NBER WORKING PAPER SERIES

THE EFFECT OF UNIONISM ON PRODUCTIVITY IN PRIVATELY AND PUBLICLY OWNED HOSPITALS AND NURSING HOMES

Steven G. Allen

Working Paper No. 1649

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
June 1985

Financial support was provided by the U.S. Department of Labor and the National Science Foundation. Steve Margolis and an anonymous referee gave me some helpful comments on earlier drafts. Katherine Foote provided excellent research assistance, and Jim Comer once again did a masterful job in getting the data set in shape. The research reported here is part of the NBER's research program in Labor Studies and project in Government Budget. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

NBER Working Paper #1649
June 1985

The Effect of Unionism on Productivity in Privately and Publicly Owned Hospitals and Nursing Homes

ABSTRACT

This paper examines the effect of unions on productivity within a sample of publicly and privately owned hospitals and nursing homes to determine whether public ownership influences union behavior. The results show that the productivity of union contractors is much greater in private than in public projects. Within the sample of private projects, the estimates of the union-nonunion productivity difference are generally positive but very imprecise.

Steven G. Allen
Department of Economics and Business
North Carolina State University
Box 8110
Raleigh, NC 27695
(919) 737-3886

I. Introduction

Allen (1983) compared the productivity of union and nonunion contractors using two samples of construction projects: commercial office buildings and elementary and secondary schools. Measuring output both in terms of dollar value and square footage, productivity was at least 30 percent higher for union contractors in the commercial office building sample. In the school sample, however, there was no strong evidence of any union-nonunion productivity difference.

These conflicting results can be rationalized in two ways. First, it is possible that the technologies for school and office building construction are different and that nonunion labor has a comparative advantage in the former and union labor has a comparative advantage in the latter. This could arise because of the differences in the size or complexity of the projects. The mean square footage of the union projects in the office building sample is 208,815, which is much larger than the 27,319 square feet of the nonunion projects in that sample. In contrast, there is very little difference in the mean size of the union (98,108) and nonunion (85,250) projects in the school sample. Furthermore, the union projects in the office building sample are much larger than the union projects in the school sample. These size differences may result in biased estimates because there are much greater economies of scale in the union projects in both samples (but not in the nonunion projects).[1] Thus, the appearance of a union productivity advantage in office building construction may result from the greater union-nonunion

difference in project size. In the school sample, however, the union and nonunion buildings are of similar size, so that neither scale economy differences nor productivity differences between union and nonunion contractors are observed.

The other possibility focuses on differences in ownership between the two samples. The office buildings are privately owned and the schools are owned by state or local governments. This can have two types of effects. First, state and local governments impose a number of restrictions on materials and techniques that are not present in the building codes for private projects. These restrictions may limit the ability of union and nonunion contractors to choose the optimal mix of inputs, causing any private sector productivity differences to vanish. This is essentially a technological argument as well, with the focus being on regulation instead of size.

Second, ownership affects incentives. State and local governments have less incentive to minimize costs than do the owners of commercial office buildings. This lack of incentive, combined with prevailing wage laws that prevent nonunion contractors from entering union strongholds and bidding practices that facilitate collusion, allows unions and contractors to collect rents in public construction.[2] Freeman and Medoff (1984) and Hirsch (1985) have speculated that the effect of unionism on productivity is more likely to be zero or negative in noncompetitive markets. If the market for public construction is not sufficiently competitive, this could account for the absence of a

union-nonunion productivity difference in the school sample.

A data set that holds technology constant but that contains both publicly and privately owned projects is needed to determine which set of interpretations--the former focusing on technology, the latter focusing on economics--is correct. This paper examines such a data set, a sample of 44 hospitals and nursing homes completed in 1976. These projects are covered by the same building regulations, as all were funded under the Hill-Burton program. This permits a direct test of the hypothesis that the effect of unions on productivity in construction varies between publicly and privately owned projects. One complicating factor is that the privately owned hospitals and nursing homes in this sample are non-profit organizations, so the focus is on the effects of differences in ownership rather than on the effects of the incentive of profit maximization. Clearly, it would be desirable to compare the effects of unions on productivity in private for-profit, private non-profit, and public construction.

