

Salary and Benefit Compensation at American Research Universities

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ABSTRACT

Employee benefit compensation for faculty at American research universities varies across institutions. In this study a unique set of data is used to analyze the factors leading to the differences in benefit compensation. The size and salary compensation of the faculty are found to be significant determinants of the level of benefits offered by universities.

Salary compensation is found to be generally higher in nominal terms in Northeastern urban universities. Following adjustments for the differences in tax burden and cost of living at different universities; salaries paid by Southern, Midwestern, and nonurban universities are found to compare favorably with salaries paid by Northeastern urban universities.

Average compensation, including wages and employee benefits, paid to full professors at American research universities has grown from \$35,920 in 1980 to \$68,540 in 1988 (*Academe*, 1989). Faculty compensation accounts for a sizable portion of a university's total expenses and is a significant factor in the increasing cost of a college education (Blum, 1990).

Several factors may explain the steep increase in faculty compensation of the last ten years. Among these reasons is the escalating cost of employee benefits. The cost of a typical family health and dental insurance plan rose from \$860.50 in 1980 to \$2,052 in 1988 (U.S. Chamber Research Center, 1989). Other reasons include a shortage of faculty in some areas and an increased demand for high priced professors in the business and engineering disciplines.

Faculty compensation has significant implications for American higher education. This study will examine two aspects of faculty compensation which have not previously been analyzed. In the next section a unique set of data obtained from the American Association of University Professors (AAUP) is

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used to examine the determinants of compensation through employee benefits for senior faculty at research universities. Then nominal salaries paid by universities are adjusted for variations in taxes and the cost of living across university locations. Nominal salaries are found in several cases to vary greatly from real disposable salaries and to be misleading as an indicator of the competitiveness of a university's compensation practices in comparison with other universities. The findings of the study are followed by conclusions.

Employee Benefit Compensation At American Research Universities

Employee benefit compensation is a significant and growing part of total compensation for persons in the United States labor force. In 1970 the average employee benefit package was 26.6 percent of compensation. By 1987 the percentage had grown to 39 percent. Although employee benefits constitute a significant portion of total compensation, employee benefit payments vary widely among employers. Approximately 2 percent of employers spend 18 percent of total compensation on benefits. At the other extreme roughly 2 percent expend as much as 60 percent of total compensation on benefits (U.S. Chamber Research Center, 1989).

Employee benefit compensation practices at American research universities reflect those of the general labor market. In 1988 benefits for full professors averaged 17.95 percent of total compensation. Payments for benefits varied widely between universities. At one extreme benefits accounted for 9.16 percent of total compensation at the University of Illinois; at the other, benefits accounted for 32.02 percent of total compensation at the University of Alaska.¹

In this section a unique set of cross-sectional data is used to examine why benefit compensation varies widely across universities for full professors. The study follows previous cross-sectional work (Alpert, 1983 and Woodbury, 1983) but focuses on one particular job classification, that of full professor at a research university. This allows for the direct comparison and evaluation of benefits offered by competing employers for workers in a particular job classification.

Model of the Determinants of Benefit Compensation

The authors assume that utility-maximizing individuals in the job market select employers on the basis of the total compensation package offered. Since individuals derive different levels of utility from the employee benefits offered by employers, employers structure their compensation packages to appeal to the types of workers they hope to attract.

¹ The employee benefits for professors reported here do not include several benefits that are included in the benefit calculation of individuals in the general labor market. These include paid rest periods, lunch periods, payments for holidays, sick leave and vacation. Benefits may account for a lower percentage of total compensation for senior faculty members than for society as a whole because salaries for senior faculty members are considerably higher than average salaries.

