Public Sector Unionism without Collective Bargaining

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ABSTRACT

Seven states in the US outlaw public sector collective bargaining, but employees in these states still join unions. Public sector workers join unions in other states even when unions are unable to obtain collective agreements. Using the Current Population Survey Merged Outgoing Rotation Group 2001-2010, we estimate union membership wage premium for public sector employees across states with different public sector bargaining laws. We find that unionism is associated with higher earnings even in states that outlaw public sector bargaining. Using the School and Staffing Survey for teachers, we find that a substantial and increasing proportion of school districts reach meet-and-confer agreements with teachers unions and that those agreements are associated with better retirement plans for teachers. The percentage of workers who join unions in a school district is associated with higher earnings and lower contract working days for union members in states that outlaw collective bargaining as well as in states that mandate bargaining, which suggests that density contributes to the success of unions in the absence of collective bargaining.

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The 2010-2011 attack on public sector bargaining in Wisconsin and Ohio and earlier executive orders by governors in Indiana, Missouri, and Kentucky to rescind bargaining by state employees has brought questions about the desirability of collective bargaining between government and employee organizations. The debates on the impact of collective bargaining on economic outcomes of public sector employees have gained national attention. Many conservative Republicans view public sector collective bargaining as usurping the authority of elected governments and as a barrier to an efficient low-cost public sector. Many Democrats view collective bargaining as a right of employees and as the best way to organize public sector labor markets.

This paper seeks to inform this debate with new evidence on the relationship between the laws governing public sector bargaining, workers' decisions to unionize, and the effects of public sector unions on economic outcomes. Using Current Population Survey (CPS) data, we compare union membership and earnings across states with different legal regimes for public sector bargaining.[3] The legal environments range from states that outlaw public sector collective bargaining to states that mandate that state and local governments negotiate with unions and that allow unions and employers to require all workers covered by collective bargaining to pay an agency shop fee to the union for providing them with union services.[4] Using School and Staffing Survey (SASS) data for teachers, we examine the link between unionism and work conditions and non-earnings "fringe benefits".

We find that:

1. A substantial number of public sector workers join unions in states that outlaw collective bargaining, though at rates considerably below those in states with legal environments that mandate or permit collective bargaining.

2. Unionism is associated with higher earnings for members even in states that outlaw collective bargaining.

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[3] The legal environments were largely determined by state legislation enacted in the 1970s and 1980s. Wisconsin's 2011 limitation of public sector bargaining for all public sector workers except police and firefighters; Michigan's 2012 "right-to-work" law; and the earlier executive orders by the governors of Missouri, Indiana, and Kentucky rescinding bargaining rights for state employees offer opportunities for before/after studies of the effect of legal environments on union membership and outcomes.

[4] Right-to-work laws prohibit such contracts.

3. Among teachers, meet-and-confer agreements have increased relative to collective bargaining contracts. Meet-and-confer is associated with higher non-wage benefits in states whose public sector laws strongly favor collective bargaining and to a weaker extent in states that outlaw collective bargaining.

4. The effects of unionism are greater with higher union density.

In short, the legal framework for collective bargaining is important in determining the extent and ability of unions to organize and affecting labor market outcomes, but workers join public sector unions and gain benefits even absent the right to bargain.

Legal Environment for Public Sector Unionism

The legal environment for public sector unionism differs greatly by state. As a broad summary of how states regulate public sector union activity, we categorize states along two dimensions: the legal status of public sector collective bargaining (CB) and of the agency shop. Using these criteria, we classify the states into the four groups shown in Table 1.

The "High-CB" group contains 23 states that have compulsory collective bargaining laws and allow unions and employers to negotiate mandatory agency fees for workers who do not join the unions. The "Med-CB" group contains 11 states that have compulsory collective bargaining laws but also have "right to work" provisions for public sector workers that prohibit mandatory agency fees. The "Low-CB" group consists of 9 states that allow collective bargaining but do not require public sector management to bargain collectively with unions. The "No-CB" group consists of 7 states that outlaw collective bargaining by public sector workers.

Table 2 shows the number of teachers, police, firefighters, and all state and local government employees (panel 1)[5] and the relevant union density (panel 2). It is based on CPS Merged Outgoing Rotational Group file data for 2010. Highly populous East coast and West coast states have laws that require collective bargaining between public sector management and that allow agency fees. About half of all public sector workers are in the High-CB group. The second largest number of public sector employees is in the No-CB group, which bans collective

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[5] We do not examine federal employees or postal workers, who are covered by national regulations. When we refer to public sector employees, we refer to state and local employees only.

bargaining. Texas is the largest state in this category. About a quarter of all state and local employees are in the other two intermediate groupings.

The density figures in panel 2 of the table justify the names we have given to the groups. For each of the categories of employees, the High-CB group has the largest union density among all groups followed by the Med-CB group. The low-CB group has higher density than the No-CB group among all state and local employees and among teachers but not among police and firefighters. The surprise in panel 2 is the significant union density among teachers, police, firefighters, and other public sector workers in the seven states that outlaw collective bargaining.

