



# COMPENSATION MATTERS: THE CASE OF TEACHERS

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## INTRODUCTION

The 2008 financial crisis sharply reduced the assets and funded levels in state and local pension plans. The drop in funding means that state and local governments have to raise additional revenue to fill the gap. At the same time, the ensuing recession eroded state and local revenues and increased the demand for public services. In response, governments have looked to cut benefits to their workers in order to reduce pension costs. Since, in many cases, state laws prevent any reduction in benefits for current employees, much of the cost-cutting activity has been aimed at new employees. As discussed below, studies have shown that total compensation is roughly equal in the public and private sectors, so a reduction in pension benefits will make total compensation lower in the public sector than in the private sector. Economic theory suggests that lower compensation will reduce

the quality of workers attracted to the public sector. To assess the impact that recent cuts to pension benefits may have on the public sector workforce, this *brief* examines how total compensation differences within the public sector affect the quality of newly hired teachers.

The discussion is organized as follows. The first section summarizes the data on the relative level of compensation in the public and private sectors today. The second section presents the existing evidence on the relationship between compensation and worker quality. The third section discusses the unique data set – the National Center for Education Statistics *School and Staffing Survey* – used for this analysis and describes the measure of teacher quality (SAT scores at the teacher's undergraduate college) and the construction of the compensation variables. The

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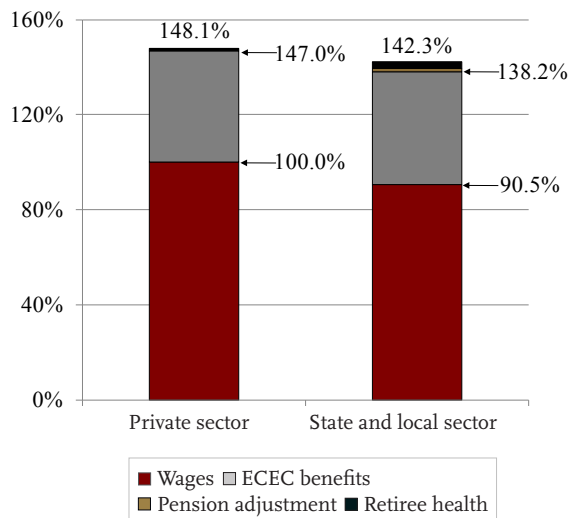
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fourth section describes the regression and presents the results, which show that schools offering higher compensation are able to hire new teachers from colleges with higher SAT scores. The final section concludes that since compensation differences do impact the quality of newly hired teachers, reduced pension benefits are not costless. Unless these reductions are offset with higher wages, states and localities will almost certainly see a lower quality of applicants.

#### COMPENSATION IN THE PUBLIC AND PRIVATE SECTORS TODAY

At this point in time, virtually all analysts agree that wages in the state and local sector – when adjusted for the higher educational attainment of public sector workers – are lower than those in the private sector (see lower portion of bars in Figure 1).

FIGURE 1. TOTAL COMPENSATION AS A PERCENT OF PRIVATE SECTOR WAGES, BY SECTOR, 2010



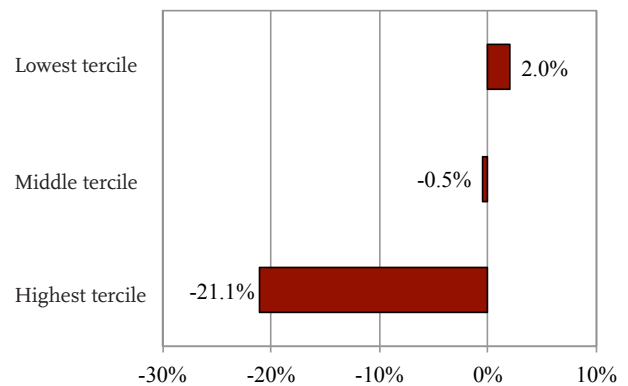
Source: Munnell et al. (2011).

