Gender Discrimination Determination in Faculty Salary Patterns from Small-Population Colleges

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Attempts were made to develop multiple linear regression models to represent salary patterns from two small-population (N=91, N=44) colleges. Multiple discriminant, canonical, and set correlation analyses were used to confirm the presence or absence of "tainted" variables. Problems with multicollinearity were solved by removing variables. "Fixed" models were formulated after using variable selection techniques to determine statistical significance. Entry salary (which acted as a suppressor variable) did not have a linear relationship to salary and the models involving it violated the normality of error terms assumption. Average percent increase in salary was used instead. However, the presence of heteroscedasticity in models for both colleges could not be eliminated. For these colleges, using multiple linear regression to determine, statistically, the presence or absence of gender discrimination in salary patterns was not possible.

In order to detect discrimination in salary based on factors such as sex, race, or ethnic group, comparisons have been made between the discriminatory groups and white males. Mean and median salaries have been used to show overall inconsistencies in salary allocation (Boyd, 1979). Some nondiscriminatory factors have been accepted as reasons for differential salaries. With regard to discrimination due to sex, Greenfield (1977) states that these factors are merit, quality or quantity of production, seniority, or "any reasonable factor other than sex" (p. 43).

Multiple linear regression has been accepted by the legal system for displaying or refuting discrimination (Finkelstein & Levin, 1990; Baldus & Cole, 1980). Some researchers (Hengstler, Muffo & Hengstler, 1982) think it is possibly "the most effective method for analyzing sex discrimination in faculty salaries" (p. 16). Others have also used canonical analysis and multiple discriminant analysis (Carter, Das, Garnello, & Charboneau, 1984; Heiny, Houston, & Cooney, 1985; Houston, Intarapanich, Thomas, & Heiny, 1989; Intarapanich, 1988). A large number of studies have combined male and female faculty members into one regression model using dummy variables for the discriminatory factors (e.g. Braskamp & Johnson, 1977). Academic yearly salary is usually the criterion variable. A formerly discriminatory set of variables, market or discipline factors, are now accepted as justifiable reasons for salary differences (Gordon, Morton & Braden, 1976). Age, which some view as a proxy variable for experience, is considered by others as discriminatory (Heiny, et al., 1985; Snyder, Hyer & McLaughlin, 1993). Some consider rank a proxy variable for productivity since it correlates well with scholarly activity, research, and publications (Tennessee Higher Education Commission, 1979). Others think it is a "tainted" variable because discrimination in promotion could also occur along with discrimination in salary. For this purpose, Heiny, et al. (1985) have used canonical analysis and discriminant analysis to test the relationship between rank and sex and, also, to see if age might be a discriminatory variable. A related method for discerning relationships between sets of variables is recommended by Cohen (1993). Set correlation determines the proportion of generalized variance of one set of variables (dependent) accounted for by a second set of variables (independent). Besidesdiscipline factors and rank (if not related to sex), other acceptable explanatory variables are degree, tenure status, and experience.

Most researchers prefer to have a "fixed" model built with their preselected variables as Moore (1992) suggests. Computer selection techniques (stepwise regression, forward selection, backward elimination and all-possible-regressions) can be used to produce models that include only statistically significant variables. Baldus and Cole (1987) recommend deleting variables from the model to solve multicollinearity problems, but using fewer variables may mean a decrease in the predictive power. The number of observations available for a study also affects the number of independent variables to include in the regression equation. Crosswhite (1972) has shown that three subjects per variable is sufficient for samples from populations whose coefficient of multiple determination is as low as 0.20.

Simpson and Rosenthal (1982) have suggested some standards that a final model should meet: a coefficient of multiple determination of 0.75 or more, a standard error of the estimate (SEE) less than 3000 For each institution separate equations containing all selected variables were developed. A variance inflation factor (VIF) greater than 10 and a condition number (CN) greater than 30 indicated moderate to severe collinearity. These equations were also subjected to various model selection techniques.

Three statistical techniques were used to determine the presence of "tainted" variables. Canonical analysis (CA) and set correlation were used to examine the relationship between the variables of gender and age and the nondiscriminatory variables. Structure coefficients of 0.30 or more signified an influence on the canonical variable. Set correlation measured the amount of variation in the set of variables, age and gender, that was explained by the other set of variables (nondiscriminatory). If this correlation was significant, both age and gender were tested separately. Discriminant analysis (DA) was used to determine possible misclassification of faculty members in both rank and tenure status.