Readers may wonder why we do not use the CPS question on collective bargaining status in our analysis. The reason is that the CPS questions on unionism and collective bargaining gives a misleading picture of public sector collective bargaining. The CPS asks if someone is a member of a union and then asks nonunion workers if they are covered by a collective bargaining contract. The implicit assumption is that all union members are covered, which is a reasonable assumption for the private sector but not for the public sector. Tabulations of collective bargaining coverage using the CPS data show substantial coverage in non-CB states, due to the erroneous assumption that union members have a contract which the law forbids. The validity of the CPS data for analyzing public sector unionism could be easily enhanced by extending the question on coverage to workers who say they are in a union. The bargaining coverage data could be even more improved by asking if workers were covered by a collective bargaining contract or by a meet-and-confer agreement, which our data suggests is substantial.

For public sector teachers, the Department of Education's School and Staffing Survey (SASS) data provides an alternative measure of unionization. The SASS is composed of a multi-level surveys that obtain data from teachers, the schools in which they work, and the school districts to which the school belongs. It asks teachers about union membership and asks school districts about whether they have a collective bargaining contract or meet-and-confer agreement with a union. Calculating union density in the SASS for 2007-2008, Han (2012) finds a similar ranking by groups to that in table 2 but obtains a union density for teachers in No-CB states that is close to 50%, considerably larger than in table 2; and a difference in the union density between

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the Med-CB group and the High-CB group of 20 percentage points compared to 32 percentage points in Table 2.[6]

Differences in magnitudes between the CPS and the SASS aside, both show that while public sector employees are more likely to join unions in states that mandate or allow collective bargaining, many workers join unions even without the legal possibility of collective bargaining, per the title of the paper.

What Unions Do with and Without Collective Bargaining

What benefits, if any, do unions gain for members without collective bargaining? The traditional starting statistic for assessing the economic effects of unionism are estimates of union-nonunion earnings gaps (Lewis, 1990). To obtain a large sample of workers by occupation and state, we pooled the CPS MORG data for 2001-2010 into a single data file and estimated ln hourly earnings equations for workers in different legal regimes and with different union status. We restricted the sample to full time workers who have usual weekly work hours of 30 or above; dropped observations if the values for usual weekly earnings or usual hours worked were missing; and truncated earnings at the bottom 1 percentile. To compare observationally equivalent workers, we included a kitchen sink of worker attributes in every regression: gender, education, potential experience and its squared, interaction between gender and experience and experience^2, race, ethnicity, metropolitan area, population size, marital status, family head, citizenship status, occupation, and industry. To capture common period effects, we included year dummies. We weighted the regressions by the sample weights.

Column 1 of table 3 summarizes the results of these regressions in terms of estimated coefficients on dummies for the High-CB, Med-CB, and Low-CB groups relative to the No-CB omitted reference group by occupation. The estimates show that earnings for teachers, police, firefighters, and other state and local employees are higher in states with the most favorable laws for public sector bargaining relative to the others. The workers in the High-CB group receive 10-20 log points higher hourly earnings than the workers in the No-CB group, while workers in the intermediate groups have little or no edge over those in the No-CB group. The negligible

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[6] See Han (2012), Table 2. She also finds that the collective bargaining coverage in Med-CB group is as high as in High-CB group, which suggests that the absence of agency fee might produce many free riders.

coefficient on workers in the Med-CB states, which have compulsory bargaining laws but have right-to-work laws that outlaw agency fees, could reflect the adverse effect of right-to-work on unions' bargaining power in those states or could reflect some other factor that manifests itself in negligible wage effects and in right-to-work legislation.

The columns 2 of each occupational group add union membership status to the regressions. With the dummy variables for legal environment in the regression, the coefficient on union membership reflects the average union/nonunion earnings differentials across the legal regimes. The estimates show that union members earn higher hourly earnings than non-members by 4.9 to 14.5 log points depending on their occupations.

A priori it seems reasonable to expect the union/nonunion wage gap to differ in different legal regimes. It should be larger, in particular, in states where collective bargaining is mandated than in states where collective bargaining is illegal. To see if this is the case, we separately estimate the union premium from ln earnings equations for each of the legal groups. Table 4 summarizes our findings. The coefficients under the heading OLS include the covariates listed in the source note. The coefficients under the heading OLS+state add state dummies to the regression. Without state dummies, the regressions compare union members in all states in a group to non-members in all states in the group. This could capture differences associated with the different distribution of union and nonunion workers among the states. However, the regressions with the state dummies also have interpretative problems. Comparing union members to non-members within a state can produce differences due to selectivity of union members and/or to spillovers of union effects within a state (both likely to be greater within than across states). In states where few workers are unionized, such as Mississippi, or almost all workers are unionized, such as Massachusetts, union members may be quite different than observationally equivalent non-members. In states with high union density, non-members may be covered by the same contract as members or work for an employer whose pay follows union settlements.

The estimated coefficients in the OLS and OLS+state columns in table 4 are sufficiently similar to suggest that these concerns are not a first-order problem. The biggest differences in the estimated union membership premium are by occupation, not by inclusion/exclusion of the state dummies. The estimates for teachers show a significant union premium in the High-CB group, a smaller premium for the Med-CB group, and a small premium for the Low-CB and the No-CB

groups, with the latter significant at the 10% level. The estimates for police show high premium under all legal settings. The estimates for firefighters show sizable premium for the High-CB and Med-CB groups, small and negligible premium for the low CB group, and then a sizable premium in the No-CB group. The estimates for other state and local workers have a similar pattern to the firefighters.

