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11 Unionism and Licensing of Public School Teachers: Impact on Wages and Educational Output

Morris M. Kleiner and Daniel L. Petree

Teacher union chief Albert Shanker is urging education leaders to join him in an effort to create a tough new national exam for entry to the profession. Asked if the test was really a way to help his members get higher pay and status, Shanker said: "I confess (it is). And you might also get the same quality and standards that go with (professionalism)."

Associated Press, 16 April 1985

As this statement by the leader of the American Federation of Teachers (AFT) suggests, teachers unions seek to increase the quality of the educational system as well as to raise the earnings of its members. Are they successful in improving the quality of education? How important is occupational licensure as a tool for improving the quality of education and raising wages compared to collective bargaining and the other activities of public sector unions?

To answer these questions we will examine in this paper the extent to which unionism leads to stronger licensing statutes for teachers, and

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alters teacher wages and student test scores directly and through provisions to license schoolteachers. We analyze the experience of U.S. states from 1972–82—a decade when school enrollments and the demand for teachers declined (Murnane 1985). This decline led to increased teacher layoffs, fewer opportunities to move across school districts, fewer transfers to better schools, and a decline in teachers' real earnings of over 10 percent (O'Neil 1984). As a consequence of these developments, entrance into the profession was reduced: the number of students graduating with education degrees declined from 177,000 in 1971 to 101,000 in 1982, and the number meeting minimum licensing requirements fell from 317,254 in 1971–72 to 140,639 in 1980–81. Further, the number of first-year college students planning to choose teaching as an occupation fell from 19.3 percent to 4.7 percent (Commission of Education 1983).

Comparing states with greater and lesser unionization we find that collective bargaining coverage is associated with higher salaries for public school teachers and generally, though not uniformly, higher educational performance as measured by student test scores and high graduation rates. Fixed-effects analysis of the effects of unionism on teacher wages and student performance yield greatly reduced estimated effects of unionism on wages but continue to show substantial teacher union impacts on student performance. We also find that unionization and licensure are complementary for schoolteachers in the sense that more heavily unionized states have more stringent licensing laws. With collective bargaining held fixed, however, we find no impact for rigid licensing statutes on pay and uncertain effects on student achievement scores. Hence, licensure does not appear to be an important route by which teacher unionism affects the education marketplace.

We present our analysis in three stages. First, we briefly review past findings on the relation between teacher unionism, licensure, and wage and educational performance outcomes. Then we describe our data and present our empirical results. Finally, we offer a general interpretation, with caveats, of our findings.

11.1 Past Work

There exists a substantial literature on the impact of teacher unions on wages, but relatively little analysis of the role of licensing provisions as an intervening route for the union wage effect or of the impact of teacher unions on the output of the educational system. As a prelude to our analysis it will be useful to briefly review past findings on the issues of concern.

With respect to the effect of teacher unions on pay there is a wide variation in the estimated impact, depending on the unit of analysis,

which ranges from states and school districts to individual teachers, and differs in the period of time covered (see the summary in Freeman 1986). From the late 1960s through the early 1970s studies using state-level data showed a range of estimates from 2 percent to 9 percent for the impact of teachers unions on pay (Kaspar 1970; Brown 1975). Studies that used the school district as the level of analysis estimated effects that varied from 1 percent (Landon and Baird 1971) to 12–14 percent (Schmenner 1973). Analyses for the 1980s covering districts and individuals suggest a greater impact of unions on wages. For example, Baugh and Stone (1982) find union wage effects that range from 12 to 21 percent. Apparently, for reasons having to do with changes in union power and in conditions in the teaching market (union wage effects are often larger in declining rather than booming markets (Lewis 1963)), the impact of unions on wages appears to have increased for teachers in the period covered by our study.