Residual analyses were used to investigate the adherence of any prospective final model to the assumptions of multiple linear regression. These include linearity of the variables, normality of the error terms, and homoscedasticity.

Results

The data from each college was subjected to the procedures described in the methodology section. Descriptive statistics for each are given in Tables 3 and 4. and only statistically significant variables. However, Paetzold and Willborn (1994) have stated that an R^2 of 0.45 may be acceptable if the residual analysis confirms the applicability of the model (random residuals and absence of defects such as multicollinearity). For smaller institutions (N<100), an applicable model may be especially difficult to construct.

This research involved attempts to develop multiple linear regression equations to represent separate salary patterns for two small higher-education institutions . Records from the academic year 1992-93 for college A (N = 91) and the year 1993-94 for college B (N = 44) provided the information given in Tables 1 and 2. A new variable was developed for each college (average percent increase in salary per year).

As shown in Table 5 the initial model for college A including all selected variables exhibited multicollinearity.

Canonical, set correlation, and multiple discriminant analyses were conducted on this beginning model. The one significant canonical variate (CV) (Table 6) correlated highly with age and with the variables ESALA, PROFA, ASSTA, YRRKA, LONGA, TENA, TTA, and YRWTEN. The CV also had a structure coefficient of 0.3419 with gender. This result was consistent with the significant $R_{Y,X}^2$ of 0.727 (p = 0.000) from set correlation and the significance of the age variable (p=0.000). The p-value of the gender variable was 0.075.

In the multiple discriminant analysis for type of appointment, there were thirteen misclassifications, but only two of these were instances where the person should have been tenured and was not; one was a male and one was a female. Discriminant analysis on rank produced a different male and female in a lower rank than predicted.

Using the model selection techniques and dropping correlated variables, a "fixed" model was developed (ESALA, PROFA, ASSOCA, ASSTA, LONGA, TENA, GENDERA, BUSA, HUMA, EDUCA, MATHSCIA, HISTA, PSYCHA, PERF1A, and PERF2A). VIF for LONGA was still high (10.1), but to decrease it, ESALA would have to be dropped from the model. It acted as a suppressor variable so a large decrease in R^2 occurred, from 0.9236 to 0.7747 when ESALA was dropped, and the SEE increased from 2200.97 to 3753.32. This final model was checked for normality, linearity, and constant variance. The Shapiro-Wilk W was 0.9539 which had a p-value of 0.0100 indicating departure from normality. Also, entry salary exhibited a curvilinear relationship with salary (Figure 1), and the graph of the fitted values against the standardized residuals demonstrated an increase in variance as salaries increased. Using average percent increase in salary per year instead of entry salary gave a model that did not violate normality assumptions, but in the various different variable selection procedures, PCINCA was insignificant. Transforming salary (log salary, square root salary, inverse salary) did not solve the heteroscedasticity problem.

The original model for college B given in Table 7 had a very low adjusted R-square and a large SEE and exhibited multicollinearity. As with college A, the canonical correlation analysis of age and gender versus the other independent variables (Table 8) yielded one significant canonical variate (0.9160, p = 0.0006).

Table 1 College A Explanation of Variables

Variable	Description and/or Code
SALA	Academic yearly salary
ESALA	Entry salary
PROFA	1 (professor), 0 (else)
ASSOCA	1 (associate professor), 0 (else)
ASSTA	1 (assistant professor), 0 (else)
INSTA	1 (instructor), 0 (else)
YRRKA	Years in current rank
HPROFA	1 (hired professor), 0 (else)
HASSOCA	1 (hired assoc. professor), 0 (else)
HASSTA	1 (hired assistant professor), 0 (else)
HINSTA	1 (hired instructor), 0 (else)
AGEA	Chronological age
TTA	1 (tenure track, nontenured), 0 (else)
NTTA	1 (nontenure track), 0 (else)
TENA	1 (tenured), 0 (else)
YRWTENA	Years with tenure
LONGA	Length of service with institution
DOCA	1 (doctor's degree), 0 (else)
MAA	1 (master's degree), 0 (else)
GENDERA	1 (male), 0 (female)
BUSA	1 (business), 0 (else)
EDUCA	1 (education), 0 (else)
HISTA	1 (history), 0 (else)
HUMA	1 (humanities), 0 (else)
MATHSCIA	1 (mathematics or science), 0 (else)
PSYCHA	1 (psychology), 0 (else)
PVAA	1 (perform. and vis. arts), 0 (else)
PERF1A	1 (rating of 1), 0 (else)
PERF2A	1 (rating of 2), 0 (else)
PERF3A	1 (rating of 3), 0 (else)