Looking across the occupations, the union membership premium is consistently significant and positive in the High-CB and Med-CB groups, where collective bargaining is mandatory. However, it is also positive and substantial for police, firefighters, and other public sector workers in states which outlaw collective bargaining and in states which permit but do not make bargaining mandatory. This suggests that unions may affect outcomes in those states outside of the traditional collective bargaining channel.

It is possible that the estimated union effects in the states without collective bargaining or with permissive but not mandatory laws are due to subtle differences between union and nonunion workers that the OLS regression model does not capture. To refine our comparison, we estimated union/nonunion differentials using propensity score matching for the probability that a worker would be unionized in each of the four legal groupings (see Appendix I for details). We checked how well the propensity score model did in constructing the comparison groups in two ways. First, we looked at histograms of propensity scores for union membership by union status. The histograms are symmetrical for nearly all our groups[7], as Figure 1 illustrates for teachers. Second, we calculated standard test statistics for the pattern of covariates in the propensity model between union and nonunion workers and found little difference.[8] Given a seemingly successful matching of union members with non-members, the difference in ln (hourly earnings) between the union member and paired non-member estimates the average treatment effect on the treated (ATT).

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[7] The exception is firefighters in No-CB group.
[8] We computed the percent difference of the sample means between the treated and non-treated group, called percent of bias, for each covariate used to estimate the propensity score. The percent of bias for most covariates was less than 5%, which suggested that most covariates were well balanced in all groups. We also performed a t-test of the mean difference between the treated and non-treated groups and found an insignificant difference for most covariates.

The ATT column in table 4 records the weighted average of the mean differences.[9] The estimates are similar to those in the OLS calculations. The biggest change in coefficients is for firefighters in the No-CB group, whose estimated union premium drops from significant 0.190 (OLS) and 0.159 (OLS+state) to a still sizable positive but insignificant 0.082. Overall, however, the ATT estimates from propensity score matching are consistent with those from two OLS models in showing that union membership is positively associated with higher earnings for public sector workers in states which outlaw collective bargaining as well as in states which permit collective bargaining without mandating it.

Finally, we performed one additional "placebo" check to see whether the differences in table 4 are associated with public sector laws rather than with some unmeasured feature of the labor markets in the relevant states. We estimated union wage premium for private sector workers for each of the four groups separately. Since private sector workers are covered by the National Labor Relations Act (NLRA), differences in states' public sector laws should not affect the private sector union/nonunion differentials. If the laws were also associated with private sector differentials, we would worry about interpreting the public sector results as reflecting the different legal environments. We found no such pattern: the union/nonunion differentials barely differ for private sector workers across the four legal groups.[10]

The Union Effects among Teachers: Meet-and-Confer Agreement

Given that workers join unions in states which outlaw collective bargaining and in states which permit but do not encourage bargaining and that union members gain higher wage, how do the unions improve the well-being of members in those states?

There are several mechanisms through which unions exert pressure on employers. They lobby legislators or other elected bodies. They contribute money and volunteer in campaigns to elect the candidates favorable to their members. They also provide education, legal assistance to members facing job-related problems, and advice independent of employers. The SASS data set for teachers contains information on one of these channels. The survey asks school districts

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[9] We estimated the variance of the estimator for ATT by bootstrapping.
[10] The OLS estimates of union/nonunion differentials is 11.6 ln points for High-CB group, 15.2 ln points for Med-CB group, 13.9 ln points for Low-CB group, and 12.1 ln points for No-CB group.

whether they have collective bargaining or "meet-and-confer" agreements with teachers unions. Before states enacted laws mandating or permitting collective bargaining in the public sector in the 1970s, meet-and-confer was the primary way for public sector unions to represent their members' interests to employers. During meet-and-confer, the union and management exchange views and discuss proposals, which can lead to an agreement that is likely to affect outcomes even absent a legally binding collective bargaining contract. In the states that prohibit public sector bargaining, meet-and-confer is the only agreement option available to employers and employees. In other states, employers and employees can choose a meet-and-confer agreement instead of a bargaining contract.

Using three waves of School and Staffing Survey (SASS) school district data between 1999 and 2008, we computed the number of school districts that had meet-and-confer agreements, the number that had collective bargaining agreements, and the number that had no agreements at all (see Appendix 2). Figure 2 shows a surprising increase in the proportion of school districts with meet-and-confer agreements, from about 8% in 1999 to 14% in 2008 and a commensurate drop in the proportion of school districts with collective bargaining agreements from 62% in 1999 to 57% in 2008. The proportion with no agreements was held roughly constant. Figure 3 takes this a step further by decomposing the proportion of school districts with meet-and-confer agreements across our legal regime groups. It shows that meet-and-confer is most common and increased rapidly in states in the Low-CB group, where collective bargaining is permitted but not mandatory. The figure also shows that meet-and-confer is least common but also increased substantially in states with mandatory collective bargaining, expanding from less than 2% of school districts in 1999 to more than 9% of schools districts in 2008. In the Med-CB group and the No-CB group, meet-and-confer increased more modestly over the period.

What do unions achieve for teachers in the different legal environments? How important is meet-and-confer in affecting outcomes?

