DOCUMENT RESUME

ED 410 883		HE 030 480

AUTHOR	Toutkoushian, Robert K.
TITLE	Using Regression Analysis To Determine If Faculty Salaries Are Overly Compressed. AIR 1997 Annual Forum Paper.
PUB DATE	1997-05-00
NOTE	26p.; Paper presented at the Annual Forum of the Association for Institutional Research (37th, Orlando, FL, May 18-21, 1997).
PUB TYPE	Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*College Faculty; Compensation (Remuneration); Equal Opportunities (Jobs); Higher Education; Nontenured Faculty; Personnel Policy; Regression (Statistics); *Research Methodology; *Salary Wage Differentials; School Statistics; Sex Discrimination; Statistical Analysis; *Teacher Salaries; *Teaching Experience; Tenured Faculty
IDENTIFIERS	*AIR Forum; Junior Faculty; *Salary Compression; University of Minnesota

ABSTRACT

This paper proposes a five-step process by which to analyze whether the salary ratio between junior and senior college faculty exhibits salary compression, a term used to describe an unusually small differential between faculty with different levels of experience. The procedure utilizes commonly used statistical techniques (multiple regression analysis and hypothesis tests of a population mean), and is flexible with regard to model specification. In this methodology, "junior faculty" were defined as all assistant professors with less than four years of seniority, while "senior faculty" were those with more than four years of seniority who began their career at the institution (thus excluding faculty hired directly at either the Associate or Full Professor ranks). Application of the methodology to faculty data in academic year 1990-91 from the University of Minnesota found that the average salaries paid to junior faculty were not above what would be predicted if all faculty were compensated similarly for their qualifications. (Contains 22 references.) (BF)

USING REGRESSION ANALYSIS TO DETERMINE IF FACULTY SALARIES ARE OVERLY COMPRESSED

By Robert K. Toutkoushian

Executive Director
Office of Policy Analysis
University System of New Hampshire
Myers Financial Center
27 Concord Road
Durham, NH 03824

phone: (603) 862-0966
e-mail: r_toutkoush@usnh.unh.edu

For presentation at the annual meetings of the
Association of Institutional Research
Orlando, FL
May 1997

for Management Research, Policy Analysis, and Planning

This paper was presented at the Thirty-Seventh Annual Forum of the Association for Institutional Research held in Orlando, Florida, May 18-21, 1997. This paper was reviewed by the AIR Forum Publications Committee and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC Collection of Forum Papers.

Jean Endo
Editor
AIR Forum Publications

25

ABSTRACT

Whether the salary differential between junior and senior faculty is overly small or is falling ("salary compression") is curently a popular topic in higher education. However, simple comparisons of average salaries for junior and senior faculty alone cannot address the question of whether salaries are overly compressed, since there is no standard for comparison. This paper presents a simple five-step regression analysis procedure that researchers can use to determine whether salaries are overly compressed. Faculty salary data in academic year 1990-91 from the University of Minnesota shows that contrary to popular opinion, the average salaries paid to junior faculty are not above what they would be predicted to receive if they were paid as senior faculty.

USING REGRESSION ANALYSIS TO DETERMINE IF FACULTY SALARIES ARE OVERLY COMPRESSED

"So when evening had come, the owner of the vineyard said to his steward, 'Call the laborers and give them their wages'...And when those came who were hired about the eleventh hour, they each received a denarius. But when the first came, they supposed that they would receive more; and they likewise received each a denarius. And when they had received it, they complained against the landowner, saying 'These last men have worked only one hour, and you made them equal to us who have borne the burden and the heat of the day."

- The Bible (Book of Matthew, Chapter 20, verses 8-12)

INTRODUCTION

As evidenced by articles in The Chronicle of Higher Education (see Heller, 1987; Blum, 1989; The American Assembly of Collegiate Schools, 1990; Mooney, 1991), salary compression is an important concern among many faculty and administrators in higher education institutions. The term "salary compression" refers to an unusually small salary differential between faculty with different levels of experience. The most cited explanation is that salary compression occurs when the demand for faculty members changes in external labor markets, and institutions adjust their offers to new ("junior") faculty in order to attract applicants while failing to adjust salaries for their faculty already on staff ("senior" faculty). As a result, the argument concludes, the salary differential between junior and senior faculty is smaller than it should be. Salary compression in this sense is a form of discrimination, arising from institutions compensating junior and senior faculty differently for the same characteristics.

