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COLLECTIVE BARGAINING AND STAFF SALARIES IN AMERICAN COLLEGES AND UNIVERSITIES

By

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I. Introduction

In 2001, a twenty-day sit-in at Harvard University brought the living-wage debate to the forefront of American consciousness. After a six-month study, the Harvard Committee on Employment and Contracting Policies, a 19 member committee of faculty, staff, administrators and students that had been appointed by Harvard's president as a result of the discussions to end the sit-in, recommended giving raises to the university's lowest paid employees and relying more on collective bargaining in the future to assure that the wages paid by subcontractors did not undercut local union wage scales.[1] A three-day sit-in at the University of Connecticut that related to the living wage issue also yielded a substantive victory for campus workers. The protesters there generated an almost two-dollar increase in wages, as well as substantial improvement in benefits for many of the university's workers.[2] Collectively these struggles represent a new battleground in American higher education.

The growth of living wage movements on almost one hundred campuses reflects the large variation in the wages paid to college and university staff across the country.[3] There are many potential explanations for these salary differences, including differences in local cost of living and differences in the resources that the academic institutions have available to pay faculty and staff salaries. One other possible explanation is the influence of staff unions. Previous studies of the impact of unions on salaries in academia have focused on faculty unions and have concluded that faculty unions have increased the

[1] Chronicle of Higher Education (January 11, 2002)
[2] Chronicle of Higher Education (May 25, 2001)
[3] Martin Van Der Werf (August 3, 2001)

salaries of their members relative to the salaries of faculty at academic institutions in which faculty are not covered by collective bargaining agreements by at best a small percentage amount.[4] There have been no studies, however, of the impact of collective bargaining on staff salaries in higher education.

Our paper addresses this issue. After providing some background data on the number of blue-collar and white-collar employees covered by collective bargaining agreements at American higher education institutions, we use data from a 1997-1998 study on the costs of staffing in higher education conducted by the Association of Higher Education Facilities Officers (APPA) and other sources to estimate models that explain the variation in academic institutions' salaries for a number of narrowly defined blue collar and white collar occupational groups that are employed by the academic institutions' facilities divisions.[5] Of primary interest to us, is the extent to which the salaries of academic staff covered by collective bargaining agreements exceed the salaries of otherwise comparable academic staff that are not covered by such agreements.

II. Background Data

Table 1 presents data on the employment levels of blue-collar and white-collar staff members employed in American higher education in the mid 1990s, as well as the percentage of each group that was covered by a collective bargaining agreement. The percentage of blue-collar employees represented by staff unions, 42.8%, is much larger than the percentage of white-collar employees, 23.4%, represented by staff unions. Because there are many more white-collar employees, in the aggregate about 27.7% of

[4] See, for example, Javad Ashrat (2000), Debra Barbezat (1989), Randall Kessering (1991) and Daniel I. Rees (1993). James Monks (2000) estimates union impacts of 7 to 14%, which are larger than the estimates found in other studies,

[5] The acronym APPA is derived from the earlier name of the organization, the Association of Physical Plant Administrators of Universities and Colleges.

staff at American colleges and universities were covered by union contracts in the mid 1990s.

The salary and collective bargaining coverage data used in our study come from the APPA's *1997-1998 Comparative Costs and Staffing Report for College and University Faculties*.[6] This data set provided information on salary levels and collective bargaining coverage for 47 narrowly defined occupations at 193 American and Canadian colleges, universities and elementary and secondary schools. We restricted our attention to American higher education institutions that could be classified as Research, Doctoral, Masters, Baccalaureate, or Associate (2-year) institutions.[7] The sample that we used ultimately consisted of 163 institutions

Table 2 presents the breakdown of the institutions in our sample by Carnegie classification and by form of control. Public institutions constitute the majority of the institutions in each Carnegie category in our sample, except for the Baccalaureate category.