Panel 1 of table 5 summarizes the results of regressing outcome measures for teachers on union membership in each of the four legal settings, along with the covariates listed in the table note. The SASS data contains a somewhat different set of measures than the CPS data for teachers related to the actual work of the teacher such as teaching level, teaching subjects, and so on as specified in the note to the table. The estimated wage premium for teachers in this table is a

bit lower than in the CPS estimates for teachers in high CB states but is nearly identical for teachers in the No-CB (.016 vs. .017). The coefficients on contract days show little difference between union members and non-members in any of the calculations.

Panel 2 of table 5 presents coefficients results for regressions of the outcome variables on dummy variable indicating whether a teacher works in a school district that has collective bargaining agreement or meet-and-confer agreement relative to a school district that has no agreement at all, which serves as the reference group. The estimated coefficients in the High-CB states show that having a collective bargaining produces better working condition (lower contract days) for teachers. Meet-and-confer produce better non-wage benefits for teachers, notably in increasing the likelihood that an employer funds defined-contribution retirement plan. In the Med-CB group, the coefficients on both collective bargaining and meet-and-confer show little relation to earnings and contract days but positive effects on the two measures of retirement benefits. In the Low-CB group, collective bargaining has a significant effect on contract days and a large impact on employer contributions to defined-contribution retirement plans but not on the other outcomes, while meet-and-confer agreements have no noticeable effect on any of the outcomes. In the No-CB group, meet-and-confer agreement have negligible effect on base salary, contract days, and employer contribution to retirement plan, but positive effect on the provision of defined-contribution retirement plan. Districts that have meet-and-confer agreements with unions have significantly higher probability to offer defined-contribution retirement plan for their teachers compared to districts with no agreement. Overall, meet-and-confer agreements are positively associated with non-wage benefits.

Union Density

Analyses of union effects in the private sector often stress the need for unions to have a substantial share of the work force in a given sector to bargain for higher wages and benefits. If non-union competitors have a sizable share of the market and can provide good substitutes for the union-made products, union labor will likely have a high elasticity of demand, which will force the union to moderate bargaining demands for the fear of large job losses. In the public sector, union density is also likely to affect the ability of unions to obtain benefits for members

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through different pathways. Higher union density can translate into great lobbying and political pressure on government employers even in the absence of collective bargaining.

We investigate the relation between union density and economic conditions of teachers using SASS 2007-2008 with the following equation:

$$(1) \quad \ln(Outcome)_{id} = \beta_0 + \beta_1 Density_d + \beta_3 Teacher_{id} + \beta_4 District_d + \varepsilon_{id}$$

where the outcome variable relates to teacher i in district d and *Teacher* and *District* denote the covariates for teacher characteristics and districts characteristics respectively that are listed in the table note of Table 6.

Table 6 reports OLS estimates of the union effect on base salary and contract days, separately estimated from equation (1) for each of the legal regime groups. We run the regressions for all teachers and then differentiate between union members and non-members. In the High-CB group, union density has a sizable positive effect on the base salary of all teachers due to its positive effect on members while it is negatively related to the pay of non-members. Density has an insignificant negative effect on the contract days, implying shorter contract days with greater unionization, but this effect turns out to be due to the negative effect on non-members. In the Med-CB group, density also reduces contract days but in this case it is for union members.

The most striking result in table 6 is for the No-CB group. Density is positively associated with the base salaries of union members, although the magnitude is smaller than in the High-CB group. Density also has a small positive impact on the base salaries of non-members, but with a high standard error. Density is significantly negatively related to contract days for union members and has a nearly significant effect on contract days of non-members. On average, an increase in district's union density by 10 percentage points is associated with the increase in base salary by 0.4 percent and with the decrease in contract days by 0.2 percent. Density, therefore, appears to be a particularly important channel for unions to benefit members in the absence of the right to collectively bargain.

In sum, our empirical analysis of the SASS data for teachers shows that teachers unions improve members' well-being absent collective bargaining partly through meet-and-confer

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agreements. However, the key to unions' impact is the high union density in the school district in which they operate.

Conclusion

Our analysis of CPS data for teachers, police, firefighters, and all other state and local employees shows that public sector workers join unions and that membership is associated with higher earnings even in states that outlaw collective bargaining. Our analysis of the SASS data highlights the growth of meet-and-confer agreements and the importance of union density in gaining benefits for members of teachers unions in states that outlaw collective bargaining as well as in states with laws favorable to collective bargaining. The ability of public sector unions to attract workers and improve their well-being in the absence of collective bargaining resonates with recent developments in the private sector in which unions, labor activists, and workers have formed non-bargaining organizations to help the workers in the labor market.[11] Collective bargaining for a majority of workers at a given workplace has been at the heart of US unionism for decades, but it is not the only way for unions and workers to advance employees' interests. The experience of the public sector unions who operate without collective bargaining power has potentially important lessons for private sector unions and worker groups who are following the same path.

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[11] These include: worker centers that aid low wage immigrant workers, occupation-based unions that seek to affect labor market regulations without collective bargaining contracts such as the New York Taxi-drivers Alliance (http://www.nytwa.org) or that provide benefits to freelancers who shift employers frequently (www.freelancersunion.org), minority union locals (www.Alliance@IBM), and non-union employee groups (OurWalmart, http://forrespect.org) that seek to improve the economic position of workers without a collective contract. See Freeman (2012).

