

**Teacher Unionization and Student Academic Performance: Will the Weakening
of Teachers' Unions Harm the Middle Class and Intensify Educational Inequality?**

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April 2019**

Income inequality has risen and middle-class incomes have stagnated in the US over the past several decades. At the same time, the impact of organized labor has declined markedly. Farber et al. (2018) document that labor unions have historically served to reduce income inequality in the US: union wage premia have generally been larger for the less skilled than the more skilled, and residual wage variance is also lower among union than non-union workers. Freeman et al. (2015) demonstrate that union affiliation has been important to the attainment of middle-class status for many families, and they also show that the children of union members tend to experience more upward economic mobility than the children of otherwise-similar non-union parents. The weakening unionization of workers is thus one likely source of rising income inequality and the decline of the middle class.

Through much of this period, public sector unions, including teachers' unions, experienced membership growth while unions in the private sector declined. However, the recent Supreme Court decision in *Janus V. American Federation of State, County, and Municipal Employees* (AFSCME) threatens the continued vigor of public sector unions by declaring unconstitutional their collection of agency fees from non-members who are covered by union contracts.

The potential reduction in unionization among teachers arising from this decision may have a direct effect on one group of middle class workers - teachers: union premia for public school teachers are estimated to be in the range of 8 to 13 percent (Han, 2013). In addition to this direct effect, a decline in the efficacy of unions' collective bargaining for educators may have an indirect effect on economic inequality and the fortunes of the middle class: If teachers' unions aid student success (for instance, by attracting and retaining more able instructors, raising financial support for schools, and giving educators a more effective voice to shape educational

practices), then the weakening of union rights for teachers may have a negative effect on student outcomes. If these effects are concentrated in low- and middle-income districts, they may exacerbate the existing trend toward rising inequality and a shrinking middle class.

In this paper, we examine the relationship between teachers' collective bargaining status and students' academic performance using nationally representative data. Particularly, we focus on differences in this link across more and less advantaged communities. Our results indicate generally positive effects of teachers' unions on student performance on standardized tests; moreover these positive effects are concentrated in middle- and, to a lesser degree, low-SES school districts. A decline in the ability of teachers to organize may therefore have differentially negative effects on the outcomes of students in these districts.

Literature

There is a broad body of literature on the impact of teachers' unions on student outcomes. While the measures of unionization and student achievement vary across studies, the mechanisms considered by researchers – the pathways through which unions might have positive or negative impacts on students – are fairly common. Teachers' unions may have positive impacts on student outcomes by attracting and retaining higher quality teachers and improving communication between teachers and district management around matters related to instruction. Unions may also improve teacher performance by raising morale and professional commitment through better working conditions and higher compensation (Freeman and Medoff, 1984; Lindy, 2011; Vachon and Ma, 2015). Proposed mechanisms

leading to negative union effects on student outcomes include union-imposed limits on the ability of administrators to assign teachers to classrooms and schools in the most efficient way, union policies promoting the retention of ineffective teachers, and union rent-seeking practices that may inflate educational costs (Hoxby, 1996).

Research on union impacts on student performance incorporates a variety of measures of union strength. Cowen and Strunk (2015) provide a thorough review of the literature focusing on the variety of empirical approaches that researchers have adopted to investigate these questions. Our discussion here draws on their review. Some studies rely on the state-level legal framework governing teachers' unions as their indicator of union influence. For instance, Lindy (2011) examines the impact of changes in collective bargaining law in New Mexico (from a "duty to bargain," to no bargaining requirement, and back again). Others use more local indicators of union influence – usually a binary measure indicating the presence of a collectively-bargained contract at the district level (Matsudaira and Patterson, 2017; Vachon and Ma, 2015; Eberts and Stone, 1987; Milkman, 1997; Register and Grimes, 1991). Still others have used continuous measures of union strength, arising from indicators of union membership or union dues collected (Carini, Powell and Steelman, 2000; Lott and Kenny, 2013). Similarly, some studies have focused on particular contract provisions, expressed as indexes describing the degree to which these provisions restrict supervisors' discretion (Marianno and Strunk, 2018; Moe, 2009).

These measures - binary indicators of bargaining contracts, the specific provisions of these contracts, or the legal framework governing union rights in state laws - do not fully capture the relevant spectrum of organizing activity in different legal contexts. For instance, in seven states

(Arizona, Georgia, Mississippi, North Carolina, South Carolina, Texas, and Virginia) which ban collective bargaining of public school teachers, many teachers still unionize (Freeman and Han, 2013). Thus, the existence of a collective bargaining agreement between districts and unions, descriptions of the provisions of such contracts, or a simple categorization of state law will not be able to measure the true variation of unionization in those states.

Just as measures of the union presence vary in the empirical literature, so do measures of student performance. The most common measure is district-level performance on standardized tests. Many of these studies rely on scores from California Standards Tests and the related summary Academic Performance Index (API). In this framework, Matsudaira and Patterson (2017) identify positive impacts of collectively-bargained contracts on mathematics proficiency in California charter schools; Moe (2009) finds negative impacts of contract restrictiveness on the growth of API in the largest California districts; and Marianno and Strunk (2018) find small, negative impacts of contract strength in simple OLS regressions, though these effects are generally not significant when prior test performance or district fixed effects are included.

Although our study focuses on union effects at the grade school level, there is also a vast literature focusing on union impacts on high school students, as measured in ACT and SAT scores and graduation rates. Most empirical studies find that teachers' unions positively affect performance of high school students (Kleiner and Petree, 1988; Milkman, 1997; Carini, Powell and Steelman, 2000; Lindy 2011), but some find negative union impact (Hoxby, 1996; Kurth, 1987. Lovenheim and Willen (2016) attempt to identify effects of teachers' unions on labor market outcomes rather than educational outcomes. They find that students educated under

state “duty to bargain” laws have lower lifetime earnings due to reduced labor force participation.

To the extent that prior studies have examined variation in these union effects across students and communities, they have mainly focused on differential impacts on students at different points in the *achievement* distribution. For instance, Lindy (2011) identifies positive impacts of unions on SAT scores, but negative impacts on high school graduation rates, and interprets this to mean that unions are more beneficial for high-achieving students than for students in the lower tail. In contrast, Matsudaira and Patterson (2017) find the greatest positive union impacts at the bottom of the student achievement distribution. Eberts and Stone (1987) find mixed results, with positive union impact on math test scores in the middle of the performance distribution and negative impacts in the upper and lower tails.

Additionally, researchers have examined rising income segregation in the US, its impact on student performance, and variation in that impact across income groups and race/ethnicity groups (Owens, 2018). However, few researchers have studied differential union impacts by the socio-economic status (SES) of districts, though Marianno and Strunk (2018) find evidence of differentially negative (but small) impacts of contract restrictiveness on the performance of low-income students in California schools.

Building on this large body of literature, our study contributes to our understanding of the relationship between teachers’ unions and student outcomes in a number of ways. First, we use detailed, district-level standardized test scores based on national data to overcome the external validity problems posed by studies with limited geographic scope. Second, we measure the strength of teacher unionization beyond collective bargaining status and offer a more

comprehensive view of unions' role in public education than is considered in most studies. Lastly, we examine whether the link between teachers' unions and student outcomes differs by districts' SES, and how that influences educational inequality and the prospects of middle-class students.

Data

Our data come from the School and Staffing Survey (SASS) and the Stanford Education Data Archive (SEDA). The SASS, administered by the National Center for Education Statistics (NCES), is a large-scale and nationally representative data set that covers about a third of US public school districts. It provides our information on teacher unionization in each district. The SEDA, housed in the Center for Education Policy Analysis at Stanford University, incorporates the main outcome measures for students – district and grade level averages of achievement test scores. It also includes district-level information on schools and students from the Department of Education's Common Core Data (CCD), as well as descriptive information on the characteristics of families with school-age children residing in each district, derived from the American Community Survey (ACS) via the NCES School Districts Demographic System (SDDS).

Based on school district ID number, we merge these sources to construct a data set containing a great deal of information on school districts, teachers, students, and their communities. To allow for the effect of teachers' collective bargaining on student performance to emerge over time, we link the data with a one-year lag. Our data set thus consists of two waves of information on the included districts: student outcomes and school district

characteristics from 2008-2009 SEDA linked to information on teacher unionization from 2007-2008 SASS, and 2012-2013 SEDA linked to 2011-2012 SASS (see Appendix I for descriptive statistics).