We restrict our attention to the 9 occupations for which at least 115 institutions in the sample reported both an occupational salary level and whether the employees in the occupation were covered by a collective bargaining agreement. Table 3 shows the difference in the mean annual salaries of unionized and non-unionized employees for each occupation, as well as the ratio of the mean salary in an occupation for employees that were covered by union contracts to the mean salary in an occupation for employees

[6] We are grateful to Joseph Lally, Director of Business Operations for Cornell's Facilities Services Division, for granting us access to these data, under the condition that we not identify the specific institutions that participated in the survey.
[7] Carnegie Foundation for the Advancement of Teaching (1994) In addition to excluding Canadian and elementary and secondary institutions, we also excluded specialized United States institutions such as seminaries and conservatories.

that were not covered by a union contract. In each occupation, employees covered by a union contract earned considerably more than employees not covered by a contract, with the raw differentials in the means salaries varying across occupations from 23 to 42 percent. The differentials were largest in the skilled trades. Salaries for custodial workers, the group of employees that have been the focus of the living wage debate on many campuses were the lowest in the group and the unionized custodial workers in the sample earned about 35 percent more on average than custodial workers at academic institutions that were not covered by a collective bargaining agreement.

III. Estimating the Union/Nonunion Salary Advantage of Unionized Academic Staff

The estimated differences in the salaries of academic staff covered by and not covered by union contracts reported in table 3 are raw differences that do not control for characteristics of the institutions, or the areas in which the institutions are located, that might be expected to influence staff salaries independent of unionization. For example, if academic institutions whose employees were organized also had greater financial resources, or were located in higher cost of living areas, than institutions whose employees were not organized, one would expect to observe the former paying higher salaries than the latter, even if unionization per se had no effect on the salaries of staff at academic institutions. To estimate, whether staff unions to influence salaries, it is necessary to control for the other characteristics of the institutions that might be expected to influence salaries.

To accomplish this, we estimate staff salary equations, by occupation, of the form:

$$\text{Log}(W_i) = a_0 + a_1U_i + a_2Y_i + a_3Z_i + e_i$$

In the equation W_i is the annual salary paid to a staff member in an occupation at the academic institution, U_i is a categorical variable indicating whether the particular occupation is unionized at the institution, Y_i is a vector of categorical variables indicating the Carnegie classification of the institution (two-year colleges are the omitted category), Z_i is a vector of other variables that vary across institutions and are expected to influence staff salaries, and the e_i are random error terms. Because the dependent variable is the logarithm of salaries, the interpretation of the estimate of the coefficient a_1 is that it is the estimated percentage by which the salaries of staff in institutions with collective bargaining for the occupation exceed the salaries of staff at institutions without collective bargaining for the occupation, after controlling for the other factors expected to influence salaries.[8]

We include in the Y_i a set of variables that influence the resources that the academic institutions have at their command out of which to pay the salaries of staff. These include the logarithm of the institution's endowment per student (LENDOW), the logarithm of its average undergraduate tuition (LTUIT) and, for public institutions, the logarithm of its state and local government appropriation per student (LAPP).[9] In our basic specification, we also include the logarithm of the average salary that the institution pays its full professors (LSAL), under the assumption that this probably represents the best single measure of the financial capacity of the institution. Also included in this vector, to control for differences in cost of living or wage levels across areas, is the

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[8] More precisely, the estimated union/nonunion salary differential is given by $(e^{a_1} - 1)(100)$

[9] For public institutions this is a weighted average of its in-state and out-of-state tuitions, with the weights depending upon the fraction of its students that come from each category.

logarithm of the mean salary of custodians in the city in which the academic institution is located (LMEAN). When an institution was not located in a city for which we had mean custodian salary data, the mean custodian wage in the state was substituted. Finally, included in this vector is the logarithm of the average math and verbal SAT 75th percentile score for entering freshmen at the institution (LSAT). This variable, as well as the Carnegie category variables were included to see if the "selectivity" of an academic institution, or its institutional type, influences the salary of its staff, once we have controlled for its financial resources.

Table 4 presents the estimates of our logarithm of occupational salary equations. Looking first at the effect of being covered by a collective bargaining contract on the salary of staff, for 6 of the 9 occupations union coverage is associated, other factors held constant, with higher salaries, with the estimated differentials being in the range of 10 to 17 percent. The differentials are the largest for several of the occupations that historically have been heavily unionized nationwide in the building trades. Relevant to the living wage debate, we do observe that unionized custodians appear to earn about 10 percent more than nonunionized custodians at academic institutions, other factors held constant

Turning next to the financial variables, staff members' salaries are clearly strongly related to the proxy for the cost of living or alternative wages in the area. For most occupations, one cannot reject the hypothesis that a 1 percent increase in the average wage of custodians in the area is associated with a 1 percent increase in the academic staff members' salaries.

