A Statistical Investigation of Gender Equity in Salaries of Faculty at the University of Minnesota

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Executive Summary

In late 2010, the Office of the Senior Vice President and Provost plus the Office of Human Resources at the University of Minnesota jointly sponsored the engagement of an external consultant to provide expertise and leadership in creating a credible salary analysis model to be applied to University of Minnesota tenure track and tenured faculty. This document summarizes the methods, findings, and recommendations resulting from this work.

Multiple linear regression was used to determine whether there was evidence of a gap in salary between male and female faculty after various adjustment factors considered to influence salary were taken into account (such as department, years of faculty employment at the University of Minnesota, etc.). The data used for analyses were taken principally from a 2007 "snapshot" of projected salaries for fall contracts, and included tenured and tenure-track faculty from the Twin Cities campus. Faculty from Nursing, Dentistry, Medicine, and Veterinary Medicine were excluded because of differences in the salary structure for those faculty. Merit data were not available, and therefore not used.

Based on the statistical analyses summarized in this report, after taking into account various factors thought to influence faculty salary (but not merit), there is evidence that male faculty are, overall, paid an average of 2.2% more than female faculty. More detailed analyses provide statistical evidence that this gap in salary is not evenly distributed across the schools/colleges nor is it evenly distributed across the ranks.

These conclusions do not identify specific individuals whose salary warrants adjustment. Further, these methods do not identify the causes of any gap in salary, and indeed, in some circumstances a gap in salary between male and female faculty might be justifiable based on merit or other information. These conclusions lead to the following recommendations.

1. *Develop a system for adjusting the salaries of female faculty as warranted, on a case-by-case basis.* For a given female faculty member, this might be done by comparing her salary to those of males with comparable records and performance. An across-the-board remedy whereby each female faculty member receives a salary adjustment of 2.2% is *not* recommended.

2. *Work to identify the causes of salary inequities, and develop policies to prevent their recurrence.* Such causes might include responses to retention cases, differential assignment of teaching and other duties, differential assignment of laboratory space, starting rank, committee assignments, etc. Policies should exist to ensure that equity in these factors is maintained and monitored.

3. *Routinely monitor faculty salaries at the institutional level.* Periodically repeating the primary analyses of this report can provide an overall view of faculty salaries, can emphasize the need for and value of maintaining vigilance in monitoring and addressing salary inequities as they arise, and can aid in preventing the occurrence of gender gaps in faculty salaries in the future.

Introduction

There is nationwide interest and concern about gender equity in faculty salaries at institutions of higher learning, and statistical analyses have been employed at many institutions to attempt to learn whether a gap in salary exists between male and female faculty. Historically, a number of studies have been conducted at the University of Minnesota (UM) with the same goal in mind. The most recent of these appeared in May 2010, when the UM Women's Faculty Cabinet (WFC) issued a report summarizing a salary equity study conducted under their direction by personnel in the UM Office of Institutional Research (OIR). The report concluded that, "salary inequities exist between men and women at all ranks, and that differences increase with increasing rank." Later in the same year, in response to a request by the UM Provost, the Office of Institutional Research (OIR) reviewed the WFC equity analysis and commented on the methods used. A memo issued jointly by the assistant director of OIR and the executive director of the Office of Planning and Analysis concluded that the WFC analyses should have included some means for accounting for disciplinary and merit effects on salary. OIR included an aspect of the former in their preliminary analysis, but not the latter. The memo concluded with the recommendation to engage an external consultant, and thus the Office of the Senior Vice President and Provost plus the Office of Human Resources jointly sponsored such an action in late 2010. Working in collaboration with a steering committee of eight faculty and administrators, the consultant's task was to provide expertise and leadership in creating a credible salary analysis model to be applied to University of Minnesota tenure track and tenured faculty.