The SEDA outcome variables reflect student performance on achievement tests in English and Mathematics in the third through eighth grades. Using ordered probit models, estimated means and standard deviations of scores are generated from reports of the counts of the number of students scoring in each proficiency category on these tests. These means and standard deviations are converted to a common scale calibrated to the scores taken from the National Assessment of Educational Progress (NAEP) tests administered in 4th and 8th grades in odd-numbered years (a discussion of these methods is available in Fahle et al., 2018). Means and standard deviations are reported for all students in the district/grade/year, and they are also reported separately for white, black, Hispanic, and Asian students.

Our indicators of unionism come from the SASS and describe the contractual status in each school district. We have three mutually exclusive measures of agreement status between school districts and teachers' unions. The first, "collective bargaining (CB) agreement," indicates that a union contract is in place in the school district. The second, "meet and confer (MC) agreement," indicates that no formal union contract has been signed but that representatives of the union and district management have met to discuss and determine various working conditions, workplace rules, and school policies. MC agreements are not legally enforceable but are often treated as implicitly binding (Han, 2015). The third, "no agreement (NA)," identifies districts in which neither a formal contract nor a meet-and-confer process is in place (though individual teachers may still affiliate with unions in such districts).

We are primarily interested in whether union effects vary across better-off, middle class, and poor districts. Our main indicator of district socioeconomic status comes from the SES index generated from local community characteristics for each school district, as presented in the SEDA data. This index is constructed from district level measures of median income; the share of adults with a bachelor's degree or higher; the poverty rate among families with school-age children; the unemployment rate; the proportion of households that are SNAP recipients; and the proportion of households headed by single mothers.¹ The index is standardized to have a mean of 0 and a standard deviation of 1. Using the SES index, we classify districts into three groups: "high SES" (the 25% of districts with the highest index value), "mid-SES" (the middle 50% of districts), and "low SES" (the bottom 25% of districts).

Figure 1 presents simple, pooled means of scores on these achievement tests, broken down by SES status of the district and also by collective bargaining status of the district. Unsurprisingly, average scores are highest in the districts in the high SES group and lowest in districts in the low SES group. This is true for NA districts, MC districts, and CB districts, and for both subjects (math and English). Certainly, some of the differences in scores by district SES will reflect the resources available to schools, as well as the composition of the student body and home life conditions, in each SES group.

Table 1 presents mean characteristics for each of our three SES categories. High SES districts are more likely to be CB districts whereas low SES districts are less likely to have a CB agreement in place. Higher SES districts tend to have high white shares among their student

¹ For a description of the principal components analysis used to construct the index, see Fahle et al 2018, p. 32-33.

body, as well as fewer English language learners, higher revenue per pupil, and lower rates of provision of subsidized lunch. High SES districts are also more likely to be located in suburban areas, while low SES districts are disproportionately urban and mid-SES districts are disproportionately rural. Table 1 also presents information on the economic and demographic characteristics of the district community, including components underlying the SES index – female headship, poverty, unemployment, household income, and parental education.

Figure 1 also indicates that, controlling for SES, average test scores tend to be highest in CB districts and lowest in NA districts, with MC districts found in the middle. This pattern holds for all three SES groups. Again, this ordering may reflect the correlation of school resources or other district attributes with contract status. According to our calculations, within each SES group, NA districts have larger black and Hispanic student populations and the lowest levels of per-pupil revenue (see Table 2). They also tend to have the highest levels of poverty and single motherhood and the lowest levels of income, even measuring within SES group (which reduces the variation in these measures). Thus, some of the apparent advantage of CB and MC districts over NA districts may reflect these differences in other district characteristics.

Methods

To control for various confounding factors that may be correlated with both student outcomes and union presence in estimating union effects on student performance, we employ both ordinary least squares regression and propensity score matching.

Ordinary Least Square Regressions

To identify the general direction of the association between teacher unionization and students' test scores and to see whether these effects vary by district SES, we first estimate a model pooling all districts and then interacting our union variables with our SES categorization. So, we estimate the following model:

$$Y_{kgst} = \beta_0 + \beta_1 Union_{kt} + \beta_2 SES_{kt} + \beta_3 (Union_{kt} * SES_{kt}) + \beta_4 X_{kt} + \delta_g + \theta_k + \lambda_t + \varepsilon_{kgst}, \quad (1)$$

where k , g , s and t indicate districts, grades, subjects and years, respectively. Y_{kgst} represents the test score, $Union_{kt}$ measures the form of teacher unionization of district k in year t (CB, MC, or NA), and SES_{kt} indicates the SES category of the districts (high, middle, or low) in year t . X_{kt} is a vector of district and community characteristics. δ_g is a vector of dummy variables for grade (4 through 8, with grade 3 as the reference), θ_k is a dummy variable for subject (1 for English tests, with Math as the reference), and λ_t is the year dummy (1 for 2013, with 2009 as the reference year). ε_{kgst} is the error term, reflecting variation not accounted for in the model. The β_3 coefficients indicate whether the effects of union presence on student achievement vary across districts according to their SES status.

We then estimate the model separately by SES category of each district (high, middle, and low):

$$Y_{kgst} = \beta_0 + \beta_1 Union_{kt} + \beta_2 X_{kt} + \delta_g + \theta_k + \lambda_t + \varepsilon_{kgst}, \quad (2)$$

This more flexible form of the estimation allows all effects to vary across SES class.

Our control (X_{kt}) variables describing the characteristics of school districts include the ethnic composition of the student body (percent Hispanic, black, Asian, Native American, with white as the reference), total student enrollment, the total number of teachers, the total number of instructional aides, revenue per pupil, the share of students on free or reduced price lunch, the share of students who are English Language Learners, the share who are in special education, the share of district residents living in the same house as in the prior year, and the geographic locale of the district (city/urban, suburban, or town, with rural as the reference). While we classify districts by SES index and estimate the model for each SES class (high, middle, and low) separately, we also include in our estimation the components of the SES index (share of 5 to 17 year olds in poverty, share of households receiving SNAP benefits, median income, share of households that are female-headed, the unemployment rate, and the share of adults with a bachelor's degree or more education) as distinct variables within each model.

Propensity Score Matching

As an alternative method of controlling for confounding factors in our analysis, we employ propensity score matching (PSM). Considering CB as a treatment, districts with CB are the treated units. Separately, we also consider MC districts as the treated units. Using PSM, we define the non-treated units as NA districts. We construct a model of the propensity of having CB (MC), and we match each CB (MC) district to an NA district with a probability (propensity) of having CB (or MC) similar to that of the CB (MC) districts.

Assuming the treatment decision is random conditional on observable pre-treatment characteristics X (i.e. “selection on observables” or “conditional independence”), we specify the propensity score (p) of receiving a treatment as a function of X that determines the selection into treatment such that: $p_{kt} = \Pr(D_{kt}=1 | X_{kt}=x)$, where D indicates whether the district receives the treatment (CB or MC).

Since the treatment status is a binary variable, we use a logit regression of the following form to estimate the propensity score, $p(X)$:

$$CB_{kt} = \alpha_0 + \alpha_1 X_{kt} + \varepsilon_{kt} \quad (3)$$

where CB is a binary variable equal to 1 if there exists a CB contract and 0 if there is no agreement between a district and teachers union (the comparison group is NA districts), and X represents the district-level covariates that determine selection into treatment. $p(X)$ is the predicted value of CB that we get from equation (2). For MC effects, we replace CB with MC in model (2), and the comparison group is still NA districts.

For a matching algorithm, we use nearest neighbor (NN) matching based on the propensity score p . NN matching takes each treated unit and searches for the control unit with the closest p , so all treated units find a match. To avoid bad matches and to keep the potential bias low, we apply the “with replacement” option so that a control unit can be the best match for more than one treated unit. We also impose the common support restriction to improve the quality of the matches, so only the observations whose p belongs to the intersection of the regions of the p of the treated and control units are considered in the analysis.

Once each treated unit is matched with a control unit based on the propensity score, we compute the mean difference of student test scores between the treated and control units. The average treatment effect on the treated (ATT) is then obtained by taking the weighted average of these mean differences.

Ideally, this matching process allows us to attribute the entire difference in student outcomes – average student test scores – between the treated units and non-treated units as resulting from CB (or MC) status.