Analysts usually investigate claims of salary compression by calculating the ratio of average salaries for junior and senior faculty, either in one particular year across departments (cross-sectional) or for two or more points in time (time-series). With cross-sectional data, when the ratio in one department is deemed "large" relative to others, there is the impression that salaries are overly compressed. Likewise, analysts using time-series data who observe a rising junior-to-senior faculty salary ratio use this information as evidence that salaries are compressing. Of course, the two approaches are related; if salaries are compressing over time, eventually this will lead to salaries appearing to be overly compressed in cross-sectional data.

These measures fail to consider that salary differentials between junior and senior faculty may be explained by factors other than discrimination, such as the relative qualifications of junior and senior faculty. Gender equity studies of faculty compensation is an area of research where the limitations of such comparisons are obvious. While many gender equity studies are initiated due to a large salary differential between females and males, researchers acknowledged that salaries are influenced by human capital factors such as experience and educational attainment. Measures of sex discrimination were developed based on the difference between actual and predicted earnings (residuals) obtained after controlling for differences in these factors between males and females (Oaxaca, 1973; Blinder, 1973; Neumark, 1988). Likewise, a similar argument holds when examining salary differences between junior and senior faculty.

To identify whether salaries are overly compressed in cross-sectional data, a measure is needed of what the salary ratio between junior and senior faculty would be in the institution if all faculty were treated equally. Salary compression would then be present if the actual salary ratio exceeds this expected value. This paper provides a five-step process for performing such an analysis at most any institution. The process is applied to faculty at the University of Minnesota in academic year 1990-91. The results show that for this institution, junior faculty are not paid more, on average, than they would receive if compensated in the same manner as senior faculty. Therefore, in this case there is no evidence that salaries are overly compressed.

LITERATURE REVIEW

Most of the early literature on salary compression focused on salary differentials for workers based on factors other than their experience level. Wolfe and Candland (1979) examined the impact of the minimum wage on salary compression between workers of different job categories. Dooley (1986) and Knight and Sabot (1987) investigated whether the salary ratios between workers with different educational levels have changed, and if these changes could be explained by changes in the supply of labor. The consensus among analysts who examine salary compression by experience appears to be that salary compression is a problem since it represents discrimination of senior workers, and will lead to reduced morale among those workers with more seniority (Snyder, McLaughlin, and Montgomery, 1992). In contrast, Lazear (1986) argues that salary compression may benefit organizations when workers compete with one another for higher wages. In such situations, he asserts that salary compression leads to less uncooperative behavior between individuals within the organization.

Surprisingly, most empirical investigations of salary compression in academe rely solely on comparisons of mean salaries for junior and senior faculty, and do not take into account how faculty characteristics could influence these statistics. This ratio can be written as:

(1) $\text{Salary Ratio} = 1 + (y_J - y_S)$

where y_J, y_S = average salaries (in logarithms) for junior and senior faculty, respectively. Logarithms are used here for consistency with the semilogarithmic earnings equation presented in the next section; however, all of the calculations in this paper could be performed using actual salaries.[1] Figure 1 uses data collected by the U.S. Department of Education (1996) to show the ratios of average salaries for (i) assistant to associate professors, and (ii) assistant to full professors for all postsecondary institutions for selected years from 1970-71 through 1994-95:

****** ***INSERT FIGURE 1 HERE*** ******

Note from Figure 1 that overall there has been very little change in the average salary ratios for faculty by rank during the past twenty years. Dworkin (1990) calculated ratios of mean salaries for full to assistant professors, associate to assistant professors, and full to associate professors for a sample of sociology departments, and tracked these ratios over time. Snyder et al. (1992) compared average salaries for new faculty hires to the average salaries of either existing assistant professors or associate professors (also see Heller (1987) and Blum (1989)).[2]

A starting point for critiquing the literature on salary compression is to pose the question: if salaries are overly compressed due to discrimination, then how compressed *should they be* if all faculty were treated equally? It should not be surprising to find that on average senior faculty earn more than junior faculty, due in part to across-the-board salary increases for cost of living adjustments (Henderson, 1979; Snyder et al., 1992; McCulley and Downey, 1993), and thus salary ratios would usually be less than one. However, is the "proper" salary ratio 0.90, 0.80, or some other value, and what criteria should be used for choosing a proper value? The answer to this question is central to determining whether an observed salary ratio is indicative of differential treatment of faculty by the institution.