The level of fringe benefits offered by university i is written:

$$B_i = f(S_i, G_i, U_i, T_i),$$

where B_i is the average dollar expenditure for employee benefits per full professor paid by university i . The benefits included in B_i are retirement plans, health insurance, disability insurance, tuition waiver, dental insurance, life insurance, unemployment insurance, Social Security, and workers compensation insurance. The data set also reported a miscellaneous "all other" category of benefits which is included in the analysis. This category includes moving and housing allowances as well as bonuses. S_i is the average salary of full professors at university i . G_i is the number of full professors at university i . U_i is a classification variable which takes the value of 1 if university i has a unionized faculty and 0 otherwise. T_i is the marginal state income tax rate applicable to the average full professor at university i .

Benefit compensation has been found by Alpert (1987) to be positively correlated with salary and wage compensation. There are three reasons for this relationship. First, at higher incomes the tax advantages inherent with certain benefits such as health insurance are greater. This is due to the increasing marginal tax rate on income. Second, the consumption of normal goods increases as income rises.² Third, several employee benefits are functionally related to salary compensation, including Social Security, retirement plans, and disability insurance.³

Phelps (1973) has shown that the group purchase of certain employee benefits lowers the cost of those benefits. Savings are achieved primarily with insurance benefits through a reduction in the sales and administrative costs of the product. The reduction in this cost has been shown to increase with group size. In this study the number of full professors is used as a proxy for group size since the true group size is not available in the data set. Typically for nonretirement benefits the true group size at a university would include not only other professorial ranks but staff employees as well. It is hypothesized that universities will purchase more employee benefits when the cost of the benefits is lower. A positive relationship is therefore expected between the independent variable, faculty group size, and the dependent variable, benefits.

Lewis (1963) has shown that unionization tends to increase compensation in general and benefit compensation in particular has been shown to be related to unionization by Freeman (1981) and Alpert (1982 and 1983). This is attributable to the increased bargaining strength of unions as well as the ability of unions to perceive workers' tastes for employee benefits more clearly than management.

² If insureds have decreasing absolute risk aversion then the income elasticity of demand for insurance is negative. Therefore, insurance may not be a normal good.

³ An alternative hypothesis is that benefit compensation is negatively related to salary compensation. If employers in a competitive labor market structure their compensation package subject to the constraint that the cost of the package will reflect the workers' marginal product of labor, an increase in benefits or wage compensation will be associated with an offsetting decrease in the other. To date little empirical work supports this hypothesis.

Since several employee benefits receive preferential income tax treatment, it is hypothesized that universities in states with high state income taxes will provide greater employee benefits than universities in states with low income tax rates. The marginal state tax rate applicable to the average full professor at each university is included in the analysis to test for this relationship.

The following relationships are therefore hypothesized:

$$\delta B_i / \delta S_i > 0, \delta B_i / \delta G_i > 0, \text{ and } \delta B_i / \delta T_i > 0.$$

It is also anticipated that universities with unionized faculties will provide more fringe benefits than those without a union.

Empirical Results of the Benefits Determination Hypotheses Tests

The data used in this study come from the AAUP. The AAUP compiles data annually concerning the compensation of professors at American colleges and universities. Only research universities were used so that comparisons could be made between like institutions. The rank of full professor was used because it was believed to be indicative of university faculty compensation practices in general. Senior faculty at major research universities have demonstrated their ability to produce research. There is greater uncertainty as to the ability of lower ranking faculty to produce research. Therefore, remuneration paid to senior faculty is indicative of a university's compensation practices for a scholar of proven ability.⁴

The AAUP data contain information on the average salary paid to full professors, as well as a breakdown of the benefits provided by the universities. The per employee cost of the benefits to the universities is also reported. Finally, the data set reports the number of full professors at each university. Table 1 reports summary statistics of the benefits in the data set.

The data set was augmented with cost of living data collected from the American Chamber of Commerce Researchers Association. Tax information was obtained from the Tax Foundation Inc. The union status of the faculty at each university was obtained from the AAUP.⁵ The hypotheses of the study were tested with the model⁶:

$$B_i = \beta_0 + \beta_1 S_i + \beta_2 G_i + \beta_3 U_i + \beta_4 T_i + e_i$$

⁴Although focusing on the rank of full professor attempts to control for variations in productivity, variation may still exist across universities if different institutions have different promotion standards.