Results

Table 3 presents our first attempt to control for the influence of various district characteristics, in order to refine our understanding of the impact of teachers' unions on student outcomes in low-SES, middle class, and high-SES districts. Model 1 presents the estimated relationship between unions' contractual status (CB and MC status) and test scores (with NA districts as the reference group). Model 2 adds controls for district SES status (with "high-SES" as the reference). Model 3 adds interactions between collective bargaining status and SES category, to concretely test for differences in the correlation between student outcomes and teacher collective bargaining in high, middle, and low SES districts. All models pool grades, years (2009 and 2013), and subjects but include dummy variables to control for average differences across these categories. All models also control for district and community characteristics.

Model 1 reveals that CB and MC status are correlated with increased test scores in the face of an extensive list of district and community characteristics. Perhaps surprisingly, MC status has a larger positive association with test scores than does CB status. In model 2, we find that the addition of SES category does not alter the positive correlation of CB and MC status with average score, and that students in low SES districts actually have higher average scores once we have controlled for district and community characteristics.

In model 3, we interact collective bargaining status with SES category to see whether these associations vary across districts by “class.” When we add these interactions, the main effects of CB and MC are dramatically reduced and are no longer statistically significant, suggesting that CB and MC have no significant relationship to student test scores in high SES districts. The interaction of MC and low SES is positive and significant, as are the interactions of both CB and MC with mid-SES. Once other district characteristics are controlled, we find that teachers’ unions, whether operating under a formal CB or through a MC agreement, have their greatest positive link with student achievement in middle-class schools districts. In low-SES districts, MC agreements appear to be correlated with higher student achievement, though formal CB contracts are not. In high SES districts, neither MC nor CB status is positively correlated with student performance.

Table 3 also reveals that overall test scores are lower for districts with higher fraction of minority students, except Asians, ELL students, students under free/reduced-priced lunch programs, greater enrollment, and, surprisingly, higher revenue per student.² Districts with a

² We suspect that this coefficient may be affected by issues of multicollinearity among our explanatory variables. For a thorough review of recent, quasi-experimental studies of the impact of school funding on student outcomes, see Jackson 2018.

greater proportion of Asian students, more students under special education programs, and more teachers and instructional aides tend to score higher. As expected, higher median income and percent of adults with BA and above are positively associated with test scores whereas greater fraction of single moms, higher unemployment rate, and higher share of SNAP recipients are negatively correlated with student performance.

In Table 4, we present a more flexible OLS estimation of the correlation of teachers' union status and student achievement disaggregated by the SES status of the district. We run separate analyses for each SES class, allowing our CB and MC coefficients, as well as the coefficients on all school and district characteristics, to vary across SES status groups. The patterns are very much the same as those in Table 3. Again, both MC and CB status are correlated with higher student test scores in middle-class districts. MC agreements are correlated with higher scores in low SES districts. Neither form of union agreement seems to be related to student performance in high SES districts.

Our main propensity score matching analysis is presented separately for CB and MC effects in Tables 5 and 6, respectively. In these models, we provide results by grade and subject. Table 5 presents evidence on CB effects. Middle-class districts with a CB had higher average math test scores, in all grades, than did districts with similar propensity scores but no CB agreement in place. These effects are around 1 point and are statistically significant in all grades. Neither low-SES nor high-SES districts exhibited significant effects of CB on math score (except for an isolated, modest effect in 4th grade in high-SES districts). The CB effects are relatively greater for lower grades than for higher grades. CB agreements were not correlated with English test scores in any grade for any SES level.

In Table 6, consistent with our OLS results, MC effects are larger and more widely felt. MC agreements are correlated with higher scores, in both math and English, in all grades in middle-class districts, and these effects are larger than those found for CB agreements. No significant effects are found for either low or high-SES districts, though for English scores in particular the point estimates are fairly large and positive for low-SES districts whereas they are small and negative for high-SES districts.

The PSM assumes that all selection is based on observable factors, and CB (or MC) status is randomly determined once controlling for these factors. Because we cannot assert that we have controlled for all the factors, both observable and unobservable, relevant to the selection process, our PSM results may still suffer from omitted variable bias. However, the set of factors we have controlled for is quite extensive, including school funding, size, and staffing levels, student body characteristics, local SES status and related measures, parental education, and household structure and stability. By utilizing this unusually rich sets of control variables, our PSM estimation provides strong evidence that teachers' unions positively impact student performance.

Given the concentration of union impacts in middle class districts, we provide an additional PSM analysis examining differential effects across students' race-ethnicity groups within these districts (Tables 7 and 8). In Table 7, CB effects are present for math scores but not for English scores (with the exception of the average English scores of 6th grade Hispanic students). These math effects are present in all grades for white students, in grades 3 and 4 for black students, and in grade 5 for Hispanic students. In Table 8, again, MC effects are larger and more widely present. MC agreements are correlated with higher math test scores for white students in all

grades and for black students in grades 3 through 6. Positive effects on English test scores are apparent for both white and black students in all grades (and for Hispanic students in 4th grade).

Discussion and Conclusion

Our OLS and PSM analyses of teachers' unions and student test scores tell a consistent story. The presence of an active teachers' union, as revealed through a formal CB contract or through an MC agreement, is associated with higher levels of student achievement on standardized tests, particularly in middle-class school districts. MC agreements are also associated with better outcomes in low-SES districts. These correlations are present in models that include a wide range of school and district characteristics as control variables.

What explains the differentially positive association between teachers' unions and student academic performance that we observe in middle class districts? The answer may in part be due to the impacts of unions on teacher morale, professionalism, and "collective voice." To the extent that teachers unions have positive impacts on schooling and student outcomes, the relevant mechanisms could be through the union's ability to bargain for higher pay and better working conditions for themselves and more resources for students, or through the enhanced ability that unions provide for teachers to influence school practices and the elevated sense of worth in one's work that such associations can foster. The effects of these latter, less quantifiable forces may be less visible when schools are already very highly resourced (leaving less room for additional improvement from these factors). On the other hand, some lower threshold of resources and community conditions may be necessary to enable teachers to

improve learning through these means. That is, these union impacts might be most apparent in schools in mid-SES districts. Such effects may be, somewhat counterintuitively, particularly apparent in MC districts. In these districts, teachers must be especially dedicated in order to remain active and engaged with district administration, through their MC agreement, despite being unable to secure a formal CB contract. Such teachers may be best able to apply the less-tangible benefits of union membership to enhance student learning.

Our results suggest that a weakening of unionization among teachers may harm student performance broadly and may intensify differences between the most advantaged districts and others. In addition, our finding of positive “meet and confer” effects has implications for how we interpret the prior literature. These MC effects are largely ignored in many studies of the impact of teachers’ unions on student outcomes. Indeed, districts with such agreements are likely to be grouped among the “non-union” category in most studies, biasing down the point estimates of the impact of teachers’ unions on student outcomes.

The positive impact of both CB contracts and MC agreements on student outcomes, and their potential inequality-reducing effects, should inform any discussion of the rights of teachers to organize. In particular, our findings on “meet and confer” arrangements suggest the potential benefits for low-income and middle-income households of policies and institutional frameworks that can engage teachers and harness their commitment and expertise, even when CB is not available or rarely used.

While we examine impacts on student test scores, the effects that we document in this study may have broader significance: Chetty, Friedman, and Rockoff (2016) show that higher test scores are correlated with greater odds of college attendance and college completion, and

with higher labor earnings. By improving academic performance of students especially from middle-class and high-poverty districts, teachers' unions will ultimately raise intergenerational mobility and reduce income inequality.

