The Impact of Teacher Unions on Student Learning

By

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Abstract

The overall impact of unions and collective bargaining agreements on student achievement has produced a literature with decidedly mixed results. Unions are seen to have both positive and negative influences on a teachers' ability to perform the teaching act. This study researches the impact of unions on state level student achievement, controlling for socio-economic differences among states. We find that students perform significantly worse on the mathematics component of the NAEP assessment (since passage of NCLB) in states that permit collective bargaining, and worse in reading compared to states where collective bargaining is illegal. The negative impact of teachers' unions on student achievement was consistent over all years studied. States that don't permit teacher unions give their students a competitive advantage in the learning process.

The Impact of Teacher Unions on Student Learning

The relationship between teacher quality and student performance has been the subject of controversial research. Analyzing cumulative teacher effects in mathematics from grades 3 to 5, Sanders and Rivers (1996, p. 6) found that "groups of students with comparable abilities and initial achievement may have vastly different academic outcomes as a result of the sequence of teachers to which they are assigned". Wright, Horn and Sanders (1997) found the single most dominant factor affecting student academic *gain* is teacher effect. A more muted conclusion was reached by McCaffrey, Lockwood, Koretz, and Hamilton (2004) when they state:

> We cautiously conclude from our review of the literature that teachers differentially affect student achievement. Across diverse studies using different age cohorts, different models and statistical approaches, and different types of achievement measures, the studies all find nonzero teacher effects. (p. 113)

Teachers can make a difference in the education of a child, but what about their collective bargaining agreements? One step removed from the relationship between teacher quality and student performance is the impact on collective bargaining agreements on student achievement, the focus of this study.

Theoretical framework

The impact of unions on student achievement

The overall impact of unions and collective bargaining agreements has been researched, with the overall assessment of their impact on student achievement decidedly mixed. Traditionally, unions were concerned with "bread and butter" issues (wages, hours, and working conditions) and work under the perception that unionism is rooted in a self-serving mindset that

fosters the “us versus them” mentality of union/management relations (Kerchner & Koppich 1993).

Research supports the notion that unions, through the collective bargaining process, have the ability to be both a hindrance and a help to the process of implementing the professionalism called for in education reform (McDonnell & Pascal, 1988; Johnson & Kardos, 2000). Critics of collective bargaining often claim that teacher contracts constrain teachers’ best professional efforts (Johnson & Kardos, 2000). The traditional (industrial) unionism practiced by many educational associations narrows the scope of teacher responsibilities and restricts teacher involvement in reforms/policy-making to the issues discussed at the bargaining table (Sullivan, 2008).

Collective bargaining affects the way schools are run in the United States. Union teachers receive higher salaries, teach smaller classes, and spend slightly less time instructing students and more time in class preparation (Eberts & Stone, 1984). Nonetheless, the overall quality of education as measured by scores on standardized tests has been found to be about the same in union and nonunion districts (Eberts, 2007).

A high percentage of teachers are unionized when compared to other professions

It is estimated that 67% of teachers belong to a union (Eberts, 2007). That 67% figure compares to (about) 36% of all public sector employees, and 7.5% of all private sector employees. Thus, teachers are one of the more highly unionized professions in the United States.

Studies showing positive impact of collective bargaining agreements on student achievement

Eberts and Stone (1987) and Grimes and Register (1990) found that students in unionized schools scored higher on tests than non-unionized schools. Further, Eberts and Stone found the biggest advantage in union schools went to average students, implying greater standardization in unionized schools. Grimes and Register and Steelman, Powell and Carini (2000) found that African-American students had higher SAT scores in union schools, when compared to non-union schools. Nelson and Rosen (1996), using state level NAEP scores for 4th grade students, found teachers in union environments and smaller class size resulted in higher student achievement.

Studies showing negative impact of collective bargaining agreements on student achievement

Hoxby (1996) found that districts with collective bargaining agreements had higher drop out rates, after controlling for district and economic characteristics. Restrictive collective bargaining agreements resulted in lower student achievement on California's state mandated assessments (Moe, 2007).

Methodological disputes in the literature on the relationship between collective bargaining agreements and student achievement

Longitudinal analysis typically found teacher unions result in lower student achievement and cross sectional analyses typically found that teacher unions result in higher student achievement (Burroughs, 2008). Studies using the student as the unit of analysis have found positive results for the impact of teacher unions on student

performance (Burroughs). Studies using the state as the unit of analysis have reported mixed results on the topic. Studies using the district as the unit of analysis have found negative impacts for teacher unions (Hoxby, 1996). Hanushek, Rivkin and Taylor (1996) argued that state level analysis suffered from aggregation bias, but Steelman et al. (2000) pointed out that state policies creating centralized outcomes like state mandated assessments made the states the appropriate level of analysis.