The debate has been the extent to which pensions, retiree health insurance, and other amenities offset the lower wages. The basis for most comparisons of benefits is the Bureau of Labor Statistics' *Employer Costs for Employee Compensation* (ECEC) database. These data need to be adjusted, however, because they omit retiree health insurance, which employers

generally do not pre-fund, and they do not reflect the guaranteed return implicit in defined benefit plans. Even with those adjustments, which raise public sector compensation, total compensation for state and local workers falls slightly short of that in the private sector (see Figure 1). Given all the assumptions required, the best way to describe the respective compensation levels is that they are roughly equal.<sup>1</sup>

While compensation may be roughly equal between the public and private sectors in the aggregate, the pattern differs dramatically by level of earnings. As shown in Figure 2, controlling for education and

FIGURE 2. STATE AND LOCAL RELATIVE TO PRIVATE SECTOR WAGES, BY WAGE TERCILE, 2006-2010

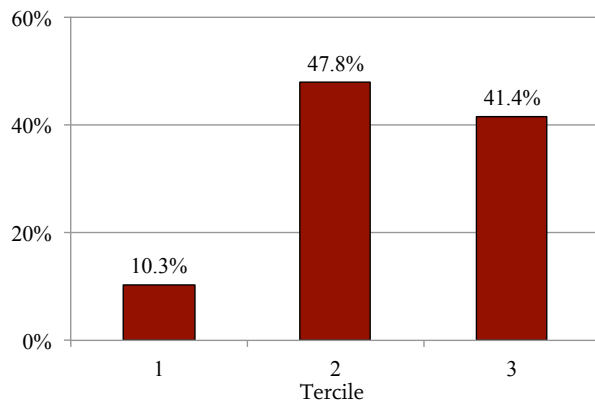


Source: Munnell et al. (2011).

other characteristics, the public-private wage differential is roughly zero for the middle third of public sector workers. However, state-local workers in the lower third of the earnings distribution earn slightly more, while those in the top third earn dramatically less than private sector workers with similar characteristics. Although these data refer to wages, the same pattern most likely holds for total compensation.

The issue of relative compensation may be particularly important for teachers, who make up more than half of the state and local workforce and who are among the more highly-paid state and local workers (see Figure 3 on the next page). To the extent that teachers start out at a pay disadvantage relative to private sector workers with similar levels of education, pension cuts for new hires could seriously reduce the attractiveness of a teaching career.

FIGURE 3. PERCENT OF TEACHERS, BY WAGE TERCILE



Note: Terciles are based on public sector wages only. Teachers include only those in the 2007-08 *School and Staffing Survey* wave who are covered under teacher retirement plans in the *Public Plans Database*.

Sources: Authors' calculations based on U.S. Department of Labor, *Current Population Survey* (CPS) (1999-2010); and National Center for Education Statistics, *School and Staffing Survey* (SASS) (2003-04, 2007-08).

## EVIDENCE TO DATE ON COMPENSATION AND WORKER QUALITY

Economists have shown that changes in relative wages between the public and private sector have a real impact on individual job decisions. A particularly persuasive study focused on the impact on job choice as, between 1970 and 2000, wage dispersion rose sharply in the private sector while the wage structure in the public sector remained relatively compressed.<sup>2</sup> An examination of two groups – 1) those who had just entered the private sector; and 2) those who were leaving the private sector – revealed that as public sector wages became relatively more compressed, high-skilled private sector workers became increasingly less likely to quit their jobs to enter the public sector and high-skilled public sector workers became increasingly more likely to switch to the private sector. In short, with a compressed wage structure, the public sector found it harder to attract and retain high-skilled workers.

In terms of teachers – as opposed to workers generally – previous analyses indicate that teacher quality responds to wage changes. One study showed that the average aptitude test scores of the entering class at teachers colleges in Australia decreased when teacher wages declined, suggesting that students take into ac-

count the wages available to them when making their career choice.<sup>3</sup> Another study found, for the United States, that as a larger array of careers became available to women, the average teacher quality declined, driven primarily by the highest quality workers choosing other forms of employment.<sup>4</sup>

While existing evidence indicates that teacher quality responds to differences in wages, what has not been determined is whether deferred compensation also affects job choice. Previous research has found conflicting evidence on how workers value deferred compensation. Some research has suggested that workers have high discount rates and value payment today over deferred compensation, particularly for lump-sum buyouts of pension programs.<sup>5</sup> By contrast, another study finds a one-to-one salary trade-off for pension benefits of current workers when they are viewed as a long-term contract, but a much smaller trade-off when they are evaluated on a year-to-year basis.<sup>6</sup> Another reports a significant willingness to accept reduced wages for employer-provided health insurance.<sup>7</sup> These findings suggest that workers may well consider benefits in the employment decision, but may value them less than wages. Hence, the analysis reported below will treat current and deferred compensation both together and separately to see whether teachers value both their current wages and their deferred compensation.