Implicit in most discussions of salary compression is that salary compression is caused by institutions giving unequal salary adjustments to junior and senior faculty for changes in salaries in the external labor market. This is consistent with the model of monopsonistic discrimination offered by Ransom (1993) to describe why salaries of more senior professors are often lower than the salaries of their colleagues who have equal labor market experience but less seniority at the particular institution. While ratios of mean salaries can identify how close the mean salaries of faculty are by experience level, the statistic obtained from Equation (1) contains no information about whether the salary ratio is the result of unequal treatment of junior and senior faculty by the institution in the setting of wages, or is attributable to differences in their characteristics and qualifications. Thus, it is impossible to determine solely from Equation (1) if the observed salary ratio represents unfair treatment of senior faculty by the institution.[3]

It is well known in the education and labor economics literature that faculty salaries are in part determined by human capital characteristics/qualifications that are valued by the institution, such as previous academic experience, educational attainment, and productivity (see Holtmann and Bayer, 1970; Ferber, 1974; Hammermesh et al., 1982; Diamond, 1986). Accordingly, the mere existence of relatively high salaries for junior faculty would not necessarily constitute unfair treatment of senior faculty by the institution. This point is acknowledged by Snyder, et al. (1992, p.113): "It should be noted that salary compression is not by definition a problem. There are a number of situations that may result in compressed salaries that are very appropriate." Failure to determine how these differences impact the ratio of mean salaries could lead to incorrect inferences about whether salary compression exists in an institution.

FIVE STEPS FOR MEASURING SALARY COMPRESSION

This paper presents a five-step procedure for measuring salary compression. The <u>first step</u> is to specify a salary model of the form:

(2) $$y_i = x_i\beta + u_i$$

where y_i = logarithm of annual salary for the i-th faculty member, $\boldsymbol{x}_i$ = set of independent variables that institutions are justified in using to differentiate salaries, such as experience levels, educational attainment, and faculty productivity, β = parameters to be estimated showing how each variable influences annual salary, and u_i = error term. Specifying a salary model involves choosing the independent variables to include in the model and how they will be measured.

The <u>second step</u> is to distinguish junior from senior faculty members. While Snyder et al. (1992) restrict junior faculty to only newly-hired faculty, this results in a very small set of junior faculty, thereby limiting the statistical tests that could be performed on the data. An argument in favor of expanding the definition of junior faculty beyond new hires in one year is that if the institution is paying higher salaries to new faculty hires, then it has likely been doing so for several years, and thus new hires from several consecutive years would also exhibit higher than expected salaries. At the other extreme, Dworkin (1990) defines junior faculty as all assistant professors. This study uses a hybrid approach where a junior faculty member is defined as an assistant professor with three or less years of seniority at the institution.

Once the criteria for selecting junior faculty has been chosen, all remaining faculty with more than this threshold of seniority would potentially fall into the senior category. However, the relationship between salary and seniority for faculty hired directly at either the associate or full professor levels is likely to be quite different than that for those faculty who began their career at the institution. In order to construct a more useful experience-earnings profile for faculty, only faculty members who began their career at the institution in question are included in the senior category for this analysis.

The <u>third step</u> in determining if junior faculty are compensated in the same manner as senior faculty is to estimate the salary model in Equation (2) for only the set of senior faculty:

(3) $$\hat{y}_{S,i} = \boldsymbol{x}_{S,i}\,\boldsymbol{b}_S$$

where $\hat{y}_{S,i}$ = predicted salary for the i-th senior faculty member from the model, $\boldsymbol{x}_{S,i}$ = values of the independent variables in the model for the i-th senior faculty member, and $\boldsymbol{b}_S$ = estimated coefficients for the variables in $\boldsymbol{x}$. These coefficients show how senior faculty, on average, are compensated for their qualifications in $\boldsymbol{x}$, and is thus referred to as the *senior faculty model.* Note that junior faculty are not included in the observations.

The fourth step in the analysis is to substitute each junior faculty (subscript J) member's characteristics into the senior faculty model and obtain their predicted salaries, denoted $\hat{y}_{J/S,i}$. These values show what each junior faculty member would be predicted to earn if they were compensated for their qualifications in the same way as senior faculty. The difference between each junior faculty member's actual salary ($y_{J,i}$) and predicted salary if paid in the same manner as senior faculty ($\hat{y}_{J/S,i}$) is his or her residual, denoted $e_{J/S,i}$:

(4) $$e_{J/S,i} = y_{J,i} - \hat{y}_{J/S,i}$$

This residual represents the estimated amount by which each junior faculty member is being overpaid (in logarithms), relative to what he or she would receive if paid according to the same formula as senior faculty. When $e_{J/S,i}$ is positive, junior faculty receive more than they would be predicted to earn if paid according to the baseline model. Likewise, the opposite case can also occur ($e_{J/S,i} < 0$), which would suggest that junior faculty receive less than what they would be predicted to earn if compensated according to the same formula as senior faculty. This is shown graphically in Figure 2 where the senior faculty model is used to construct a predicted salary profile for junior faculty. Junior faculty with $e_{J/S,i} > 0$ would have actual salaries that fall above this curve, while junior faculty with $e_{J/S,i} < 0$ have actual salaries that fall below this curve.