⁵Portions of the data set will be made available by the authors to interested parties. Due to restrictions from the AAUP the complete data set can not be made available.

⁶An earlier version of the model was estimated with a classification variable for whether the university was private or public. This variable was found to be highly collinear with salary and was therefore omitted from the model.

The model was estimated with and without Social Security. Social Security had no significant impact upon the model. The model presented here includes Social Security. Social Security was included because in some states university employees do not participate in Social Security.

Table 1
Benefits Provided at Research Universities

Benefit	N*	Mean Contribution	S.D
Pension	106	\$5,831.90	\$1,843.89
Medical Insurance	106	1,951.73	1,002.71
Disability Insurance	76	145.72	112.53
Tuition Supplements	48	1,142.68	988.66
Dental Insurance	39	225.28	144.12
Social Security	100	3,245.89	373.86
Unemployment Insurance	84	138.83	166.27
Life Insurance	90	168.27	155.67
Workers Compensation	96	272.18	246.90
Other	21	753.71	1,371.31
Average Total Benefit Package	106	\$12,205.10	\$3,081.84

The number of universities providing each type of benefit.

where B_i , S_i , G_i , U_i , and T_i are as previously defined. β_0 is the intercept term of the model. β_1 , β_2 , β_3 , and β_4 are the estimated coefficients of the exogenous variables. The error term of the model, e_i , is assumed to be normally distributed. Ordinary least squares was used to estimate the model. Table 2 reports the empirical results of the analysis.

Table 2

Determinants of A University's Level of Faculty Fringe Benefit Compensation
Dependent Variable: Log (Dollar Value of Fringe Benefits Provided)
($R^2 = .50$)

Variable	Mean	Coefficient
Intercept		-3.702*
log (Average Salary of A Full Professor)	10.91	1.249*
log (Number of Full Professors)	5.83	-0.096*
Union (1 if the Faculty is Unionized)	0.16	-0.010
Marginal State Income Tax Rate	5.06	0.004

* Significant at .05 level

The empirical results strongly support the hypothesis that benefit compensation and salary compensation are positively related. The data analysis does not support the hypothesis that state income tax rates are positively related to the level of employee benefit compensation.

The data in this study indicate that unionization of the faculty has an insignificant negative relationship with the level of benefit compensation at research universities. The insignificant relationship may be attributable to the faculty being only one component of the work group at a university.

Unionization of the staff and other nonacademic employees at universities may influence the level of benefits provided to all employees including the faculty. Unfortunately the current data set does not provide information on whether the universities in the study have unionized non-faculty employees. A negative relationship may arise if faculty unions generally form at universities that are comparatively less well funded than universities without faculty unions. In this case unions may have little ability to influence benefit compensation.

Contrary to what was anticipated, the number of full professors at a university has a significant negative relationship to the value of employee benefits paid for by universities. This relationship would result if universities do not increase their benefit package when the cost of benefits declines. The negative relationship then indicates that the cost of providing a given level of benefits per employee decreases as group size increases. This is consistent with earlier empirical work which demonstrated that economies of scale exist in the group purchase of fringe benefits (see Phelps, 1973; Farley and Monheit, 1985).

Real And Nominal Salary Compensation

Nominal salary compensation at research universities varies widely. In 1988 the lowest average salary, \$34,000, was paid by the University of Montana and the highest average salary, \$79,300, was paid by Harvard University. Nominal salary as a measure of compensation may not accurately reflect the competitiveness of a university in the labor market. This is because in addition to not accounting for the value of a university's benefit package, the measure does not account for the variation in taxes and cost of living in different university locations.

An alternative measure of compensation, real disposable income, accounts for tax and cost of living variations between universities. This measure is defined:

$$RDI_i = (NW_i - T_i)/CPI_i,$$

where, NW_i is the average nominal salary at university i . T_i is the total state tax paid by a faculty member at university i . T_i is proxied by three times the average annual tax burden of an individual in the state in which university i is located.⁷ CPI_i is the consumer price index of the area in which university i is located.

