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The Effects of Gender on Salary-At-Hire in The Academic Labor Market

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Abstract
This paper uses data compiled from faculty files at a private, doctoral-granting research university to investigate whether or not there are gender-related differences in salary offers at the time of initial appointment. The investigation uses single- and multiple-equation regression models that control for gender, date of hire, experience and degree attained, rank, characteristics of the position being filled, inflation, and academic department. The study finds an unexplained and statistically significant differential in salary-at-hire between men and women of from 2.9% to 8.4%, and it finds that the unexplained male–female differential in salary-at-hire has increased since 1990.

Keywords
Economics of education, Salary wage differentials

1. Introduction

The topic of gender discrimination in the academic labor market has a long and distinguished history in the economics literature. Most of the attention has been paid to identifying and measuring differences in current salary. Somewhat less attention has been paid to the possibility of gender discrimination in faculty rank. Very little attention has been paid to the question of whether gender discrimination exists in faculty salaries at the time of hiring (salary-at-hire), although, for both theoretical and practical reasons, it is a very important question. The theoretical causes and the legal consequences of discrimination that is rooted in a market are quite different from discrimination that is rooted in an institution. One does not know whether gender discrimination in current salary is market- or institution-driven, whereas discrimination in salary-at-hire is presumably all market-driven.

Embedded in the literature examining discrimination in current salaries is some contradictory evidence concerning initial salaries. Johnson and Stafford (1974) find that, although the initial salary differential is small and statistically insignificant, it increases as the seniority of the faculty member increases. They cite this result as evidence consistent with the hypothesis that interruptions in labor force participation during child-bearing years are responsible for the salary gap. The opposite conclusion is drawn by Hirsch and Leppel (1982) and by Bayer and Astin (1968), who find that there does exist an initial salary differential. Formby, Gunther and Sakano (1993) have written an article that focuses exclusively on entry-level salary. They find no statistically significant effect due to gender, if other human capital and labor market variables are accounted for.

This article, using institution-specific data generated by a gender equity study, examines whether or not there exists a gender-related differential in initial faculty salaries (salary-at-hire) at Marquette University, a private, Catholic, doctoral-granting research university in Milwaukee, Wisconsin.[1] The standard single- and multiple-equation methodologies are used to explain salary at the time of initial hire for full-time faculty employed by the university in the fall 1999 semester. The study finds an unexplained and statistically significant differential in salary-at-hire of from 2.9% to 8.4% (depending on measurement methodology), taking into account the influences of degree attained, date-of-hire, rank-at-hire, experience, type of contract, job characteristics, and academic discipline. It finds that the unexplained male–female differential in salary-at-hire has increased since 1990.

The plan of the article is the following. Section 2 presents a brief review of relevant literature. Section 3 describes the variables used in the investigation and provides summary statistics of the data. Section 4 presents the regression specification and a priori hypotheses. Section 5 provides tables and narrative of the results of the regression estimates, and Section 6 summarizes and concludes the article.

2. Review of literature

The question of whether salary discrimination by gender exists in the academic labor market has received close scrutiny for more than three decades. With only a few exceptions, the literature has converged on a methodology that employs a single-equation model and/or multiple-equation models to measure differentials in faculty salary that can be attributed to gender, holding constant a variety of other determinants of salary. The studies are distinguished from one another in their use of different datasets and different groups of explanatory variables. A preponderance of evidence suggests that there is an unexplained gap between male and female current salaries, even when human capital and productivity measures are taken into account. There is mixed evidence on whether the gap is increasing, decreasing, or remaining constant over time.[2] The evidence on initial salaries is less conclusive, both because initial salary determination has received less attention in the literature, and because the evidence that does exist is mixed. This brief review of the literature includes only studies that provide some evidence, often indirect, on the initial salaries of male and female faculty.

Bayer and Astin (1968) provide an early statistical analysis of male–female salary differentials in the academic labor market. Using data from the 1964 National Register of Scientific and Technical Personnel, they compare differences in mean salaries between male and female faculty who have been employed for 2 years. They segment the data to control for discipline (natural or social sciences), and type of employer institution (College or University). Although their data are insufficient to allow them to control for institution type and discipline simultaneously, they find statistically significant differences for faculty employed by colleges (not controlling for discipline), and they find statistically significant differences for each discipline (not controlling for type of institution).