Overall, the literature has come to no consensus regarding the impact of collective bargaining agreements on student academic performance. Additionally, the literature has come to no consensus regarding the appropriate unit of analysis for studying the impact of collective bargaining on student academic performance, with studies at the individual student, district or state level coming to different substantive conclusions on the question of interest.

Given the divergence in the literature, we hypothesize:

Hypothesis

H_1: States that allow collective bargaining agreements will show different student achievement outcomes than state where collective bargaining is not legal.

Methods

One way analysis of variance and multiple regression was used to estimate the hypothesized relationship between the legality of collective bargaining and student achievement. Regression allowed us to estimate the impact of the legality of collective bargaining in a state, and student achievement, defined as state level National Assessment of Educational Progress (NAEP) scores, controlling for socio-economic status differences between the states. We note here that state level NAEP scores are available at the 4^{th} and

8th grade for reading, writing, mathematics and science. State level NAEP scores are not available at the 12th grade, precluding the inclusion of high school data in this study.

Unit of Analysis

The unit of analysis is the 50 states, plus the District of Columbia. Thus, our total N is 51.

Data sources

The TR3 database, put together under the auspices of the National Council on Teacher Quality, offers an exceptionally detailed set of information to estimate models looking at teacher's rules, roles, rights and school policies (http://www.nctq.org/tr3). Data on the legality of collective bargaining agreements came from the TR3 database. We supplemented the TR3 database with NAEP state level data from fourth and eighth grade mathematics, science, reading and writing, along with an indicator of socio-economic status (percentage of students eligible for the lunch program).

Results

The Legality of Collective Bargaining Agreements

Collective bargaining is mandatory in 35 states, permissible in 11, and illegal in 5, as shown in Figure 1. Two examples from state law highlight the difference in the ability of teachers to join in collective bargaining agreements and are presented below. One example is taken from the State of Georgia, a state where collective bargaining is illegal. A second example is taken from the Commonwealth of Massachusetts, a state where collective bargaining is mandatory.

Georgia. Chatham Association of Educators v. Board of Education for Savannah and Chatham Counties (**http://www.nctq.org/tr3**). "School Boards have no authority to enter collective bargaining agreements with representatives of their employees and any such agreements they enter are void and unenforceable" (**http://www.nctq.org/tr3**).

Massachusetts. The General Laws of Massachusetts, 150E-6. "The employer and the exclusive representative shall meet at reasonable times…and shall negotiate in good faith with respect to wages, hours, standards of productivity and performance, and any other terms and conditions of employment" (**http://www.nctq.org/tr3**). These two examples highlight the extremes with respect to state differences with respect to collective bargaining, illegal in Georgia, mandatory in Massachusetts (if a majority of teachers vote to be represented by a union).

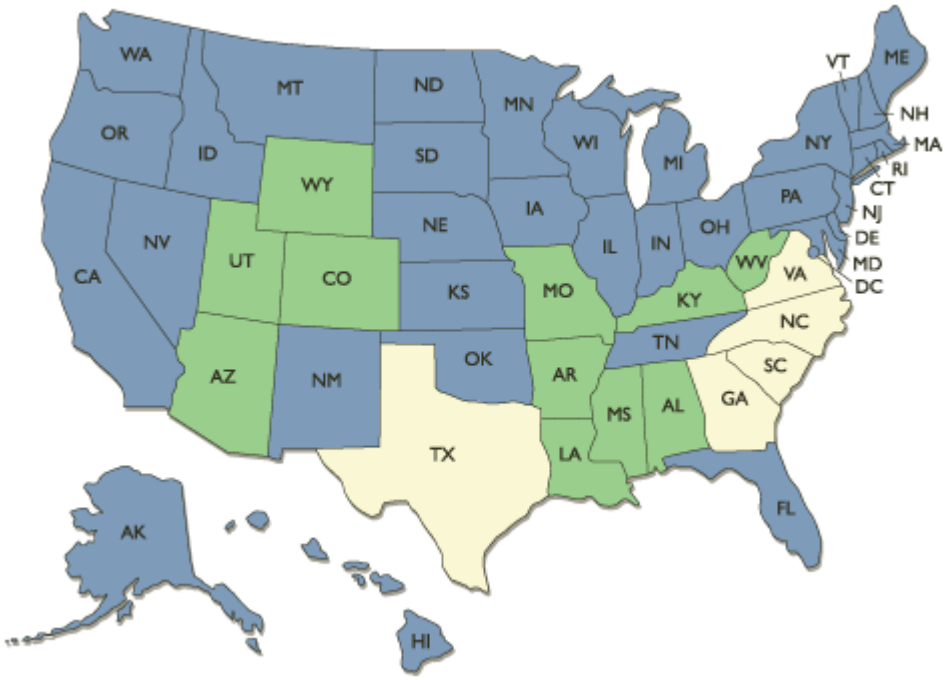
Differences in Socio-economic Status of the Three Collective Bargaining Conditions