II. Empirical Specification and Data

The effect of unions on productivity is estimated by allowing the intercept of a Cobb-Douglas production function to vary by union status. The specification includes a control for labor quality and allows for nonconstant returns.[3] Capital, labor, labor quality, and union status are all defined in the same ways for the hospital sample as for the commercial office building sample in Allen (1983). Value added, square footage, and beds are used as output measures. Most attention is

focused on the first two measures because the last measure does not take into account facilities such as operating rooms, laboratories, and special equipment, which are important components of output.

The data set was collected as part of the BLS Labor and Material Requirements series. It contains 36 union and 8 nonunion observations, of which 10 and 3 represent publicly owned projects.[4] An interaction term between union and public ownership status is used to test the hypothesis that the effect of unions on productivity is smaller in publicly owned buildings. A dummy for public ownership was also examined. Its coefficient was smaller than its standard error and is not included in most of the specifications reported below.

The buildings in this sample vary in two other important respects: 8 of the projects are nursing homes and 29 are additions. These factors, along with public ownership, could affect the coefficients of the capital-labor ratio, labor hours, labor quality, or union status. To test this, interaction terms between these four variables and dummies indicating public ownership, nursing homes, and additions were estimated in a variety of combinations. One interaction--between nursing homes and the capital-labor ratio--was simultaneously helpful in explaining the patterns in the data while being consistent with reasonable priors regarding the sign of the coefficient. It is included in some of the specifications below.

A set of control variables for building characteristics and

materials must also be included in the model in order to avoid bias in the union coefficient resulting from differences in design and amenities that are correlated with union status. The distribution of union and nonunion projects for a number of characteristics is reported in Table 1. Fifty percent of the nonunion observations are nursing homes in contrast to only 11 percent of the union observations. Both in terms of stories and square footage, the union buildings are much larger than the nonunion buildings. There is no difference in scale economies by union status in this sample, however, so this factor is less likely to bias the results reported below.[5]

There are a few important differences in the structural features of the union and nonunion observations. All of the nonunion observations have parking facilities, but 30 percent of the union observations do not. Failure to control for this factor would bias upward the estimated effect of unionism on productivity. The greater use of masonry interior walls in the nonunion observations produces the same bias, as labor requirements tend to be greatest for such walls. Nonunion observations are more likely to have a steel frame, which biases the estimated effect of unionism downward because more units of labor are required to erect a steel frame than a concrete one. The same argument applies to the greater use of steel decking than concrete as the roof base of the nonunion observations. The impact of the greater use of masonry than concrete exterior walls in the nonunion sample is difficult to predict, as no distinction

Table 1

Frequency Distribution of Selected Building Characteristics, by Union Status

Building characteristic	Union	Nonunion
Hospital	89	50
Nursing home	11	50
New	36	25
Addition	64	75
Publicly owned	28	38
Privately owned	72	62
Number of stories		
1	11	38
2-4	44	50
5-11	44	12
Square footage		
50,000 or less	22	50
50,001-100,000	19	38
100,001 or more	58	12
Parking		
Outdoor	67	100
Indoor and outdoor	3	0
None	30	0
Framing		
Steel	53	62
Concrete	47	25
Masonry	0	12
Exterior wall		
Concrete	30	25
Masonry	50	62
Curtain wall	17	12
Other	3	0
Interior wall		
Drywall	61	62
Plaster	28	0
Masonry	11	38
Roof base		
Steel decking	17	38
Concrete	78	62
Other	6	0

is made in the data between precast and poured concrete. On balance, it is difficult to say without examining the data which set of potential biases dominates.

The union and nonunion samples are more similar in terms of the types of facilities included in each building, as shown in Table 2. A useful summary measure of the proportion of the building allocated to special purpose areas is the ratio of beds to square footage. As the proportion of space used for special purposes increases, this ratio declines. Looking at hospitals and nursing homes combined, this ratio is much higher for nonunion buildings. This is somewhat misleading, however, because half the nonunion buildings are nursing homes. When this comparison is made for hospitals only, the ratios for union and nonunion buildings are about the same. There are no major differences by union status in the percentage of hospitals with emergency rooms and intensive care units. Nonunion hospitals are more likely to have delivery rooms, while union hospitals are more likely to have operating rooms, X-ray rooms, and laboratories. Once again, the net effect of these differences is unclear ex ante.