In contrast to the well-documented impact of unions on wages, past studies have not systematically analyzed the relation between unionism and licensure or between licensure and wages. Much of the theoretical literature on the effect of licensing treats its impact on societal welfare, with ambiguous results (Leland 1980), rather than directly addressing its effect on wages or performance. In this framework licensing is seen as a means to protect the public from an inability to judge the quality of services delivered by specialists, given that it is unlikely that specialists will act strictly in the interest of the consumer (Jensen and Meckling 1976; Williamson 1964). At the same time, however, it is to the advantage of teachers (as well as other groups) to use licensing to limit supply and extract economic rents (Stigler 1975). In the education market the fact that governments employ teachers as well as determine licensing laws creates further complexities, as it is not in the government's interest to restrict supply and drive up costs. Given these considerations, we expect licensing laws for teachers to affect the teachers market in two ways: assuring the meeting of minimum quality standards that improve performance (Ehrenberg 1973; Frey 1975) and raising wages by limiting supply.

Relatively few studies have examined the impact of teacher unionism or licensing on student performance. To the extent that unions raise the quality of teaching through licensing, improve the operation of schools by forcing administrators to behave more efficiently, or improve the quality of teachers by creating professional standards and reducing turnover, unions will have positive effects on the productivity of the educational system, as has been found to occur in some parts of manufacturing (Freeman and Medoff 1984). To the extent that unions simply reduce teacher resources by raising costs, they are likely to have the opposite impact. We are aware of only two studies that provide em-

pirical evidence on which of these effects dominates. Eberts and Stone (1986) use test scores on 14,000 fourth graders in selected school districts to evaluate the impact of unionization on performance and find that when other socioeconomic factors are controlled for, scores are 7 percent higher in union districts. In a study published after the work for this paper was completed, Kurth reports the opposite result: a negative relation between union strength and SAT scores across states and time. This finding, however, appears to be due to the absence of any trend or regional controls in the regressions, in contrast to the work that we report in this paper. As for the impact of licensing on student performance, we do not know of any studies. The few studies that have attempted to examine the impact of licensing on output in other fields, such as dentistry (Holen 1978) or medical and legal specialties (Carroll and Gaston 1981), find no systematic relation between licensing provisions and performance, suggesting that it is not easy to uncover a licensing productivity relation, if one exists.

In sum, while existing work provides us with reasonable expectations about the wage effects of teaching unions, the other issues under study—the impact of unions on licensure and the impact of unions and licensing on performance—are rarely explored, with existing studies yielding uncertain results. It is this “hole” in the literature that motivates our study.

11.2 Data and Analysis

To estimate the impact of teacher unionism on wages, licensing laws, and student performance we have obtained state-level data for the 1972–82 period. We chose states as units of observation for four reasons. First, licensing of public school teachers in the United States is implemented on a state-by-state basis, so that states are the natural unit for studying licensure. Second, we have reasonably good data on unionization and collective bargaining coverage at the state level for the entire period. Third, we are able to obtain student test scores by states for the period, providing us with a critical outcome variable. Fourth, we can use the state data to develop a longitudinal or fixed-effects analysis that examines how within-state changes in unionization produce changes in the outcomes under study. Recent work in labor economics has stressed the importance of checking cross-section findings with longitudinal data to control for potential unmeasured variables that can bias cross-section results (Freeman 1984).

Table 11.1 lists the key variables in our analysis and gives their source, mean, and standard deviation for all states in the 1972–82 period. Lines 1–3 give the independent variables reflecting unionization and licensing. We use the percent of teachers who are members of the

Table 11.1 Means and Standard Deviations of Key Independent and Dependent Variables

	Mean	(std dev)
Key Independent Variables		
1. Percent of teachers organized	.86	(.20)
2. Percent of teachers with collective bargaining contracts	.65	(.35)
3. State-set licensing statutes	.45	(.50)
Dependent Variables		
4. Average state SAT score	951	(73)
5. Average state ACT score	18.80	(1.14)
6. State graduation rate	.75	(.07)
7. Average state teacher pay	12,235	(2,175)

Sources:

Line 1: NEA membership data obtained from NEA and National Council of State Education Associations (Washington, D.C.), *Profiles of State Associations*, various editions. AFT membership provided by the union with confidential computer printout. To get the percentage organized, we divided by the number of teachers in the state.

Line 2: Calculated from U.S. Bureau of the Census, Survey and Census of Governments, various editions.

Line 3: Obtained by reading relevant state legal statutes.

Line 4: Obtained from Educational Testing Service.