****** *INSERT FIGURE 2 HERE* ******

The fifth step is to calculate the mean prediction residual for all junior faculty using the coefficients from the senior faculty model ($e_{J/S}$) and determine the significance of this statistic:

$$(5) \qquad e_{J/S} = \left(\frac{1}{N_J}\right) \sum_{i=1}^{N_J} e_{J/S,i}$$

where N_J = number of junior faculty. Under the null hypothesis of no salary compression, the average residual should be zero ($E(e_{J/S}) = 0$). When $e_{J/S}$ is significantly greater than zero, the average salaries paid to junior faculty are greater than what would be predicted through the senior faculty model, and thus would be evidence that salaries are overly compressed. Likewise, $e_{j/s}$ could be significantly less than zero, indicating that the salaries paid to junior faculty are lower than would be predicted through the senior faculty model. To determine whether $e_{J/S}$ is statistically different from zero, note that when N_J is large, the statistic $e_{J/S}$ will approach a normal distribution. A t-test can be used to test the null hypothesis of no salary compression:

$$(6) \qquad t_c = \frac{e_{J/S} - 0}{\hat{\sigma}_e / \sqrt{N_J}}$$

where σ_e = standard deviation of the prediction errors, and t_c will follow a Student t-distribution with (N_J-1) degrees of freedom.

To determine if there is evidence of salary compression within smaller units of the institution, this test statistic can be calculated separately for specific colleges and/or academic departments of interest. When the sample sizes become small, the results from the test statistic in Equation (6) are only applicable when the prediction errors ($e_{J/S,i}$) are normally distributed. A nonparametric test that does not depend on this assumption, and is thus appealing in small samples (generally $6 \leq N_J < 30$), is the Wilcoxon Matched-Pairs Signed Ranks test.

The mean predicted salaries for junior and senior faculty from the senior faculty model can also be used to determine what the average salary ratio should be between the two groups if all faculty were compensated for their qualifications in a similar manner. Substituting the mean predicted salaries for each group (denoted $\hat{y}_S$ and $\hat{y}_{J/S}$) into Equation (1) yields the predicted salary ratio:

$$(7) \qquad \text{Predicted Salary Ratio} = 1 + (\hat{y}_{J/S} - \hat{y}_S)$$

Equation (7) shows the predicted ratio of average salaries if junior faculty were compensated in the same manner as senior faculty. The difference between the observed salary ratio and the predicted salary ratio represents the unexplained salary ratio. Simplifying the expression for this difference yields:

$$(8) \qquad \text{Unexplained Salary Ratio} = (y_J - \hat{y}_{J/S})$$

which is equivalent to $e_{J/S}$ in Equation (5).

AN APPLICATION

The five-step procedure is applied to the set of regular faculty at the University of Minnesota, excluding Health Sciences, in academic year 1990-91. Junior faculty are defined as all Assistant Professors with less than 3 years of experience. The dataset excludes all faculty who were hired directly at either the Associate or Full Professor ranks, leaving 1,015 senior faculty members and 159 junior faculty members. The salary model for faculty includes the following independent variables: educational attainment (DOCTDEG, MASTERS), academic experience (EXPER), previous experience (PREVEXP), whether administrative experience (ADMIN), whether tenured (TENURE), average market salary by rank (LMKT90), and collegiate unit (C1 through C29). Table 1 contains the estimated coefficients for each of these variables when the salary model is applied to the set of senior faculty members:

****** ***INSERT TABLE 1 HERE*** ******

Table 2 reports the mean salaries for junior and senior faculty for the whole institution and for selected colleges within the university, along with their actual and predicted salary ratios:

****** ***INSERT TABLE 2 HERE*** ******

The third column in Table 2 shows that the ratio of mean salaries for junior to senior faculty for the entire institution is 0.7775, meaning that on average a junior faculty member earns about 78 percent of what a senior faculty member earns at the institution. This ratio varies considerably across colleges, from a low of 0.61 (college C) to a high of 0.96 (college E). Note from the fourth column that the predicted salary ratios also vary across colleges. While the actual salary ratios in Colleges A, B, and E are higher than their predicted ratios, the opposite is true for Colleges C and D as well as the institution as a whole (0.80). The overall salary ratio of 0.8025 suggests that if all faculty members were both compensated in the same manner for their qualifications in the salary model, then junior faculty on average would earn slightly more than 80% of what senior faculty earn.

