first state prevailing wage law was passed in Kansas in 1891. Eventually 41 states would adopt such legislation. Between 1979 and 1988, nine states repealed their prevailing wage laws. In 1995, Oklahoma's law was judicially overturned and in 1997 Ohio exempted school construction from the purview of its prevailing wage law. The federal Davis Bacon Act was passed in 1931. Because most public school construction does not include federal funds in the U.S., public school construction is regulated by state laws.

[3] "...without the constraint of the Little Davis-Bacon Act, we could build four schools instead of three for the same amount of money." New Mexico Governor Gary Johnson, State of the State Address, January 16, 1996.

[4] Rick Savors, Ohio School Boards Association Deputy Director of Legislative Networks, Testimony on Ohio Senate Bill 102, May 8, 1997.

[5] Richard Maxwell, Testimony on Ohio Senate Bill 102, May 8, 1997.

[6] Jim Shirey, Testimony on Ohio Senate Bill 102, May 8, 1997 (emphasis in the original).

[7] This result is from the U.S. *Census of the Construction Industry, 1992, Industry Series, United States Summary*, CC92-I-27 Table 3, page 27-8. There is no comparable

construction census for Canada. The data are for contractors with payroll. The numerator of the ratio of labor costs to total costs includes total wages paid to construction workers plus the value of both legally mandated benefits (such as social security) and voluntary benefits (such as a private pension) paid for by the employer. This benefit figure includes not only benefits paid to construction workers but also to all other clerical and support workers employed by construction contractors. Thus, this is an overestimate of the wages and benefits paid to workers covered by prevailing wage regulations. The denominator is the net value of construction work done. This figure avoids double counting associated with subcontracting.

Anecdotally construction contractors sometimes report higher labor costs as a percent of total costs. While labor costs as a percent of total costs vary among contractors and any one contractor is unlikely to reflect the average, anecdotal reports suffer from a second handicap. Often when contractors calculate their labor costs as a percent of total costs, they are thinking of labor costs to them. Consequently they exclude their charge for capital depreciation and profit to the purchaser of their services. The U.S. *Census of Construction* figure includes the contractor's markup in the total costs paid by the owner or purchaser of the construction. This is the relevant figure when trying to assess the effect of a savings on labor costs to school board construction costs.

[8] Davis Bacon periodically surveys counties. Davis Bacon sets the “prevailing” wage rate at the modal rate found in the survey for specific occupations if the mode accounts for 50 percent plus one wage rates found. Otherwise, the average wage rate is said to prevail.

[9] All prices are in Canadian $.

[10] The mark-up on change order is likely to be different from *m* because the change order price is negotiated separately. Dyer and Kagel (1996) argue on the basis of U.S. field data that contractors who underbid may use these negotiations to recover their losses.

[11] The data provide only the gross area size.

[12] Private values model implies that the bidders' estimation errors of cost of construction are independent. In the alternative case of common values model, estimation errors are interdependent. The latter would be the case if all bidders face some common uncertainty concerning the cost of construction which may be attributable to factors such as weather conditions or the state of the general labor market (Milgrom, 1989).

[13] We identified six size categories in terms of average volume of sales: less than $15 million, $15 to 30 million, $30 to 60 million, $60 to 100 million, $100 to 200 million, and above $200 million.

[14] In B.C., school construction specifications, including building, mechanical and electrical codes, were changed in the late 1980s and early 1990s in order to make structures more earthquake resilient.

[15] The assumption of exogeneity of the number of bidders deserves further comment. The number of bidders may be exogenously determined if the bid/no-bid decision is influenced by the desirability of the project. If so, the number of bidders would no longer be an appropriate measure of the degree of competition, and the estimated parameters would be biased and inefficient. In the economics of auctions literature it is suggested that the decision to bid would be affected by factors including the variance of the estimated value of the project and

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asymmetric distribution of information across the bidders. These factors were shown to be significant in the outer continental shelf (OCS) hydrocarbon lease auctions (Gilley and Karels, 1981; Hendricks and Porter, 1988). In addition, in school construction some contractors may chose not to bid in school districts that are difficult to work with. These problems are not serious in our sample because school construction is a far more standard item to bid in comparison with the OCS leases and the scope of asymmetric information across contractors, if any exists, is likely to be very narrow. The variance of the submitted bids for any project suggests a much smaller variation in cost estimates. Inspection of "special features" in the architect's cost estimation forms indicates little variation across projects and between the pre- and post-SDFWP periods, and supports these contentions. Finally, the spread of the average number of bidders across districts is quite narrow, ranging from 7.3 to 9.3, and do not suggest that contractors deem any district to be less desirable than the others.