Line 5: Obtained from American College Testing Service. For reasons of confidentiality, the ACT tabulated means for us and performed the various regressions reported here.

Line 6: U.S. Bureau of the Census, *U.S. Statistical Abstract*.

Line 7: National Education Association and National Council of State Education Associations (Washington, D.C.), *Profiles of State Associations*, various editions.

AFT or National Education Association (NEA) and the percent of teachers covered by a collective bargaining contract to measure the strength of unionism in a state. Because not all teacher union locals bargain collectively it is generally believed that having a contract is a more desirable measure (see Lewis, this volume, chap. 6). Still, the percent union may reflect the political power of the union in lobbying or campaigning for outcomes, leading us to examine each of these variables in our analysis. To measure the strength of state licensing of teachers we use a dummy variable that takes on the value 1 if state statutes make licensing subject to specific kinds of education, experience, and a statewide examination. The means and standard deviations in table 11.1 show an average across states of 86 percent of teachers in the AFT or the NEA with, however, considerable dispersion among states; a smaller but still high percentage covered by collective bargaining of 65 percent; and 45 percent of the states having what we categorize as a strong teacher-licensing statute.

Lines 4–7 relate to our primary dependent variables: the average earnings of schoolteachers in a state, and the average Scholastic Aptitude (SAT) and American College Testing (ACT) scores of students, which we obtained from special tabulations of test results from the Educational Testing Service in Princeton, New Jersey and from the American College Testing Service in Iowa City, Iowa. Although only about 27 percent of high school students take either of these exams, the exams are the most widely administered national measures of performance available (Dynarski 1985). To evaluate the effects of unionism and licensing on lower educational achievers, we also examine the percentage of students who graduate from high school.

In addition to these variables our calculations include diverse controls for a range of factors that might be expected to affect teacher salaries or educational performance across states: real (price-deflated) expenditures per student, nonwage expenditures per student; per capita personal income; the percentage of high school graduates in a state; the percentage of students attending private schools; the average wage in manufacturing; average public school enrollment; the percentage of minority students in a state; and the average age and experience (estimated as age – years of schooling – 5 years) of teachers in a state, calculated from the Current Population Surveys as a measure of the human capital of teachers in a state, and an indicator of the favorableness of state labor law toward teacher collective bargaining.¹

As our analysis covers an eleven-year period (1972–82), there are 555 state-by-year observations for most variables, though there are some missing values for some states and years in several cases. In all of our empirical work we pool the cross sections for the years and include year dummy variables to allow for any year effects. In addition, in some calculations we add state dummy variables as independent variables, changing the structure of the analysis from cross-section comparisons to a fixed-effects longitudinal design. We deal first with the relation between unionism and licensing, and then analyze the impact of the two variables on outcomes.

11.2.1 Teacher Unionism and Licensing

To see whether unionization in a state is associated with stronger or weaker licensing laws we estimated a logistic equation linking the presence of a strong statewide licensing policy to the proportion of teachers who are members of organizations, or to the proportion who are covered by collective bargaining and by various control variables using our complete pooled cross-section data set.² The results of these calculations reveal the expected positive relation between unionization and licensing statutes. In our logit analysis of the impact of the extent of union membership on statewide licensing statutes, the membership

variable obtained a positive and significant coefficient of 1.34 with a standard error of .57. This implies that an increase in union density of 10 percentage points would raise the probability of having a statewide statute by about 4 percentage points. In our logit analysis of the impact of the extent of collective bargaining coverage, we obtained a similar positive and significant coefficient for that variable: .91 with a standard error of .44. These results indicate that in states where teachers unions are stronger, legislatures pass more rigorous licensing statutes. This is consistent with the Shanker quote with which we began this paper.