Salaries of staff members at American colleges and universities are also clearly related to the salaries paid to full professors employed at their institutions. Interestingly, the magnitude of the relationship appears to be strongest for the one white-collar occupation represented in our sample, administrative secretary. Once we control for the salaries paid to full professors, we find little evidence that knowledge of the financial picture facing the institution, as measured by its endowment per student, its average tuition level or, for publics, its per student state and local government appropriation level, influence its staff members' salaries[10]

Other factors held constant, including the financial and unionization variables, for several categories of staff, the Carnegie category of the institution in which they are employed is a statistically significant determinant of their salaries. In particular, administrative secretaries, custodial employees, and locksmiths employed at 2-year institutions appear to earn 12 to 25 percent more than their counterparts who are employed at baccalaureate, masters, doctoral or research institutions. Put perhaps another way, 2-year institutions appear to be the least elitist; the faculty/staff salary differential is lowest at these institutions.[11] Finally, the selectivity of an institution's undergraduate students, as measured by their SAT scores, is not related to the salaries of staff in these occupations.

IV. Testing for the Sensitivity of Our Findings to Alternative Specifications

Our primary concern is the effect of unionization of staff employees at academic institutions on the salaries of those staff employees. Table 5 summarizes the results of

[10] As we indicate in the next section, we also estimated models that excluded the logarithm of full professors' average salary. However, in these models the measures we included of the institutions' financial wealth- endowment per student, tuition and state and local appropriations per student - again never proved to be positively related to the salaries of staff in an occupation

[11] For the other occupations, two-year colleges also appear to pay higher salaries, ceteris paribus, than the other categories of institutions but the estimated differentials are usually not statistically significantly different from zero.

additional econometric modeling we conducted to investigate the sensitivity of the estimated union coefficient to the variables included in the analyses and to the econometric methods we utilized. Row A of table 5 simply repeats the estimated union coefficients that are reported in table 4.

A key explanatory variable underlying table 4 was the logarithm of the average salary of full professors at the institution. One can easily argue that this variable should be treated as endogenous and that including it in the model may bias the estimated union coefficient. To see if the inclusion of the full professor salary variable mattered, we reestimated our equation excluding this variable from the analyses and the estimated union coefficients are found in row B of table 5. The exclusion of the full professor salary variable from the right-hand side of the equation leads to slightly higher estimated union/nonunion differentials, with the statistically significant coefficients now ranging from 13 to 21 percent.

The estimates presented in table 4 treat each occupational equation as independent. They ignore the fact that there may be some omitted institutional level variables that influence the salaries of staff commonly in all occupations. For example, the union/nonunion wage advantage for an occupation at an institution may depend upon the fraction of the other staff occupations at an institution that are covered by collective bargaining agreements. Hence the wages any given staff occupation at an academic institution may depend upon the unionization of all staff occupations at the institution.

We attempted to reestimate the models underlying table 4, adding as an additional explanatory variable the fraction of all 9 occupations that were covered by collective bargaining agreements.[12] Unfortunately, when 1 of the 9 occupations was covered by a contract, the vast majority of the other occupations also were covered by a contract. Hence the coverage by union contract variable for an occupation was very highly correlated with the fraction of the 9 occupations at the institution that were covered by union contracts. The high degree of collinearity prevented us from estimating such a model.

A second way to get at this issue is simply to treat the 9 occupational salary equations as a single system and to allow the error terms to be correlated across equations. Estimating this system using the method of seemingly unrelated regressions will increase the efficiency of our estimates, however, as long as none of the other statistical assumption was violated, the estimates reported in table 4 would remain unbiased.[13]

The method of seemingly unrelated regressions will increase the efficiency of the estimated coefficients only if the identical explanatory variables do not appear in each equation. In our system, the only explanatory variable that varies across occupations is whether employees in an occupation are covered by a collective bargaining agreement at an institution. We have already indicated that the fraction of occupations organized at an institution is highly correlated with whether any one of the occupations is organized across institutions. Given this fact, it is not surprising that the estimated union coefficients that we obtained when we reestimated the model by seemingly unrelated regressions (these estimates found in row C of table 5); the estimated prove to be very similar to the coefficients found in row A of the table. Any differences are probably due

[12] Ehrenberg and Goldstein (1975) followed a similar procedure in their study of the impact of public sector unions on the wages of different occupational categories of public employees.
[13] The seemingly unrelated regression model was developed by Arnold Zellner (1962)

to sampling error since the seemingly unrelated regression model could only be estimated using data on the subset of institutions that reported occupational salary and unionization data for all 9 occupations.