This document is the result of these processes. It presents statistical analyses that build upon and extend the earlier WFC and OIR analyses. The next section describes the methods used, the results of their use, and some discussion of the issues underlying the analyses used and the interpretation of results. The body of the report ends with some recommendations for further action. Finally, the Appendix contains technical details regarding the data and analyses.

Methods and Results

The data used for analyses were taken principally from a 2007 "snapshot" of projected salaries for fall contracts. Tenured and tenure-track faculty from the Twin Cities campus were included, but P&A staff, administrators, and faculty on phased retirement were excluded. Similarly, faculty from administrative units (e.g., Human Resources, University Library) were also excluded. Finally, faculty from Nursing, Dentistry, Medicine, and Veterinary Medicine were excluded because of differences in their salary structure compared to the remainder of the campus.

For each faculty member, the following data were used: salary (converted, if necessary, to a nine-month basis), gender, whether the person is a historically underrepresented minority (African American, Hispanic, American Indian), number of years between terminal degree and hire as faculty at UM, rank (assistant, associate, or full professor), number of years in rank, total number of years as a faculty member at UM, college or school, and department.

Merit and performance data were not available and thus were not included. For each person's discipline (as assigned by OIR using Department of Education CIP – Classification of Instructional Programs – codes), a market value was calculated to reflect differences in salary among disciplines (see the Appendix for details of this calculation).

The table below summarizes the numbers of male and female faculty in each rank and the number of years since hire as a faculty member at UM.[1]

	All Ranks		Assistant Professor		Associate Professor		Full Professor	
	Males	Females	Males	Females	Males	Females	Males	Females
Number	1136	519	190	137	300	210	646	172
Yrs since hire								
Average	15.5	11.1	2.8	3.0	11.6	11.2	21.2	17.5
Standard Deviation	12.6	9.7	4.7	4.2	10.3	8.4	11.7	9.6
9 mo salary($)								
Average	105,010	89,147	75,623	72,464	85,397	80,324	122,859	112,867
Standard Deviation	40,465	30,094	22,867	21,354	24,217	17,410	41,293	33,201

The last two lines of the above table show a difference in salary between men and women, with the differences being larger for faculty in the higher ranks. For data of this sort, it is often argued that this difference could result from differences in career length. Specifically, because salaries generally go up over time, there might appear to be a difference in salaries between men and women because there are more men than women who have been on the faculty for a longer time. The above data are consistent with this, at least for full professors. On average, male faculty have been at UM for 21.2 years, while female faculty have been at UM for an average of 17.5 years, and the average salary for male full professors is $122,859 compared to $112,867 for female professors. This leads to the question whether the difference in average salaries for male and female faculty can be attributed wholly to a difference in the average time on the faculty.

More broadly, the question is whether there is evidence of a gap in salaries between males and females once quantities such as years since hire, discipline, or other factors have been taken into account. The most common tool for addressing this is multiple linear regression, and accordingly, multiple linear regression analyses were used to compare Fall 2007 salaries of male and female faculty, adjusting for factors thought to influence salary, including department, years of faculty employment at UM, and years since terminal degree

[1] Depending on the attribute being examined (e.g. years since hire, years since degree until hire, etc.) the total number of observations can vary slightly. This occurs because, for some attributes, data are missing. Thus, in each of the ensuing analyses, the number of observations used varies slightly depending on the attributes in the given model.

before employment at UM as faculty. (A full list of the variables, i.e. "adjustment factors" or "explanatory variables," used in the regression models can be found in the Appendix.)

An issue often discussed is whether or not to include professorial rank as an explanatory factor in the regression model. Certainly we would expect salary to be related to rank: full professors generally make more money than assistant professors, and at UM, like other institutions, promotion in rank is usually accompanied by an increase in salary. However, in studies of this kind rank is often referred to as a potentially "tainted" variable that might itself reflect gender bias. Specifically, the process of promotion through the ranks might be biased against women, and therefore using rank as an adjustment factor could lead to an incorrect estimate of a gender gap in salary. The same could be said for the assignment of rank at the time of hire. Therefore, throughout this work two sets of analyses were conducted in parallel. In the first set, rank was included in the list of adjustment factors; in the second, rank was excluded. The average of the gender gaps estimated by these two methods will be referred to as the "combined" gender gap.