11.2.2 Unionization and Wages Across States

Given that unionization appears to increase the strength of licensing provisions, the next question to investigate is whether licensing and unionism affect outcomes. We consider first their impact on wages. Our wage analysis takes two forms. First, we regress the log of teacher pay in a state on the percentage of teachers in a teacher organization or on the percentage of teachers covered by collective bargaining, the licensing dummy variable, and various controls. Second, to remove the influence of any persistent state effect over time, we add dummy variables for states and thus estimate the impact of the variables in a fixed-effects model. Table 11.2 summarizes the results of these regressions in terms of the estimated coefficients on the unionism and licensing variables. The cross-section regressions show moderate unionization effects, which are higher for the collective bargaining coverage variable than for the union membership variable. The regression

Table 11.2 Coefficient Estimates and Standard Errors for the Effects of Unionization on Log of Teacher Wages

Independent Variables	Cross-Section Analysis		Fixed-Effects Analysis	
Percent members	.04 (.01)		-.01 (.01)	
Percent covered by contracts		.07 (.01)		.01 (.01)
State licensing	.01 (.02)	.01 (.01)	.003 (.004)	.003 (.004)
State dummies	no	no	yes	yes
R ²	.65	.70	—	—

Notes: Cross-section regressions include the following control variables: manufacturing wage, index of legal environment in the state toward collective bargaining, age and experience of teachers, year dummies, and three-region dummies. Fixed-effect regressions include the same control variable as the cross-section regressions. The R² are not reported as they are extraordinarily high with the state dummy variables.

with percentage union membership also shows a modest impact for licensing laws. However, when we replace membership with collective bargaining coverage the coefficient on licensing becomes smaller and remains insignificant. The implication is that collective bargaining rather than licensing was the means by which teacher unions affected wages in the period. Note, finally, that our cross-state results are within the same range as the earlier estimates of the effect of teacher unionism on pay using states data cited in section 11.1.

The results of the fixed-effects analysis are more surprising, as they show that state dummy variables absorb any union wage effect. This does not mean that unionization has no effect on teacher wages, as longitudinal analyses tend to understate union wage effects due to measurement error (Freeman 1984). Rather, it indicates that the longitudinal test is in fact a relatively stringent one, as it eliminates all cross-state variation and general time-series variation to focus on changes within states over time. The fixed-effects wage results do, however, provide us with a measuring rod for assessing ensuing fixed-effects analyses of the relation between unionism and educational performance.

11.2.3 Unionization, Test Scores, and Graduation Rates

The most controversial issue that we address in this paper is the impact of unionism and licensing on the quality of educational performance. Is educational performance better or worse in states with stronger teacher unionization and/or licensing than in other states?

To answer this question we have regressed the average level of the SAT and ACT standardized test scores and the proportion of students who graduate high school, on the percentage of teachers who are union members and the percentage of teachers who are covered by collective bargaining and various control variables. These variables include: the percent minority in the state (because of the tendency of minorities to score lower on standardized tests); the student/teacher ratio; nonwage expenditures per student (to reflect resources for public education); and the proportion of high school graduates in the state and the per capita income (to reflect the educational and income background of students). We exclude measures of the physical capital in the state school systems because prior studies have not shown an impact of physical capital on outcomes (Brown and Saks 1975). As before we have calculated both cross-section and fixed-effects estimates of the impact of unionism and licensing on outcomes.³

Table 11.3 presents the results of our cross-section analysis. Columns 1 and 2 record the coefficients and standard errors on the unionization and licensing variables when the SAT is the measure of performance, columns 3 and 4 treat the ACT test scores, while columns 5 and 6 relate

Table 11.3 Coefficients and Standard Errors for the Cross-Section Impact of Unionism and Licensing on Student Achievement Scores and Graduation Rates

Independent Variables	Dependent Variables					
	SAT		ACT		Graduation Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
Percent members	49.09 (13.66)		.35 (.25)		5.67 (1.26)	
Percent covered by contracts		-.40 (10.92)		1.06 (.20)		3.27 (1.01)
State licensing	-20.96 (4.45)	-19.75 (4.49)	.33 (.08)	.30 (.08)	1.25 (.41)	1.38 (.41)
R ²	.54	.53	.58	.63	.56	.55
Sample size	490	490	446	446	490	490

Note: All regressions include the following control variables: student/teacher ratios, nonwage expenditures per student, percent minority, per capita income, percentage of population who are high school graduates, index of the legal environment for collective bargaining, experience of teachers. Estimates using selectivity bias controls also were estimated and are available from the authors (Murnane et. al., 1985).