Finally, our estimates of the salary advantage that staff who work in unionized academic environments have over staff who work in nonunion academic environments treats staff coverage by a collective bargaining agreement as being exogenous. If, for example, the institutions in which we observe staff covered by a collective bargaining agreement were initially the institutions in which staff compensation was lowest, other factors held constant, our estimates will understate the extent to which academic staff unions have improved their members compensation relative to the compensation of academic staff at institutions not covered by collective bargaining agreements.

In the absence of having a panel data set that would permit us to estimate how changes in staff salaries at academic institutions are related to changes in collective bargaining coverage, there are two ways to handle this problem. The first is to obtain an instrument for the presence of a union contract and to reestimate our basic model using the method of instrumental variables. We obtained an instrument for collective bargaining for a staff occupation at an institution by regressing this variable on all of the other variables found on the right hand side of the salary equations, as well the proportions of private and public employees in the institution's state covered by collected bargaining agreements, each interacted with a dichotomous variable indicating whether the institution was a public or private institution.[14]

[14] The latter four variables are included to allow both public and private collective bargaining coverage in the state to influence whether the occupation at an academic institution was covered by a collective bargaining agreement, but to allow the importance of each of these variables to depend upon whether the institution was a public or a private institution.

The estimated union coverage coefficients that we obtained using this methodology are found in row D of table 5. All of the estimated union coefficients are now statistically significantly different from zero and their magnitudes have increased. Indeed, on balance they are now very close to the raw differences in the salaries of unionized and nonunionized staff in these occupations that are found in table 3. The implication of this result is that those academic institutions in which staff in these occupations have been organized were, on balance, among the lower paying academic institutions, other factors held constant, at the time that they were first organized

The second is to use the sample selection bias correction method developed by James Heckman (1979) and Lung-fei Lee (1978). To implement this method, we estimate a probit equation for union coverage in an occupation in which union coverage is assumed to be a function of the variables discussed above.[15] The estimates of this equation allow us to compute an estimate of the inverse mills ratio for each observation, this is added as an additional explanatory variable to equation and equation (1) is then reestimated. Inclusion of this estimated inverse mills ratio in the model controls for the nonrandom nature of union coverage.

The estimated union coefficients that we obtained when the sample selection bias correction method was used are found in row E of table 5. In most cases these estimates prove to be very similar to the OLS estimates reported in row A. The estimated union coefficients for carpenters, electricians, heating and cooling technicians, painters and plumbers remain statistically significant and each coefficient is close to its value in the OLS equations. The estimated union coefficients for secretaries, groundskeepers and

[15] A table with the estimated coefficients of the union coverage equation for each occupation is available from the authors upon request.

locksmiths are statistically insignificantly different from zero, as they were in the OLS estimation. While custodians' salaries appeared to be higher when they were covered by a collective bargaining contract in the OLS specification, the selectivity corrected estimate of the effects of unions on custodians' salaries is close to zero.

V. Concluding Remarks

Our paper has provided an initial effort at estimating the effect of collective bargaining coverage on the salaries of staff members at American higher education institutions. When we treated collective bargaining coverage as exogenous, we obtain estimated union/nonunion salary differentials that are in the range of 10 to 17 percent for the occupations in our sample. When we remove full professor salaries from the set of control variables used in the model, these differentials increase by about 3 percentage points. When we treat collective bargaining coverage as endogenous and estimate the union/nonunion differential using an instrumental variable approach, the differentials rise to the 15 to 40 percent range, which is roughly what the unadjusted mean differences were in the sample in the salaries of staff covered and not covered by collective bargaining agreements. However, these latter estimates are a good deal higher than previous estimates of the impact of unions on their members' relative salaries, either for the economy as a whole or for the public sector and when we instead use a sample selection bias model to correct for the endogenity of union coverage, estimates close to the OLS estimates are obtained for most occupations.