As will be discussed in greater detail subsequently, no single statistical model can capture all of the complexities of the salary structure of a large institution like the University of Minnesota. As a result, several models were examined, each based on its own set of assumptions. Further details regarding these analyses appear in the appendices. In addition to these analyses, several additional analyses were conducted to assess the strength of the statistical evidence supporting the overall conclusions. These analyses strongly support the overall conclusions and therefore are omitted for the sake of brevity. In addition, for the main analyses reported here, various diagnostic procedures (e.g. examination of residuals) were conducted to assess the adequacy of the models. There was no evidence of violation of the statistical assumptions of the models, and again for brevity, the results of these diagnostic procedures are not commented upon further.

<u>Aggregate Model</u>

The first analysis, an "aggregate analysis," was used to determine whether there was evidence for a gender gap in salary taking the campus as a whole, and taking into account the explanatory variables described in the Appendix, but assuming that any gap in salaries between male and female faculty was the same across the schools and colleges.

Based on the aggregate analysis where rank was included in the list of explanatory variables, the gender gap was estimated to be -1.8%; that is, it was estimated that, on average, and taking other compensable factors into account that may affect salary, female faculty are paid 1.8% less than male faculty. In the aggregate analysis in which rank was excluded from the list of explanatory variables, it was estimated that women are paid 2.5% less than men. *The combined estimated gender gap for all colleges and schools is 2.2%. That is, on average across the whole campus, it is estimated that male faculty are paid 2.2% more than female faculty.*

The similarity of the estimated gaps whether professorial rank is included or excluded is a bit remarkable, and suggests (but does not prove) that "rank" as an explanatory variable is not tainted to a high degree.

Interaction Model

In an "interaction analysis," a multiple linear regression was fit that allowed for the possibility that the gender gap may be different for the different schools and colleges. This interaction analysis is based on the assumption that all of the adjustment factors except for gender have the same effect on salary across the schools and colleges. For example, the interaction analysis includes the assumption that the number of years at UM has the same effect on salary for all the schools and colleges.

The results appear in the following table. Again, analyses were conducted where professorial rank was included in the analysis, and where professorial rank was excluded. Focusing on the combined estimates, there appears to be a sizable gap favoring women in Design, a sizable gap favoring men in Public Health, and smaller gaps favoring men in most of the other schools and colleges. Many of these gaps are near 0; CLA and the Humphrey Institute stand out as having moderate estimated gaps (about 3%) favoring male faculty.[2]

Estimated Gender Gap (%) – Interaction Analysis

College/School	With Rank	Without Rank	Combined
Design	5.1	5.0	5.1
Biological Sci	1.3	0.3	0.9
Education	-1.6	2.7	0.5
CLA	-3.0	-3.0	-3.0
CFANS	0.3	-1.5	-0.6
Carlson School	-1.3	-2.3	-1.7
Humphrey Inst	-5.7	0.0	-2.9
Sci & Engr	-1.5	-2.8	-2.1
Law	-0.4	-1.7	-1.0
Pharmacy	0.9	-1.3	-0.2
Public Health	-6.3	-8.3	-7.3

Separate Regressions

As noted, an assumption of the interaction analysis is that all adjustment factors (rank, years at UM, etc.) have impacts on salary that are the same across the colleges and schools.

[2] It is potentially disagreeable to define a gap of 3% as "moderate," but perhaps a way to conceptualize the magnitude of a gap is to consider the reaction to pay plans of various sizes. Few faculty members would be excited by a pay plan that promised a 1% increase; many would be pleased by an increase of 5%.

This might not be correct, for example, because salaries might increase more quickly over time in one college compared to another. Therefore, the third form of analysis used was a "separate regressions" analysis wherein a separate regression model was fit for each college or school. Once again, rank was both included and excluded.