Table 2 College B Explanation of Variables

Variable	Description and/or Code
SALB	Academic yearly salary
ESALB	Entry salary
PROFB	1 (professor), 0 (else)
ASSOCB	1 (associate professor), 0 (else)
ASSTB	1 (assistant professor), 0 (else)
INSTB	1 (instructor), 0 (else)
YRRKB	Years in current rank
HASSOCB	1 (hired associate professor), 0 (else)
HASSTB	1 (hired assistant professor), 0 (else)
HINSTB	1 (hired instructor), 0 (else)
AGEB	Chronological age
TENB	1 (tenured), 0 (else)
NTENB	1 (nontenured), 0 (else)
YRWTENB	Years with tenure
LONGB	Length of service
DOCB	1 (doctor's degree), 0 (else)
MAB	(master's degree), 0 (else)
GENDERB	1 (male), 0 (female)
BUSB	1 (business), 0 (else)
EDUCB	1 (education), 0 (else)
HISTB	1 (history), 0 (else)
HUMB	1 (humanities), 0 (else)
MATHCSB	1 (math or comp. science), 0 (else)
PSYCHB	1 (psychology), 0 (else)
PVAB	1 (perform. and vis. arts),0
(else)PRB	1 (park or recreation), 0 (else)
PHILB	1 (philosophy or religion), 0 (else)
SCIB	1 (sciences), 0 (else)

Table 3 College A Descriptive Statistics for Quantitative Variables

Females N = 30

	SALA	ESALA	AGEA	YRRKA	YRWTENA	LONGA
Mean	34270	22470	45.7	4.6	4.9	7.3
SD	6004	8575	7.9	5.5	8.1	7.8

Males N = 61

	SALA	ESALA	AGEA	YRRKA	YRWTENA	LONGA
Mean	37320	23120	45.7	6.1	5.9	8.7
SD	7660	8478	8.5	6.3	8.6	8.8

Table 4 College B Descriptive Statistics for Quantitative Variables

Females N = 15

	SALB	ESALB	AGEB	YRRKB	YRWTENB	LONGB
Mean	27340	22740	46.6	3.7	1.1	4.9
SD	3464	6892	9.3	3.0	2.1	3.1

Males N = 29

	SALB	ESALB	AGEB	YRRKB	YRWTENB	LONGB
Mean	31380	18800	46.3	7.3	6.1	12.0
SD	4287	8530	8.5	8.4	7.8	9.5

Table 5 College A Multiple Linear Regression (All Variables)

Variable	*Coefficient*	*Std. Error*	*P*	*VIF*	*TOL*
Intercept	4112.12	4366.2	0.349		
ESALA	0.98	0.10	0.0000	11.4	0.09
PROFA	2984.97	1944.31	0.1294	13.7	0.07
ASSOCA	1472.70	1617.16	0.3657	8.6	0.12
ASSTA	908.80	1376.61	0.5114	7.6	0.13
HPROFA	-1237.80	2930.17	0.6741	1.6	0.62
HASSOCA	-1929.14	1373.22	0.1647	5.6	0.18
HASSTA	-995.01	966.28	0.3068	4.0	0.25
YRRKA	16.62	69.71	0.8123	3.1	0.33
LONGA	1336.58	151.25	0.0000	28.4	0.04
AGEA	2.39	45.86	0.6270	2.5	0.41
TENA	3791.16	3129.64	0.2300	42.4	0.02
TTA	1469.65	2992.81	0.6250	38.6	0.03
YRWTENA	-28.07	115.06	0.8080	16.1	0.06
DOCA	229.57	967.07	0.8131	3.3	0.30
GENDERA	449.18	633.12	0.4805	1.5	0.65
BUSA	2129.62	1135.67	0.0651	2.4	0.42
HUMA	536.73	1001.02	0.5936	2.0	0.50
EDUCA	96.35	932.36	0.9180	2.6	0.38
MATHSCIA	612.94	955.11	0.5232	2.6	0.38
HISTA	630.45	1097.99	0.5678	1.9	0.53
PSYCHA	-124.12	1143.38	0.9139	1.8	0.55
PERF1A	4022.70	1010.72	0.0002	2.3	0.43
PERF2A	1785.26	745.53	0.0194	2.1	0.48