The mean residuals in the last column are the actual minus the predicted salary ratios. Note that only in College E is the actual salary ratio found to be significantly higher than the predicted salary ratio, suggesting the presence of salary compression. There is no statistical difference between the actual and predicted salary ratios for the institution, so that on the whole, there does not appear to be widespread salary compression at the institution since junior faculty salaries are not out of line with what they would be predicted to receive if compensated in the same manner as senior faculty. In fact, the results suggest that in Colleges C and D the salary ratios between junior and senior faculty are significantly *smaller* than they should be if all faculty were treated equally. These examples illustrate the importance of comparing actual to predicted salary ratios before concluding that a "high" salary ratio is indicative of salary compression.

Alternative Salary Model Specifications

It is important to recognize that since $e_{J/S}$ is derived from residuals from the salary model, changes in the variables included in the salary model could influence the conclusions drawn about salary compression. To determine how sensitive the earlier results are to the set of independent variables used in the salary model, $e_{J/S}$ was recalculated for the institution as a whole using several variants of the baseline model. In the first model (denoted Alternative I), the variable TENURE was replaced with two separate dummy variables for faculty rank (FULL = 1 if full professor, 0 otherwise, and ASSO = 1 if associate professor, 0 otherwise). The second alternative model specification (Alternative II) uses a set of ninety-two departmental dummy variables in place of the college affiliation dummy variables. Finally, the third model (Alternative III) includes both changes. The results are summarized in Table 3:

****** *INSERT TABLE 3 HERE* ******

In each of the alternative salary models considered in Table 3, the mean residuals for junior faculty are negative. In Alternatives I and III, the value of $e_{J/S}$ is not only negative, but also statistically significant at the 5% level. At a minimum, the previous results appear to be fairly robust in that there is no evidence that salaries are overly compressed at the institution. If it is accepted that the baseline model should allow the salaries of faculty to deviate according to rank rather than tenure, then there is evidence of salary expansion for the institution as a whole.

SUMMARY

To assess whether any gap in the average salaries of junior and senior faculty is the result of discrimination, a procedure for determining how large the average salaries of junior faculty should be relative to the average for senior faculty is needed. Without this standard, simple comparisons of mean salaries cannot accurately reveal whether salary compression exists. This paper presents a simple methodology by which institutions may examine salary compression in a more refined framework. The procedure utilizes commonly used statistical techniques (multiple regression analysis and hypothesis tests of a population mean), and is flexible with regard to model specification. It is hoped that this technique will become useful to administrators and researchers in testing assertions about salary compression within institutions.

TABLE 1: Regression Coefficients and Descriptive Statistics for Explanatory Variables Used in the Baseline Salary Model - University of Minnesota 1990-91

dependent variable = logarithm of annual base salary in 1990-91

Variable	**Estimated Coefficient**	**Mean**	**Standard Deviation**
TENURE	+0.146539** (0.0200)	0.856	0.351
ADMIN	+0.162255** (0.0162)	0.221	0.415
PREVEXP	-0.000030 (0.0013)	5.133	5.146
EXPER	+0.005454** (0.0007)	18.281	9.798
DOCTDEG	+0.079956** (0.0225)	0.871	0.335
MASTERS	+0.037982 (0.0571)	0.015	0.121
LMKT90	+0.869378** (0.0758)	10.559	0.157
INTERCEPT	+1.315393* (0.8118)		
# Observations	1,015		
R-Squared	0.4535		

NOTES: Standard errors are shown in parentheses. ADMIN=1 if any current or previous administrative experience at the University of Minnesota, 0 otherwise. EXPER = years of experience at the University of Minnesota. PREVEXP = years of academic experience prior to being hired by the University of Minnesota. LMKT90 =logarithm of median salary for Assistant Professors by field in academic year 1990-91 for thirty institutions surveyed by the AAUDE. TENURE = 1 if tenured, 0 otherwise. DOCTDEG = 1 if highest degree is doctorate degree. MASTERS = 1 if highest degree is Master's or Bachelor's level. C1 - C29 = 29 dummy variables for college affiliation (C10 is the omitted college variable). ** $p < 0.01$, * $p < 0.10$ (two-tailed test). Results for the twenty-nine college dummy variables are not shown here.

TABLE 2: Comparison of Average and Predicted Salary Ratios by College - University of Minnesota, 1990-91.