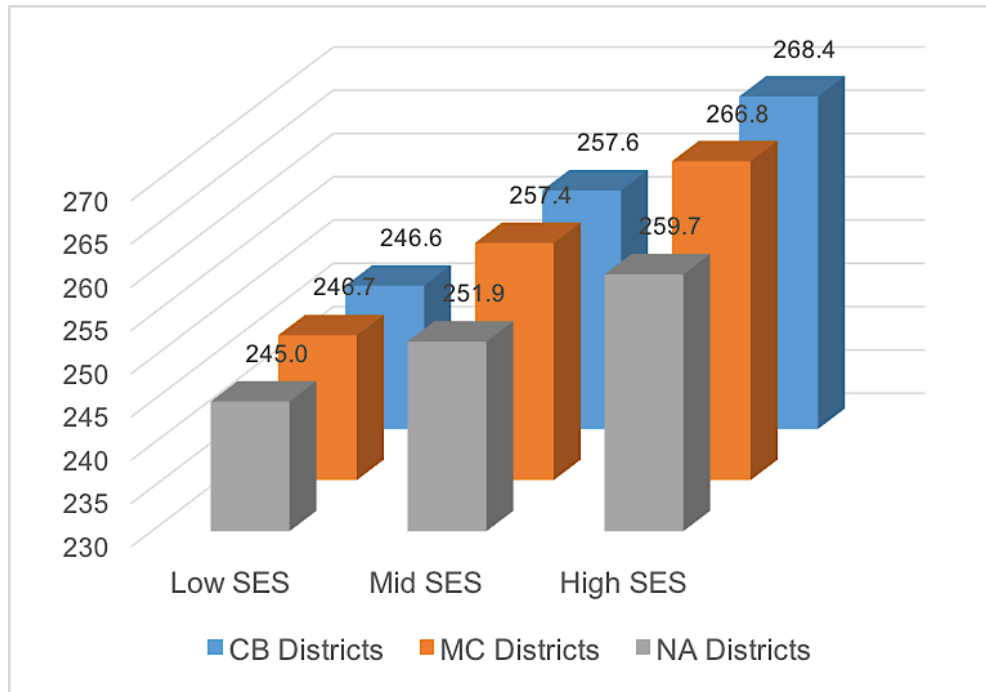
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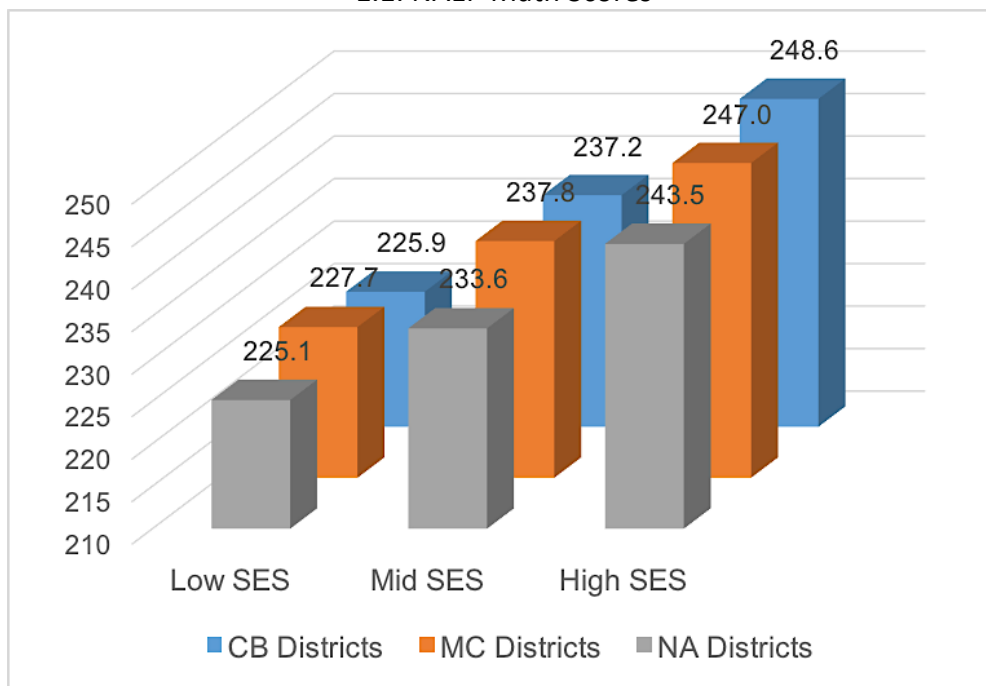
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Figure 1: NAEP Scores by Districts' SES and Contractual Status



1.1: NAEP Math Scores



1.2: NAEP English Scores

Source: Authors' calculation based on 2008-2009 and 2012-2013 *Stanford Education Data Archive* (SEDA, v. 2.1) combined with 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS).

Table 1: Mean Characteristics by SES Status of Districts

	SES Status		
	Low SES districts	Mid SES districts	High SES districts
Districts Characteristics			
Collective bargaining (%)	44.9	63.3	74.6
Meet and confer (%)	10.1	12.7	12.0
No agreement (%)	45.0	24.0	13.4
Student composition (%)			
White	52.5	78.1	83.6
Black	24.9	7.0	4.4
Hispanic	16.6	10.3	6.5
Asian	1.1	1.8	4.3
Native American	4.9	2.3	1.2
% English language learners	5.8	3.6	2.3
% Special education	13.5	13.8	13.1
Total enrollment (grade 3-8)	4,365	3,188	2,852
Total teachers	617.9	451.7	389.6
Total instructional aides	121.6	94.26	86.28
Revenue per pupil	\$11,641	\$11,693	\$13,686
% free/reduced-price lunch	70.4	47.3	23.3
Neighborhood Characteristics			
Location (%)			
Urban	17.3	8.9	5.3
Suburban	15.4	22.0	51.1
Town	30.2	26.4	12.6
Rural	37.1	42.6	30.9
% Female-headed household	35.3	22.2	14.7
Poverty rate (age 5-17)	28.0	13.5	5.1
Unemployment rate	6.1	4.3	3.1
% in same house as last year	83.9	86.5	90.8
Median household income	\$38,594	\$57,913	\$92,757
% adults with BA and above	16.2	21.9	40.0
Observations	56,759	114,663	56,602

Source: Authors' calculation based on 2008-2009 and 2012-2013 *Stanford Education Data Archive* (SEDA, v. 2.1) combined with 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS).

Table 2: Mean Characteristics by SES Status and Union Status of Districts

Union Status	<u>Low SES districts</u>			<u>Mid SES districts</u>			<u>High SES districts</u>		
	CB	MC	NA	CB	MC	NA	CB	MC	NA
<i>District Characteristics</i>									
Student composition (%)									
White	0.547	0.569	0.494	0.805	0.817	0.723	0.850	0.852	0.739
Black	0.183	0.207	0.324	0.056	0.053	0.115	0.038	0.045	0.080
Hispanic	0.191	0.125	0.149	0.097	0.087	0.129	0.058	0.052	0.117
Asian	0.016	0.008	0.007	0.020	0.015	0.012	0.046	0.037	0.032
Native American	0.063	0.091	0.025	0.023	0.028	0.021	0.008	0.014	0.032
% English language learners	0.071	0.045	0.049	0.036	0.034	0.038	0.022	0.023	0.030
% Special education	0.152	0.145	0.117	0.145	0.141	0.119	0.135	0.136	0.104
Total enrollment (grade 3-8)	5,411	3,889	3,429	3,050	2,431	3,956	2,453	2,947	5,004
Total teachers	768.4	534.5	490.1	427.4	342.2	572.3	327.7	417.0	701.0
Total instructional aides	127.8	117.8	116.3	86.91	79.56	121.4	78.28	91.72	126.2
Revenue per pupil	12,794	11,774	10,455	12,175	11,553	10,492	14,123	13,131	11,687
% free/reduced-price lunch	0.695	0.690	0.717	0.453	0.460	0.535	0.215	0.245	0.326

Neighborhood Characteristics

Location (%)									
Urban	0.213	0.160	0.135	0.090	0.078	0.096	0.047	0.068	0.075
Suburban	0.234	0.127	0.081	0.252	0.182	0.156	0.550	0.429	0.367
Town	0.270	0.337	0.325	0.289	0.274	0.196	0.124	0.164	0.105
Rural	0.283	0.376	0.459	0.370	0.466	0.553	0.279	0.339	0.453
% Female-headed household	0.349	0.348	0.359	0.220	0.211	0.232	0.146	0.147	0.156
Poverty rate (age 5-17)	0.264	0.264	0.299	0.129	0.131	0.155	0.049	0.054	0.059
Unemployment rate	0.067	0.0626	0.057	0.0450	0.042	0.042	0.033	0.029	0.028
% in same house as last year	0.834	0.825	0.848	0.868	0.864	0.857	0.914	0.902	0.878
Median household income	40,120	39,776	36,804	59,288	57,999	54,244	94,521	88,501	85,778
% adults with BA and above	0.171	0.159	0.153	0.227	0.215	0.200	0.415	0.376	0.337
Observations	25541	5676	25542	72582	14562	27519	42225	6792	7585

Source: Authors' calculation based on 2008-2009 and 2012-2013 *Stanford Education Data Archive* (SEDA, v. 2.1) combined with 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS).