## THE DATA

The following analysis examines the relationship between teacher quality and teacher compensation across plans, controlling for the nature of the job and for personal characteristics. The analysis is based on data for teachers' pension plans from the *Public Plans Database* (PPD) and for individual teacher compensation and the nature of schools from the National Center for Education Statistics (NCES) *School and Staffing Survey* (SASS). Data from the SASS are collected every three to six years and survey many aspects of elementary and secondary education around the United States.

## THE SAMPLE

The analysis uses teacher data from the 2003-2004 and 2007-2008 waves of the SASS to coincide with the 2001-2010 data in the PPD.<sup>8</sup> Rather than use the total population of teachers, the sample is limited to teachers who have been teaching for three years or less. The focus on new hires better illustrates the effects

of compensation on hiring, since new teachers are those who are currently looking at the compensation being offered to them and deciding where to work. To assure that age does not affect how the teachers value their retirement benefits, the analysis is restricted to teachers under 30. The sample includes only new teachers working in public schools covered under a teacher retirement system within the PPD.<sup>9</sup> For each state, schools are assumed to be covered under a locally-administered plan within the PPD (for example, the St. Louis Schools Retirement System) if their U.S. Postal Service zip codes correspond to a zip code within the locality. All remaining schools in the state are considered covered under the state plan for teachers.

### MEASURE OF TEACHER QUALITY

School districts would like to hire the highest quality teachers they can for a given level of compensation. Teacher quality is notoriously difficult to measure, particularly in a way that is observable to employers when making hiring decisions.<sup>10</sup> This analysis uses the average SAT score at a teacher's undergraduate institution as an observable characteristic that administrators and parents value, a measure used in two earlier studies.<sup>11</sup> For teachers in the 2007 SASS wave, 2003 average SAT scores are used. For teachers in the 2003 SASS wave, 2001 average SAT scores are used.<sup>12</sup> The average SAT data come from the NCES Integrated Postsecondary Education Data System.<sup>13</sup> Restricting the sample to new teachers who attended undergraduate institutions that collect SAT data reduces the final number to 3,830 teachers. The NCES provides the 25th and 75th percentile entering SAT scores for each school, and results are presented for both scores.

### MEASURE OF COMPENSATION

Constructing a measure of total compensation requires combining each teacher's wage from the SASS with a measure of pension generosity from the PPD. The analysis includes two different measures of compensation. The first treats wages and pensions separately. Each teacher's wage is measured relative to the wage that the teacher could receive by choosing another profession in the state. The adjustment reflects both differences in cost-of-living across states and alternative opportunities within the state.<sup>14</sup> The employer's cost for the public pension benefits<sup>15</sup> and Social Security (since some teacher plans offer Social

Security coverage and others do not) is entered as a percent of payroll and reflects the generosity of the promised benefits. The second approach increases each teacher's wage to reflect the employer's contribution to the public pension and to Social Security. That is, compensation is set equal to wage multiplied by (1 + employer normal cost + Social Security contribution rate). That figure is then divided by the average wage in the state increased by the Social Security contribution rate.

### THE REGRESSION

The regression estimates the relationship between the average SAT score at the newly-hired teacher's undergraduate institution and the individual teacher's compensation, controlling for the demands of the job and for the teacher's personal characteristics. A variable is also included to identify whether a teacher is in the 2003 or the 2007 wave. Thus, the equation is:

SAT Score = function (compensation, demands of job, personal characteristics, SASS wave)

The analysis aims to determine how the compensation offered by a school district (explanatory variable) affects teacher quality (outcome). The structure of the regression, therefore, is the opposite of the approach taken in studies that examine how worker inputs (including the quality of their education) contribute to their compensation. For most workers, the observed levels of compensation and worker quality would be endogenous; that is, it is unclear whether higher compensation improves the quality of the worker hired, or higher-quality workers demand higher pay. But most districts set compensation at the same level for all new teachers with the same qualifications (usually just whether the candidate has a master's degree), so compensation is largely independent of individual quality. This independence makes it possible to estimate an equation that asks: "how good a candidate can the school district get for a teaching vacancy, given the demands of the job and the amount of money it is willing to pay in wages and fringe benefits?"