The single-equation model measures earnings' differentials as the estimated coefficient on a binary variable denoting gender. This methodology is used by Johnson and Stafford (1974) and Formby et al. (1993). The seminal article by Johnson and Stafford uses a national database, the NSF Register for 1970, to estimate a single-equation model explaining the log of current salary with gender and post-degree and pre-degree experience (in quadratic form). They find that a small initial differential (the effect of the first year of post-degree experience), which they attribute to market discrimination, increases with additional post-degree experience to reach a maximum differential of about 20% after 20 years on the job. This finding is reinforced by their estimate of the same equation with institution-specific data from Michigan State University. Johnson and Stafford do not measure salary-at-hire in their studies. Only a cross-section of current salary is measured, along with years of experience. Their finding of a small initial differential is an inference from the estimated, quadratic, effects of experience on current salary.

Formby et al. (1993) explain entry-level salary directly. They use data generated by a survey of economics departments in 1987 to estimate the log of entry-level salaries using explanatory variables that account for the effects of gender, age, field, and Ph.D. school of new hires, and additional variables that control for specific characteristics of the department, the university, and the region of the hiring school. They find that gender has no effect on entry-level salary, and that age has an effect (statistically significant at the 10% level) only insofar as it is interacted with other independent variables.

Brewton and Freiberg (1995) estimate a model that explains salary-at-hire by rank, area of study, quality of graduate program, degree at the time of hire, and gender. Although they claim that the coefficient estimated for gender is insignificant, it is in fact significant at the 5% level using a one-tailed test. Their model suffers from the lack of a variable measuring the date of hire, and it is estimated only in linear form, in contrast with the usual log-linear salary specification.

The multiple-equation model, pioneered by Blinder (1973) and Oaxaca (1973) and modified by Neumark (1988), estimates separate salary equations for male and female faculty and decomposes the male–female gap by comparing the estimated salaries of each group to an assumed non-discriminatory model. This approach is used by Hirsch and Leppel (1982). They use institution-specific data gathered in 1980–1981 from a large, public, historically women's university. They find statistically significant differences in male and female current salaries of from 3.8% to 4.8%, depending on the method used to calculate the differential. Their model accounts for the effects of rank, terminal degree, experience, and administrative positions. Although Hirsch and Leppel do not measure salary-at-hire directly, they find that experience on the job does not have a significant effect on the male–female differential, and therefore conclude that earnings' differences are primarily explained by differences in entry salaries. They infer that, if there is discrimination, it does not come from within the university, where the reward structure is similar for male and female faculty.

The study described in this article distinguishes itself in its use of salary-at-hire as the dependent variable. Note the distinction between salary-at-hire and entry-level salary, the dependent variable in Formby et al. (1993). Salary-at-hire includes not only entry-level hires, but also faculty who came to the university with experience at other institutions, and at different ranks. Salary-at-hire also has a longitudinal aspect to it. The faculty in place in the fall semester of 1999 were hired over a number of years ranging from 1958 to 1999. Therefore, these data can be used to investigate male–female salary-at-hire differentials over time with a database that permits inclusion of professional experience as an independent variable and holds constant institutional characteristics of the employing university. The study uses both the single-equation and multiple-equation models to measure the salary differentials; and it examines faculty from all academic departments in the university.

Although the data are specific to Marquette University, conclusions from this study should apply generally. At the time of initial hiring there is no institutional history between employer and employee, and the employee's mobility is at its greatest. The university recruits faculty nationally, and is situated in both a city and region with other doctoral-granting universities. A finding of discrimination in salary-at-hire can only be due to market conditions, not institution-specific differences in rewards. In contrast, the determination of current salary may have an institution-specific component, especially in an environment of limited labor mobility as in the academic job market.[3]

3. Data

The data used in this study were collected from institutional files of full-time faculty at the university during the fall 1999 semester. The university is classified according to the Carnegie system as a doctoral-granting research university, extensive. The database includes faculty members from 37 different academic departments. Complete data are available for 446 faculty, of whom 136 (30.5%) are women. The variables used in this study describe personal characteristics of the faculty member, academic rank at the time of hire, and special characteristics of the position for which the hire was made.