To select which building characteristics to include in the empirical model, I followed the procedure in Allen (1983). Characteristics are included if they are observed in more than one building, their coefficients were consistent with the engineering data in the 1977 Dodge Construction Systems Costs manual, and their coefficients were larger than their

Table 2

Facilities in Hospitals and Nursing Homes, by Union Status

Variable	Union	Nonunion
Mean beds per 1,000 sq. ft., hospitals and nursing homes	1.16	1.80
Mean beds per 1,000 sq. ft., hospitals only	1.03	1.05
Percent of hospitals with:		
Emergency room	75	75
Intensive care unit	81	75
Delivery room	56	100
Operating room	81	50
X-ray room	75	50
Laboratory	72	50

standard errors. This resulted in the following variables being included in the model: number of stories, frame, interior wall, and parking. All other characteristics failed to meet one or more of these criteria.

III. Results

Three specifications of the model are reported in Table 3. In the first, all interaction terms and building characteristics variables are omitted. In the second, the interaction terms are added. The third includes the interaction terms and the building characteristics. Results are reported for each of the three output measures: value added, square footage, and beds. The results for beds were not sensitive to the inclusion of building characteristics, so this specification is not reported.

In the simplest specifications (columns 1, 4, and 7), there is no significant productivity difference between union and nonunion contractors. This is not altogether surprising, as each sample contains publicly and privately owned projects and the effect of unionism is restricted to be the same for each type of project. When this restriction is removed (columns 2, 5, and 8), the union coefficient (corresponding to privately owned projects only) increases substantially, suggesting higher productivity for union contractors than for nonunion contractors in privately owned projects. The interaction term, indicating the difference between the effect of unions on productivity in publicly and privately owned projects, is negative in all

Table 3

Hospital and Nursing Home Production Function Estimates

Output measure:	Value added			Square feet			Beds	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	-1.142	-6.826	-7.643	3.851	-2.023	-1.300	11.638	5.220
	(12.843)	(12.754)	(11.694)	(15.235)	(15.346)	(12.746)	(24.598)	(25.218)
log (K/L)	.156	.228	.325	.151	.247	.217	.414	.516
	(.096)	(.104)	(.099)	(.113)	(.125)	(.108)	(.184)	(.211)
log (L)	-.239	-.226	-.285	-.314	-.290	-.299	-.567	-.557
	(.059)	(.059)	(.063)	(.070)	(.071)	(.069)	(.099)	(.104)
Union	.185	.273	.196	.093	.162	.276	-.134	-.023
	(.170)	(.172)	(.162)	(.202)	(.206)	(.177)	(.337)	(.352)
Beds/1000 sq. ft.	-.217	-.203	-.165	-.181	-.169	-.049		
	(.066)	(.065)	(.063)	(.079)	(.078)	(.069)		
Labor quality index	.791	1.409	1.588	.004	.606	.491	-1.345	-.638
	(1.426)	(1.415)	(1.306)	(1.692)	(1.702)	(1.424)	(2.754)	(2.822)
Northeast	.226	.173	.233	-.442	-.438	-.548	-.210	-.268
	(.156)	(.168)	(.153)	(.186)	(.202)	(.167)	(.309)	(.344)
North Central	.091	.029	-.002	.062	-.001	.010	.412	.337
	(.136)	(.135)	(.124)	(.161)	(.163)	(.136)	(.268)	(.275)
West	.188	.150	.132	-.216	-.231	-.290	-.133	-.183
	(.164)	(.163)	(.150)	(.195)	(.196)	(.164)	(.324)	(.333)
Rural	-.285	-.238	-.170	-.182	-.142	.007	.106	.170
	(.113)	(.112)	(.104)	(.135)	(.135)	(.114)	(.222)	(.229)
log (K/L) x nursing home		-.176	-.393		-.325	-.358		-.245
		(.208)	(.200)		(.250)	(.218)		(.427)
Union x public ownership		-.193	-.272		-.123	-.314		-.239
		(.123)	(.116)		(.148)	(.127)		(.251)
Number of stories			.031			.031		
			(.024)			(.026)		
Steel frame			.017			.407		
			(.095)			(.103)		
Masonry interior wall			-.401			-.325		
			(.133)			(.145)		
Parking included			-.143			-.171		
			(.107)			(.116)		
σ	.296	.287	.253	.352	.346	.275	.586	.589
R^2	.631	.674	.779	.471	.519	.732	.612	.630
F	6.45	6.00	6.58	3.36	3.14	5.11	6.89	5.62