to state graduation rates. With test scores as the dependent variables, the coefficients on union membership are positive and significant. With mean values of 951 for the SAT and of 18.8 for the ACT, the coefficients imply unionization impacts on the order of 6–8 percent for increases in unionization from 0 to 1.00 and elasticities of test scores to unionization of about 0.5 to 0.7. These are of similar magnitude to the impacts estimated by Eberts and Stone on individual students (Eberts and Stone 1986). By contrast, the coefficients on the percentage of teachers covered by union contracts are insignificant in the SAT calculations and smaller and less significant in the ACT calculations than the coefficients on the percentage of teachers who are union members. With state graduation rates as the dependent variable, both union variables are accorded significant positive effects. In sum, the general impression from the table is that unionism is associated with better performance of the school system, but varies with the measure of union strength and outcome.

The estimated coefficients on our licensing dummy variable, by contrast, present a less clear pattern. In columns 1 and 2 licensing is estimated to reduce SAT scores, whereas in columns 3 and 4 it is estimated to raise them, and in columns 5 and 6 it is estimated to raise graduation rates. Given the negative results with the SAT variable, we are reluctant to make any firm conclusion about the impact of licensing on outcomes.

To test further the impact of unionization and licensing on educational outcomes we performed a fixed-effects analysis, adding state dummy variables to our regressions. These dummy variables pick up the impact of any omitted state factor that has a constant effect on outcomes over time. Including them can greatly reduce the estimated effect of independent variables on outcomes, as we saw with our wage analysis. The results of these calculations are given in table 11.4, which follows the same format as table 11.3. The majority of the results here confirm the positive effect of teacher unionism on test scores: both the percentage of teachers who are union members and the percentage who are covered by collective bargaining contracts are estimated to raise test scores, with the difference between the coefficients on the two variables considerably less than in the cross-section regressions. Roughly, unionism has a 3 percent impact on performance in these calculations. The results with respect to graduation rates are more ambiguous, as the union membership variable is estimated to have a modest positive effect while the collective bargaining variable has a modest negative effect on graduation. As for licensing, inclusion of the state dummy variables reverses the negative relation between licensing statutes and SAT scores and the positive relation between licensing and graduation rates, while leaving the positive relation between licensing and the ACT scores virtually unchanged. As the estimated impact of licensing appears to vary with

Table 11.4 Coefficients and Standard Errors for the Fixed-Effect Impact of Unionism and Licensing on Student Achievement Scores and Graduation Rates

Independent Variables	Dependent Variables					
	SAT		ACT		Graduation Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
Percent members	18.86 (5.76)		.19 (.12)		1.30 (.87)	
Percent covered by contracts		27.47 (6.92)		.15 (.34)		-.83 (1.06)
State licensing	4.70 (3.60)	6.33 (3.57)	.28 (.08)	.30 (.07)	1.25 (.54)	-1.18 (.54)
State dummy variables	yes	yes	yes	yes	yes	yes
Sample size	490	490	446	446	490	490

Note: All regressions include the following control variables: student/teacher ratios, nonwage expenditures per student, percent minority, per capita income, percentage of population who are high school graduates, index of the legal environment for collective bargaining, experience of teachers.

the outcome measure and estimating technique, we feel that the most sensible conclusion is that our evidence is ambiguous on the effect of licensing on outcomes.

11.2.4 Unionism and Educational Process Variables

To see whether we can delineate, at least in part, some of the ways in which unionization may affect outcomes, we examine the relation of unionism and licensing to two educational process variables likely to play a role in the performance of the system—student/teacher ratios and nonwage expenditures per student—and between those variables and outcomes. Table 11.5 shows the results of the two sets of calculations in terms of the estimated impacts of unionization and licensing on student/teacher ratios and on nonwage expenditures per student and of those variables on test scores and graduation rates. Columns 1–4 show that unionization is associated with higher student/teacher ratios and greater nonwage expenditures per student, while licensure is associated with lower student/teacher ratios and has ambiguous effects on nonwage expenditures, depending on the unionization measure. The impact of unionization on student/teacher ratios presumably reflects the standard labor demand response to higher union-induced wages: a decline in employment. Columns 5–7 show that higher student/teacher ratios are associated with lower test scores and lower graduation rates, while nonwage spending per pupil has no noticeable effect on the SAT, a positive effect on the ACT, and a negative effect on the graduation rate. Since unionization tends to raise the student/teacher ratios, the implication is that unions reduce rather than improve performance through this route. The ambiguous effects of nonwage spending on outcomes also rules out the union effect on this variable as a potential route of impact. In short, our state data are not rich enough to enable us to determine the educational process variables by which unionism improves student test scores and reduces dropout rates among states.