R-Squared 0.9264 Adjusted R-Squared 0.9011
Standard Error of Estimate 2285.25

Table 6
Structure Coefficients for the Canonical
Correlation Analysis of the Initial Model for College A

	V1	V2
AGEA	0.9411	-0.3381
GENDERA	0.3419	0.9397

	W1	W2
ESALA	-0.5674	0.3733
PROFA	0.8156	-0.0381
ASSOCA	-0.1811	0.0517
ASSTA	-0.5379	0.0146
HPROFA	0.1748	0.0535
HASSOCA	0.2025	0.2939
HASSTA	-0.1323	-0.1034
YRRKA	0.6124	-0.0909
LONGA	0.7459	0.2413
TENA	0.6150	0.0588
TTA	-0.6261	0.0087
YRWTEN	0.7547	-0.2910
DOCA	0.2612	0.0076
BUSA	0.0581	- 0.0839
HUMA	-0.0243	- 0.1298
EDUCA	-0.0885	0.0016
MATHSCIA	0.0233	0.3591
HISTA	0.1324	0.0795
PSYCHA	0.2267	-0.1797
PERF1A	-0.0156	-0.5539
PERF2A	0.0838	0.1328

Figure 1
Scatterplot of entry salary versus salary for College A
COLLEGE A

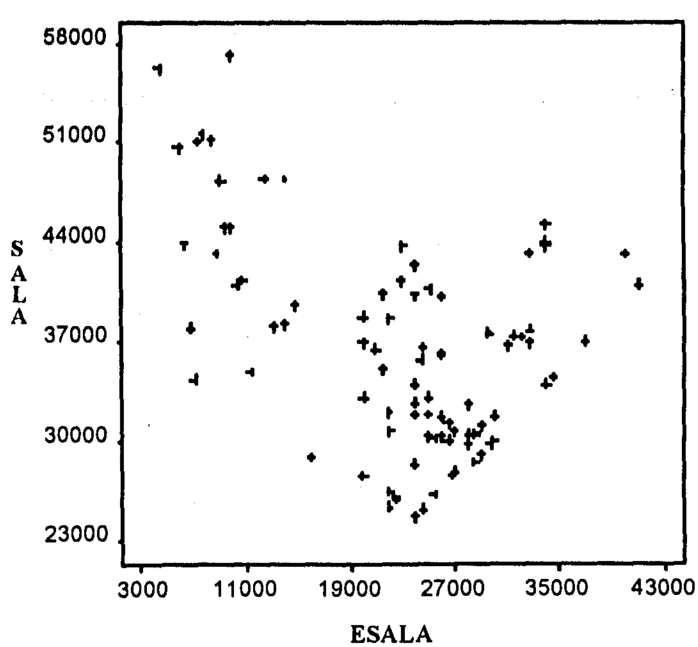

Table 7
College B Multiple Linear Regression (All Variables)

Variable	Coefficient	Std. Error	P	VIF	TOL
Intercept	18599.31	8458.83	0.0392		
ESALB	0.26	0.23	0.2652	13.1	0.08
PROFB	5051.59	4492.88	0.2736	11.4	0.09
ASSOCB	37.66	4037.89	0.9926	13.9	0.07
ASSTB	-1205.42	3468.59	0.7317	11.2	0.09
HASSOCB	5127.49	4219.32	0.2378	6.8	0.15
HASSTB	3402.35	2142.58	0.1272	3.9	0.26
YRRKB	73.28	246.51	0.7692	11.7	0.09
LONGB	329.33	426.54	0.4487	49.1	0.02
AGEB	-72.78	129.49	0.5800	4.7	0.21
TENB	705.26	1969.11	0.7238	3.6	0.27
YRWTENB	-207.87	347.93	0.5566	20.8	0.05
DOCB	1552.93	2622.36	0.5600	4.9	0.20
GENDERB	416.93	2056.65	0.8413	3.6	0.28
BUSB	5840.83	4238.15	0.1827	6.9	0.15
HUMB	863.25	2229.20	0.7025	1.9	0.53
EDUCB	2678.32	3058.70	0.3911	2.9	0.34
MATHCSB	4891.38	2762.71	0.0912	3.4	0.29
SCIB	1280.54	2482.55	0.6114	1.9	0.52
HISTB	-742.72	2965.45	0.8047	2.1	0.47
PSYCHB	-1448.78	2929.74	0.6261	2.1	0.48
PHILB	1843.74	2661.19	0.4960	1.7	0.59
PRB	-439.21	2855.68	0.8792	2.0	0.51