States show considerable variation in the percentage of their school children eligible for the lunch program. New Hampshire, at 17%, has the lowest percentage of children eligible for the lunch program in the United States. Mississippi, at 66%, has the highest percentage of children eligible for the lunch program in the United States. Figure 2 shows the differences in socio-economic status of schoolchildren in the different conditions of the legality of collective bargaining. States where collective bargaining is mandatory have 35.6% of their school children eligible for the lunch program, compared to 44.0% states where collective bargaining is permissible, and 39.8% where collective bargaining is illegal. The difference in the percentage of schoolchildren eligible for the lunch program across the three conditions is about 7.4%.

The 7.4% difference in schoolchildren eligible for the lunch program was statistically significant ($F=3.4, df=48, p<.05$). The Games-Howell post hoc test showed two statistically significant differences; mandatory collective bargaining compared to states where collective bargaining was illegal and mandatory and permissible collective bargaining. There was no significant difference between where collective bargaining was illegal and permissible.

Figure 1

The legality of collective bargaining across the states.



Legend:

Blue-collective bargaining mandatory [darkest shade if copy printed on black and white paper]

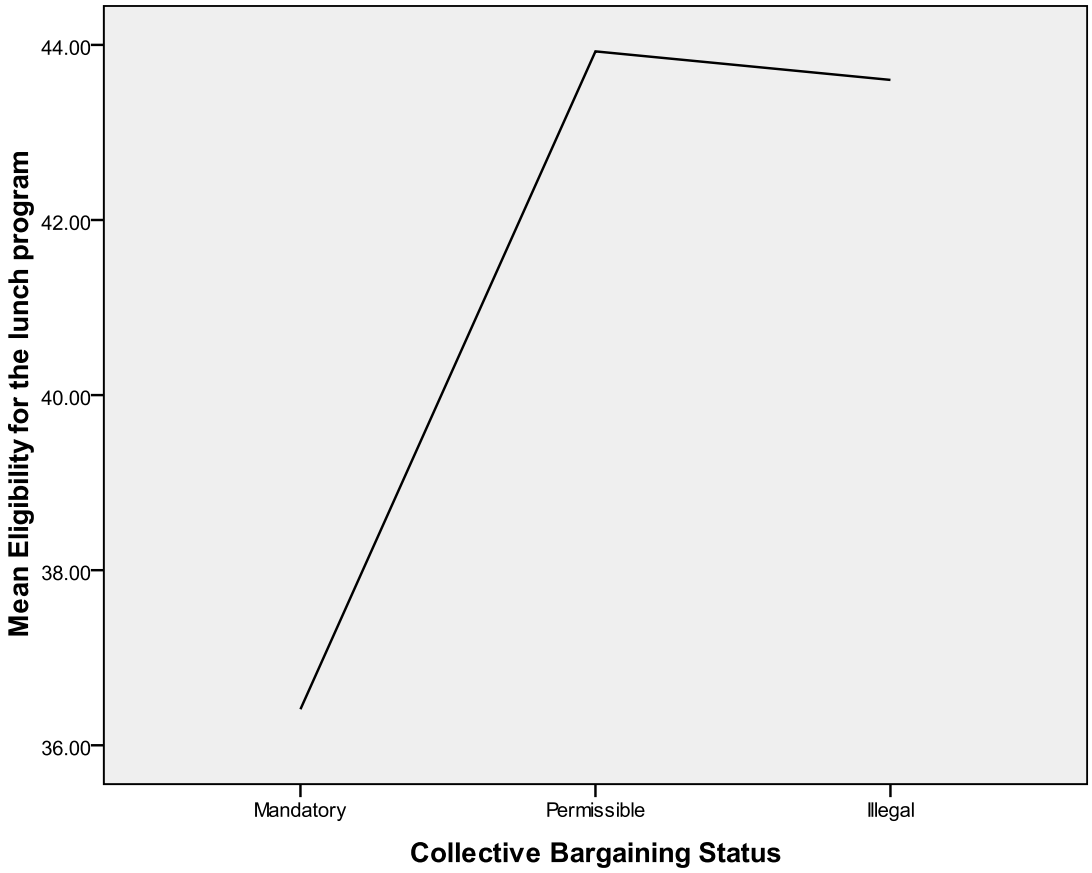
Green-collective bargaining possible [middle shade if copy printed on black and white paper]

White-collective bargaining illegal [lightest shade if copy printed on black and white paper]

Source: **http://www.nctq.org/tr3/scope.jsp**

Figure 2

Collective Bargaining Status by Percentage of Schoolchildren Eligible for the Lunch program.