College	Average Log of Salary for: Senior Faculty	Junior Faculty	Average Salary Ratio	Predicted Salary Ratio	Mean Residual ($e_{J/S}$)
A	10.9248 (n=163)	10.7612 (n=21)	0.8364	0.8169	+0.0195 (.0410)
B	10.7337 (n=332)	10.5139 (n=41)	0.7802	0.7266	+.0536 (.0336)
C	10.8233 (n=111)	10.4366 (n=12)	0.6133	0.7332	-0.1199** (0.0347)
D	10.9671 (n=228)	10.6431 (n=66)	0.6760	0.7808	-0.1048** (0.0264)
E	11.0457 (n=44)	11.0073 (n=6)	0.9616	0.7791	+0.1825* (0.0219)
OVERALL	10.8476 (n=1015)	10.6251 (n=159)	0.7775	0.8025	-0.0250 (0.0180)

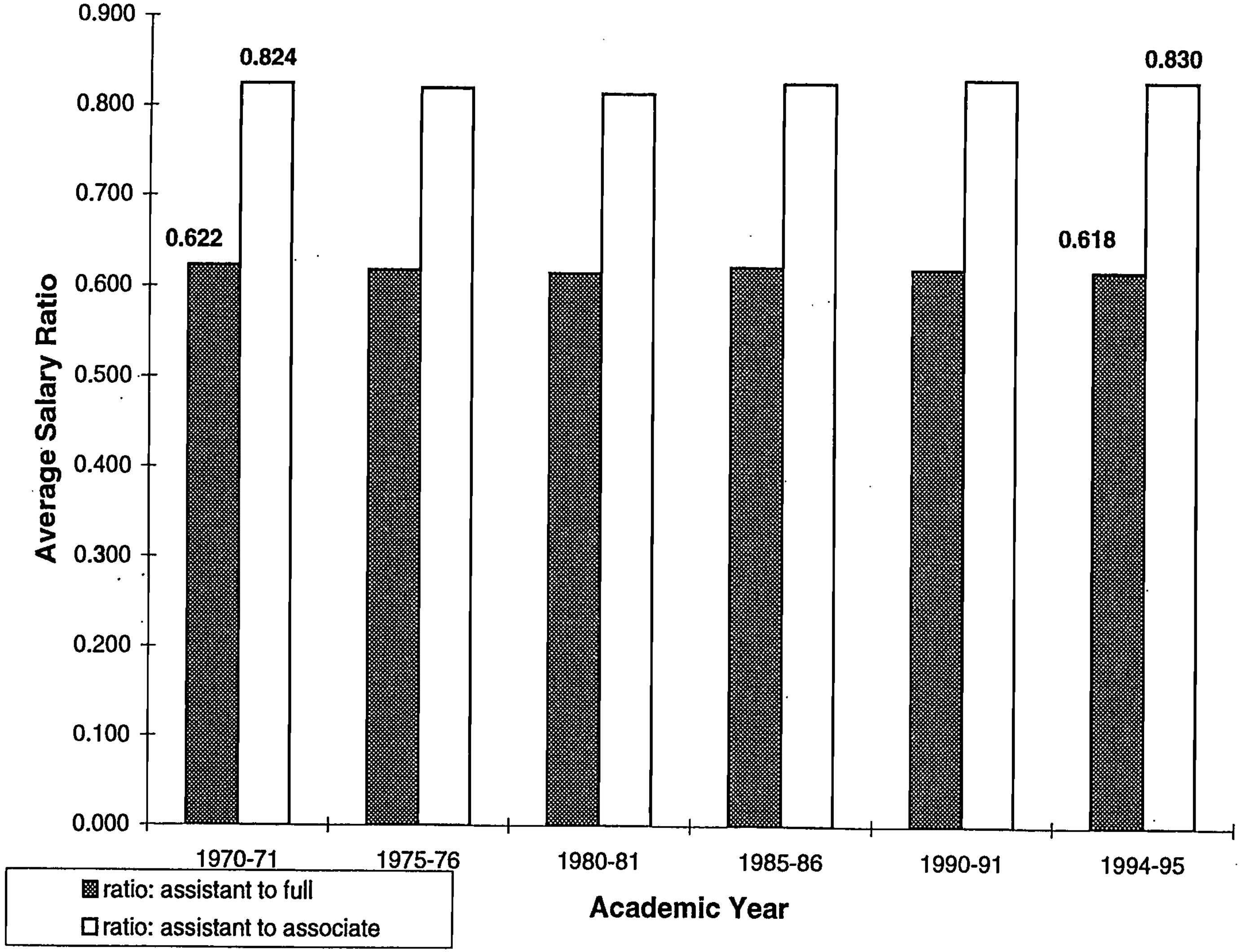
NOTES: The regression model controls for the following variables: Each regression model controls for the following variables: ADMIN=1 if any current or previous administrative experience at the University of Minnesota, 0 otherwise. EXPER = years of experience at the University of Minnesota. PREVEXP = years of academic experience prior to being hired by the University of Minnesota. LMKT90 =logarithm of median salary for Assistant Professors by field in academic year 1990-91 for thirty institutions surveyed by the AAUDE. TENURE = 1 if tenured, 0 otherwise. DOCTDEG = 1 if highest degree is doctorate degree. MASTERS = 1 if highest degree is Master's or Bachelor's level. C1 - C29 = 29 dummy variables for college affiliation (C10 is the omitted college variable). Colleges with less than six junior faculty are not shown separately above. The numbers in parentheses in columns 1 and 2 denote the number of observations within each group. The reported standard errors are the estimated standard deviations of the residuals (σ_e) for junior faculty in each college divided by the square root of the number of junior faculty in the college. Significance tests for colleges where $6 \leq N_J < 30$ were conducted using the Wilcoxon Matched-Pairs Signed Ranks test.