Of the regressions performed in this report, the separate regressions are based on the fewest assumptions, but necessarily each of these regressions is based on fewer data points compared to the larger aggregate and interaction models, and thus conclusions based on these smaller data sets are less firm. The following table summarizes the results of the separate regressions approach, and for each college/school, the table includes the number of observations used to build the regression model.

Estimated Gender Gap (%) – Separate Regressions

College/School	Number	With Rank	Without Rank	Combined
Design	41	2.8	4.8	3.8
Biological Sci	84	-2.8	-3.3	-3.1
Education	164	-1.9	-3.1	-2.5
CLA	500	-2.8	-2.9	-2.8
CFANS	222	0.1	-1.6	-0.7
Carlson School	89	-7.6	-3.9	-5.8
Humphrey Inst	22	-6.0	3.4	-1.3
Sci & Engr	340	-1.5	-3.1	-2.3
Law	39	-1.6	-3.1	-2.4
Pharmacy	55	0.7	-1.2	-0.2
Public Health	89	-1.6	-5.2	-3.4

Again, focusing on the combined estimates, these results indicate an estimated 3.8% gap favoring women in Design, a 5.8% estimated gap favoring men in the Carlson School of Business, and moderate gap estimates (about 3%) favoring men in Biological Sciences, CLA, Public Health, and Education.

Before presenting further analyses, it is useful to summarize the results obtained thus far, focusing on the combined estimated gaps. First, the interaction and separate regressions results support the results of the aggregate analysis: taking the campus as a whole, there is statistical evidence of a gender gap in salaries favoring men. Based on the interaction and separate regressions analyses, however, *the estimated gap in salaries between male and female faculty varies in both size and direction across the schools and colleges.*

The interaction analysis and the separate regressions approaches do not perfectly agree. Both point to a gap in salary favoring women in Design and a moderate size gap (about 3%) favoring men in CLA. Both also point to near zero gaps in the College of Forestry, Agriculture and Natural Resources, and in Pharmacy.

The lack of complete accord between the interactions approach and the separate regressions approach are important in terms of the recommendations to be made later in this report, but first we turn to one additional set of analyses.

Analyses by Rank

An important element of the WFC study was a series of analyses conducted separately for each professorial rank. The extension of that work to the current setting involves applying the aggregate model described above to the data separately for the assistant professors, the associate professors, and the full professors. Performing this analysis for each rank separately allows for the possibility that any gender gap in salary is different across the ranks. The estimated gender gaps from these analyses are: 0.4% for the assistant professors, -0.3% for associate professors, and -4.1% for full professors. These results suggest that, *when looking at the ranks separately, there is little estimated gender gap in salaries between men and women at the assistant and associate level, but a 4.1% estimated gap favoring male full professors.*

As with the other analyses reported here, these separate analyses for each rank rest on certain assumptions. In particular, it is assumed in these analyses that the impact of factors such as "years at UM" is the same across the schools and colleges. It would be tempting to conduct a separate regressions analysis for each combination of college/school and rank. However, in many cases this would result in a subdivision of the data that is too fine grained to be reliable: in that case the circumstances of just a few individuals can have a big impact on the results.

Regardless, a reasonable conclusion based on the interaction analyses, the separate regressions analyses, and the analyses by rank is that *there is good evidence that the overall estimated gap of 2.2% (favoring men) based on the aggregate analyses is* not *evenly distributed across the schools/colleges and ranks.*

Limitations of These Analyses

Although the methods employed here are common in analyses of gender equity in faculty salaries,[3] nonetheless, it is important to understand their limitations in order that the results are not over interpreted. This is particularly important to bear in mind when policy decisions are based upon analyses such as these. Accordingly, some key issues are outlined next. Some of these will be reflected in the recommendations made subsequently.