They are:

Dependent variable:

LOG(SALHIRE)=Logarithm of annual salary at the time of hire in current dollars
Personal characteristics:[4]
FEMALE=Dummy variable (= 1 if female)
EXPHIRE=Years of experience as faculty prior to appointment
HIREDATE=Year in which faculty was hired
TERMHIRE=Dummy variable (=1 if faculty had the terminal degree at the time of hire)
Rank at hire: All dummy variables:
PROF=Full Professor
ASSO=Associate Professor
ASST=Assistant Professor
INST=Instructor
LECT=Lecturer
Characteristics of the position (all dummy variables):
ADJ=Adjunct position
VISIT=Visiting position
CHAIR=hired as department chair
ASSODEAN=hired as Associate Dean
ASSTDEAN=hired as Assistant Dean
TWELVE=12 month contract

In addition to the variables explicitly described above, the consumer price index (CPI) for the year of hire was included to control for the effects of inflation on starting salary.[5] Dummy variables identifying the academic department of the faculty member, and other dummy variables for special duties such as director, supervisor, and clinical duties (dental school and nursing) were also included in all regression models.[6]

The database does not include any variables that account for scholarly publications or teaching performance prior to hiring. It may be reasonably assumed that, to a certain degree, these productivity measures are captured by the combination of rank, experience, and terminal degree at the time of hire. To the extent that productivity is not proxied by these included variables, the estimated regression equations may suffer from omitted variable bias. This possibility can affect conclusions regarding male–female differentials if, for example, women hired at the rank of Associate Professor have systematically different (worse) publication records than men hired at the rank of Associate Professor. This possibility is considered unlikely, given the evidence in Ransom and Megdal (1993), Dwyer (1994) and Sonnert and Holton (1996) that women are less likely to be promoted than men, even when publication records are accounted for. Furthermore, given that 98% of women were hired at the entry-level ranks of Assistant Professor or lower, the possibility may be further discounted.

The database also does not include a variable that accounts for the quality of the graduate program from which the hired faculty member graduated. This omission is due to the fact that what is considered a quality graduate program differs markedly across department, both because the strength of the graduate program differs across disciplines, but also because the standards of a department that has a Ph.D. program are different than the standards of a program that grants only undergraduate degrees. The lack of this variable is mitigated by the fact that the pool of acceptable applicants tends to be stable for any specific department at the university and department affiliation is accounted for. As is the case with the omission of productivity data, this omission can affect conclusions regarding male–female differentials if new female hires are graduates of consistently worse graduate programs compared to new male hires.[7]

Table 1 presents the mean values of SALHIRE, EXPHIRE, and HIREDATE for men and women faculty, and counts for men and women faculty for the rest of the variables described above (all dummy variables). Note that, although the mean salary-at-hire for women is $ 563.34 more than for men, the average hiring date for women is more than 5 years later than for men, and the difference is statistically significant. Significantly higher percentages of men were hired at the Associate Professor and Assistant Professor ranks and had the terminal degree at hire relative to women. Significantly higher percentages of women were hired as instructors, lecturers, and in adjunct positions, relative to men.

Table 1. Comparison of means

Variable	**Male**	**Female**
SALHIRE	27,463.87	28,027.21
EXPHIRE	3.63	3.51
HIREDATE*	1982.6	1987.7
TERMHIRE*	90.0%	70.0%
PROF	2.6%	0%
ASSO*	8.1%	2.2%
ASST*	67.4%	59.6%
INST*	21.3%	33.8%
LECT*	0.6%	4.4%
ADJ*	2.6%	12.5%
VISIT	3.2%	5.1%

TWELVE	16.5%	20.6%
CHAIR	0.3%	0%
ASSODEAN	0.3%	0%
ASSTDEAN	0.3%	0%
No. Observations	310	136

*Difference in means significant at 5% level.

4. Specification

It has become a standard practice in the discrimination literature to use a semi-log model and to report several specifications. Both the linear and semi-log functional forms were estimated. The semi-log form was chosen on the basis of the test described by Ramanathan (1998: p. 277), in which an adjusted sum of squared residuals from the semi-log estimate is calculated and compared to the sum of squared residuals from the linear form. The adjusted sum of squared residuals is calculated using a predicted salary equal to the anti-log of the sum of the predicted log of salary plus one-half of the standard error of the estimate squared.

In this study, the single-equation model, in which FEMALE is included as an independent variable, is presented first. This model is used to address several questions. (1) Do women receive lower salaries at the time of hire than men, other factors constant? (2) Is the effect of rank on salary-at-hire different for women than for men? (3) Are the effects of experience and terminal degree different for women than for men? (4) Have the estimated relationships for recent hires (1990 and later) changed relative to early hires (before 1990)?[8] (5) Are there structural differences in the estimated models for men and women faculty? The first question is examined with a one-tailed *t*-test of the coefficient on FEMALE. The second and third questions are examined with *F*-tests of joint significance of the respective variables interacted with FEMALE. The fourth question is examined with a Chow test, separating the data according to HIREDATE. Finally, Chow tests are used to determine if there exists a structural difference in the estimated models for male and female faculty. A Park test indicated the existence of heteroskedastic residuals related to the proportionality factor HIREDATE. Therefore, the models are estimated using Weighted Least Squares (WLS), using HIREDATE as the weight.[9] Results of the single-equation models are reported in Table 2.