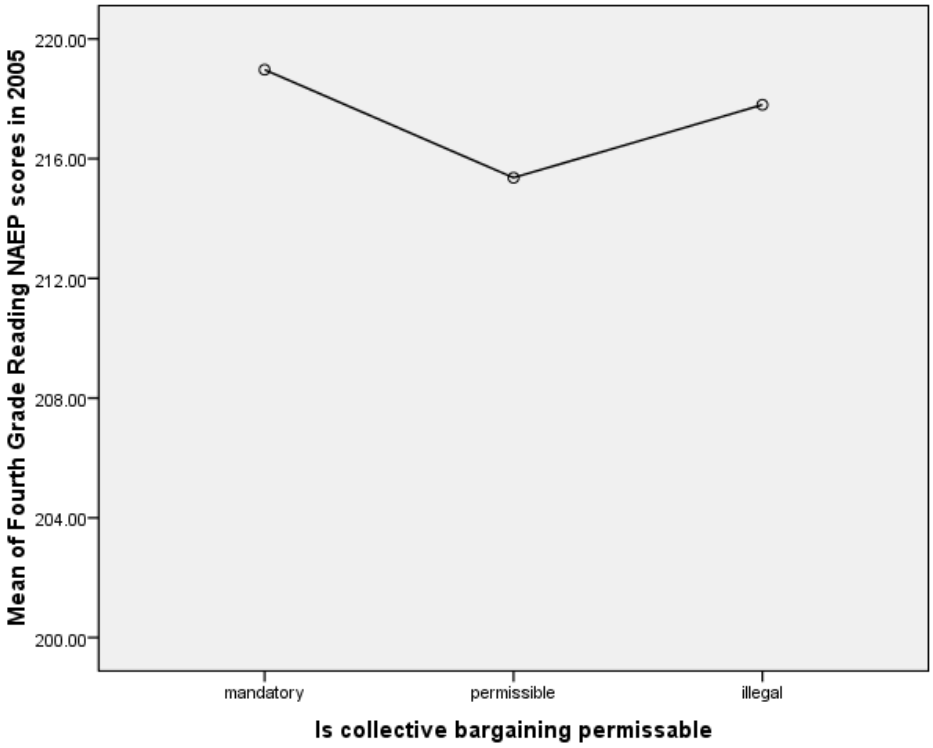
Relationship between the legality of collective bargaining agreements and student achievement without controlling for socio-economic status

We estimated 36 models in the disciplines of reading, mathematics, science and writing in the fourth and eighth grade, to investigate the relationship between the legality of collective bargaining agreements and student achievement without controlling for socio-economic status. Our findings with respect to 33 of those comparisons (fourth grade reading in 1992, 1994, 1998, 2002, 2003, 2005, 2007; eighth grade reading in 1998, 2002, 2003, 2005, 2007; fourth grade mathematics 1992, 1996, 2000, 2003, 2005,

2007, 2009; eighth grade mathematics 1992, 1996, 2000, 2003, 2005, 2007, 2009; fourth grade science 2000, 2005; and eighth grade science 1996, 2000, 2005) were consistent. We found no significant differences in student performance on the NAEP due to the legality of a state's collective bargaining laws. Additionally, we found very few of the differences were close to statistical significance. The prototypical result was virtually no difference in academic achievement by legality of the collective bargaining laws, as shown in Figure 3. Students living in states with mandatory collective bargaining typically had *slightly* higher performance on the NAEP on these 33 models.

Figure 3

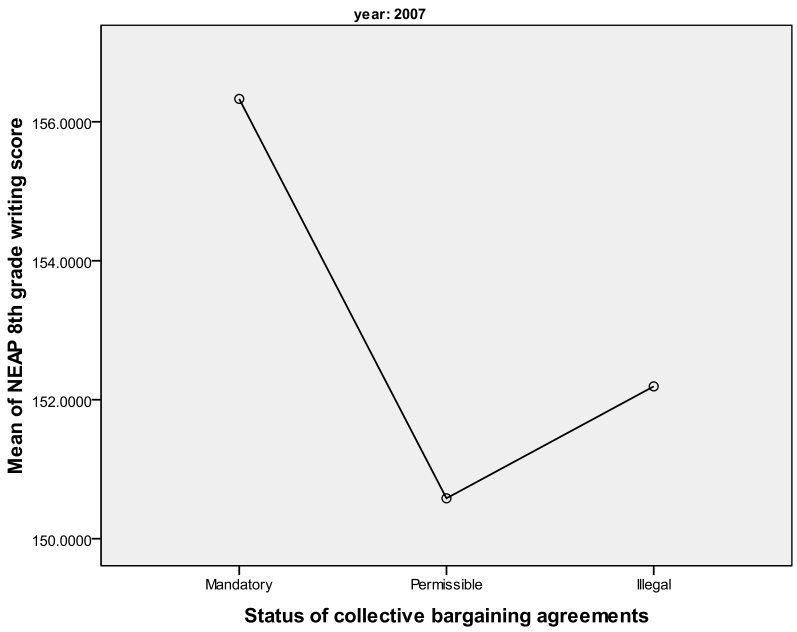
Prototypical result showing virtually no difference in academic achievement by legality of collective bargaining in models without controlling for socio-economic status: The case of fourth grade reading scores in 2005.