The limitations of our study should be kept in mind. The sample of 163 academic institutions used in our study is not necessarily representative of the population of over

3000 2- and 4-year colleges and universities in the United States. The 9 occupations whose salaries we analyze all relate to employees employed in the facilities division of America's colleges and universities and the effects that we estimate for them are not necessarily representative of the effects for staff unions that one might observe for a wider range of college and university staff employed in other areas (for example, housing and dining, athletics, academic support, student services, external relations).

Nonetheless our study does suggest that collective bargaining coverage does influence staff salaries in higher education. The *National Labor Relations Act* governs collective bargaining for staff of private academic institutions, while state public employee bargaining laws govern collective bargaining for staff at public academic institutions. While student and faculty activists on campuses around the country may continue to press academic institutions to pay living wages to their lower paid staff, including custodial staff, our findings suggest that a more direct way to achieve better salaries for low-paid college and university employees is to encourage them to organize and bargain collectively. Unlike private college and university faculty members, who are effectively precluded from collective bargaining at many institutions because of the Supreme Courts decision in the *Yeshiva* case, there is no such prohibition to prevent staff at these institutions from organizing.[16]

Our study also suggested that other factors held constant, including the proxy for area cost-of-living and area wage levels and collective bargaining coverage, that there is no evidence that more financially well-off academic institutions pay their staff higher salaries. Whether public pressure can be effectively brought to bear on a wider range of academic institutions that have the financial resources to improve their staff salaries if

[16] See *NLRB V. Yeshiva University,* 944 U.S. 672 (1980)

they choose, as we indicated at the outset was done at Harvard and the University of Connecticut, is an open question.

References

Javed Ashraf, “The Effect of Unions on Professor’ Salaries: The Evidence Over Twenty Years”, *Journal of Labor Research* 18 (Summer 1997): 439-450

Debra Barbezat, “The Effect of Collective Bargaining On Salaries in Higher Education”, *Industrial and Labor Relations Review* 42 (April 1989): 443-455

Carnegie Foundation for the Advancement of Teaching, *A Classification of Institutions of Higher Education* (Princeton NJ: Carnegie Foundation for the Advancement of Teaching, 1994)

Ronald G. Ehrenberg and Gerald S. Goldstein, “A Model of Public Sector Wage Determination”, *Journal of Urban Economics* 1 (June 1975): 223-245

“Harvard Panel Recommends Wage Parity: Raises Coming to Cambridge?” *Chronicle of Higher Education,* January 11, 2002, p. A34

James J. Heckman, “Sample Selection Bias as a Specification Error”, *Econometrica* 47 (January 1979): 153-161

Randall Kesselring, “The Economic Effects of Faculty Unions”, *Journal of Labor Research* 12 (Winter 1991): 61-72

Lung-Fei Lee, “Unionism and Wage Rates: A Simultaneous Equations Model With Qualitative and Limited Dependent Variables”, *International Economic Review* 19 (June 1978): 415-433.

James Monks, “Unionization and Faculty Salaries: New Evidence from the 1990s”, *Journal of Labor Research* 21 (Spring 2000): 305-314.

Daniel I. Rees, “The Effects of Unionization on Faculty Salaries and Compensation: Estimates from the 1980s”, *Journal of Labor Research* 14 (Fall 1993): 399-422.

“Sit-Ins Over Staff Wages Have Different Outcomes at Harvard and U. Connecticut”, *Chronicle of Higher Education*, March 25, 2001, p. A41.

Martin Van Der Werf, “How Much Should Colleges Pay Their Janitors? Student Protests Force Administrators to Consider Issues of Social Justice and Practicality”, *Chronicle of Higher Education*, Aug 3, 2001, p. A27.

Arnold Zellner, “An Efficient Method of Estimating Seemingly Unrelated Regressions and Testing for Aggregation Bias”, *Journal of the American Statistical Association* 67 (June 1962): 348-365.