R-Squared 0.7113
Adjusted R-Squared 0.4088
Standard Error of Estimate 3406.63

Source	*DF*	*SS*	*MS*	*F*	*P*
Model	22	6.004E+08	2.729E+07	2.352	0.0274
Error	21	2.437E+08	1.161E+07		
Total	43	8.441E+08			

Table 8
Structure Coefficients for the Canonical Correlation
Analysis of the Initial Model for College B

	V1	V2
AGEB	0.7880	0.6157
GENDERB	0.6045	-0.7966
	W1	W2.
ESALB	-0.4127	0.0054
PROFB	0.4642	-0.1452
ASSOCB	0.1754	-0.2066
ASSTB	-0.4070	0.2048
HASSOCB	0.4261	-0.0382
HASSTB	0.2522	0.0885
YRRKB	0.6249	0.1875
LONGB	0.7119	-0.0015
TENB	0.5190	-0.2042
YRWTENB	0.6554	0.0190
DOCB	0.2620	0.0118
BUSB	-0.4159	0.0612
HUMB	-0.1038	0.0227
EDUCB	0.1394	0.6199
MATHCSB	0.1681	-0.0938
SCIB	0.1472	0.0369
HISTB	-0.0637	0.2667
PSYCHB	0.0002	-0.0075
PHILB	-0.0731	-0.4161
PRB	-0.0364	-0.0433

Age had a structure coefficient of 0.7880 and the following variables had loadings of 0.30 or more: ESALB, PROFB, ASSTB, HASSOCB, YRRKB, LONGB, TENB, YRWTENB, and BUSB. However, gender also had a high correlation with this CV (0.6045). The $R_{Y,X}^2$ (0.919) from set correlation was significant (p = 0.001). Of the two Y variables, age was significant (p = 0.009) while the test for gender had a p-value of 0.071.

The multiple discriminant analysis for tenure status had two misclassifications, both males. There were three individuals (two males, one female) classified in ranks lower than they currently held and two males were classified into higher ranks.

For the model selection procedures, in all but backward elimination, the gender variable entered the model. However, in each case, its coefficient was insignificant after other variables were added. Gender had the highest correlation (0.4375) with salary of all the variables considered for the original model.

For this college, ESALB again acted as a suppressor variable, but LONGB also was a suppressor variable. They both had higher partial R-squares when they united with the variable PROFB. When all three were combined with gender in a stepwise regression, gender became insignificant or dropped out, suggesting that their presence may mask the significance of gender. Without ESALB in the model, LONGB did not exhibit a suppressor effect with PROFB. All models indicated that the variance was not constant, and models with ESALB violated the normality assumption.

Table 9 is a model in which ESALB was replaced with the average percent increase in salary per year (PCINCB). In all the variable selection procedures, PCINCB was significant. The "fixed" model (PCINCB, ASSOCB ASSTB, INSTB, HASSOCB HASSTB, GENDERB BUSB, HUMB, EDUCB, MATHCSB, SCIB, HISTB, PSYCHB, PHILB, and PRB) had an R^2 of 0.7775 (RSQ-adj = 0.6456) and a SEE of 2637.49. In the set correlation analysis ($R_{Y,X}^2$ = 0.821, p = 0.002), however, the other independent variables were shown not only to be related to age (p = 0.015), but also to gender (p = 0.050). The Shapiro-Wilk W was 0.9792 with a p-value of 0.7342, therefore, normality could be assumed. The residual plot still displayed variance that was not constant, though, and, as with college A, salary transformations did not provide any improvement.

Attempts were made to develop models for each of the institutions. Both initial models had severe collinearity. This was solved by removing variables that were intercorrelated with each other. Linearity and normality problems were also corrected. However, both sets of data demonstrated heteroscedasticity which was not remedied.