In order to examine further the impact of unionization and licensing on outcomes, and to help us interpret our econometric results, we conducted telephone interviews with union and government officials in ten states with varying degrees of teacher unionization, ranging from Mississippi, which has long outlawed bargaining, to New York, where unionization is strong. The general opinion of these officials was that teacher unionism increases wages through political and bargaining means. There were, by contrast, conflicting opinions on the effect of teachers unions on educational quality. Our interviews suggested that unionized school districts have lower turnover, greater teacher voice on the job, and greater standardization of work activity, which might contribute positively to productivity. With respect to licensing, some respondents suggested that the weak or ambiguous effects that we have

Table 11.5 Regression Coefficients and Standard Errors for the Relation of Unionism and Licensing to “Educational Resource Variables” and of the Resource Variables to Outcomes

Independent Variables	Dependent Variables						
	Student/Teacher Ratio		NonWage Expenditures Per Student		SAT	ACT	Graduation Rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Percent members	1.22 (.48)		93.97 (52.42)				
Percent covered by contracts		1.48 (.38)		158.41 (40.85)			
State licensing	-.35 (.16)	-.33 (.16)	-37.38 (17.07)	35.54 (16.81)			
Student/Teacher Ratio					-7.62 (1.33)	-.04 (.03)	-.90 (.12)
Non-wage expenditure per pupil					.001 (.012)	.0005 (.0002)	-.004 (.001)
R ²	.53	.54	.54	.53	.55	.47	.58

Note: All regressions include the following control variables: percent minority, relative per capita income, year and regional dummies.

found are due to differences in the market for schoolteachers across states, since state and local education officials relax licensing constraints in response to the condition of the market.

11.3 Conclusions

Our cross-state analysis suggests that greater teacher unionism is associated with better performance of students across states, consistent with the analysis of individual students by Eberts and Stone. The relatively strong relation between unionism and student performance found in the longitudinal analysis, compared to the negligible relation between unionism and wages there, is our strongest piece of evidence that teacher unionization is in fact a positive factor in education. Our inability to show empirically how unionization improved outcomes, and the sensitivity of the cross-section results to the measure of outcomes and unionization represent the major weaknesses in our findings. At a minimum, however, our study rejects any claim that unionization contributed to the decline in student achievement scores during the 1970s and early 1980s. With respect to licensing, given the modest statutes in existence during the period, it is perhaps not surprising that we obtained ambiguous effects in the statistical analysis. Recent strengthening of licensing laws and pressures to increase entry requirements for schoolteachers may result in greater and more consistent effects of licensure in the future.

Finally, while our analysis provides some evidence of the relation between unionization and education, there are several important questions that we did not address. First, from the perspective of economics, what was the effect of teacher unionization on the earnings of graduates as opposed to on their test scores? Second, how do licensing and unionization affect students who do not take college entrance exams or are on the verge of dropping out? Third, would we obtain similar longitudinal results with more disaggregate school district data over time to those reported for states? More evidence on these issues would enhance our knowledge of the role of unions in education.

Notes

1. These variables are obtained as follows: percent population graduated high school, percent students in private school, per capita income, student/teacher ratio, percent minority students. All are from the U.S. Bureau of the Census *Statistical Abstract*, various editions. Mean experience of teachers (age - education - 5 years) is tabulated from annual Current Population

Surveys. The index of labor laws for collective bargaining in education is from the NBER Public Sector Law data set.

2. In these calculations we controlled for: enrollment, percent minority, per capita income, nonwage expenditures, the legal environment, the percent of students in private schools, age of teachers, and year dummies.