Table 2. Single-equation models[a]

Variable	**(OLS)**	**(WLS)**			
	Model 1	**Model 2**	**Model 3**	**Model 4 (pre-1990)**	**Model 5 (1990–1999)**
CONSTANT	−64.61*(−4.05)	−64.59* (−4.02)	−48.41* (−3.12)	−73.69* (−4.10)	145.98 (0.84)
FEMALE	−0.060* (−2.30)	−0.060* (−2.30)	−6.30 (−1.20)	−0.047 (−1.25)	−0.077* (−2.85)
EXPHIRE	0.005* (1.78)	0.005* (1.77)	0.008* (2.54)	0.009* (1.79)	0.001 (0.52)
HIREDATE	0.037* (4.55)	0.037* (4.52)	0.028* (3.58)	0.042* (4.53)	−0.070 (−0.79)
TERMHIRE	0.086* (2.42)	0.086* (2.26)	0.050 (1.10)	0.108* (1.87)	0.151* (3.42)
PROF	1.239* (11.04)	1.239* (11.06)	2.032* (12.50)	1.36* (7.03)	1.117* (9.09)
ASSO	1.023* (11.37)	1.023* (11.37)	1.818* (12.11)	1.068* (9.38)	0.828* (7.24)
ASST	0.787* (9.77)	0.787* (9.76)	1.60* (10.98)	0.844* (8.29)	0.583 (5.65)
INST	0.651* (8.03)	0.652* (8.04)	1.45* (9.96)	0.662* (6.42)	0.641* (6.21)
CHAIR	0.079 (0.33)	0.078 (0.33)	0.068 (0.30)		−0.084 (−0.38)
ASSODEAN	0.778* (3.52)	0.776* (3.52)	0.797* (3.77)	0.894* (3.50)	
ASSTDEAN	0.227 (1.10)	0.227 (1.09)	0.242 (1.22)	0.232 (1.05)	
TWELVE	0.099 (1.53)	0.10 (1.54)	0.081 (1.30)	0.048 (0.54)	0.157 (1.54)

ADJ	0.017 (0.35)	0.017 (0.36)	0.002 (0.04)	−0.021 (−0.28)	0.049 (0.94)
VISIT	−0.030 (−0.56)	−0.030 (−0.56)	−0.029 (−0.56)	−0.005 (−0.05)	−0.088* (−1.78)
CPI	0.004* (2.01)	0.004* (2.01)	0.005* (3.00)	0.003 (1.43)	0.025 (1.09)
FEM*EXP			−0.008** (−1.32)		
FEM*DATE			0.004** (1.38)		
FEM*TERM			0.088** (1.40)		
FEM*ASSO			−1.100*, *** (−5.28)		
FEM*ASST			−1.110*, *** (−6.56)		
FEM*INST			−1.07*, *** (−6.33)		
Adj. R^2	0.894	0.907	0.916	0.850	0.857

Dependent variable: LOG(SALHIRE) (*t*-statistics in parentheses).

[a]Other variables not listed in the tables but included in each model are: dummy variables identifying the academic department, and other dummy variables for special duties such as director, supervisor, and clinical duties. Note that INST is the omitted condition for the dummy variables describing rank at time of hire.

*Significant at 5% level.

**Not jointly significant at 5% level.

***Jointly significant at 5% level.

A finding that the estimated structural equation is significantly different for women than for men suggests the multiple-equation model is appropriate for estimating the size of the male–female differential. The multiple-equation model, suggested simultaneously by Blinder (1973) and Oaxaca (1973), is used to decompose wage differentials in male and female salaries. This methodology requires the estimation of separate regression equations for men and women faculty. Salary differentials are then decomposed into two components: the first due to differences in endowments, the second due to differences in coefficients (including the constant term). The first applies assumed non-discriminatory coefficients to the different characteristic endowments of men and women. Differences due to differences in endowments are considered to be explained and therefore non-discriminatory. The second component applies the female endowments to the differences in coefficients. The second component is considered to be unexplained, and possibly the result of discrimination.[10] Blinder and Oaxaca assume the appropriate set of non-discriminatory coefficients to be those estimated for either the male or the female model. Neumark (1988) pools the male and female data to estimate a non-discriminatory set of coefficients. Salary differentials are decomposed using both techniques in this study. Regression estimates for the multiple-equation models are reported in Table 4 and results of the wage decompositions are reported in Table 5.