Table 9

College B Multiple Linear Regression (Percent Increase)

Variable	*Coefficient*	*Std. Error*	*P*	*VIF*	*TOL*
Intercept	18611.40	6220.02	0.0069		
PCINCB	38332.60	11846.50	0.0040	1.6	0.63
PROFB	1112.68	3735.21	0.7687	11.1	0.09
ASSOCB	-2512.13	3354.57	0.4622	13.5	0.07
ASSTB	-1713.51	2856.81	0.5551	10.7	0.09
HASSOCB	8378.17	3095.64	0.0132	5.2	0.19
HASSTB	3478.36	1750.60	0.0601	3.7	0.27
YRRKB	-95.15	212.17	0.6584	12.2	0.08
LONGB	26.97	292.86	0.9275	32.7	0.03
AGEB	25.32	108.73	0.8181	4.7	0.21
TENB	263.92	1668.17	0.4571	3.7	0.27
YRWTENB	-5.62	285.18	0.9845	19.7	0.05
DOCB	1636.74	206.86	0.4665	4.9	0.20
GENDERB	2565.22	1588.85	0.1213	3.0	0.33
BUSB	10609.60	3065.65	0.0023	5.1	0.20
HUMB	1814.16	1850.65	0.3381	1.8	0.56
EDUCB	5500.35	2239.72	0.0229	2.2	0.45
MATHCSB	6456.48	2169.15	0.0072	3.0	0.33
SCIB	1552.36	2081.39	0.4640	1.9	0.53
HISTB	1315.44	2463.14	0.5989	2.1	0.48
PSYCHB	944.05	2450.90	0.7040	2.0	0.50
PHILB	276.30	2298.87	0.9055	1.8	0.56
PRB	2229.81	2216.00	0.3258	1.7	0.59

R-Squared 0.7953
Adjusted R-Squared 0.5809
Standard Error of Estimate 2868.32

Source	*DF*	*SS*	*MS*	*F*	*P*
Model	22	6.713E+08	3.051E+07	3.71	0.0019
Error	21	1.728E+08	8.227E+06		
Total	43	8.441E+08			

Conclusions

The purpose of this study was to try to develop multiple linear regression models for salary patterns from two small population (N < 100) higher education institutions. The initial R^2 and adjusted R^2 for college A were greater than 0.90 and the SEE was less than 3000 even though there was high multicollinearity. The results of canonical correlation indicated that older faculty were more likely to be tenured professors and have more years of service, more years in rank, and more years with tenure. They would also be less likely to be assistant professors and have been hired with high salaries. The multiple discriminant analysis did not detect any gender discrimination in type of appointment or in promotion. The p-value (0.075) for the gender variable in set correlation, however, gave some evidence of a possible relationship between gender and other independent variables.

It was determined from the various variable selection procedures that seven variables were statistically significant: entry salary, length of service, tenure status, business discipline, and the two performance variables. Gender entered only the forward selection model and was not significant at the 0.05 level. Entry salary was replaced by average percent increase in salary per year. This corrected the nonlinearity and nonnormality of models. Transformations of salary to log salary, square root salary and inverse salary did not correct for unequal variance in the error terms, however.

In the CA for college B, the one significant canonical variable had high positive correlations with age and gender. Older people were more likely to be tenured full professors, had been hired as associate professors, had been professors and had tenure longer, and had been at the institution longer. They also weren't as likely to have high entry salaries, be assistant professors or be in the business discipline. The high correlation for gender might mean that males also were more likely to exhibit these characteristics than females. Gender discrimination in tenure status or promotion was not signified in the DA. But, the fact that the gender variable had one of the highest correlations with salary and the circumstance that certain variables (entry salary, length of service, and professor) could mask this relationship signaled possible gender discrimination in salary.

Removing the entry salary variable gave a model that adhered to the normality assumption, but the heteroscedasticity was still present and the model had little predictive ability ($R^2 < 0.60$). Taking the entry salary values and using them to compute the average yearly percent salary increases resulted in a "fixed" model with R^2 greater than 0.70 and SEE less than three thousand. Since there was still a problem with variance that was not constant, however, no specific predictions could be made.