Table 3: Estimated Relationship between Unions' Contractual Status and Students' Test Scores

VARIABLES	(1)	(2)	(3)
Collective bargaining agreement (CB)	0.384*** (0.115)	0.398*** (0.115)	0.173 (0.191)
Meet and confer agreement (MC)	1.367*** (0.218)	1.367*** (0.218)	0.262 (0.443)
Low SES districts		1.374*** (0.338)	1.342*** (0.346)
Mid SES districts		0.293 (0.194)	0.108 (0.206)
Low SES districts *CB			-0.324 (0.341)
Mid SES districts *CB			0.555** (0.246)
Low SES districts *MC			1.311** (0.635)
Mid SES districts *MC			1.502*** (0.530)
% Hispanic students in the district	-9.453*** (0.519)	-9.498*** (0.519)	-9.489*** (0.519)
% black students in the district	-15.42*** (0.480)	-15.27*** (0.490)	-15.33*** (0.490)
% Asian students in the district	4.718*** (1.551)	4.760*** (1.540)	4.749*** (1.540)
% Native Americans in the district	-16.95*** (0.821)	-16.82*** (0.814)	-16.83*** (0.817)
Total student enrollment (in thousand)	-0.248*** (0.0559)	-0.246*** (0.0558)	-0.246*** (0.0556)
% of Students in district that are ELL	-8.888*** (1.185)	-8.739*** (1.183)	-8.784*** (1.183)
% of Students in district that are Special Ed	2.128* (1.105)	2.210** (1.104)	2.275** (1.105)
Total number of teachers (in thousand)	1.733*** (0.413)	1.721*** (0.415)	1.730*** (0.413)
Total number of instructional aides (in thousand)	1.855*** (0.488)	1.830*** (0.495)	1.827*** (0.491)
Revenue per pupil (in thousand \$)	-0.073*** (0.014)	-0.073*** (0.014)	-0.072*** (0.014)
% of Students with free/reduced-price lunch	-17.67***	-17.96***	-17.89***

	(0.581)	(0.589)	(0.589)
% of 5-17 year olds in poverty	4.200***	2.638**	2.595**
	(1.131)	(1.187)	(1.189)
% living in household receiving snap benefits	-2.523**	-3.875***	-3.922***
	(1.039)	(1.079)	(1.079)
income at 50th percentile	2.7e-05***	2.6e-05***	2.6e-05***
	(4.44e-06)	(4.48e-06)	(4.47e-06)
% in household with children, female head	-1.925**	-2.767***	-2.715***
	(0.930)	(0.954)	(0.953)
% unemployed	-33.41***	-37.18***	-37.11***
	(3.241)	(3.399)	(3.398)
% of adults with BA and above	24.75***	24.89***	24.89***
	(0.762)	(0.773)	(0.773)
% living in same house as last year	0.854	0.886	0.894
	(0.885)	(0.885)	(0.884)
city/urban locale	-0.264	-0.228	-0.215
	(0.248)	(0.248)	(0.248)
suburban locale	0.843***	0.857***	0.860***
	(0.154)	(0.154)	(0.154)
town locale	0.228*	0.235*	0.224*
	(0.135)	(0.134)	(0.134)
Grade is 4th	10.38***	10.39***	10.39***
	(0.0574)	(0.0574)	(0.0574)
Grade is 5th	21.06***	21.06***	21.06***
	(0.064)	(0.064)	(0.064)
Grade is 6th	32.49***	32.50***	32.50***
	(0.070)	(0.070)	(0.070)
Grade is 7th	43.15***	43.15***	43.15***
	(0.074)	(0.074)	(0.074)
Grade is 8th	54.22***	54.23***	54.23***
	(0.080)	(0.080)	(0.080)
Subject is English	-20.04***	-20.04***	-20.04***
	(0.046)	(0.046)	(0.046)
Year is 2013	3.340***	3.359***	3.355***
	(0.066)	(0.066)	(0.066)
Constant	232.9***	233.2***	233.3***
	(0.894)	(0.911)	(0.912)
Observations	228,024	228,024	228,024
R-squared	0.874	0.874	0.874

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

Source: *Education Data Archive* (SEDA, v. 2.1) combined with 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS).

Table 4: Estimated Relationship between Unions' Contractual Status and Students' Test Scores, by SES Status of Districts

VARIABLES	(1) Low SES districts	(2) Mid SES districts	(3) High SES districts
Collective bargaining agreement (CB)	0.134 (0.285)	0.765*** (0.158)	-0.0278 (0.187)
Meet and confer agreement (MC)	1.646*** (0.463)	1.742*** (0.296)	0.297 (0.433)
% Hispanic students in the district	-8.214*** (0.797)	-10.48*** (0.800)	-16.23*** (2.077)
% black students in the district	-15.95*** (0.788)	-12.15*** (0.864)	-11.92*** (1.835)
% Asian students in the district	-12.91** (5.624)	-0.828 (2.865)	11.90*** (1.614)
% Native Americans in the district	-16.59*** (1.085)	-14.87*** (1.353)	-29.57*** (5.219)
Total student enrollment (in thousand)	-0.184*** (0.069)	-0.286*** (0.068)	-0.316*** (0.078)
% of Students in district that are ELL	-8.493*** (1.686)	-6.262*** (1.783)	-12.16** (5.126)
% of Students in district that are Special Ed	2.030 (1.828)	3.569** (1.635)	-1.156 (2.618)
Total number of teachers (in thousand)	1.333*** (0.481)	2.311*** (0.513)	2.193*** (0.596)
Total number of instructional aides (in thousand)	1.424* (0.738)	0.640 (1.146)	1.487 (1.751)
Revenue per pupil (in thousand)	-0.118*** (0.034)	-0.075*** (0.020)	-0.053** (0.023)
% of Students with free/reduced-price lunch	-17.12*** (1.184)	-20.12*** (0.852)	-17.08*** (1.461)
% of 5-17 year olds in poverty	-1.577 (2.180)	0.875 (1.765)	0.210 (3.723)
% living in household receiving snap benefits	-5.197*** (1.721)	-5.494*** (1.510)	-1.959 (3.691)
income at 50th percentile	-3.28e-05 (2.30e-05)	-2.1e-05** (1.02e-05)	1.7e-05*** (6.18e-06)
% in household with children, female head	-2.017 (1.803)	-1.250 (1.315)	-5.301*** (2.043)
% unemployed	-38.87*** (5.574)	-36.73*** (4.779)	-12.69 (8.172)
% of adults with BA and above	24.36***	19.42***	27.37***

	(2.186)	(1.191)	(1.191)
% living in same house as last year	-1.330	0.585	3.913**
	(1.671)	(1.235)	(1.990)
city/urban locale	-0.513	0.727**	-0.381
	(0.442)	(0.369)	(0.537)
suburban locale	0.434	1.189***	0.692***
	(0.394)	(0.227)	(0.242)
town locale	0.208	0.285	0.354
	(0.261)	(0.178)	(0.331)
Grade is 4th	9.943***	10.19***	11.23***
	(0.115)	(0.083)	(0.105)
Grade is 5th	20.09***	20.85***	22.48***
	(0.132)	(0.090)	(0.118)
Grade is 6th	31.25***	32.28***	34.20***
	(0.146)	(0.097)	(0.129)
Grade is 7th	41.33***	42.79***	45.68***
	(0.151)	(0.102)	(0.136)
Grade is 8th	52.32***	53.86***	56.83***
	(0.167)	(0.110)	(0.147)
Subject is English	-21.04***	-20.11***	-18.84***
	(0.097)	(0.062)	(0.0945)
Year is 2013	3.082***	3.628***	3.386***
	(0.143)	(0.097)	(0.127)
Constant	242.1***	238.5***	228.3***
	(2.206)	(1.423)	(2.008)
Observations	56,759	114,663	56,602
R-squared	0.848	0.857	0.886

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

Source: *Education Data Archive* (SEDA, v. 2.1) combined with 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS).