Table 4. Multiple-equation models[a]

Variable	**(WLS)**								
	Full sample			**1958–1989**			**1990–1999**		
	Model 6 (male)	**Model 7 (female)**	**Model 8 (neutral)**	**Model 9 (male)**	**Model 10 (female)**	**Model 11 (neutral)**	**Model 12 (male)**	**Model 13 (female)**	**Model 14 (neutral)**
CONSTANT	−35.3*	−113*	−65.0*	−35.55*	−212.0	−74.29*	−75.3	295.1	150.2
	(−2.83)	(−1.95)	(−4.03)	(−2.79)	(−1.95)	(−4.13)	(−0.42)	(0.67)	(0.84)
EXPHIRE	0.008*	0.012	0.005*	0.010*	0.027	0.010*	0.004*	0.002	0.001
	(3.48)	(1.50)	(1.89)	(2.53)	(1.18)	(2.00)	(1.99)	(0.28)	(0.41)
HIREDATE	0.022*	0.062*	0.037*	0.022*	0.112*	0.042*	0.043	−0.146	−0.072
	(3.40)	(2.09)	(4.52)	(3.35)	(2.02)	(4.56)	(0.47)	(−0.65)	(−0.78)
TERMHIRE	0.053	0.206*	0.089*	0.137*	0.273*	0.111*	0.064	0.326*	0.149*
	(1.40)	(2.48)	(2.32)	(2.78)	(1.85)	(1.94)	(1.31)	(3.69)	(3.27)
PROF	2.023*		1.28*	2.16*		1.367*	0.434*		0.523*
	(16.8)		(11.4)	(14.4)		(7.06)	(6.05)		(6.68)
ASSO	1.82*	0.789*	1.05*	1.845*		1.09*	0.154*	0.098	0.203*
	(16.2)	(3.57)	(11.7)	(16.4)		(9.59)	(2.14)	(0.73)	(3.01)
ASST	1.62*	0.586	0.809*	1.644*	0.535*	0.857*	−0.062	−0.165*	−0.042
	(14.8)	(4.08)	(10.1)	(15.1)	(2.35)	(8.44)	(−1.14)	(−2.15)	(−0.94)
INST	1.47*	0.484*	0.671*	1.47*	0.387	0.675*			
	(13.60)	(3.28)	(8.28)	(13.6)	(1.55)	(6.57)			
LECT								−0.653*	−0.659*
								(−4.75)	(−6.19)
CHAIR	0.048		0.062				−0.215		−0.115
	(0.29)		(0.26)				(−1.26)		(−0.51)
ASSODEAN	0.72*		0.767*	0.885*		0.878*			
	(4.67)		(3.46)	(5.35)		(3.43)			
ASSTDEAN	0.253*		0.229	0.280*		0.229			
	(1.76)		(1.09)	(2.00)					
TWELVE	0.148*	−0.541*	0.111*	0.054	0.246	0.062	0.289*	0.055	0.153
	(2.87)	(−2.02)	(1.71)	(0.87)	(0.62)	(0.70)	(2.91)	(0.34)	(1.46)
ADJ	−0.034	0.047	0.010	−0.021	0.0008	−0.025	−0.021	0.109	0.039

	(10.61)	(0.48)	(0.20)	(−0.27)	(0.005)	(−0.33)	(−0.35)	(1.06)	(0.72)
VISIT	−0.019	−0.013	−0.034	0.009	−0.062	−0.005	0.002	−0.233*	−0.095*
	(−0.40)	(−0.08)	−(0.63)	(0.14)	(−0.16)	(−0.05)	(0.036)	(−1.84)	(−1.85)
CPI	0.007*	−0.002	0.003*	0.008*	−0.012	0.003	−0.004	0.045	0.025
	(4.79)	(−0.28)	(1.91)	(4.98)	(−1.05)	(1.34)	(−0.19)	(0.79)	(1.06)
Adj. R^2	0.959	0.803	0.906	0.940	0.662	0.849	0.925	0.757	0.847

Dependent variable: LOG(SALHIRE) (*t*-statistics in parentheses).

[a]Other variables not listed in the tables but included in each model are: dummy variables identifying the academic department, and other dummy variables for special duties such as director, supervisor, clinical duties. Note that the omitted condition for rank variables in models 6 through 11 is LECT, and the omitted condition for models 12 through 14 is INST. This change in omitted condition is necessary because no men were hired at lecturer rank between 1990 and 1999.