Eighth Grade Writing. We had three comparisons for eighth grade writing. Two of those three, in 2002 and 2007, showed a six to seven point difference between mandatory and permissible collective bargaining states, and that difference was statistically significant by a Games-Howell post-hoc test ($p<.05$) (see Figure 4). However, finding two statistically significant differences in 36 different tests is (about) what we would expect on the basis of chance, with the conventionally used $\alpha=.05$ criterion. With a Bonferroni correction and an $\alpha=.05$ criterion for all 36 tests combined, the result showed in Figure 4 would not have been "statistically" significant.

Figure 4

Eighth grade writing in 2005 by legality of collective bargaining without controlling for socio-economic status



The impact of the legality of collective bargaining agreements on student achievement when controlling for socio-economic status

Entries in the tables that follow represent unstandardized regression coefficients. States where collective bargaining is illegal is the referent group for the bargaining variable in the regression tables.

Fourth Grade Mathematics. Table 1 shows the relationship from 1992 to 2009 with respect to fourth grade mathematics. When collective bargaining is allowed, our 14 estimated coefficients showed that states with mandatory and permissible collective bargaining agreements had lower student achievement on the NAEP. The differences achieved statistical significance just after the No Child Left Behind bill became law (No Child Left Behind Act of 2001, 2004), and stayed significant in 2005, as shown in Table 2. Table 2 also shows the impact of socio-economic status on student performance. In all estimated models, the higher the percentage of students eligible for the lunch program, the lower the state score on that particular component of the NAEP, a statistically significant difference.

Table 1.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 4th Grade Mathematics NAEP scores

Year	Constant		Mandatory		Permissible		SES		R^2	N
	b	s.e. b	b	s.e. b	b	s.e. b	b	s.e. b		
1992	242.22	3.46	-.097	2.23	-1.06	2.43	-.60	.065	.73	42
1996	248.72	4.40	-3.12	2.75	-2.05	2.97	-.64	.083	.61	44
2000	252.12	4.19	-5.10	2.58	-4.51	2.84	-.60	.080	.63	41
2003	259.57	3.04	-6.56	1.96	-6.33	2.15	-.52	.056	.67	51
2005	260.87	3.11	-5.14	2.01	-5.83	2.21	-.50	.058	.65	51
2007	262.04	3.17	-3.79	2.05	-4.43	2.25	-.51	.059	.64	51
2009	261.73	2.59	-3.05	1.67	-4.27	1.83	-.50	.048	.73	51

Table 2. Relationship of Collective Bargaining Agreements and Socio-economic Status on 4th Grade Mathematics NAEP scores, t-values and statistical significance

Year	Mandatory	Permissible	SES
1992	-.04	-.43	-9.3*
1996	-1.13	-.69	-7.6*
2000	-1.97	-1.58	-7.5*
2003	-3.34*	-2.94*	-9.2*
2005	-2.56*	-2.64*	-8.6*
2007	-1.85	-1.97	-8.6*
2009	-1.82	-2.32*	-10.5*

*=statistically significant at the p. <.05 level

Eighth Grade Mathematics. Table 3 shows the relationship between student achievement on the NAEP and the legality of collective bargaining agreements from 1990 to 2009 with respect to eighth grade mathematics. When collective bargaining is allowed, our estimates showed that states with mandatory and permissible collective bargaining agreements had slightly higher student achievement on the NAEP in the early years of the time trend (1990 to 1992). In 1996, states with permissible collective bargaining went slightly negative, both permissible and mandatory bargaining were negative in 2000, and both went significantly negative just after the passage of the No Child Left Behind Act (No Child Left Behind Act of 2001, 2004), and stayed significantly negative for permissible states through 2009. Table 4 shows the impact of socio-economic status on student performance. In all estimated models, the higher the percentage of students eligible for the lunch program, the lower the state score on that particular component of the NAEP and those differences were statistically significant.