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Figure 1: Histogram for Propensity Scores for Teachers, by Group
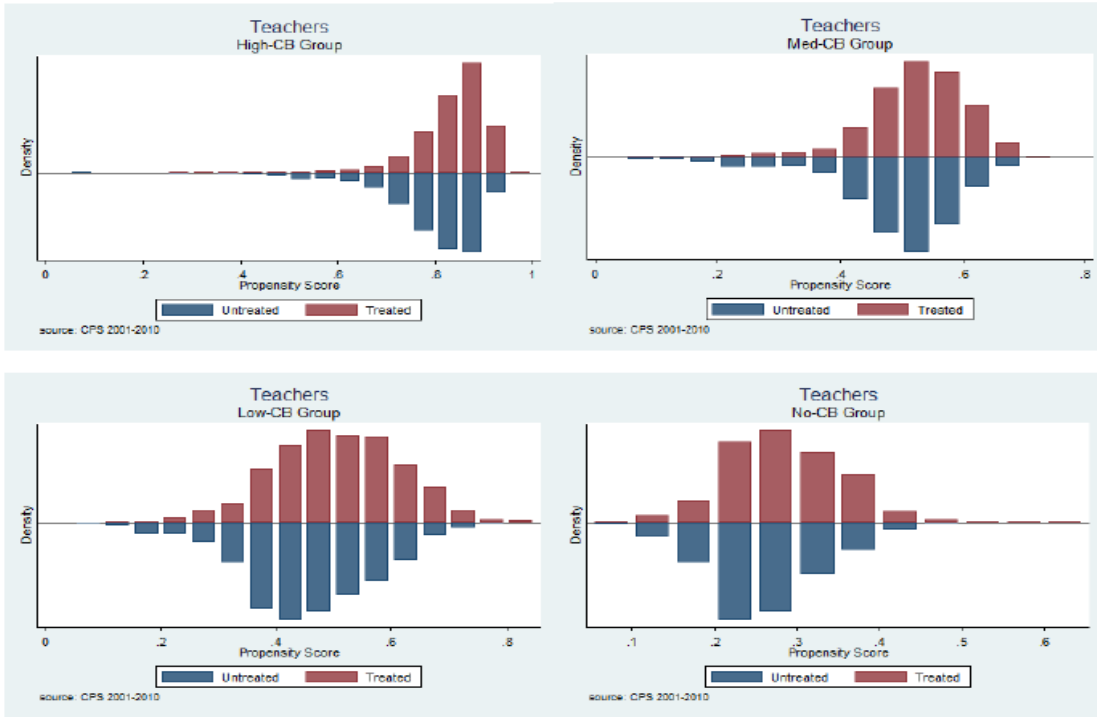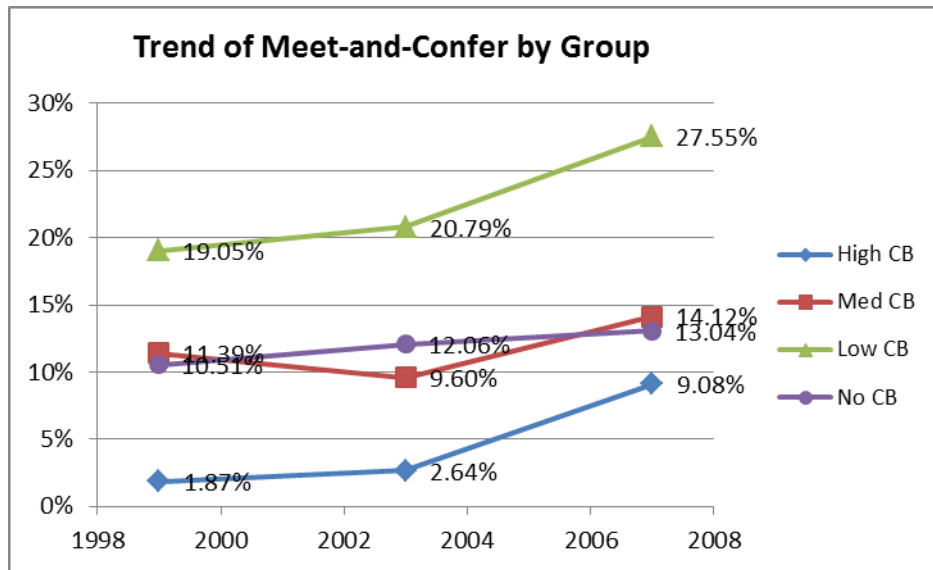