*Significant at 5% level.

Table 5. Measures of the salary-at-hire gap (in percentage)

	Full sample			**1958–1989**			**1990–1999**		
	Total	**Explained**	**Unexplained**	**Total**	**Explained**	**Unexplained**	**Total**	**Explained**	**Unexplained**
Oaxaca	−7.6	−12.6	5	−0.6	−5.7	5.1	22.2	15.5	8.4
Neumark	−7.6	−11.4	3.8	−0.6	−3.5	2.9	22.2	18.6	4.2
Single−equation	−7.6		5.8			4.6	22.2		6.4

5. Results

Table 2 reports five sets of estimates. Model 1 and Model 2 are the OLS and WLS estimates of the single-equation regression model, respectively. These estimates are almost identical. Many of the estimated coefficients and *t*-statistics are the same, and any differences appear only in the third significant digit. The estimated coefficient for FEMALE is negative and significant in both estimates, and indicates that female faculty received 5.8% lower initial salaries, holding all other included variables constant.[11] The coefficients estimated for EXPHIRE, HIREDATE, TERMHIRE, PROF, ASSO, ASST, INST and ASSODEAN are all positive and significant, as expected. Coefficients estimated for CHAIR, ASSTDEAN, TWELVE, ADJ, and VISIT, are all insignificant.

Model 3 includes variables in which FEMALE is interacted with personal characteristics (EXPHIRE, HIREDATE, and TERMHIRE) and with rank (ASSO, ASST, and INST) to test whether or not these groups of variables affect women's salaries-at-hire differently than men's. The personal characteristics are not found to affect salaries differently for women than for men, either individually or jointly. Rank is found to affect salaries differently for women than for men. At each rank, women are found to earn a significantly lower salary than men. According to the estimates, the salary premium relative to the rank of Instructor that is paid to women is less than half that paid to men at all higher ranks, including Lecturer. Because it is very unlikely that male or female candidates with publication records were hired at the Lecturer rank, this latter result cannot be explained by an omitted productivity variable.

In order to determine whether or not the estimated equation is stable over time, the data were arranged in order of HIREDATE and grouped according to HIREDATE<1990 and HIREDATE≥1990. The year 1990 was chosen because it is the median date of hire for women in the sample. A Chow test rejected the null hypothesis that there are no significant differences in the two sub-samples (*F*-statistic=1.96, log-likelihood ratio=106.1). A comparison of sub-sample means is presented in Table 3. The table reveals that in the later period, the date of hire is almost identical, but that the starting salary for women was almost $ 10,000 less than for men. This can be explained partly by the fact that women were hired at lower ranks than men, and significantly more women were hired at adjunct positions. The composition of ranks at which women were hired is approximately the same between sub-samples, however, men were hired at substantially higher ranks after 1990 than before. Both male and female faculty had, on average, more than 2 years more academic experience after 1990 than before.

Table 3. Comparison of sub-sample means[a]

Variable	**HIREDATE<1990**		**HIREDATE⩾1990**	
	Male	**Female**	**Male**	**Female**
SALHIRE	19,216.53	19,314.49	**46,707.53**	**37,000.00**
EXPHIRE	2.98	2.42	5.15	4.64
HIREDATE	**1977.5**	**1981.2**	1994.3	1994.4
TERMHIRE	93.5%	73.9%	**82.8%**	**65.7%**
PROF	0.9%	0%	**6.5%**	0%
ASSO	**8.3%**	**0%**	7.5%	4.5%
ASST	63.6%	58.0%	**76.3%**	**61.2%**
INST	26.3%	36.2%	**9.7%**	**31.3%**
LECT	**0.9%**	**5.8%**	0%	3.0%
ADJ	**1.8%**	**11.4%**	**4.3%**	**13.4%**
VISIT	2.3%	1.4%	5.4%	9.0%
TWELVE	13.4%	17.4%	23.7%	23.9%
CHAIR	0%	0%	1.1%	0%

ASSODEAN	0.5%	0%	0%	0%
ASSTDEAN	0.5%	0%	0%	0%
No. Observations	217	69	93	67

[a]Bold-face signifies that the difference in means is statistically significant at 5% level.

Models 4 and 5 in Table 2 report the estimates for the pre-1990 sub-sample and the sub-sample from 1990 and later, respectively. Note that there are no initial hires at Chair in the pre-1990 sub-sample, and no initial hires at Associate Dean or Assistant Dean in the 1990 and later sub-sample. The most important distinction between Model 4 and Model 5 is the estimated coefficient for FEMALE, which is negative but insignificant for the early sub-sample, and negative and significant for the later sub-sample. This finding suggests that gender differences in salary-at-hire were greater from 1990–1999 (7.4% lower salary-at-hire for women) than from 1958–1989 (4.6% lower salary-at-hire for women), *ceteris paribus*.