### THE VARIABLES

Compensation includes both wages and pensions. The expectation is that the higher the compensation, the higher the SAT score at the teacher's undergraduate institution.

## Option 1

- *Wage ratio.* This variable is the teacher's wage divided by the average state wage for college graduates.
- *Employer retirement cost.* This variable is the employer's normal cost for public plans and for Social Security as a percent of the teacher's wage.

## Option 2

- *Total compensation ratio.* This variable is the teacher's wage multiplied by (1+ employer retirement cost) divided by the average private sector wage for college graduates in the state multiplied by (1 + Social Security contribution rate).

The demands of the job could either offset or enhance the financial compensation package.

- *Hours teaching.* For any given level of compensation, individuals would be expected to choose schools with less strenuous teaching requirements. This variable is expected to have a negative sign.
- *Free lunch.* The percent of students participating in the national school lunch program is included as a proxy for student poverty. It may be harder to recruit high-quality teachers to very poor schools, so the coefficient would be expected to be negative.
- *Level of school.* The intellectual demands increase with the level of school, but so do the rewards. It is unclear whether a job in a high school would be viewed more favorably than a job in an elementary school.
- *Household income ratio.* This variable is the ratio of the average household income of the Census region of the school district to the average household income of the state.<sup>16</sup> Wealthier communities within a given state are likely to have better students and more support for the teachers. This situation would make it easier to attract high-quality teachers, leading to a positive coefficient.
- *Minority enrollment.* The percent of the students in the school who are of a racial or ethnic minority. To the extent that discrimination exists, teachers may prefer low minority schools, producing a negative coefficient.

Personal characteristics could affect how prospective employers approach the hiring of candidates and, in particular, their willingness to trade off observable teacher quality for other appealing characteristics.

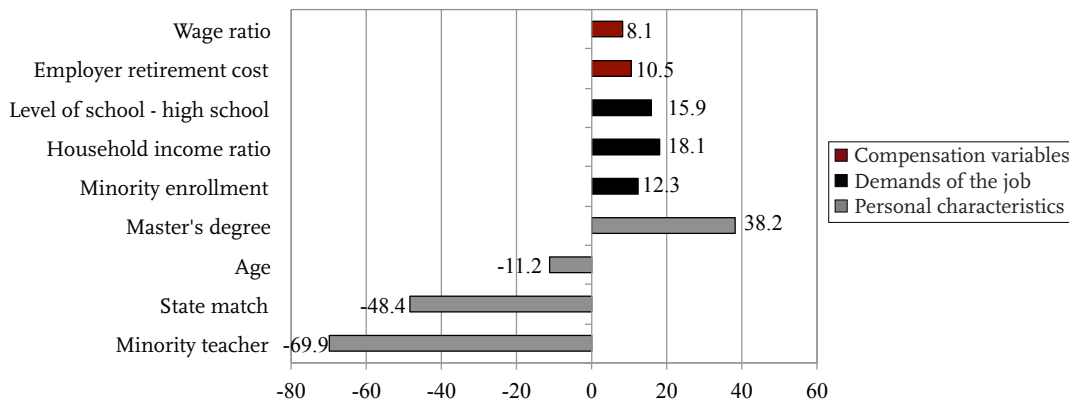
- *Master's degree.* This variable is equal to one if a teacher has a master's degree and zero otherwise.<sup>17</sup> If those teachers who seek higher degrees went to better undergraduate colleges, higher levels of education would be expected to have a positive sign.
- *Age.* The teachers in the sample are all under 30 and have been teaching for three years or less. The age variable captures the age at which the teacher began teaching. A willingness of schools to trade undergraduate institution quality for real world experience would produce a negative coefficient.
- *Gender.* This variable is one for female and zero for male. If gender discrimination in the private sector were greater than in the public sector, the coefficient would be positive.
- *State match.* This variable is set equal to one if the teacher attended college in the same state in which he/she is currently teaching. Schools may prefer teachers with some knowledge of the local culture, so one would expect a negative coefficient.
- *Minority teacher.* This variable is equal to one if the teacher is black or hispanic and zero otherwise. Prior research suggests that discrimination is greater in the private sector than in the public sector.<sup>18</sup> If true, schools would be able to attract higher quality minorities for a given wage. Such a pattern would produce a positive coefficient. On the other hand, if school districts have a difficult time recruiting minority candidates, they might take a minority candidate from a lower quality institution; in this case, the coefficient would be negative.