Source: CPS MORG 2001-2010

Figure 2: Percentage of School Districts with Collective Bargaining Contracts, Meet-and-Confer Agreements or No Agreements, 1998-2008
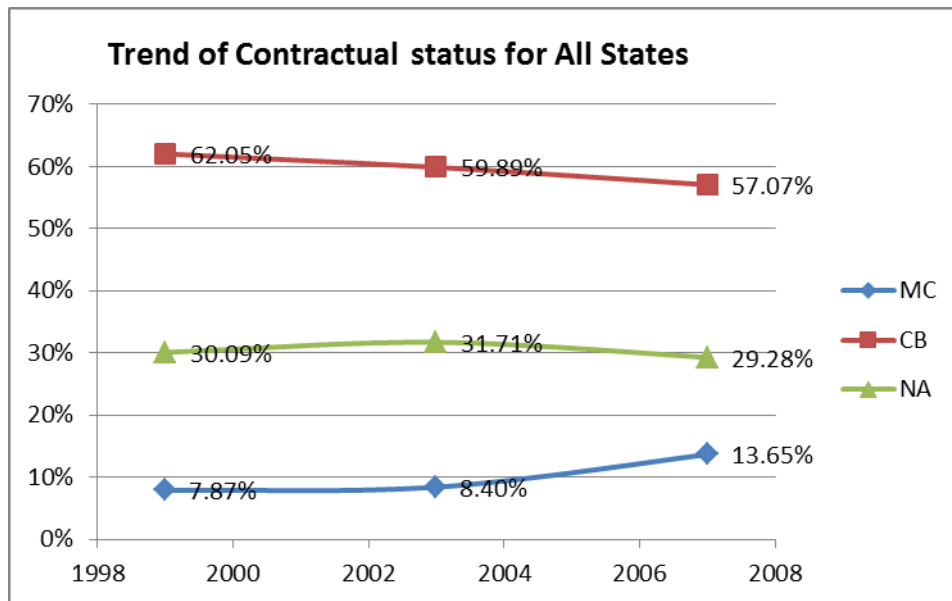
Source: SASS (School and Staffing Survey) School District Data, 1999-2008

Figure 3: Percentage of School Districts with Meet-and-Confer Agreements, 1998-2008

by Group

Source: SASS (School and Staffing Survey) School Districts Data, 1999-2008

Table 1: Legal Environments toward Collective Bargaining of Public Sector Employees

Group	Definition	States
High-CB	States that have collective bargaining laws and allow agency fees	Alaska, California, Connecticut, Delaware, Hawaii, Illinois, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, New Hampshire, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Vermont, Washington, Wisconsin
Med-CB	States that have collective bargaining laws but prohibit agency fees	Florida, Idaho, Indiana, Iowa, Kansas, Nebraska, Nevada, North Dakota, Oklahoma, South Dakota, Tennessee
Low-CB	States that do not have collective bargaining laws but allow collective bargaining	Alabama, Arkansas, Colorado, Kentucky, Louisiana, Missouri, Utah, West Virginia, Wyoming
No-CB	States that ban collective bargaining of public sector workers	Arizona, Georgia, Mississippi, North Carolina, South Carolina, Texas, Virginia

Source: "Teacher Monopoly, Bargaining, and Compulsory Unionism, and Deduction Revocation Table", National Right to Work Foundation (2010)

Table 2: The Employment and Union Density in the Public Sector

Panel 1: Employment by Occupation, in Thousands				
Group	Teacher	Police	Firefighter	State & Local employees
High-CB	1,852	363	140	9,007
Med-CB	538	108	60	2,687
Low-CB	391	58	27	1,836
No-CB	876	139	57	3,811
Total	3,657	668	284	17,341
Panel 2: Union Density by Occupation				
Group	Teacher	Police	Firefighter	State & Local employees
High-CB	84.70%	79.21%	88.86%	60.81%
Med-CB	52.35%	45.53%	52.75%	25.58%
Low-CB	46.37%	19.51%	39.29%	19.58%
No-CB	26.77%	29.41%	41.46%	13.67%

Source: CPS MORG 2010 File

Table 3: Estimated OLS Regression Coefficients on the relation of Legal Environment and Union membership Status of Public sector workers, by occupation

Dependent Variable: ln(hourly wage)

Occupation	Teacher		Police		Firefighter		Other state & local workers	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Union		0.049***		0.141***		0.145***		.068***
High-CB	0.143***	0.115***	0.179***	0.107***	0.205***	0.147***	.132***	.101***
Med-CB	-0.008	-0.019	0.067	0.04	0.054	0.022	-0.001	-0.006
Low-CB	-0.026	-0.035	-0.005	-0.011	-0.006	-0.023	0.003	-0.001
N	31,231	31,231	6,327	6,327	2,474	2,474	112,374	112,374
R	0.26	0.27	0.21	0.22	0.24	0.26	0.34	0.35

Source: CPS MORG 2001-2010. *** p<0.01, ** p<0.05, * p<0.1

Control variables of OLS regression for teacher, police, and firefighter: gender, education, potential experience and its squared, interaction between gender and experience, interaction between gender and experience^2, categorical dummies for race, ethnicity, metropolitan area, population size, marital status, a dummy for family head, citizenship status and year dummies. For other public employees, categorical dummies for broad industry and occupation are also included. All regressions use persons' final weight.