Caution must be exercised before drawing the conclusion that gender discrimination increased over this period, however. The data were collected from files of faculty who were still at the university in the fall semester of 1999. All the faculty hired before 1990 can be considered 'survivors;' i.e. they were all tenured and they had all chosen to remain at the university for at least 10 years. The same cannot be said for the sample of faculty hired in 1990 and later, which may include more 'bad fits' who either have not yet had the opportunity to go elsewhere or who have not yet been eliminated from the sample by the tenure process. To the extent that 'bad fits' both before and after 1990 might include women who were dissatisfied because of perceived inequities in salary-at-hire, the difference in the measured gender differentials between the two periods may be over-estimated.

Other distinctions between Models 4 and 5 are that coefficients estimated for EXPHIRE and HIREDATE are positive and significant in Model 4, but decidedly insignificant in Model 5; the coefficient estimated for ASST is positive and significant in Model 4 but insignificant in Model 5; and the coefficient estimated for VISIT is negative but insignificant in Model 4, and negative and significant for Model 5.

In order to test whether or not the model is structurally different for men than for women, the data were grouped according to gender, and Chow tests rejected the null hypothesis that there are no significant differences between the models estimated for men and women. Three Chow tests were performed: one using all 455 observations (*F*-statistic=3.38, log-likelihood ratio=136.4), one using faculty hired before 1990 (*F*-statistic=3.27, log-likelihood ratio=106.9), and the third using only the faculty hired in 1990 or later (*F*-statistic=2.19, log-likelihood ratio=80.8). These results suggest that it is appropriate to use the multiple-equation approach for calculating explained and unexplained differences in salary-at-hire for men and women faculty. Table 4 reports the estimated equations for men, women, and the pooled data for both the full sample, and the two sub-samples. Table 5 reports the results of the salary gap decompositions. Three equations were estimated for each sample of data: one for only the male faculty, one for only the female faculty, and a pooled (neutral) estimate including all faculty. The estimated coefficients were used to decompose the total salary gap into two components; that which is explained by the different characteristics or endowments of the male and female faculty, and that which is due to unexplained differences in the estimated coefficients for male and female faculty. The Oaxaca methodology uses only the male and female estimates, assuming the male coefficients to represent a neutral or non-discriminatory model, whereas the Neumark methodology uses all three estimates, assuming the pooled model to be neutral and non-discriminatory. In addition to the results of the wage decompositions, Table 5 reports the percentage differential computed from the single-equation models as an unexplained salary gap.

Estimates of the unexplained gap in salary-at-hire range from 3.8% to 5.8% in the full sample including all faculty, with the lowest estimate using the Neumark method and the highest using the single-equation estimate.

The lowest salary gaps were estimated using the sub-sample of faculty hired before 1990, ranging from a low of 2.9% using the Neumark method to 5.1% using the Oaxaca method. The highest salary gaps were estimated using the sub-sample of faculty hired from 1990 to 1999, ranging from a low of 4.2% using the Neumark method to 8.4% using the Oaxaca method. Note that, although the total gap is negative for the full sample and earlier sub-sample of faculty, the unexplained component is positive. In other words, the neutral models would predict an even larger negative salary gap in favor of women than was actually observed. This is because the average woman in this sub-sample was hired 4 years after the average man, in an environment of rising salaries. For the sub-sample using only faculty hired in 1990 or later, the total gap is positive (22.2%), indicating that men in this sub-sample were paid on average a higher salary-at-hire. Of the 22.2%, between 4.2% and 8.4% is unexplained by differences in characteristics of the male and female faculty.

6. Conclusion

This paper uses data compiled from faculty files at a private, doctoral-granting research university to investigate whether or not there are gender-related differences in salary offers at the time of initial appointment. The investigation uses single- and multiple-equation regression models that control for gender, date of hire, experience and degree attained, rank at the time of hire, characteristics of the position being filled, inflation, and academic department. Statistically significant structural differences are found between the regression models estimated separately for men and women faculty, and for faculty hired before 1990 and 1990 and later. The study finds a statistically significant differential in salary-at-hire between men and women of from 2.9% to 8.4%, and it finds that the male–female differential in salary-at-hire has increased since 1990. Inferences of discrimination from these regression results must be tempered by the possibility of biased estimates due to the absence of data describing the research productivity of the faculty member at the time of hire.