## FINDINGS

The regression results for SAT scores at the 25th percentile are shown in Figure 4 on the next page. (Full regression results for both the 25th percentile and the 75th percentile of SAT scores and summary statistics are presented in the Appendix.) For this figure, compensation is represented by the wage ratio and employer retirement cost. The results using the "total compensation ratio" are fully consistent (see equations (2) and (4) in Appendix Table A-2). The figure also presents the statistically significant coefficients for "demands of the job" and "personal characteristics."

The key finding is that both measures of compensation – the wage ratio plus the employer retirement cost and the total compensation ratio – show statis-

FIGURE 4. IMPACT OF SELECTED FACTORS ON TEACHER UNDERGRADUATE INSTITUTION SAT SCORE



Notes: Changes are one standard deviation for continuous variables and 0/1 for dichotomous variables. All variables displayed are significant at the 5 percent level or better. The SAT score in this equation is for the 25th percentile.

Source: Authors' calculations from various sources as described in the text.

tically significant positive coefficients. This result suggests that school districts that compensate their employees adequately relative to the private sector are able to hire teachers from undergraduate institutions with higher SAT scores.

More specifically, a one-standard-deviation increase in the wage ratio results in an 8.1-point increase in the 25th percentile SAT score of a teacher's college. A one-standard-deviation increase in employer retirement cost results in a 10.5-point average SAT score increase. When wages and benefits are combined into a total compensation ratio, the SAT score increase is 13.0 points. These increases may seem small given that the average 25th percentile SAT score is 957 (out of a maximum of 1600). Part of the explanation is that compensation ratios do not vary much across plans. It is also worth keeping in mind that the SAT score of the undergraduate institution is only an indirect way to gauge an individual's abilities, so finding even a modest effect is notable. And the effect is statistically significant and consistent across different specifications of the equations.

Interestingly, the results also suggest that applicants for teaching positions value deferred compensation – the generosity of the public pension and Social Security – as well as the wage. This finding suggests that large cuts in pension benefits would indeed reduce the attractiveness of teaching to young applicants.

Most of the control variables appear to impact the quality of an individual's undergraduate institution as measured by SAT scores. For demands of the job, holding compensation constant, high school teaching and students with higher socioeconomic status appear to be attractions and are associated with higher SAT scores at the teacher's undergraduate institution. Surprisingly, minority enrollment – all else held constant – appears to attract teachers from higher quality schools.

Personal characteristics are important as well. Having a master's degree suggests that the teacher attended an undergraduate school with high SAT scores. The coefficient for age does suggest that employers are willing to trade off experience for quality of undergraduate education. It also appears that employers are willing to trade local knowledge for SAT scores. And they may be hiring minorities from the top of the class from lower quality schools. While the minority's qualifications may be fully consistent with those of his/her white counterpart, the 25th percentile SAT scores at the minority's college are considerably lower.

The important finding is that compensation matters in attracting people into the teaching profession. Somewhat surprisingly, benefits are as important as wages for younger teachers. Teachers may value benefits highly because they believe that they will retire in the same job, allowing them to collect the full amounts.<sup>19</sup> In any event, cutting pensions will almost certainly have an adverse effect on the quality of people applying for teaching positions.



## CONCLUSION

The purpose of this *brief* was to show that compensation matters in attracting quality teachers. The analysis found that, controlling for demands of the job and personal characteristics, state and local teacher plans that compensate teachers more generously are able to hire higher quality teachers – as measured by the SAT score at their undergraduate institution. These findings are important in a period when financial pressures are leading public sector employers to cut pension benefits. Since cuts for current employees are precluded under the laws of many states, most of the cuts fall on new hires. These people are not at the table; they do not have a voice. But cutting their compensation is not costless; it will almost certainly result in a lower quality of applicants for one of the nation's most important jobs.