TABLE 3: Measures of Overall Salary Compression for Several Alternative Baseline Model Specifications

Salary Model	Mean Residual ($e_{J/S}$)	Standard Error of Residual	Calculated t-statistic
Alternative I:[1] Ranks substituted for TENURE	-0.0430	0.0194	-2.215*
Alternative II:[2] Departments substituted for Colleges	-0.0258	0.0186	-1.389
Alternative III:[1,2] Ranks substituted for TENURE, and Departments substituted for Colleges	-0.0405	0.0200	-2.023*
Original Model:	-0.0250	0.0180	-1.389

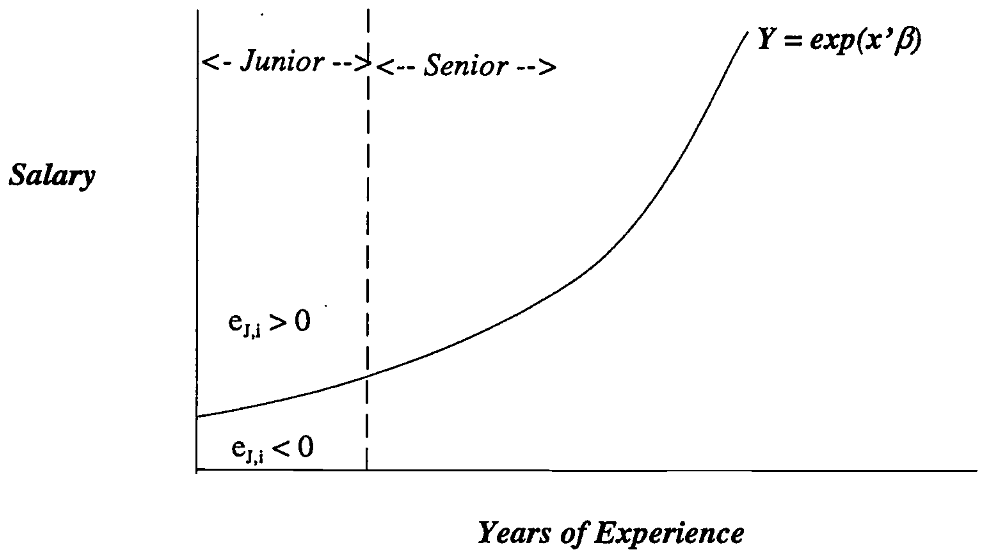
NOTES: Each regression model controls for the following variables: ADMIN=1 if any current or previous administrative experience at the University of Minnesota, 0 otherwise. EXPER = years of experience at the University of Minnesota. PREVEXP = years of academic experience prior to being hired by the University of Minnesota. LMKT90 =logarithm of median salary for Assistant Professors by field in academic year 1990-91 for thirty institutions surveyed by the AAUDE. TENURE = 1 if tenured, 0 otherwise. DOCTDEG = 1 if highest degree is doctorate degree. MASTERS = 1 if highest degree is Master's or Bachelor's level. C1 - C29 = 29 dummy variables for college affiliation (C10 is the omitted college variable). [1]Replaces 29 college dummy variables with 92 departmental dummy variables (D1 - D92). [2]Replaces TENURE variables with two variables for academic rank (FULL, ASSO). * $p < 0.05$ (two-tailed test).

FIGURE 1: Average Salary Ratios for Full-Time Instructional Faculty in Higher Education, 1970-71 to 1994-95



Source: U.S. Department of Education, Digest of Education Statistics, November 1996.

FIGURE 2: Graphical Relationship Between Experience and Salaries for Senior Faculty



REFERENCES

American Assembly of Collegiate Schools (1990). Business Schools Are the Latest to Experience 'Compression'. Chronicle of Higher Education, 36(29): pp.15.