Table 3.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 8th Grade Mathematics NAEP scores

Year	Constant		Mandatory		Permissible		SES		R^2	N
	b	s.e. b	b	s.e. b	b	s.e. b	b	s.e. b		
1990	287.33	5.54	3.32	3.61	1.23	4.05	-.70	.105	.61	38
1992	293.52	4.51	1.25	2.94	.13	3.17	-.72	.084	.69	42
1996	302.03	4.73	.98	2.95	-.59	3.17	-.82	.090	.70	41
2000	304.14	4.99	-2.12	3.07	-4.09	3.37	-.76	.096	.68	40
2003	307.97	3.71	-4.98	2.40	-4.80	2.63	-.70	.069	.71	51
2005	308.88	3.73	-6.39	2.41	-7.34	2.65	-.66	.069	.69	51
2007	312.36	3.81	-6.37	2.46	-6.61	2.70	-.68	.071	.69	51
2009	312.58	3.50	-4.51	2.26	-5.44	2.48	-.68	.065	.73	51

Table 4.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 8th Grade Mathematics NAEP scores, *t*-values and statistical significance

Year	Mandatory	Permissible	SES
1990	.92	.30	-6.6*
1992	.42	.04	-8.5*
1996	.98	-.59	-9.1*
2000	-.69	-1.21	-8.0*
2003	-2.08*	-1.82	-10.2*
2005	-2.65*	-2.77*	-9.5*
2007	-2.59*	-2.45*	-9.6*
2009	-2.00	-2.19*	-10.4*

*=statistically significant at the p. <.05 level

Fourth and Eighth Grade Reading. Table 5 shows the relationship from 1992 to 2007 with respect to fourth grade reading, and Table 6 shows the *t*-values and statistical significance for the time trend. When collective bargaining was allowed, our estimates showed that states with mandatory and permissible collective bargaining agreements had lower student achievement on the NAEP in all 14 estimated coefficients. However, none of the estimated coefficients were statistically significant, as shown in Table 6. Like prior tables, Table 6 shows the impact of socio-economic status on student performance. In all estimated models, the higher the percentage of students eligible for the lunch program, the lower the state score on that particular component of the NAEP and those

coefficients were statistically significant. Tables 7 and 8 showed the same pattern of results for eighth grade reading. All 10 estimated coefficients between mandatory and permissible collective bargaining states and student performance on the 8th grade NAEP assessment were negative (Table 7), and none were statistically significant (Table 8).

Table 5.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 4th Grade Reading NAEP scores

Year	Constant		Mandatory		Permissible		SES		R^2	N
	b	s.e. b	b	s.e. b	b	s.e. b	b	s.e. b		
1992	239.07	3.89	-1.05	2.54	-.71	2.73	-.59	.073	.66	42
1994	240.05	4.87	-1.44	3.15	.42	3.35	-.69	.092	.63	40
1998	239.59	5.05	-2.22	3.22	-.12	3.47	-.63	.095	.55	40
2002	246.21	3.75	-3.86	2.32	-4.17	2.57	-.64	.071	.69	44
2003	244.46	3.36	-4.32	2.17	-2.45	2.38	-.62	.062	.69	51
2005	243.90	3.33	-3.61	2.15	-2.37	2.36	-.60	.062	.68	51
2007	243.63	3.09	-2.34	2.00	-2.43	2.19	-.55	.057	.69	51

Table 6.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 4th Grade Reading NAEP scores, t-values and statistical significance

Year	Mandatory	Permissible	SES
1992	-.41	-.26	-8.1*
1994	-.46	.13	-7.5*
1998	-.68	-.03	-6.6*
2002	-1.67	-1.62	-8.9*
2003	-2.00	-1.03	-9.9*
2005	-1.67	-1.00	-9.6*
2007	-1.17	-1.10	-9.68

*=statistically significant at the p. <.05 level

Table 7.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 8th Grade Reading NAEP scores

Year	Constant		Mandatory		Permissible		SES		R^2	N
	b	s.e. b	b	s.e. b	b	s.e. b	b	s.e. b		
1998	280.53	4.37	-1.50	2.69	-1.19	2.89	-.46	.084	.49	37
2002	283.89	3.87	-2.09	2.37	-1.23	2.62	-.49	.074	.55	42
2003	283.88	3.12	-1.88	2.02	-.16	2.215	-.53	.058	.65	51
2005	283.92	3.11	-1.26	2.01	-.83	2.21	-.56	.058	.69	51
2007	283.90	2.98	-1.41	1.92	-2.04	2.11	-.54	.055	.70	51

Table 8.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 8th Grade Reading NAEP scores, t-values and statistical significance

Year	Mandatory	Permissible	SES
1998	-.56	-.41	-5.51*
2002	-.88	-.47	-6.66*
2003	-.93	-.07	-9.11*
2005	-.63	-.38	-9.65*
2007	-.73	-.97	-9.68*

*=statistically significant at the p. <.05 level

Fourth Grade Writing. Table 9 shows the relationship in 2002 with respect to fourth grade writing, and Table 10 shows the *t*-values and statistical significance for this variable. When collective bargaining was allowed, our estimates showed that states with mandatory and permissible collective bargaining agreements had lower student achievement on the NAEP. The coefficient representing permissible collective bargaining states were statistically significant, as shown in Table 10. Like prior tables, Table 10 shows the impact of socio-economic status on student performance. In the estimated model, the higher the percentage of students eligible for the lunch program, the lower the state score on that particular component of the NAEP and the SES coefficient was statistically significant.