The point here is not to argue against restructuring pensions. Some plans have much too early a retirement age or unsustainable benefit factors. But rather it is to argue that pensions are a part of a total compensation package, and total compensation for teachers – even before cuts – is either the same or lower than that for private sector workers with similar characteristics. So even if the pension changes are good policy, without compensating wage increases, they will diminish the total compensation that new teachers will receive, make teaching in public schools less attractive, and reduce the quality of applicants.

## ENDNOTES

- 1 Surprisingly, most researchers do not differ in their findings up to this point. Richwine and Biggs (2011), Allegretto and Keefe (2010), Bender and Heywood (2010), Schmitt (2010), Borjas (2002) and Keefe (2010) all find that public sector compensation is slightly lower. The exception is Gittleman and Pierce (2011) who find that public sector workers earn more after controlling for occupation. The remaining disagreement is over the issue of job security and the extent to which it should be quantified and included in the compensation calculations (see Richwine and Biggs 2011). See Munnell et al. (2011) for a more complete discussion of compensation differences across the public and private sectors.
- 2 Borjas (2002).
- 3 Leigh (2012).
- 4 Podgursky (2011).
- 5 Warner and Pleeter (2001).
- 6 Montgomery, Shaw, and Benedict (1992).
- 7 Olson (2002).
- 8 Neither employer normal cost nor Social Security participation for teachers' plans in the PPD change during this period, so it is not possible to estimate a state fixed-effects model. Instead, the analysis compares compensation differences across plans, most of which are state level.
- 9 The sample covers non-charter, non-Bureau of Indian Affairs schools, with more than 10 enrolled students. Only plans with more than 10 teachers meeting the sample criteria are included. Additionally, only full-time teachers are included. A very small number of teachers hold Ph.D.s, and they are excluded from the sample because they face a substantially different labor market.
- 10 For a detailed discussion of attempts to measure teacher quality, see Hanushek (2003).
- 11 See Angrist and Guryan (2007) and Figlio (2002).
- 12 If scores for a school are only available in one year, they are imputed across years.
- 13 For teachers who attended an undergraduate institution that only collects ACT score data, the ACT scores are converted to SAT scores using this table: <http://www.act.org/solutions/college-career-readiness/compare-act-sat/>.
- 14 Average private sector wage is calculated from the 2001-2009 March *Current Population Survey* (CPS). Wages are normalized using the less volatile chained dollar CPI for all items less food and energy. Full-time private civilian workers age 20-29 with at least a bachelor's degree who were working in the same state in the previous year and earning income between \$9,000 and \$250,000 a year that is not imputed are included in each state average. Multiple years of CPS data are used because not enough workers met the sample criteria in an individual year to create an accurate picture of average state wages. For the 2007 SASS wave, average private sector wages were increased to reflect inflation through 2007. For the 2003 SASS wave, wages were increased to reflect inflation through 2003. In comparisons of total compensation, Social Security is then added to the state-level average at the employer contribution rate of 6.2 percent so that public and private sector compensation will be comparable.
- 15 The employer contribution includes only its share of normal costs, not amortization payments for unfunded liabilities.
- 16 The SASS reports 2000 Core Based Statistical Area (CBSA) codes for the school districts in the sample. These CBSA codes are matched with the 2004 median household income by CBSA reported by the U.S. Department of Housing and Urban Development. CBSA names are matched with CBSA codes using the Office of Management and Budget Bulletin. Where CBSA codes are missing, the state median household income for non-metro areas is assigned to the district.
- 17 Hanushek et al. (2005) finds no relationship between advanced degrees and teacher quality as measured by student achievement.
- 18 See Llorens, Wenger, and Kellough (2008) for a discussion of the overrepresentation of women and minorities in state government. See Blank (1985) for a discussion of how personal characteristics affect job choice.
- 19 The structure of teacher pensions may cause dissatisfied teachers with more generous benefits to continue teaching until their plans vest. See Friedberg and Turner (2010) for a discussion of how compensation generosity and pension generosity affect the retirement age of teachers.