1. These analyses do not take into account any quantitative measure of merit because such data are not generally available for faculty at the UM campus. If quantitative measures of merit were available, some might question whether there exist potential biases in

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[3] See, e.g. Gray, M. W. (1993) Can statistics tell us what we do not want to hear? The case of complex salary structures (with discussion). Statistical Science 8:144–179.

determining those values. Hence, it has been suggested that objective measures of merit be calculated based, for example, on measures of scholarly productivity. However, for a large and complex institution such as UM, this is exceedingly difficult, not least due to interdisciplinary differences in the expectations of scholarly work. In some disciplines, published books are key indicators of success, while journal articles have that role in other disciplines, patents are important in some areas but not others, etc. Even among those disciplines that rely primarily on journal articles, for example, there are different conventions regarding order of authorship as an indicator of a person's contributions to the work. Thus, a database such as Web of Knowledge provides only partial information, at most, about the quality of a scholar's work.

As a result, the analyses performed here and their interpretations are based on the assumption that, given the adjustment factors used in the regression models, men and women are equally meritorious, *overall*. This certainly does not preclude the possibility that merit might vary considerably from individual to individual. This leads to the next point.

2. These results have very little to say about a given individual. The regression results of this report are useful for understanding broad trends but, absent quantitative merit data, these methods cannot assess whether a gap in salary exists for any given individual. Indeed, even in a school where there is an *average* estimated gap favoring women (such as Design), it could still be the case that there exists a female faculty member whose salary is too low. Likewise, in a college (e.g. CLA) where there is an average estimated gap favoring male faculty, there might still be some female faculty whose salaries are too high relative to their merit.

3. The methods employed here, and the results obtained, cannot be considered to provide a *proof* that there is a gender gap in salary, not least because, as noted, merit data were unavailable. Consequently, for a given school or college, it could be that a sizeable average gap in salary exists between male and female faculty, but upon examining merit information, it is clear in that instance that the gap is justified. Accordingly, it cannot be argued that the estimated regression coefficient for gender must always be zero. However, a large regression coefficient serves as a sentinel that further investigation of salaries is warranted. Moreover, if upon examination a gap is allowed to stand, then the reasons for doing so must be well-articulated and supportable. This holds whether the estimated gap is positive (favoring women) or negative (favoring men).

4. An issue often raised in the context of the use of regression analyses is whether the p-values ordinarily calculated in a regression analysis have meaning, because the data in this study involve a "population" rather than a sample.[4] The approach that is taken in

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[4] See Freedman and Lane (1983) A nonstochastic interpretation of reported significance levels. Journal of Business and Economic Statistics 1:292–298. They argue that the formal application of significance tests can still serve a descriptive purpose; a large significance value suggests that a non-zero regression coefficient arises simply "accidentally." With that interpretation in mind, note that in the aggregate analyses, the with-rank and without-rank estimated gaps (-1.8% and -2.5%, resp.) have corresponding p-values of 0.072 and 0.014. (See SPSS output in Appendix.)

this report is to focus on the size of the regression coefficients and on the consistency of patterns observed across various analyses. From that perspective, the estimated gender gaps cited in this report can be viewed as adjusted averages. For example, based on the values that appear in the table on page 2, on average, male assistant professors are paid about 4.4% more than female assistant professors. However, this gap in salary reflects no adjustments for the factors included in the regression analyses. Once various adjustment factors are taken into account, it is estimated that female assistant professors are paid, on average, more than male assistant professors by about 0.4% (page 5).

Conclusions and Recommendations

Based on the statistical analyses summarized in this report, after taking into account various factors thought to influence faculty salary (but not merit), there is evidence that male faculty are, overall, paid an average of 2.2% more than female faculty. Although the overall figure of 2.2% is relatively modest in size, that figure is based on a very large group of individuals. Accordingly, it seems incorrect to conclude that there is no gender gap in salaries. The issue is to determine where it arises.