Table 1

Collective Bargaining Coverage of College and University Staff in 1994

	Total Employees	Estimated Employees in Bargaining Units	Percent Represented
White Collar	1,070,142	250,573	23.4
Blue Collar	306,335	131,232	42.8
Total	1,376,477	381,805	27.7

Sources: *Digest of Education Statistics 1994* (Washington DC: National Center for Education Statistics, 1994), pp. 228-229 (total employees); *Directory of Staff Bargaining Agents in Institutions of Higher Education* (New York NY: National Center for the Study of Collective Bargaining in Higher Education and the Professions, 1995), pp. (Employees in Bargaining Units)

Table 2

Distribution of Academic Institutions By Carnegie Category and Control in the APPA Sample

	Funding		
Carnegie	Private	Public	Total
Associate	1	13	14
Baccalaureate	23	3	26
Doctoral	4	16	20
Masters	12	42	54
Research	7	42	49
Total	47	116	163

Table 3

Mean Occupational Salaries in 1997-98 for Employees Covered by Collective Bargaining Agreements and Not Covered By Collective Bargaining Agreements in the APPA Sample

Occupation	Mean Salary Without Union	Mean Salary With Union (Ratio)
Administrative Secretary	21,953	26,978 (1.23)
Custodian	16,993	22,850 (1.34)
Grounds Keeper	18,838	26,138 (1.39)
Carpenter	26,206	35,962 (1.37)
Electrician	27,701	38,629 (1.39)
Locksmith	27,243	33,463 (1.23)
Heating and Cooling	26,576	37,600 (1.41)
Painter	24,468	34,645 (1.42)
Plumber	26,852	37,575 (1.40)

Source: Authors' computations from the APPA data. Only institutions that reported union coverage for an occupation and a salary figure for an occupation are included

Table 4

Logarithm of 1997-98 Salary Equations: By Occupation [a]
(Absolute value of t-statistics in parentheses)

	Administrative Secretary	Custodian	Grounds Keeper	Carpenter	Electrician	Locksmith	Heating and Cooling	Painter	Plumber
Union	0.024 (0.6)	0.101 (2.7)	0.007 (0.2)	0.107 (2.3)	0.122 (2.6)	0.071 (1.5)	0.167 (3.1)	0.138 (3.0)	0.135 (2.7)
Baccalaureate	-0.119 (1.3)	-0.156 (1.9)	-0.156 (1.5)	-0.068 (0.7)	-0.086 (0.9)	-0.180 (1.8)	-0.093 (0.8)	-0.047 (0.4)	-0.062 (0.6)
Doctoral	-0.207 (2.4)	-0.277 (3.4)	-0.134 (1.3)	-0.089 (0.4)	-0.087 (0.9)	-0.254 (2.6)	-0.111 (1.0)	-0.038 (0.4)	-0.144 (1.4)
Masters	-0.129 (1.9)	-0.206 (3.1)	-0.147 (1.7)	-0.034 (0.4)	-0.062 (0.8)	-0.201 (2.4)	-0.073 (0.8)	-0.031 (0.4)	-0.135 (1.5)
Research	-0.128 (1.6)	-0.215 (2.8)	-0.046 (0.5)	-0.036 (0.4)	-0.047 (0.5)	-0.238 (2.5)	-0.035 (0.3)	0.014 (0.1)	-0.104 (1.1)
LAPP	-0.014 (0.8)	-0.003 (0.2)	-0.011 (0.6)	0.001 (0.9)	-0.018 (0.9)	-0.005 (0.3)	0.009 (0.4)	-0.009 (0.5)	-0.015 (0.8)
LEND	-0.022 (2.3)	-0.006 (0.5)	-0.007 (0.6)	-0.016 (1.5)	-0.021 (2.0)	0.002 (0.2)	-0.005 (0.4)	-0.009 (1.0)	-0.020 (1.9)
LSAL	0.726 (4.8)	0.423 (3.2)	0.487 (2.7)	0.285 (1.9)	0.286 (1.8)	0.305 (1.8)	0.125 (0.6)	0.479 (2.9)	0.279 (1.7)
LTUIT	0.028 (1.1)	-0.015 (0.7)	-0.016 (0.5)	0.006 (0.2)	-0.003 (0.1)	-0.010 (0.4)	-0.003 (0.1)	-0.010 (0.4)	-0.030 (1.1)
LSAT	-0.548 (1.8)	-0.371 (0.2)	0.048 (0.1)	0.316 (1.0)	0.209 (0.6)	0.085 (0.3)	-0.001 (0.1)	-0.421 (1.3)	0.737 (0.3)
LMEAN	0.744 (4.8)	1.132 (7.9)	0.962 (5.1)	0.976 (5.6)	0.962 (5.3)	0.888 (5.3)	0.973 (5.0)	0.976 (5.7)	1.002 (5.4)
R^2	0.4609	0.6616	0.5154	0.5612	0.5401	0.5277	0.5630	0.6137	0.5532
N	143	142	125	143	145	119	120	131	139

[a] Also included in the model is an intercept term and dichotomous variables for non-reporting of endowment, average full professor salary, government appropriations per student, tuition and average SAT scores.