Table 9. Relationship of Collective Bargaining Agreements and Socio-economic Status on 4th Grade Writing NAEP scores

Year	Constant		Mandatory		Permissible		SES		R^2	N
	b	s.e. b	b	s.e. b	b	s.e. b	b	s.e. b		
2002	171.95	4.65	-2.55	2.89	-6.69	3.20	-.44	.088	.48	45

Table 10. Relationship of Collective Bargaining Agreements and Socio-economic Status on 4th Grade Writing NAEP scores, t-values and statistical significance

Year	Mandatory	Permissible	SES
2002	-.88	-2.09*	-4.93*

*=statistically significant at the p. <.05 level

Eighth Grade Writing. Table 11 shows the relationship from 1998 to 2007 with respect to eighth grade writing, and Table 12 shows the *t*-values and statistical significance for the time trend with respect to this variable. When collective bargaining was allowed, our estimates showed that states with mandatory and permissible collective bargaining agreements had lower student achievement on the NAEP in five of the six estimated coefficients. Two of the estimated coefficients representing permissible collective bargaining states were statistically significant, as shown in Table 12. Like prior tables, Table 12 shows the impact of socio-economic status on student performance. In all three estimated models, the higher the percentage of students eligible for the lunch program, the lower the state score on that particular component of the NAEP and those coefficients were statistically significant.

Table 11.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 8th Grade Writing NAEP scores

Year	Constant		Mandatory		Permissible		SES		R^2	N
	b	s.e. b	b	s.e. b	b	s.e. b	b	s.e. b		
1998	164.59	4.712	-3.35	2.92	-6.85	3.06	-.36	.092	.46	33
2002	169.82	4.84	-3.56	2.97	-7.42	3.20	-.40	.094	.47	38
2007	170.57	4.23	.95	2.77	-1.19	2.97	-.43	.079	.50	45

Table 12.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 8th Grade Writing NAEP scores, t-values and statistical significance

Year	Mandatory	Permissible	SES
1998	-1.15	-2.24*	-3.89*
2002	-1.20	-2.32*	-4.23*
2007	.34	-.40	-5.43*

*=statistically significant at the p. <.05 level

Fourth Grade Science. Table 13 shows the relationship from 2000 to 2005 with respect to fourth grade science, and Table 14 shows the *t*-values and statistical significance for the time trend with respect to this variable. When collective bargaining was allowed, our estimates showed that states with mandatory and permissible collective bargaining agreements had slightly higher student achievement on the NAEP in 2000 and slightly lower student achievement on the NAEP in 2005. None of these four estimated coefficients were statistically significant, as shown in Table 14. Like prior tables, Table 14 shows the impact of socio-economic status on student performance. In both estimated models, the higher the percentage of students eligible for the lunch program, the lower the state score on that particular component of the NAEP and those coefficients were statistically significant.

Table 13.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 4th Grade Science NAEP scores

Year	Constant		Mandatory		Permissible		SES		R^2	N
	b	s.e. b	b	s.e. b	b	s.e. b	b	s.e. b		
2000	170.70	4.74	.41	2.76	1.74	2.98	-.62	.093	.59	39
2005	175.86	3.81	-3.82	2.30	-2.22	2.49	-.57	.074	.62	44

Table 14. Relationship of Collective Bargaining Agreements and Socio-economic Status on 4th Grade Science NAEP scores, t-values and statistical significance

Year	Mandatory	Permissible	SES
2000	.15	.58	-6.67*
2005	-1.66	-.89	-7.70*

*=statistically significant at the p. <.05 level

Eighth Grade Science. Table 15 shows the relationship from 1996 to 2005 with respect to eighth grade science, and Table 16 shows the *t*-values and statistical significance for the time trend with respect to this variable. When collective bargaining was allowed, our estimates showed that states with mandatory and permissible collective bargaining agreements had slightly higher student achievement on the NAEP in 1996 and 2000 and a mixed result on the NAEP in 2005, with mandatory states slightly lower and permissible states slightly higher. None of these six estimated coefficients were

statistically significant, as shown in Table 16. Like prior tables, Table 16 shows the impact of socio-economic status on student performance. In all three estimated models, the higher the percentage of students eligible for the lunch program, the lower the state score on that particular component of the NAEP and those coefficients were statistically significant.