More detailed analyses provide evidence that this gap in salary is not evenly distributed across the schools/colleges nor is it evenly distributed across the ranks. Because the population sizes shrink as we look at smaller units, it becomes more difficult to use these methods to ascribe a gap to any particular department or smaller unit. Moreover, as noted in the preceding section, these conclusions do not identify specific individuals whose salary warrants adjustment. Further, these methods do not identify the causes of any gap in salary, and indeed, in some circumstances a gap in salary between male and female faculty might be justifiable based on merit or other information. All of these concluding remarks lead to the following recommendations.

<u>Recommendations</u>

1. *Develop a system for identifying and correcting cases where an individual's salary should be appropriately adjusted.* Although many processes for that exist, one used successfully at the University of Wisconsin-Madison might serve as a starting point. In a 1993 exercise, Gender Equity Pay Adjustment Committees (GEPACs) were formed for departments or groups of departments to determine, on a case-by-case basis, the size of the adjustment appropriate for each eligible woman faculty member. The GEPAC committees were to make their decision for each female faculty by examining her record and those of three male faculty deemed by the GEPAC to be comparable. Comparables were to be chosen on the basis of (in order of importance): (1) years since degree; years of work experience relevant to the position; years of service at UW–Madison; (2) responsibilities of the position, nature of work performed (e.g., laboratory research as opposed to extension/outreach); (3) rank; (4) affiliation with a particular department, program, center, office, etc. Comparables were to be chosen from within the department, unless the male faculty members in the department were so unlike the female

faculty with respect to the listed variables that valid judgments could not be made. Comparables chosen from outside the department were to be chosen from units that do similar work, ideally with similar market value. Gender equity adjustments were to be made taking into account justifiable differences in pay based on degrees attained, years since terminal degree, years of experience, rank, differences in responsibilities, differences in market, and differences in performance. The latter was to be based on cumulative career merit, based on qualitative and/or quantitative assessments of performance in teaching, research, outreach, and service as appropriate to the departmental missions and/or the individual's job description.

It should be noted that an annual salary review similar to the above is now conducted at UW-Madison to identify whether salary inequities have occurred, although the responsibility for doing so now lies with department chairs, deans, and the provost rather than ad hoc GEPACs.

Note that an across-the-board remedy whereby each female faculty member receives a salary adjustment of 2.2% is *not* recommended. While comparatively simple to implement, such a remedy does not address the variation in gender gaps across schools/colleges or across ranks. With an across-the-board adjustment, some female faculty with egregiously low salaries will still have egregiously low salaries, while some others who do not merit an adjustment will receive one. Moreover, the differences between the "interaction" and "separate regressions" results indicate that an across-the-board approach within individual colleges and schools would also be inappropriate.

2. *Work to identify the causes of salary inequities, and develop policies to prevent their recurrence.* This is a potentially challenging policy issue. For example, a potential major source of salary inequity is retention in response to outside offers. Some have advocated making no response at all; the opposite extreme is to only make major adjustments to salaries when an outside offer is in hand. The former ignores the market; the latter has salaries driven almost exclusively by the market. A possible middle position is to respond to outside offers for faculty, recognizing that such offers do help to identify a market valuation for a faculty position, but recognize, in addition, that for reasons of equity, others in the same department might merit a salary increase. Such a policy of placing equity at the forefront emphasizes the real cost of a response to an outside offer.

   Similar things could be said about starting salaries for new faculty. One perspective is that it should be the chair's and dean's responsibility to ensure that the salary of a new hire is equitable. If the market drives salaries up for new hires, then equity for existing faculty might become a problem and may need addressing.

   Some other factors that can lead to salary inequity can include differential assignment of teaching and other duties, differential assignment of laboratory space, starting rank, committee assignments, etc. Policies should exist to ensure that equity in these factors is maintained and monitored. (The MIT study[5] is a striking example of an institutional reaction to equity concerns regarding facilities, workloads, etc.)