Blinder, A. (1973). Wage Discrimination Reduced Form and Structural Estimates. The Journal of Human Resources, 8: pp.436-455.

Blum, D. (1989). Colleges Worry That Newly Hired Professors Earn Higher Salaries Than Faculty Veterans. Chronicle of Higher Education, 36(7): pp.A1, 21.

Diamond, A. (1986). What is a Citation Worth? The Journal of Human Resources, 21: pp.200-215.

Dooley, M. (1986). The Overeducated Canadian? Changes in the Relationship Among Earnings, Education, and Age for Canadian Men: 1971-81. Canadian Journal of Economics, 19(1): pp. 142-159.

Dworkin, A. (1990). The Salary Structure of Sociology Departments. The American Sociologist, 21(1): pp. 48-59.

Ferber, M. (1974). Professors, Performance, and Rewards. Industrial Relations, 13: pp.69-77.

Hammermesh, D., Johnson, G., and Weisbrod, B. (1982). Scholarship, Citations and Salaries: Economic Rewards in Economics. Southern Economic Journal, 49: pp.472-481.

Heller, S. (1987). Faculty Pay Up 5.9 Pct. to $35,470; Best Raise in 15 Years, AAUP Says. The Chronicle of Higher Education, 33(30): pp.1,16.

Henderson, R. (1979). Compensation Management: Rewarding Performance. Reston, VA: Reston Publishing Co.

Holtmann, A., and Bayer, A. (1970). Determinants of Professional Income Among Recipients of Natural Science Doctorates. The Journal of Business, 43: pp.410-418.

Knight, J., and Sabot, R. (1987). Educational Expansion, Government Policy, and Wage Compression. Journal of Development Economics 26(2): pp.201-221.

Lazear, E. (1989). Pay Equality and Industrial Politics. Journal of Political Economy, 97(3): pp.561-580.

McCulley, W., and Downey, R. (1993). Salary Compression in Faculty Salaries: Identification of a Suppression Effect. Educational and Psychological Measurement 53(1): pp. 79-86.

Mincer, J. (1974) Schooling, Experience, and Earnings. New York and London: Columbia University Press.

Mooney, C. (1991). Eight Professors at FIU File Age-Bias Grievance to Protest 'Salary Compression' Practice. Chronicle of Higher Education, March 20, pp. A17, A22.

Neumark, D. (1988). Employers' Discriminatory Behavior and the Estimation of Wage Discrimination. The Journal of Human Resources 23(3): pp.279-295.

Oaxaca, R. (1973). Male-Female Wage Differentials in Urban Labor Markets. International Economic Review 14(3): pp. 693-709.

Ransom, M. (1993). Seniority and Monopsony in the Academic Labor Market. American Economic Review 83(1): pp.221-233.

Snyder, J., McLaughlin, G., and Montgomery, J. (1992). Diagnosing and Dealing With Salary Compression. Research in Higher Education 33(1): pp.113-124.

U.S. Department of Education. 1996. National Center for Education Statistics. Digest of Education Statistics 1996, NCES 96-133, by Thomas D. Snyder. Production Manager, Charlene M. Hoffman. Washington, DC.

Wolfe, M., and Candland, C. (1979). Impact of the Minimum Wage on Compression. Personnel Administrator 24(5): pp. 24-28.

ENDNOTES

1. The semilogarithmic earnings equation was first introduced by Jacob Mincer (1974). In this model, a worker's salary is said to be an exponential function of his or her characteristics, i.e., $Y = \exp(x'\beta)$ or in semilogarithmic form, $\ln Y = x'\beta$. This would arise when workers receive salary increases on a percentage rather (e.g., 5% raise per year) rather than a flat dollar basis (e.g., $500 raise per year). The semilogarithmic equation has since become the accepted standard for most empirical studies of earnings, and hence is used here.

2. The only exception is a study by McCulley and Downey (1993), who estimate a simplified earnings equation over a small sample of faculty at a specific institution, and interpret the negative effect of experience on earnings as being evidence of a "suppressor effect" that would be consistent with salary compression. However, the negative effect of seniority on earnings could be attributable to factors associated with the model specification, and would also be consistent with other scenarios such as monopsonistic discrimination (Ransom (1993)).

3. Snyder et al. (1992) implicitly recognize this problem, and calculate comparable salary ratios for other institutions to use for comparison to the observed salary ratios at the particular institution. However, any observed difference in salary ratios between the institution and the market could be attributable to factors such as the relative experience and educational levels of faculty, as compared to the external market.

NOTICE

REPRODUCTION BASIS

☒ This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

☐ This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").