Union	1 if the occupation was covered by a union contract, 0 if otherwise
Baccalaureate	1 if the Carnegie category of the institution was Baccalaureate, 0 if otherwise
Doctoral	1 if the Carnegie category of the institution was Doctoral, 0 if otherwise
Masters	1 if the Carnegie category of the institution was Masters, 0 if otherwise
Research	1 if the Carnegie category of the institution was Research, 0 if otherwise (The omitted category was 2-year college institutions)
LAPP	interaction between a 0,1 dichotomous variable for being a public institutions and the logarithm of appropriations per student from state and local governments.
LEND	logarithm of endowment per student at the institution.

Table 4 continued

LSAL	logarithm of the average full professor salary at the institution
LTUIT	logarithm of the average tuition paid by students at the institution
LSAT	logarithm of the average75 percentile scores on the verbal and mathematics SAT test for the institution
LMEAN	logarithm of the mean salary for custodian in the city or state of the institution.

Data Sources: Union, Baccalaureate, Doctoral, Masters, Research. Public/Private (APPA Survey)
LAPP, LEND, LSAL, LTUIT (Webcaspar)
LSAT (*America's Best Colleges- 1998* (Washington DC: *U.S. News & World Report,* 1997)
LMEAN (Bureau of Labor Statistics, http://www.bls.gov/bls/blswage.htm, *(2000 Metropolitan Area Occupational Employment and Wage Estimates))*

Table 5

Logarithm of 1997-98 Occupational Salary Equations: Coefficients of Union Variables
Sensitivity Analyses
(Absolute value of t-statistics in parentheses)

	Administrative Secretary	Custodian	Grounds Keeper	Carpenter	Electrician	Locksmith	Heating and Cooling	Painter	Plumber
(A)	0.024 (0.6)	0.101 (2.7)	0.007 (0.2)	0.107 (2.3)	0.122 (2.6)	0.071 (1.5)	0.167 (3.1)	0.138 (3.0)	0.135 (2.7)
(B)	0.044 (0.9)	0.131 (2.8)	0.081 (1.1)	0.155 (2.0)	0.171 (2.2)	0.129 (1.9)	0.187 (2.5)	0.189 (2.5)	0.208 (2.7)
(C)	0.020 (0.5)	0.072 (2.2)	0.020 (0.3)	0.099(1.6)	0.130 (2.0)	0.069 (1.3)	0.139 (2.3)	0.135 (2.3)	0.158 (2.5)
(D)	0.196 (2.1)	0.237 (3.3)	0.195 (2.0)	0.353 (3.4)	0.417 (3.7)	0.166 (2.1)	0.270 (2.5)	0.312 (3.2)	0.359 (3.3)
(E)	-0.013 (0.3)	0.030 (0.7)	-0.067 (1.3)	0.084 (1.6)	0.116 (2.2)	0.032 (0.6)	0.128 (2.3)	0.125 (2.4)	0.113 (2.2)

Where:

(A) OLS coefficients from table 4
(B) OLS coefficients from model that excludes the logarithm of average faculty salary
(C) Seemingly unrelated regression estimates for the model estimated in table for the sample of institutions that report data for all 9 occupations
(D) Instrumental variable estimates of the model estimated in table 4 in which an instrument for the collective bargaining coverage variable is obtained from regressing coverage on the proportions of public and private employees in the state covered by collective bargaining agreements- each interacted with whether the institution is public or private- and all of the other right hand side variables from the wage equations
(E) Selectivity bias corrected estimates of the model estimated in table 4

Appendix A
Occupational Descriptions

Occupation	Description
Administrative Secretary	Secretarial/Clerical
Custodian	Custodial/Housekeeper
Grounds Keeper	Groundskeeper
Carpenter	Carpenter
Electrician	Electrician
Locksmith	Locksmith
Heating and Cooling	HVAC/Controls Technician
Painter	Painter
Plumber	Plumber/Pipefitter