Note: Standard errors are reported beneath each coefficient. The mean (S.D.) of the dependent variable in columns 1 through 3 is 2.846 (.434); columns 4 through 6, -.521 (.430); columns 7 and 8, -7.427 (.849). There are 44 observations in each equation.

three cases. Although this is consistent with the notion that unions are less likely to have positive effects on productivity in publicly owned projects, the null hypothesis cannot be rejected for either the union or the union-public ownership interaction coefficients.

When building characteristics are added to the model in columns 3 and 6, the union-public ownership coefficients increase considerably in absolute value, their standard errors decline, and the null hypothesis can be rejected. In the specification in which output is measured as value added, productivity is 31 percent lower in publicly owned hospitals built by union contractors than in privately owned hospitals built by them. When output is measured as square footage, the productivity of union contractors is 37 percent lower in publicly owned hospitals than in privately owned hospitals.

The productivity of union contractors is 32 percent higher than that of nonunion contractors for privately owned hospitals in the square footage per hour model, an estimate that is significantly different from zero at the 87 percent confidence level using a two-tailed test. Although this is admittedly a rather weak result, it is consistent with my earlier results for the sample of privately owned office buildings. In the value added per hour specification, union contractor productivity is 22 percent higher, but the confidence level is only 76 percent. It is interesting that the union coefficient is smaller in this specification despite the strong possibility of upward bias

involved with measuring output in terms of value added. For publicly owned hospitals, the estimates in columns 3 and 6 show union productivity to be 4 to 8 percent lower than nonunion productivity, with neither point estimate significantly different from zero.

A four-way comparison between private-nonunion, private-union, public-nonunion, and public-union productivity can be made by adding a dummy variable indicating public ownership to the specifications in columns 3 and 6. The coefficients of the variables indicating the impact of unionism and public ownership are:

	Value added specification	Square feet specification
Union	.316	.208
	(.208)	(.230)
Public ownership	.227	-.128
	(.246)	(.271)
Union x Public ownership	-.495	-.188
	(.268)	(.295)

In both specifications, the standard errors of the union and union interaction terms increase considerably when the public ownership dummy is added to the model. Given the small size of the data set and the correlation between the interaction term and both dummy variables, it is not at all surprising that these coefficients are not estimated very precisely. This does not necesarily mean that the data fail to reject the null hypothesis of no union and public ownership effects, even in the square feet specification where all three coefficients are

smaller than the standard error. The appropriate test of the null hypothesis is a joint F-test. Under this test the null hypothesis can be rejected at the 89 percent level in the value added specification and the 90 percent level in the square feet specification.

The results of the four-way productivity comparison are (using private nonunion projects as a benchmark):

	Value added specification	Square feet specification
Private union	37%	23%
Public nonunion	25%	-14%
Public union	5%	-10%

Although the imprecision of the coefficients means that these comparisons should be interpreted as very weak results, they point to the same conclusion as the results in columns 3 and 6: union productivity is at least 30 percent greater in the private sector than in the public sector.

One troubling aspect of these results is that they suggest no correlation between the capital-labor ratio and productivity in nursing home construction. To determine whether the finding of lower union contractor productivity in public (as opposed to private) construction is sensitive to this, the specifications in columns 3 and 6 were re-estimated over a sample containing only the 36 hospitals (not reported in Table 3). The union-public ownership interactions declined slightly (by no more than .03)

and remained significantly different from zero. Excluding nursing homes did have a big effect on the union coefficient in the value added specification, which dropped to near zero. The union coefficient in the square footage specification changed very little, but its standard error increased, presumably because of the smaller sample size. Thus, while the key result that the productivity of union contractors in private construction is greater than their productivity in public construction seems fairly robust, the already weak results on union-nonunion productivity differences in private construction become even weaker when nursing homes are excluded from the sample.