The rankings of the universities included in this study by nominal income and real disposable income are listed in Table 3. The table also reports the employee benefit compensation paid at each university in nominal terms. Adding benefit compensation to the salary measures may be misleading for several reasons. First, the cost of retirement benefits at some universities is

⁷ The average annual individual tax burden is multiplied by three to account for family size. The Bureau of the Census reports that the average family size of a family whose primary wage earner was a professional was three during 1988.

Table 3
A Real Income Analysis of Senior Faculty Salaries
At Major Research Institutions

	Real Disposable Income	Total Nominal Benefits (Rank)	Nominal Income (Rank)
1. U. of Notre Dame	\$65,971	\$13,950 (27)	\$65,700 (15)
2. Duke University	62,430	14,542 (23)	66,000 (11)
3. SUNY-Buffalo	61,218	16,026 (8)	66,000 (11)
4. Vanderbilt Univ.	60,569	13,706 (30)	63,200 (19)
5. Stanford Univ.	59,553	13,602 (32)	74,900 (2)
6. Rice University	57,891	11,639 (66)	62,500 (24)
7. Johns Hopkins U.	57,480	12,765 (49)	64,400 (20)
8. Univ. of Texas	57,251	11,295 (68)	61,900 (25)
9. Virginia Tech	56,968	12,914 (45)	59,900 (32)
10. Princeton	55,696	15,216 (17)	71,400 (4)
11. Ohio State	55,570	11,678 (63)	60,800 (29)
12. Washington Univ.	55,484	12,784 (48)	58,200 (35)
13. Univ. of Florida	55,110	12,420 (53)	57,400 (39)
14. Univ. of Michigan	54,932	13,297 (41)	62,900 (22)
15. SUNY-Binghamton	54,009	15,287 (16)	61,600 (27)
16. California-Berkeley	54,040	14,998 (19)	68,400 (5)
17. N. Carolina State	53,721	10,178 (81)	57,400 (39)
18. UCLA	53,516	14,621 (22)	67,300 (8)
19. Tulane Univ.	53,011	14,154 (25)	54,700 (50)
20. Indiana Univ.	52,874	14,013 (26)	54,500 (51)
21. U. of Cincinnati	52,618	16,779 (5)	57,400 (39)
22. Penn. State	52,117	12,373 (55)	58,000 (3)
23. Univ. of Houston	51,952	10,340 (79)	56,400 (46)
24. SUNY-Albany	51,707	15,442 (12)	63,600 (18)
25. Univ. of Arizona	51,521	11,859 (60)	55,500 (49)
26. Southern Cal.	51,465	16,795 (4)	64,900 (17)
27. Univ. of Georgia	51,318	12,987 (44)	53,700 (54)
28. Texas Tech Univ.	51,272	9,551 (83)	49,600 (78)
29. U. of Pennsylvania	51,192	16,259 (6)	68,400 (5)
30. University of Iowa	51,176	12,234 (56)	55,700 (48)
31. Rutgers University	51,089	12,641 (51)	65,900 (13)
32. Southern Methodist	50,808	15,941 (10)	56,800 (45)
33. Univ. of Illinois	50,468	5,768 (106)	57,200 (44)
34. Case Western	50,336	11,662 (65)	59,200 (33)
35. U. of N. Carolina	50,276	8,754 (74)	58,600 (34)
36. Georgia Tech	49,900	13,326 (40)	57,600 (38)
37. Univ. of Alabama	49,831	12,040 (58)	51,800 (67)