Table 4: Estimates of Union Membership Premium for the Public Sector, by Occupation

Dependent Variable: ln(hourly wage)

Group	Teacher				Police			
	OLS	OLS+ state	ATT	N	OLS	OLS+ state	ATT	N
High-CB	.103***	.093***	.113***	15,947	.153***	.151***	.143***	3,417
Med-CB	.028***	.024***	.028**	6,206	.139***	.118***	.16***	1,209
Low-CB	.016	.009	.019	3,968	.171***	.138***	.133***	762
No-CB	.017*	.019	.017	5,110	.102***	.088***	.073*	939

Group	Firefighter				Other state & local workers			
	OLS	OLS+ state	ATT	N	OLS	OLS+ state	ATT	N
High-CB	.156***	.153***	.125***	1,375	.064***	.054***	.077***	58,287
Med-CB	.088*	.092	.012	483	.076***	.066***	.075***	22,385
Low-CB	.029	.026	.005	285	.027***	.029***	.031**	14,634
No-CB	.18**	.127**	.081	331	.082***	.083***	.074***	17,068

Source: CPS MORG 2001-2010. *** $p<0.01$, ** $p<0.05$, * $p<0.1$
Covariates are the same as in table 3 All regressions use persons' final weight. The covariates to estimate the propensity score for union membership include the same control variables for OLS regression, as well as interactions between variables and higher order terms.

Table 5: Estimates of Coefficients and Standard Errors for the Effect of Union Membership, Collective Bargaining, and Meet-and-Confer on Teacher Compensation, by Group

Dependent Variables	Teacher level dependent variable		District level dependent variable	
	ln(base salary)	ln(contract days)	Districts has DC retirement plan	Districts contributes funds
Panel 1. Effect of Union Membership by Group				
1. High-CB group	.064(.017)***	-.003(.013)		
2. Med-CB group	.008(.006)	-.004(.005)		
3. Low-CB group	.011(.007)	-.000(.007)		
4. No-CB group	.016(.007)***	.001(.007)		
Panel 2: Effects of Collective Bargaining (CB) and Meet-and-Confer (MC) by Group				
1. High-CB group				
Coefficient (SE) on CB	.032(.045)	-.024(.014)*	.156(.093)	.126(.074)
Coefficient (SE) on MC	.036(.048)	-.009(.014)	.06(.120)	.217(.073)***
2. Med-CB group				
Coefficient (SE) on CB	-.019(.015)	.003(.011)	.019(.052)	.119(.074)
Coefficient (SE) on MC	-.005(.017)	-.007(.012)	.028(.069)	.147(.04)***
3. Low-CB group				
Coefficient (SE) on CB	-.018(.014)	-.038(.016)*	-.034(.11)	.242(.162)
Coefficient (SE) on MC	.014(.011)	.006(.008)	-.028(.034)	.023(.067)
4. No-CB group				
Coefficient (SE) on CB	NA	NA	NA	NA
Coefficient (SE) on MC	-.025(.012)	-.020(.012)	.126(.052)**	-.061(.129)

Source: Han (2012), from Table 7. SASS (School and Staffing Survey) 2007-2008.
Errors are clustered within districts (presented in parentheses). *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Columns listed as teacher level variable, based on SASS district-teacher matched data set. Control variables for SASS district-teacher matched dataset : gender, ethnicity, race, a dummy for full-time teachers, a dummy for secondary schools (grades 7th -12th) teachers, experience, experience2, interaction between experience and gender and between experience2 and gender, education level, teaching subjects, school program types, log (number of days in the school year) used in ln base salary regression only, log (total students enrollment of grades K-12), fraction of students eligible for free or reduced-price lunch program, students' ethnicity and race, log (district revenue), log (CWI), and 11 urban-centric locality code of the districts that schools are located in.

Columns listed as district level variable, based on SASS district level data set. Control variables for SASS district level dataset: log (revenue), log (CWI), a dummy variable indicating if a district requires high school students to pass a state or district assessment to earn high school diploma, log (total student enrollment grades K-12), fraction of students eligible for free or reduced-price lunch program, log (number of school days), a dummy for district offering classes to secondary grades (7th -12th), students' ethnicity and race, teachers' ethnicity and race, and 7 dummies for census district locale codes.

Table 6: Estimates of Coefficients and Standard Errors for the Relation between Union Density and Teacher Compensation by Union Membership, by Group

	High-CB	Med-CB	Low-CB	No-CB
Panel 1: ln(Base Salary)				
Member	.145(.049)**	.023(.023)	.027(.026)	.038(.019)*
Non-member	-.098(.062)	-.004(.031)	-.065(.026)*	.017(.045)
All	.132(.027)***	.014(.017)	-.008(.018)	.041(.017)**
Panel 2: ln(Contract days)				
Member	.017(.036)	-.025(.011)**	-.003(.024)	-.049(.024)**
Non-member	-.102(.067)	-.014(.02)	-.091(.023)	-.020(.013)
All	-.020(.016)	-.018(.009)*	-.004(.014)	-.022(.012)*

Source: SASS (School and Staffing Survey) 2007-2008

Note: Errors are clustered within districts (presented in parentheses). *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Control variables: gender, ethnicity, race, a dummy for full-time teachers, a dummy for teachers who teach at secondary schools (grades 7th-12th), teaching experience, experience2, interaction between the experience and gender, education level, teaching subjects, school program types, log (number of days in the school year), log (CWI), log (total students enrollment of grades K-12), fraction of students eligible for free or reduced-price lunch program, students' ethnicity and race, and 11 urban-centric locality code of the districts that schools are located in.