Table 15.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 8th Grade Science NAEP scores

Year	Constant		Mandatory		Permissible		SES		R^2	N
	b	s.e. b	b	s.e. b	b	s.e. b	b	s.e. b		
1996	170.02	4.68	.15	2.92	1.95	3.13	-.78	.089	.69	41
2000	171.77	5.23	2.10	3.04	2.49	3.27	-.64	.103	.58	38
2005	175.65	4.24	-.71	2.59	.51	2.76	-.67	.082	.66	44

Table 16.

Relationship of Collective Bargaining Agreements and Socio-economic Status on 8th Grade Science NAEP scores, t-values and statistical significance

Year	Mandatory	Permissible	SES
1996	.05	.62	-8.68*
2000	.69	.76	-6.17*
2005	-.27	.18	-8.21*

*=statistically significant at the p. <.05 level

Discussion

The paper analyzed the impact that collective bargaining agreements have on student achievement at the statewide level.

Figure 2 showed that states with mandatory collective bargaining agreements had a significant advantage with respect to having students with higher SES taking the NAEP than states that did not allow collective bargaining agreements, or had permissible agreements. And with the finding of a strong relationship between SES and student performance we would have expected students' in those states to have higher average scores on the NAEP than students in the permissible or illegal collective bargaining environments. However, we found that the SES advantage of 7.4% for the mandatory collective bargaining states did not translate into higher academic achievement. Additionally, the lack of higher academic achievement for states with mandatory collective bargaining agreements was found *without controlling for statewide differences in SES* in 33 out of 36 models. Once we analyzed achievement data controlling for state level differences in socio-economic status, states with mandatory collective bargaining laws lost their competitive advantage compared to states with permissible collective bargaining, or when collective bargaining is illegal. After controlling for socio-economic status, we found states permitting collective bargaining agreements or with mandatory collective bargaining agreements had consistently lower levels of student achievement on the NAEP, especially in mathematics and reading. In reading and mathematics, the negative coefficients were found in the first year that state level NAEP scores were available in a given discipline and persisted over the length of the study. With respect to eighth grade writing, we found negative coefficients in five out of six conditions. Only in

science did we find more positive coefficients (seven) than negative coefficients (three) relating collective bargaining status with student achievement. We note here that none of the coefficients in science were statistically significant. Overall, for the entire study, there was not a single positive coefficient with an estimated *t* value over 1.00, meaning that, even when the estimates showed unionized states were performing better than non-unionized states, the within variance for a variable was greater than the between variance for the variable. On the other hand, we found 34 negative coefficients that had *t* values greater than 1.00 in absolute value in this study. Thus, this study supports the findings of scholars who have discussed the negative impacts of collective bargaining agreements (Kerchner & Koppich 1999; Johnson & Kardos, 2000; Sullivan, 2008)

Impact of federal No Child Left Behind Act on the relationship between collective bargaining and student achievement on NAEP

Looking at the trend line for each discipline by grade, we see that the federal No Child Left Behind (NCLB) law might have had an impact on the relationships discussed above. In every case with multiple time points, the relationship between collective bargaining and student achievement became more negative in the first year of data after NCLB, especially in the fourth grade. We note here that the negative effect may be receding, albeit slowly. The NCLB effect was most pronounced in reading, mathematics and science at the fourth grade level.

Summary across disciplines analyzed

Table 17 summaries the results across the four disciplines we investigated. We found consistently negative relationships between the legality of collective bargaining agreements and the disciplines reported in Table 17. Mathematics exhibited the strongest

negative effect, reading was persistently negative, writing was a weaker negative effect and science was mixed.

Table 17

Relationship between legality of collective bargaining agreements and student achievement by discipline

Discipline	Strength and Direction of Effect
Mathematics	Strong and consistently negative
Reading	Consistently negative
Writing	Generally weakly negative
Science	Mixed, more positive effects than negative effects.

The effect for SES on academic achievement was bigger than the effect for collective bargaining

The biggest impact on student performance measured by state level NAEP scores is socio-economic status. Thus the research supports studies that argue for the importance of SES (e.g., see Coleman et al. 1966). Allowing or mandating collective bargaining *per se* has a negative effect on state level mathematics and reading NAEP scores. States with low SES, that is states that have a high percentage of students eligible for the lunch program (like Georgia) get a small competitive advantage on NAEP due to the illegal nature of collective bargaining agreements in that state. Using our regression estimates, we estimate that a state like Georgia, with collective bargaining prohibited, would accrue a benefit in NAEP scores ranging from 4 to 7 points depending on discipline and year.

The effect size could range from .1 to a high of .76 of a standard deviation unit for fourth grade mathematics in 2003.

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