38. Iowa State Univ.	49,747	12,182 (57)	53,900 (53)
39. Univ. of Tennessee	49,442	13,597 (33)	50,700 (72)
40. U. of S. Carolina	49,414	8,447 (95)	51,200 (70)
41. Syracuse	49,341	15,430 (14)	52,900 (60)
42. Texas Christian	49,021	11,118 (71)	52,900 (60)
43. Univ. of Arkansas	48,728	8,824 (88)	46,400 (88)
44. Auburn University	48,690	9,947 (82)	49,700 (76)
45. Wake Forest Univ.	48,277	11,376 (67)	50,700 (72)
46. Brown University	48,238	13,704 (31)	50,700 (72)
47. Northwestern Univ.	48,039	12,743 (50)	64,400 (20)
48. Arizona State Univ.	47,610	10,238 (80)	53,200 (58)
49. Univ. of Kansas	47,290	9,457 (84)	47,600 (86)
50. Univ. of Minnesota	47,283	13,404 (35)	54,500 (51)
51. Harvard University	47,195	15,195 (18)	79,300 (1)
52. Dartmouth Univ.	47,136	16,236 (7)	61,300 (28)
53. Univ. of Missouri	46,904	8,425 (97)	46,200 (89)
54. Baylor University	46,701	12,912 (46)	49,700 (76)
55. U. of Mississippi	46,580	8,849 (87)	46,100 (91)
56. Univ. of Colorado	46,529	8,712 (92)	51,400 (69)
57. U. of Massachusetts	46,527	11,677 (64)	60,800 (29)
58. U. of Connecticut	46,498	13,061 (43)	61,500 (26)
59. Oklahoma State	46,449	10,414 (78)	45,600 (93)
60. Univ. of Oklahoma	46,376	10,648 (75)	46,600 (87)
61. Georgia State Univ.	46,309	12,008 (59)	53,700 (54)
62. Univ. of Wisconsin	46,306	13,376 (38)	53,100 (59)
63. Louisiana State	46,250	6,451 (103)	49,000 (82)
64. Michigan State	46,072	12,571 (52)	53,500 (56)
65. Univ. of Nebraska	46,008	7,941 (100)	46,200 (89)
66. Wayne State Univ.	45,978	12,785 (47)	53,400 (57)
67. Georgetown Univ.	45,441	15,434 (13)	66,500 (9)
68. University of Utah	45,136	13,366 (39)	47,900 (85)
69. Univ. of Washington	44,788	11,096 (72)	52,800 (63)
70. Kansas State Univ.	44,611	9,457 (84)	44,400 (98)
71. Univ. of Kentucky	44,357	9,372 (86)	48,000 (83)
72. Florida State Univ.	44,218	11,814 (61)	49,600 (78)
73. University of Miami	44,011	14,702 (21)	52,200 (66)
74. Univ. of Denver	44,007	10,533 (77)	49,100 (81)
75. Univ. of Nevada	43,475	8,447 (95)	49,200 (80)
76. Univ. of Vermont	43,224	13,397 (36)	52,700 (64)
77. Univ. of Maryland	42,765	14,369 (24)	60,500 (31)
78. Washington State	42,601	10,642 (76)	45,600 (93)
79. Univ. of Idaho	42,252	8,747 (90)	42,000 (101)

80. Univ. of New Mexico	42,202	8,288 (98)	45,400 (95)
81. U. of West Virginia	41,468	7,564 (101)	43,000 (100)
82. Univ. of Oregon	40,884	11,200 (69)	45,200 (96)
83. New Mexico State	40,363	8,516 (94)	43,500 (99)
84. Mississippi State	40,006	8,732 (91)	40,900 (103)
85. Columbia University	39,897	16,991 (2)	68,300 (7)
86. Univ. of Alaska	39,660	26,989 (1)	57,300 (42)
87. U. of South Dakota	39,543	6,066 (105)	40,200 (104)
88. Temple University	38,939	11,785 (62)	52,900 (60)
89. New York Univ.	38,733	16,849 (3)	66,500 (9)
90. Utah State Univ.	38,625	12,406 (54)	41,500 (102)
91. U. of North Dakota	38,298	8,754 (89)	38,400 (105)
92. U. of New Hampshire	36,346	10,783 (73)	48,000 (83)
93. Univ. Montana	33,135	6,659 (102)	34,000 (106)
94. U. of Rhode Island	30,097	13,433 (34)	51,700 (68)
95. Northeastern U.	29,302	13,767 (29)	51,100 (71)
Yale University*		14,920 (20)	72,500 (3)
SUNY-Stony Brook*		15,949 (9)	65,500 (16)
Cornell University*		15,500 (11)	62,800 (23)
Purdue University*		13,382 (37)	57,800 (37)
U. of Virginia*		13,941 (28)	65,900 (13)
U. of Pittsburgh*		13,071 (42)	57,300 (42)
U. of Delaware*		15,301 (15)	56,000 (47)
U. of Hawaii*		6,319 (104)	52,400 (65)
Clemson Univ.*		8,555 (93)	50,400 (75)
Univ. of Wyoming*		7,942 (99)	46,100 (91)
Oregon State*		11,152 (70)	44,900 (99)
Mean	\$47,998	\$12,205	\$55,273
Std. Dev.	6,660	3,082	8,556
Pearson Corr. Coeff.			
with Real Disposable	1.00	0.60	0.20
with Benefits	0.20	1.00	0.64
with Nominal Income	0.60	0.64	1.00