The investigation described in this paper is unique in its focus on salary-at-hire as the dependent variable. Salary-at-hire is completely determined by market conditions; there is no institutional history between employer and employee, and the employee’s mobility is at its greatest. Therefore, the finding that there is an unexplained gap between men’s and women’s salary-at-hire and that the gap has increased since 1990 is presumably not particular to the experience of this university. Although direct comparison with other studies is difficult because no other study directly examines salary-at-hire using comparable methodology, the findings of this paper are consistent with those of Bayer and Astin (1968) and Hirsch and Leppel (1982), each of whom find that gender does have an effect on initial or entry-level salaries. This study does not support the findings of Johnson and Stafford (1974) or Formby et al. (1993) that starting salary is not affected by gender, nor does it support the hypothesis that experience is valued differently for women than for men. The investigation is consistent with Ashraf s (1996) finding that the unexplained differential may have increased since the 1980s.

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[1]Salary structures at the university are comparable with doctoral-granting universities nation-wide, ranking slightly below the mean salaries reported by AAUP at every rank. Therefore, despite recent evidence, cited by Ehrenberg (2002), of significantly higher salaries at private universities compared to public, the results of this study are considered to be generally applicable.

[2]Ransom and Megdal (1993) and Toutkoushian (1998) suggest that the gap has not decreased since the 1980s. Ashraf (1996) finds that the gap has increased.

[3]The practice of tenure and the past two decades' decline in the demand for university faculty tend to limit mobility in the academic labor market. Evidence of this limited mobility is the well-documented phenomenon of salary compression and, in some cases, salary inversion. See Brown and Woodbury (1998), Glandon and Glandon (2001)Gordon, Morton, and Braden (1974) and O'Boyle (2001).

[4]Age at the time of hire and race were included in the original specification. Race was omitted from subsequent specifications because of its insignificance and negligible effects on other estimated coefficients. Age was insignificant whether it was specified as linear, quadratic, or interacted with other variables, as in Formby et al. (1993). It was omitted from subsequent specifications because of collinearity with EXPHIRE and TERMHIRE. Similarly, EXPHIRE was originally included in quadratic form, consistent with Johnson and Stafford (1974). The squared term was resoundingly insignifi cant, and omitted from subsequent specifications.

[5]An alternative specification, in which salary-at-hire was adjusted by the CPI in order to measure it in real rather than nominal terms was estimated. This alternative specification is equivalent to including the log of CPI as an explanatory variable but restricting its coefficient to be equal to one. The restriction was tested with a Wald test and rejected (F=45.2). The sign and significance of the coefficient estimated for FEMALE was not changed by the restriction. Note that the inclusion of HIREDATE in addition to CPI also helps to account for changes in salary-at-hire over time.

[6]The department variables identify the faculty member's department as of 1999, which is presumed to represent accurately the academic specialization of the faculty member at the time of hire. Department designations at the time of hire differ in some cases from current department designations because of department and college reorganization. For example, the journalism department reorganized into Advertising and Public Relations, and Broadcast and Electronic Communications. There are no instances in the database of a faculty member being hired in one discipline who is currently teaching in another discipline.

[7]Some may argue that, if women are under-represented in 'quality' graduate programs, and if that under-representation is due to gender discrimination, the variable should not be included in the salary-at-hire model. To include it under such circumstances would underestimate discrimination in salary-at-hire. This argument has a prominent place in the literature discussing whether or not faculty rank should be included in models that examine gender differences in current salary. See Boudreau et al. (1997) and McNabb and Wass (1997) as examples of the latter literature.

[8]The year 1990 is chosen because one-half of the women faculty was hired in 1990 or later.

[9]The regressions were also calculated using heteroskedasticity-corrected (HC) standard errors using the White method. Levels of significance in the estimated coefficients were consistent between the WLS models and the HC models.

[10]Considering the unexplained portion to be the result of discrimination is problematic, given the inexactness of econometric modeling and the very nature of unexplained residuals. See Follett, Ward, and Welch (1993) for a critique of the use of statistical analysis in the assessment of discrimination.

[11]Single-equation estimates of the percentage differences between salary-at-hire for men and women faculty were calculated using the procedure recommended by Kennedy (1981) here and elsewhere in the paper. Accordingly, the percentage difference is calculated as $100(\exp(c - V/2) - 1)$, where c is the estimated coefficient for FEMALE, and V is the estimated variance of the coefficient.