Table 5: PSM Results for CB – Average Treatment Effect on the Treated (ATT)

Grades	Low-SES	Mid-SES	High-SES
Panel A: Math			
Grade 3	0.056 (0.600)	1.051*** (0.329)	0.205 (0.449)
Grade 4	0.926 (0.665)	1.465*** (0.342)	0.860* (0.492)
Grade 5	1.162* (0.663)	1.048*** (0.364)	0.276 (0.550)
Grade 6	0.191 (0.706)	0.833** (0.389)	0.674 (0.559)
Grade 7	0.078 (0.708)	0.901** (0.400)	0.247 (0.591)
Grade 8	0.060 (0.797)	0.833** (0.423)	0.537 (0.661)
Panel B: English			
Grade 3	-0.542 (0.747)	-0.005 (0.388)	-0.711 (0.556)
Grade 4	0.590 (0.741)	0.458 (0.370)	-0.748 (0.553)
Grade 5	-0.106 (0.697)	-0.132 (0.353)	-0.702 (0.592)
Grade 6	-0.293 (0.649)	0.027 (0.353)	-0.541 (0.549)
Grade 7	0.470 (0.663)	0.088 (0.336)	-0.244 (0.545)
Grade 8	-0.232 (0.636)	0.374 (0.330)	-0.112 (0.557)

Note: *** p<0.01, ** p<0.05, * p<0.1. The covariates to estimate the propensity score for CB for 3rd, 4th, 5th, and 6th grades are percent Hispanics in the district, percent Hispanics in the district², percent blacks in the district, percent Asians in the district, percent native Americans in the district, percent native Americans in the district², total Enrollment, total Enrollment², grades 3-8, % of all students in district that are ELL, total number of teachers, total number of instructional aides, % of all students with free or reduced price lunch, revenue per pupil, revenue per pupil², % of 5-17 year olds in poverty, income at 50th percentile, % in household with children, female head, % adults with BA and above, % living in household receiving snap benefits, % unemployed, % living in same house as last year, city/urban locale, suburban locale, town locale, and percent Hispanics in the district interacted with city/urban locale. The covariates to estimate the propensity score for CB for 7th and 8th grades also include total number of teachers² and total number of teachers interacted with total enrollment.

Source: Authors' calculation based on 2008-2009 and 2012-2013 *Stanford Education Data Archive* (SEDA, v. 2.1) combined with 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS).

Table 6: PSM Results for MC – Average Treatment Effect on the Treated (ATT)

Grades	Low-SES	Mid-SES	High-SES
Panel A: Math			
Grade 3	1.276 (1.110)	1.148* (0.624)	1.329 (1.031)
Grade 4	1.742 (1.159)	2.95*** (0.664)	1.782 (1.115)
Grade 5	1.001 (1.137)	2.378*** (0.711)	1.034 (1.197)
Grade 6	1.185 (1.359)	2.473*** (0.791)	0.306 (1.243)
Grade 7	0.109 (1.389)	1.882** (0.775)	0.395 (1.338)
Grade 8	1.452 (1.751)	2.095** (0.919)	0.435 (1.368)
Panel B: English			
Grade 3	2.036 (1.516)	2.053*** (0.757)	-0.255 (1.222)
Grade 4	1.526 (1.403)	1.967*** (0.732)	-0.875 (1.199)
Grade 5	1.995 (1.312)	1.898** (0.694)	-1.608 (1.641)
Grade 6	0.978 (1.407)	1.819** (0.722)	-0.078 (1.142)
Grade 7	0.628 (1.246)	1.173* (0.649)	-0.563 (1.109)
Grade 8	1.425 (1.217)	1.913*** (0.658)	-0.304 (1.195)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The covariates to estimate the propensity score for CB for 3rd, 4th, 5th, and 6th grades are percent Hispanics in the district, percent Hispanics in the district², percent blacks in the district, percent Asians in the district, percent native Americans in the district, percent native Americans in the district², total Enrollment, total Enrollment², grades 3-8, % of all students in district that are ELL, total number of teachers, total number of instructional aides, % of all students with free or reduced price lunch, revenue per pupil, revenue per pupil², % of 5-17 year olds in poverty, income at 50th percentile, % in household with children, female head, % adults with BA and above, % living in household receiving snap benefits, % unemployed, % living in same house as last year, city/urban locale, suburban locale, town locale, and percent Hispanics in the district interacted with city/urban locale. The covariates to estimate the propensity score for CB for 7th and 8th grades also include total number of teachers² and total number of teachers interacted with total enrollment.

Source: Authors' calculation based on 2008-2009 and 2012-2013 *Stanford Education Data Archive* (SEDA, v. 2.1) combined with 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS).

Table 7: PSM Results for CB – ATT by Race and Ethnicity in Middle Class

Grades	White	Black	Hispanic	Asian
Panel A: Math				
Grade 3	1.389*** (0.340)	1.342* (0.692)	0.490 (0.660)	-1.415 (1.449)
Grade 4	1.022*** (0.357)	2.851*** (0.781)	0.651 (0.647)	-1.591 (1.581)
Grade 5	1.138*** (0.377)	0.152 (0.742)	1.106* (0.678)	-2.495 (1.652)
Grade 6	0.960** (0.394)	0.361 (0.851)	0.603 (0.741)	0.661 (2.043)
Grade 7	0.790* (0.409)	-0.253 (0.901)	-1.207 (0.785)	-1.823 (2.341)
Grade 8	0.773* (0.430)	0.372 (0.906)	-0.398 (0.778)	-0.670 (2.025)
Panel B: English				
Grade 3	-0.450 (0.386)	0.515 (0.868)	0.127 (0.841)	-2.43 (1.878)
Grade 4	0.608 (0.382)	1.132 (0.889)	1.499* (0.830)	-3.106 (1.995)
Grade 5	0.199 (0.366)	-0.844 (0.877)	0.856 (0.767)	-2.022 (1.778)
Grade 6	-0.524 (0.350)	0.522 (0.801)	1.497* (0.770)	-1.897 (2.032)
Grade 7	0.456 (0.349)	0.410 (0.772)	0.566 (0.750)	-3.156 (2.039)
Grade 8	0.246 (0.354)	0.345 (0.731)	0.153 (0.698)	-2.001 (2.074)

Note: *** p<0.01, ** p<0.05, * p<0.1. The covariates to estimate the propensity score for CB for 3rd, 4th, 5th, and 6th grades are percent Hispanics in the district, percent Hispanics in the district², percent blacks in the district, percent Asians in the district, percent native Americans in the district, percent native Americans in the district², total Enrollment, total Enrollment², grades 3-8, % of all students in district that are ELL, total number of teachers, total number of instructional aides, % of all students with free or reduced price lunch, revenue per pupil, revenue per pupil², % of 5-17 year olds in poverty, income at 50th percentile, % in household with children, female head, % adults with BA and above, % living in household receiving snap benefits, % unemployed, % living in same house as last year, city/urban locale, suburban locale, town locale, and percent Hispanics in the district interacted with city/urban locale. The covariates to estimate the propensity score for CB for 7th and 8th grades also include total number of teachers² and total number of teachers interacted with total enrollment.

Source: Authors' calculation based on 2008-2009 and 2012-2013 *Stanford Education Data Archive* (SEDA, v. 2.1) combined with 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS).

Table 8: PSM Results for MC – ATT by Race and Ethnicity in Middle Class

Grades	White	Black	Hispanic	Asian
Panel A: Math				
Grade 3	1.650** (0.643)	2.640*** (0.684)	1.125 (1.210)	-1.457 (3.070)
Grade 4	2.516*** (0.681)	4.482*** (1.249)	0.369 (1.193)	-1.251 (2.762)
Grade 5	2.961*** (0.766)	3.733** (1.606)	1.301 (1.359)	-0.193 (2.361)
Grade 6	2.129** (0.805)	2.712* (1.547)	-0.976 (1.664)	-2.888 (4.312)
Grade 7	2.991*** (0.793)	-1.345 (1.728)	-1.586 (1.369)	-5.650 (4.511)
Grade 8	2.804*** (0.973)	-2.576 (1.976)	-0.585 (1.883)	-5.005 (5.196)
Panel B: English				
Grade 3	1.433* (0.771)	2.690* (1.481)	0.3891 (1.531)	-2.503 (4.001)
Grade 4	1.506** (0.736)	2.810** (1.294)	2.602* (1.466)	-3.993 (3.329)
Grade 5	2.463*** (0.714)	3.144** (1.488)	1.722 (1.474)	-1.719 (3.988)
Grade 6	1.941** (0.751)	2.548* (1.353)	0.899 (1.495)	-3.355 (4.048)
Grade 7	1.170* (0.674)	2.217* (1.245)	1.753 (1.415)	-4.784 (3.745)
Grade 8	1.296** (0.659)	2.949* (1.537)	1.612 (1.360)	-4.418 (4.073)

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The covariates to estimate the propensity score for CB for 3rd, 4th, 5th, and 6th grades are percent Hispanics in the district, percent Hispanics in the district², percent blacks in the district, percent Asians in the district, percent native Americans in the district, percent native Americans in the district², total Enrollment, total Enrollment², grades 3-8, % of all students in district that are ELL, total number of teachers, total number of instructional aides, % of all students with free or reduced price lunch, revenue per pupil, revenue per pupil², % of 5-17 year olds in poverty, income at 50th percentile, % in household with children, female head, % adults with BA and above, % living in household receiving snap benefits, % unemployed, % living in same house as last year, city/urban locale, suburban locale, town locale, and percent Hispanics in the district interacted with city/urban locale. The covariates to estimate the propensity score for CB for 7th and 8th grades also include total number of teachers² and total number of teachers interacted with total enrollment.