*CPI information unavailable.

based on actuarial assumptions for a group which includes others besides faculty members. Second, the cost of some benefits is dependent on group size. Therefore, the same benefit provided at two universities may cost different amounts although it would be of equal value to the employees.

Many of the universities which rank very high by nominal salary are located in areas with a high cost of living and high taxes. These include many of the

Ivy League schools - Princeton, Pennsylvania, Harvard, and Columbia - as well as several other private schools including Georgetown and Stanford. After adjustment for taxes and cost of living each of these schools drops in rank. Harvard suffers a precipitous drop, falling from the top ranking by nominal salary to the 51st by real disposable income. The greatest drop in the study, however, was by New York University, which ranked ninth by nominal income but 89th by real disposable income.

Private, non-Ivy League universities located in low to moderate cost of living areas rank highly in general by the real disposable income measure. Six of the top seven schools ranked by real disposable income are private, non-Ivy League universities: University of Notre Dame, Duke University, Vanderbilt University, Stanford University, Rice University, and Johns Hopkins University.

On a regional basis universities in the Northeast pay the highest nominal salaries, averaging \$62,154, followed by the Midwest, South, and West. The Northeast falls to third out of the four regions when adjustments are made for the cost of living and taxes. The South after adjustments ranks a strong second to the Midwest. The ability of universities in the South to offer relatively high salaries in real terms suggests these universities may be better able to compete effectively for top scholars than is indicated by their nominal salaries. Table 4 reports a comparison of the four regions in terms of real disposable income and nominal income. A listing of the states in each region follows the table.

Table 4
A Comparison of Salary Compensation By Geographic Region

Region	Real Disposable Income	Nominal Income
Midwest	\$49,850	\$54,955
South	\$49,240	\$53,366
Northeast	\$46,193	\$62,154
West	\$45,988	\$51,604

Northeast: Maine, New Hampshire, Vermont, Massachusettes, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania.

South: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas.

Midwest: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, Kansas.

West: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, Hawaii.

Conclusion

In this study two aspects of faculty compensation practices at American research universities are studied. These are the determinants of the level of

employee benefit compensation and the effect of variations in the cost of living and taxes on salary remuneration.

The analysis of the determinants of employee benefit compensation indicates that universities achieve savings in the cost of benefits as faculty size increases. This is consistent with earlier research which has shown that there are economies of scale to the group purchase of some types of benefits. The level of benefits is found to be positively related to the salary compensation provided by the university. The marginal state income tax rate and the union status of the faculty were found to have no significant impact upon the determination of the level of employee benefits of the university.

The analysis of salary compensation indicates that adjustments for variations in taxes and the cost of living have significant impact on the comparative value of salaries paid by different institutions. Salaries paid by Midwestern, Southern, and nonurban universities compare favorably with salaries paid by Northeastern urban universities after adjustments are made for variations in the cost of living and tax burden at different university locations.

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