3. These calculations included the same controls as in note 2.

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Comment Randall W. Eberts and Joe A. Stone

Kleiner and Petree explore the effects of teacher unions and teacher licensing on various aspects of the operation of public schools: teacher wages, allocation of school resources, and student performance. Although substantial work has been done on teacher unions and public

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schools, very little attention has been given to the effect of licensing on school effectiveness. The authors argue that both institutions should be considered simultaneously since each potentially can raise wages and affect student achievement.

The relationship between teacher collective bargaining and licensing, on the one hand, and teacher salaries, on the other, is easy to understand. Studies of teacher unions show that collective bargaining increases teacher salaries an average of 15 percent. Kleiner and Petree's results for teacher unions support these estimates. However, they find no evidence that licensing affects wages.

The link between unions and licensing, on the one hand, and student performance, on the other, is much more subtle. While education takes place primarily in the classroom, contract negotiations and teacher certification and licensing are determined at the district or state level. For unionization and licensing to affect student achievement, they must enter the classroom. The obvious primary carrier of these effects is the teacher. To register a significant effect, these institutions must significantly affect various teacher characteristics and/or basic aspects of the classroom environment: class size; the time teachers spend on instruction and preparation; the age, experience, and educational attainment of the teaching force; classroom organization; just to name a few.

We already know something about the effect of unions on student achievement from our own work (Eberts and Stone, 1984, *Unions and Public Schools*). Although our data sets and methodology differ in various respects (most importantly, Kleiner and Petree use state-level aggregates of student test scores while we use individual student data), it is interesting to compare the two sets of results. We find that teachers covered by collective bargaining face smaller classes; they find the opposite. We find that teachers represented by unions are more experienced; they find that these teachers are less experienced, although their estimates are statistically insignificant. We find that resources are diverted away from school activities not related to teacher salaries, presumably to finance higher salaries; they find that nonwage expenditures per student go up. Finally, we both find a significant union productivity gain. However, we may also disagree here as well because of the difference in test score measures. By using SAT and ACT test scores, Kleiner and Petree's estimates tend to include only above-average achievers. Although we find a 7 percent union productivity gain for the average elementary student, holding constant school resources and teacher and student characteristics, we find the opposite effect for above-average achievers, who are typically the students taking SAT and ACT tests.

Why do our two sets of results differ so substantially? In addition to the fact that we use different data sets and look at students in different grades, there are a number of more detailed issues that may contribute to the differences. Kleiner and Petree specify a production function for student achievement with expenditures per student as an input. This equation resembles a short-run, minimum-cost function normalized on output rather than a production function. Moreover, without specifying a production function, Kleiner and Petree are unable to account for other important educational inputs.

Another significant difference between the two studies is the level of aggregation of the respective data sets. Kleiner and Petree argue that the use of aggregate state data on student achievement is appropriate because licensing is a state function and union organization in public schools is strongly conditioned by state bargaining laws. The arguments for treating licensing and union organization at the state level may be correct, but one can use disaggregate data on individual students and schools and still also use state licensing variables as explanatory variables. The appropriate level of aggregation for one independent variable should not determine the appropriate level of aggregation for the dependent and other independent variables.

We also have concern over several details of the empirical analysis. The pooling of time-series and cross-section data in the estimates with no attention to dynamics, for example, suggests that licensing, unionization, and other independent variables have immediate effects on student test scores. In reality, however, these effects are likely to accumulate over time and take place over a protracted period. There is also the issue of selection bias in the SAT and ACT test scores. These tests are taken by only a fraction of students in each state, and this fraction varies substantially from state to state. It is difficult to separate the true effect of unionization from the spurious relationship between unionization and the students who took the test. Finally, the use of union membership as a measure of unionization for teachers means that some effect of unionization is expected in states with union members but with explicit prohibitions of collective bargaining by teachers. Presumably, such teachers should be treated differently than union members in states that permit formal collective bargaining.

In short, many of the differences in results and methodologies can be traced to the problem of data collection. It is very difficult to find data that meet all the needs of a project of this magnitude. Nonetheless, Kleiner and Petree direct our attention to a neglected but important issue: the interaction of teacher unions with the legal structure of the industry and their collective influence on the operation of public schools.

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