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# APPENDIX

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TABLE A1. SUMMARY STATISTICS FOR REGRESSION ON TEACHER UNDERGRADUATE INSTITUTION SAT SCORE

Variable	Mean	Standard deviation	Minimum	Maximum
25th percentile SAT score	957	112	200	1410
75th percentile SAT score	1172	107	200	1590
Wage ratio	0.893	0.144	0.488	1.719
Employer retirement cost	9.374	3.743	1.900	16.900
Total compensation ratio	0.920	0.155	0.478	1.761
Teacher wage*	36,603	6,977	22,850	65,000
State average private sector wage*	39,137	4,455	31,715	48,806
Hours teaching	29.244	5.463	20	70
Free lunch	40.748	27.531	0	100
Level of school – elementary school	0.251	0.433	0	1
Level of school – middle school	0.208	0.406	0	1
Level of school – high school	0.536	0.499	0	1
Level of school – combined school	0.006	0.077	0	1
Median state household income*	57,903	9,263	44,200	76,800
Median CBSA household income*	51,999	10,178	20,200	93,500
Household income ratio	0.990	0.159	0.382	1.916
Minority enrollment	40.780	36.208	0	100
Master's degree	0.183	0.387	0	1
Age	25.509	2.095	20	30
Gender	0.709	0.454	0	1
State match	0.765	0.424	0	1
Minority teacher	0.060	0.237	0	1
2007 SASS wave	0.521	0.500	0	1

\* Teacher wage, private sector wage, and median household incomes are used to construct regression variables, but are not directly included in the regression.

Source: Authors' calculations from various sources as described in the text.

TABLE A2. REGRESSION RESULTS FOR TEACHER UNDERGRADUATE INSTITUTION SAT SCORE

Category	Variable	(1)	(2)	(3)	(4)
		SAT25	SAT25	SAT75	SAT75
Compensation variables	Wage ratio	2.813** (1.342)		2.112** (0.866)	
	Employer retirement cost	56.125*** (17.948)		29.405* (16.818)	
	Total compensation ratio		84.117*** (22.250)		52.105*** (16.718)
Demands of the job	Hours teaching	-1.092 (0.864)	-1.278 (0.777)	-0.500 (0.639)	-0.650 (0.557)
	Free lunch	-0.368* (0.192)	-0.359* (0.204)	-0.288 (0.171)	-0.280 (0.180)
	Level of school – middle school	8.167 (7.179)	7.973 (7.061)	8.047 (6.071)	7.896 (6.028)
	Level of school – high school	15.863** (5.828)	15.166** (5.958)	17.072*** (4.940)	16.513*** (5.091)
	Level of school – combined school	32.088 (44.695)	27.028 (42.388)	28.193 (43.595)	24.112 (41.698)
	Household income ratio	113.703*** (26.722)	105.512*** (23.873)	111.738*** (18.766)	105.265*** (15.514)
	Minority enrollment	0.341*** (0.102)	0.337*** (0.090)	0.364*** (0.083)	0.361*** (0.073)
	Personal characteristics	Master's degree	38.184*** (8.646)	36.295*** (8.777)	32.738*** (7.293)
	Age	-5.354*** (0.910)	-5.782*** (0.977)	-4.029*** (0.886)	-4.370*** (0.900)
	Gender	5.197 (7.015)	5.232 (7.150)	6.494 (7.907)	6.508 (8.014)
	State match	-48.408*** (14.985)	-48.236*** (14.277)	-44.311*** (14.963)	-44.165*** (14.372)
	Minority teacher	-69.870*** (14.941)	-69.753*** (15.334)	-70.155*** (14.065)	-70.081*** (14.429)
	2007 SASS wave	14.155** (5.301)	14.359** (5.445)	5.154 (4.311)	5.308 (4.417)
	Constant	957.879*** (65.439)	981.949*** (58.684)	1,148.179*** (56.513)	1,166.185*** (51.153)
Observations		3,830	3,830	3,830	3,830
R-squared		0.177	0.170	0.146	0.142

Note: Robust standard errors are in parentheses. Coefficients are significant at the 10-percent (\*), 5-percent (\*\*), or 1-percent (\*\*\*) levels.

Source: Authors' calculations from various sources as described in the text.

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