Source: Authors' calculation based on 2008-2009 and 2012-2013 *Stanford Education Data Archive* (SEDA, v. 2.1) combined with 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS).

Appendix I: Summary Statistics

Appendix A1 - Summary statistics for Mathematics

VARIABLES	N	Mean	Standard Deviation
SEDA – School District Variables:			
Urban	120,846	0.062	0.242
Suburban	120,846	0.253	0.434
Town	120,846	0.212	0.409
Rural	120,846	0.473	0.499
% Indian / Native American	120,864	0.025	0.101
% Asian	120,864	0.022	0.048
% Hispanic	120,864	0.119	0.192
% Black	120,864	0.085	0.172
% Free Lunch	120,864	0.370	0.207
% Reduced Price Lunch	120,864	0.088	0.046
% English Lang Learner	120,789	0.041	0.084
% Special Education	120,059	0.135	0.051
Total Enrollment	120,864	1,955	7,218
Total Instructional Aides			
Total Teachers	116,648	267.7	998.3
Per Pupil Revenue	119,816	12,681	4,321
SEDA – Community Variables			
Poverty Rate (Ages 5-17)	117,108	0.148	0.104
% household receiving snap benefits	117,108	0.155	0.114
% in Same House Last Year	117,108	0.873	0.071
Unemployment Rate	119,958	0.046	0.022
Median Income	117,108	62,554	26,893
% of adults with BA and above	119,958	0.240	0.145
Standardized SES composite index	117,108	0.097	0.989
SEDA – Average Scores by Grade			
All Students:			
Grade 3	21,274	230.0	11.59
Grade 4	21,308	240.1	12.37
Grade 5	21,083	250.4	13.39
Grade 6	21,102	261.7	14.03
Grade 7	18,571	272.7	14.47
Grade 8	17,572	283.8	15.52
White Students:			
Grade 3	18,697	233.7	10.14
Grade 4	18,756	243.9	11.04
Grade 5	18,552	254.5	12.02
Grade 6	18,612	265.9	12.42
Grade 7	16,866	276.7	13.01
Grade 8	16,035	287.9	13.89
Black Students:			

Grade 3	4,547	215.7	9.589
Grade 4	4,557	225.1	9.756
Grade 5	4,457	234.6	10.68
Grade 6	4,493	244.2	11.04
Grade 7	4,028	253.7	11.61
Grade 8	3,905	263.2	12.67
Hispanic Students:			
Grade 3	5,845	220.5	9.952
Grade 4	5,781	230.7	10.24
Grade 5	5,692	240.8	10.73
Grade 6	5,614	251.1	11.55
Grade 7	4,106	262.3	11.33
Grade 8	3,921	273.0	12.05
Asian Students:			
Grade 3	2,345	245.3	14.54
Grade 4	2,322	258.4	15.78
Grade 5	2,223	271.9	18.51
Grade 6	2,206	284.7	19.56
Grade 7	1,728	298.8	21.14
Grade 8	1,624	312.0	22.37
SASS – Unionization Variables			
Collective Bargaining	9,240	0.56	0.49
Meet and Confer	9,240	0.13	0.33
No agreement	9,240	0.31	0.46

Source: 2008-2009 and 2012-2013 *Stanford Education Data Archive* (SEDA, v. 2.1) and 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS). N's for SEDA variables reflect 2 years and 6 grades, from approximately 12,000 districts. SASS data reflect 2 waves of approximately 4620 districts.

Appendix A2 - Summary Statistics for English

VARIABLES	N	Mean	Standard Deviation
SEDA – School District Variables:			
Urban	127,735	0.066	0.248
Suburban	127,735	0.251	0.434
Town	127,735	0.212	0.409
Rural	127,735	0.471	0.499
% Indian / Native American	127,757	0.025	0.100
% Asian	127,757	0.023	0.051
% Hispanic	127,757	0.129	0.203
% Black	127,757	0.085	0.171
% Free Lunch	127,757	0.374	0.208
% Reduced Price Lunch	127,757	0.088	0.045
% English Lang Learner	127,677	0.045	0.090
% Special Education	126,952	0.134	0.052

Total Enrollment	127,757	2,019	7,363
Total Teachers	123,542	272.9	1,002
Total Instructional Aides			
Per Pupil Revenue	126,517	12,606	4,299
SEDA – Community Variables			
Poverty Rate (Ages 5-17)	123,566	0.149	0.104
% household receiving snap benefits	123,566	0.155	0.133
% in Same House Last Year	123,566	0.872	0.071
Unemployment Rate	126,763	0.046	0.022
Median Income	123,566	62,467	26,943
% of adults with BA and above	126,763	0.240	0.145
Standardized SES composite index	123,566	0.093	0.987
SEDA – Average Scores by Grade			
All Students:			
Grade 3	21,306	208.9	14.52
Grade 4	21,326	219.5	14.45
Grade 5	21,386	230.6	14.19
Grade 6	21,413	242.1	13.93
Grade 7	21,169	252.8	13.71
Grade 8	21,204	264.0	13.64
White Students:			
Grade 3	18,798	214.3	12.36
Grade 4	18,853	224.8	12.33
Grade 5	18,901	235.8	12.03
Grade 6	18,970	247.2	11.89
Grade 7	18,824	257.7	11.81
Grade 8	18,935	268.7	11.78
Black Students:			
Grade 3	4,608	192.2	11.78
Grade 4	4,624	202.5	11.67
Grade 5	4,694	213.9	11.63
Grade 6	4,718	225.0	11.19
Grade 7	4,816	236.2	11.12
Grade 8	4,831	247.2	11.44
Hispanic Students:			
Grade 3	5,832	194.0	13.19
Grade 4	5,743	205.1	12.63
Grade 5	5,739	216.9	12.21
Grade 6	5,670	228.9	11.96
Grade 7	5,625	240.4	11.74
Grade 8	5,525	252.0	11.82
Asian Students:			
Grade 3	2,233	223.6	18.11
Grade 4	2,229	236.3	18.52
Grade 5	2,187	247.2	18.52
Grade 6	2,182	259.1	18.61
Grade 7	2,212	270.6	18.95
Grade 8	2,170	281.5	18.61

SASS – Unionization Variables

Collective Bargaining	9,240	0.56	0.49
Meet and Confer	9,240	0.13	0.33
No agreement	9,240	0.31	0.46

Source: 2008-2009 and 2012-2013 *Stanford Education Data Archive* (SEDA, v. 2.1) and 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS). N's for SEDA variables reflect 2 years and 6 grades, from approximately 12,000 districts. SASS data reflect 2 waves of approximately 4620 districts.