Appendix I: Propensity Score Matching Model

To treat the selection bias for unionization within the same legal environment bargaining, we use propensity score matching. Rosenbaum and Rubin (1983) defined propensity score as the conditional probability of receiving a treatment given pre-treatment characteristics:

(1) $\quad p(X) = \Pr(D = 1 \mid X) = E(D \mid X),$

where $D = \{0, 1\}$ is the indicator of exposure to treatment and X is the vector of pretreatment characteristics. If the exposure to treatment is random within cells defined by multidimensional X, it is also random within cells defined by the values of the propensity score, $p(X)$. Two very important assumptions must be addressed for propensity score matching.

Assumption 1 The balancing property of pretreatment covariates given propensity score: $D \perp X \mid p(X)$

Assumption 2 Unconfoundedness given propensity score: If $Y_{1i}, Y_{0i} \perp D \mid X$, then $Y_{1i}, Y_{0i} \perp D \mid p(X)$

The first assumption implies that observations with the same propensity score must have the same distribution of observable characteristics independently of treatment status. In other words, for a given propensity score, exposure to treatment is random and on average treated and control units should be observationally identical. The second assumption means that if the treatment decision is random conditional on the pretreatment observable characteristics (selection on observables), then all selection biases due to observable covariates can be removed conditional on propensity score.

Let Y_{1i} and Y_{0i} be the potential outcome of treated unit and untreated unit, respectively. Then, then the Average Treatment effect on the Treated (*ATT*) can be estimated once the propensity is given:

$$
\begin{aligned}
(2) \quad ATT &= E\{Y_{1i} - Y_{0i} \mid D_i = 1\} = E\left[E\{Y_{1i} - Y_{0i} \mid D_i = 1, p(X_i)\}\right] \\
&= E\left[E\{Y_{1i} \mid D_i = 1, p(X_i)\} - E\{Y_{0i} \mid D_i = 0, p(X_i)\} \mid D_i = 1\right]
\end{aligned}
$$

Suppose that worker i has a propensity score of joining the unions (p) as a function of the covariates (X) such that $p_i(x) = \Pr(D_i = 1 \mid X_i = x)$, where D indicates if the worker joins the unions. We use logit regression to estimate propensity score since the treatment status is a binary variable:

(3) $Union_i = \beta_0 + \beta_1 X_i + \varepsilon_i$

where *X* represents the covariates that determine selection into treatment. *X* can include higher order terms of covariates and interactions between the covariates.[12] The propensity score is the predicted value of *Union* that I get from this regression. For a matching algorithm, I use the nearest neighbor (*NN*) matching based on propensity score. *NN* matching takes each treated unit and search for the control unit with the closet propensity score, so all treated units find a match.

Following Becher and Ichino (2002), let *T* be the set of treated units (union members) and *C* be the set of control units (workers who are not members of unions), and let Y_i^T and Y_m^C be the salary of the union members and non-members, respectively. Denote by *C(i)* the set of non-members matched to the union member i with the estimated propensity score p_i. Then, *NN* matching has sets that are defined as

$$C(i) = \min_m \| p_i - p_m \|$$

Let N_i^T be the number of units in the treated group (number of union members) and N_i^C be the number of units in the control units (number of non-member) matched with union member i. Control units are given an initial weight proportionate to the number of control units that are matched with treated unit, which is then rescaled so that the sum of weights equals the number of matched treated units.

To avoid bad matches and keep potential bias low, we apply the "with replacement" option that allows a control unit to be the best match for more than one treated unit. We impose the common support restriction to improve the quality of the matches, so we only consider observations whose propensity score in the intersection of the regions of the propensity score of the treated and the control units. In matching with replacement, the weights of control units that were reused are summed across all matches in which the control unit was used. Denote $w_{im} = \dfrac{1}{N_i^C}$ if $m \in C(i)$ and 0 otherwise, so $w_m = \sum_i w_{im}$

The ATT estimator from *NN* matching is:

(4) $$ATT^{NN} = \frac{1}{N^T} \sum_{i \in T} \left(Y_i^T - \sum_{m \in C(i)} w_{im} Y_m^C \right) = \frac{1}{N^T} \sum_{i \in T} Y_i^T - \frac{1}{N^T} \sum_{m \in C} w_m Y_m^C$$

We use bootstrapping to estimate the variance of the ATT estimator, taking account of the variance from the estimation of the propensity score, the imputation of the common support, and etc.

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[12] The base covariates to estimate the propensity score for union membership are gender, education, potential experience and its squared, interaction between gender and experience, interaction between gender and experience^2, categorical dummies for race, ethnicity, metropolitan area, population size, marital status, a dummy for family head, citizenship status and year dummies. Some interaction terms between variables and higher order terms of potential experience are also included in some groups.

Appendix II: Agreement Status between Teachers Unions and School Districts

Group	Year	# of districts with MC	# of districts with CB	# of districts with No Agreement	Total # of Districts
High-CB	1999	41	2,070	82	2,198
	2003	54	1,819	169	2,042
	2007	194	1,793	149	2,136
Med-CB	1999	123	767	190	1,080
	2003	96	734	170	1,000
	2007	149	758	148	1,055
Low-CB	1999	125	68	463	656
	2003	131	81	418	630
	2007	192	70	435	697
No-CB	1999	80	5	676	761
	2003	90	12	644	746
	2007	93	5	615	713
All States	1999	369	2,910	1,411	4,690
	2003	371	2,646	1,401	4,418
	2007	628	2,626	1,347	4,601

Source: School and Staffing Survey (SASS) 1999-2008