For both of these institutions, a problem that was not resolved was the unequal variation at different levels of salaries. This presented a prediction difficulty since residuals or standardized residuals could not be used to indicate that faculty members were being paid more or less than their equally qualified peers. Each of these colleges would be advised to use a case-by-case approach for determining gender discrimination in salary. College B might be especially concerned with this.

A suggestion for further research would be to try to find a way to weight salaries at different levels so that a model with homogeneous variance might be produced. Also, since the entry salary in both models enhanced the R^2 for each model (larger in college A), further study should be made concerning its relationship to other variables (i.e., longevity). Just because the data from these two colleges did not conform to appropriate multiple linear regression models for salary patterns does not mean that all higher education institutions with small faculty populations (N < 100) would have similar problems. They can be studied, individually, as these were to determine the suitability of this approach.

References

Baldus, D. C. & Cole, J. W. L. (1980). *Statistical proof of discrimination.* Colorado Springs, CO: Shepard's Inc.

Baldus, D. C. & Cole, J. W. L. (1987). *Statistical proof of discrimination* (Cumulative supplement). Colorado Springs, CO: Shepard's Inc.

Boyd, M. (1979). *Rank and salary differentials in the 1970s:A comparison of male and female full-time teachers in Canadian universities and colleges.* Ottawa, Ontario: Association of Universities and Colleges of Canada.

Braskamp, L. A. & Johnson, D. R. (1977, April). *The use of a parity-equity model to evaluate faculty salary policies.* Paper presented at the Annual Meeting of the American Educational Research Association, New York, NY.

Carter, R. D., Das, R. S., Garnello, A. H., & Charboneau, R. C. (1984). Multivariate alternatives to regression analysis in the evaluation of salary equity-parity. *Research in Higher Education, 20*(2), 167-179.

Cohen, J. (1993). Set correlation. In G. Keren & C. Lewis (Eds.), *A handbook for data analysis in the behavioral sciences: Statistical issues.* (pp. 165-198). Hillsdale, NJ: Lawrence Erlbaum Associates.

Crosswhite, C. E. (1972). Minimal subject-to-predictor ratios in multiple linear regression (Doctoral dissertation, University of Northern Colorado, 1972). *Dissertation Abstracts International, 33,* 3371B.

Finkelstein, M. O. & Levin, B. (1990). *Statistics for lawyers.* New York: Springer-Verlag.

Gordon, N. M., Morton, T. E., & Braden, I. C. (1976). Faculty salaries: Is there discrimination by sex, race, and discipline? *American Economic Review, 64,* 419-427.

Greenfield, E. (1977). From equal to equivalent pay: Salary discrimination in academia. *Journal of Law and Education, 6(*1), 41-62.

Heiny, R. L., Houston, S. R., & Cooney, J. B. (1985). Longitudinal analysis of salary discrimination in higher education. *Multiple Linear Regression Viewpoints, 14(*1), 1-38.

Hengstler, D. D., Muffo, J. A., & Hengstler, G. A. (1982, March). *Salary equity studies: The state of the art.* Paper presented at the Annual Meeting of the Association for the Study of Higher Education. Washington, DC.

Houston, S. R., Intarapanich, P., Thomas, A., & Heiny, R. L. (1989, April). *Salary discrimination in higher education: Selective multivariate analyses.* Paper presented at the American Educational Research Association Meeting. Boston, MA.

Intarapanich, P. (1988). Discrimination patterns and statistical procedures in faculty salaries (Doctoral dissertation, University of Northern Colorado, 1988). *Dissertation Abstracts International, 50,* 857A.

Moore, N. (1993). Faculty salary equity: Issues in regression model selection. *Research in Higher Education, 34*(1), 107-126.

Paetzold, R. L. & Willborn, S. L. (1994). *The statistics of discrimination,* Colorado Springs, CO: Shepard's/McGraw-Hill, Inc.

Simpson, W. A. & Rosenthal, W. H. (1982). The role of the institutional researcher in a sex discrimination suit. *Research in Higher Education, 16*(1), 3-26.

Snyder, J. K., Hyer, P. B., & McLaughlin, G. W. (1993, May). *Faculty salary equity: Issues and options.* Paper presented at the Annual Forum of the Association for Institutional Research, Chicago, IL.

Tennessee Higher Education Commission. (1979). *Tennessee higher education commission staff study re: house resolution no. 107.* Nashville, TN: Author. (ERIC Document Reproduction Service No. ED 177 986).