To see how the effect of unions on productivity compares with their effect on wages, a log wage equation was estimated over a sample containing separate observations for each detailed occupation employed by each contractor. In addition to union status, the independent variables included dummies for region (3), SMSA, and detailed occupation (74). The results (shown in Table 4) demonstrate that controlling for detailed occupation, union workers receive 17 percent higher wages than nonunion workers. This estimate of the wage gap in construction is smaller than those reported in Allen (1983). The most likely explanation is that the entire hospital and nursing home sample was funded under the Hill-Burton program, which means that minimum wages on each project must be set by the Department of Labor, as required by the Davis-Bacon Act. Since the Department

Table 4

Wage Equation Estimates, Hospitals and Nursing Homes

Independent variable	Equation (1)	(2)
Intercept	1.782 (.013)	-
Union	.168 (.012)	.156 (.009)
Northeast	.238 (.016)	.217 (.012)
North Central	.230 (.013)	.230 (.010)
West	.208 (.017)	.204 (.013)
Rural	-.104 (.012)	-.086 (.009)
Controls for detailed occupation	No	Yes
σ	.309	.233
R^2	.220	.564
N	3933	3933

Note: Standard errors appear in parentheses below each coefficient. The dependent variable is the logarithm of the ratio of payroll to hours worked and has a mean (S.D.) of 2.037 (.350). No intercept is reported in the second column because the controls for detailed occupation were obtained with the absorption option in the SAS GLM procedure.

of Labor frequently tends to set minimum wages for federally funded building construction at union levels, one would naturally expect a rather small union-nonunion wage gap. The relative magnitude of the union-nonunion wage and productivity gap estimates implies that union contractors compete on near equal terms with nonunion contractors in private hospital construction. This is not the case in public hospital construction. The higher wages paid by union contractors are not offset by higher productivity. This increase in costs implies that either union contractors receive lower profits for public hospital construction or the price of public hospitals to state and local governments will be higher when they are built by union contractors. Evidence supporting the latter interpretation is reported in Allen (1984).

IV. Conclusion

Over a sample of publicly and privately owned hospitals constructed with similar technologies and covered by the same types of building regulations, the productivity of union contractors is much greater in private than in public projects. This finding suggests that it is the pattern of ownership rather than technological or regulatory factors that accounts for my earlier findings of higher union productivity in private office building construction but no union-nonunion productivity difference in public school construction. The bottom line seems to be that the behavior of unions and union contractors is quite different in public and private construction, the consequence of

which seems to be vastly inflated construction costs for public projects.

The evidence reported here on union-nonunion productivity differences is much weaker. Clearly, there is no such difference in public hospital and nursing home construction. In private projects, the productivity of union contractors does seem to be higher, especially in terms of square footage per hour, but the hypothesis of no union-nonunion productivity difference can be rejected at no better than an 87 percent confidence level. This will probably not change anyone's opinion on the matter.

Notes

[1]Evidence on union-nonunion differences in economies of scale is reported in Allen (1984).

[2]This argument is more fully stated in Allen (1983; 1984).

[3]The specification is identical to that in equation (3) in Allen (1983).

[4]Sampling procedures and a copy of the questionnaire are reported in U. S. Department of Labor (1983).

[5]This evidence on economies of scale is reported in Allen (1984).

REFERENCES

Allen, Steven G. "Unionization and Productivity in Office Building and School Construction." NBER Working Paper No. 1139, June 1983 (forthcoming in Industrial and Labor Relations Review).

_____ "Can Union Labor Ever Cost Less? Can Union Contractors Ever Make Higher Profits?" presented at North American Winter Meeting of Econometric Society, 1984.

Freeman, Richard B. and James L. Medoff. What Do Unions Do? New York: Basic Books, 1984.

Hirsch, Barry T. "Comment on What Do Unions Do?" Industrial and Labor Relations Review 38 (1985): 247-250.

U. S. Department of Labor, Bureau of Labor Statistics Labor and Material Requirements for Hospital and Nursing Home Construction. BLS Bulletin 2154. Washington, D.C.: GPO, 1983.