Appendix II: Histogram of Propensity Score for Collective Bargaining Status for 4th and 8th Grade in Middle Class

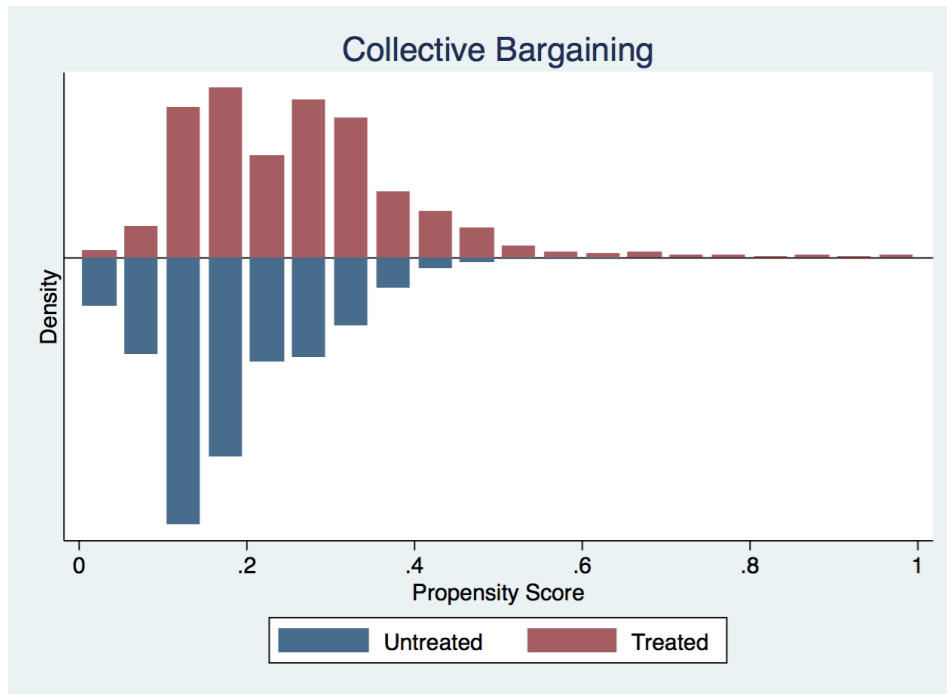


Figure A: 4th Grade

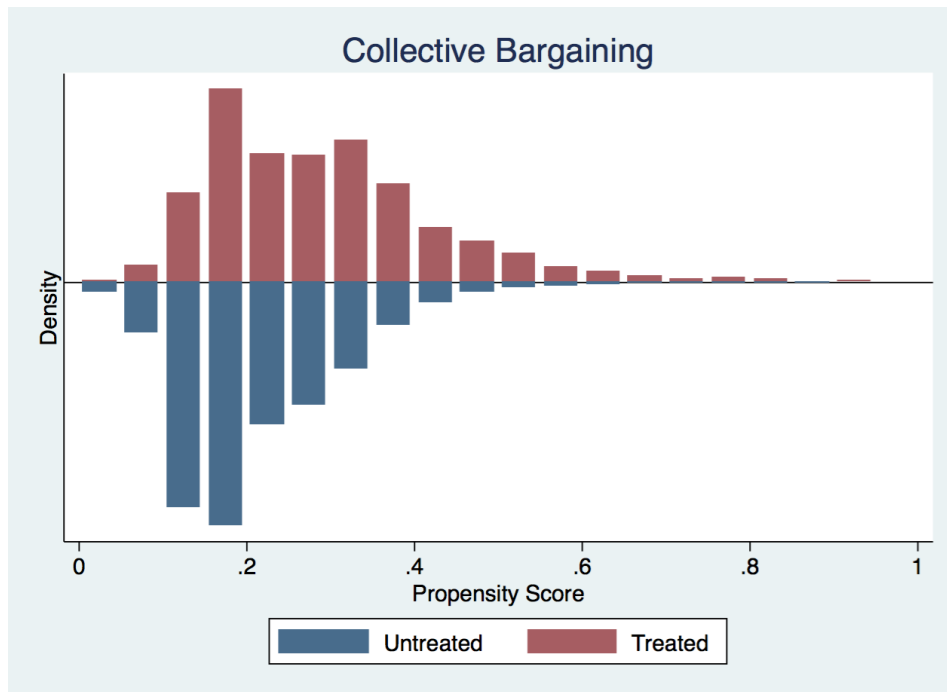


Figure B: 8th Grade

Source: 2008-2009 and 2012-2013 *Stanford Education Data Archive* (SEDA, v. 2.1) and 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS).

Appendix III: Histogram of Propensity Score for Meet and Confer Status for 4th and 8th Grade in Middle Class

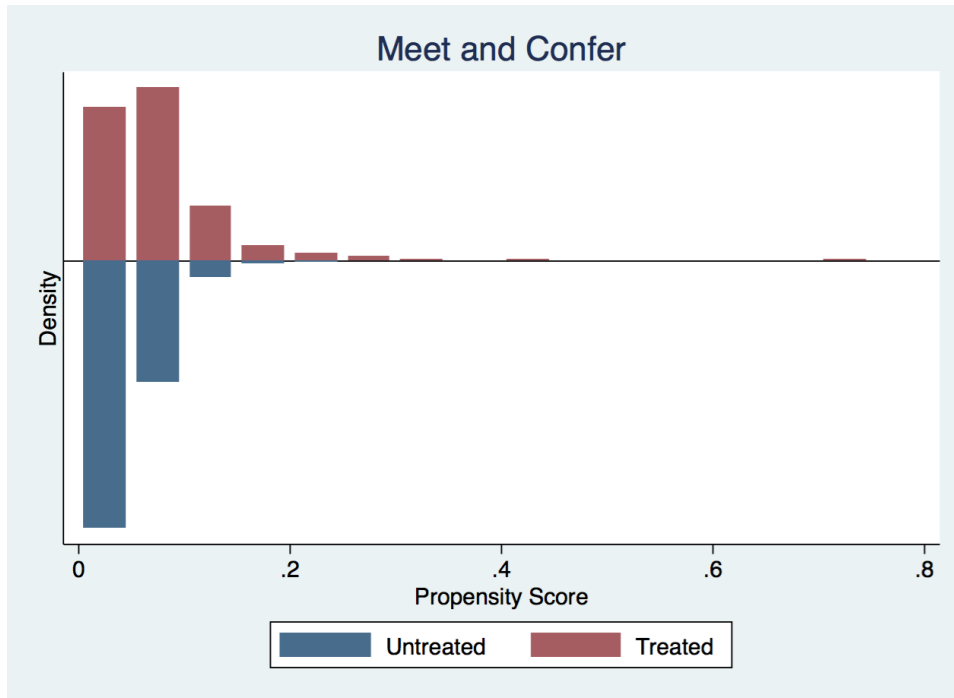


Figure A: 4th Grade

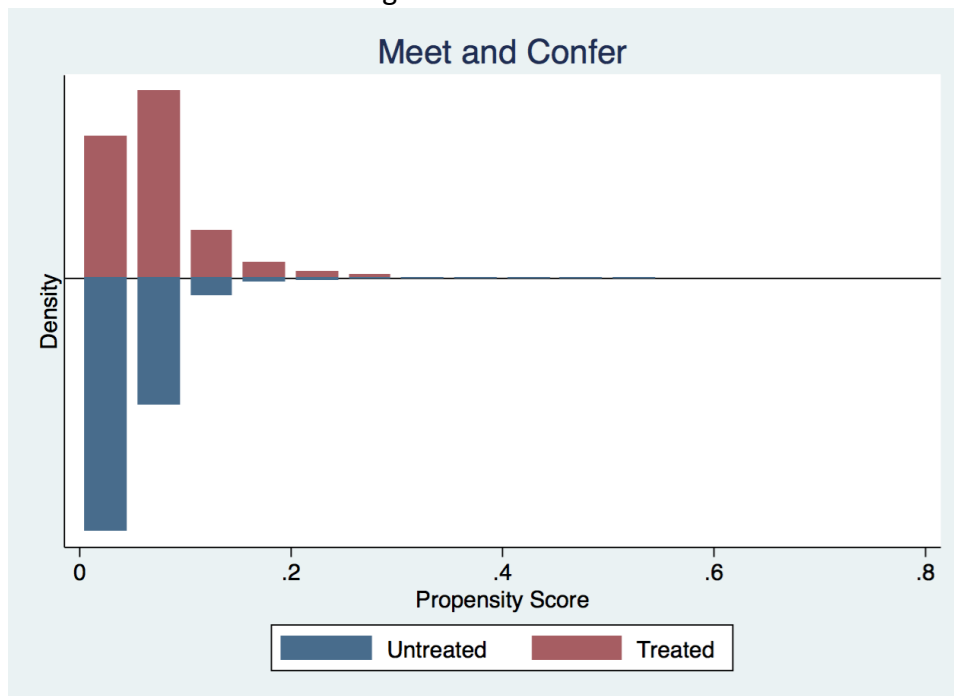


Figure B: 8th Grade

Source: 2008-2009 and 2012-2013 *Stanford Education Data Archive* (SEDA, v. 2.1) and 2007-2008 and 2011-2012 *School and Staffing Survey* (SASS).