3. *Routinely monitor faculty salaries at the institutional level.* A form of Recommendation 1 above can be implemented annually at the department level, and this can provide local monitoring of salaries. It can be valuable, however, to also repeat the work of this report, at least for the aggregate analyses. Once systematized, this can provide an overall view of faculty salaries. The process of conducting these analyses can, if done centrally, also serve as a reminder of the need for and value of maintaining vigilance in monitoring and addressing salary inequities as they arise, and can aid in preventing the occurrence of gender gaps in faculty salaries in the future.

[5] Massachusetts Institute of Technology, 1999, A study on the status of women faculty in science at MIT.

Appendix

Additional technical details regarding the regression analyses conducted for this report follow.

Variables Used in the Regressions

NAT_LOG_SAL_9mo Projected 2007 faculty salaries were converted, if necessary, to a 9-month basis and then a natural logarithm transformation was used. Accordingly, to convert the gender coefficient from a regression model provided in the appendix to a percentage difference in annual salaries, one calculates: percentage = $e^b - 1$ where b is the parameter estimate from the regression. The log transformation of salaries therefore converts estimated gaps into percentage gaps, which is appropriate because salary changes usually occur on a percentage basis. In addition, this transformation helps to reduce heteroscedasticity in the data, an important assumption in regression modeling.

FEMALE An indicator variable with Male = 0; Female = 1.

UNDER_REP_MIN Equals 1 if a member of an underrepresented minority; 0 otherwise.

prior_exp Number of years from terminal degree to time of hire as UM faculty member. An alternative would have been to use years since terminal degree. However, using prior_exp reduces the potential for multicollinearity, especially with **yrs_asst, yrs_assoc, yrs_prof, FAC_EXP** variables below. That said, all correlations between the explanatory variables are small for these data (i.e. <.3), except between **yrs_assoc**, and **yrs_prof** (corr = -.5), which is not surprising. Consequently, we should be cautious to not over interpret the coefficients for **yrs_assoc** and **yrs_prof**, but beyond that there is no reason for concern regarding the gender gap estimates.

NLMR Natural log of "market ratio." Market ratio was defined as the average salary at peer institutions for a given field and rank divided by the average peer salary for all fields of a given rank. Used to differentiate market differences in disciplines.

NLMR_ALL Natural log of average salary at peer institutions for a given field divided by the average peer salary for all fields. (This is essentially a weighted average of the market ratios in NLMR weighted for the proportion of faculty in the three ranks.) Used in the analyses that excluded rank as an adjustment factor.

PROF_DUMMY Equals 1 if rank is full professor.

ASSOC_DUMMY Equals 1 if rank is associate professor. (Assistant professor is the excluded category.)

yrs_asst Number of years in rank as assistant professor at UM.

yrs_assoc Number of years in rank as associate professor at UM.

yrs_prof Number of years in rank as full professor at UM.

FAC_EXP Number of years as a faculty member at UM (equals total of the above three). Used in the analyses that excluded rank as an adjustment factor.

Department For each department, a 0/1 variable indicating membership in the department. Note that the School of Public Health is not formally departmentalized, and thus division labels were used instead.

F_x_TCLA, F_x_TLAW, ... Indicator variables =1 if individual is a female member of a specified college or school; 0 otherwise. Equivalently, the product of an indicator variable for gender and an indicator variable for college/school.

The following material displays the output (slightly edited, to save space) from SPSS in fitting the aggregate regression models, with and without rank. Also to save space, output from other analyses are not shown.

All data analyses were performed by Dr. Leonard Goldfine, Assistant Director of the UM Office of Institutional Research, whose work on this project is deeply appreciated.

Aggregate Model Including Rank

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.875[a]	.765	.750	.167609305008017

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	141.139	100	1.411	50.240	.000[a]
	Residual	43.375	1544	.028		
	Total	184.515	1644			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.241	.026		438.436	.000
	FEMALE	-.018	.010	-.025	-1.801	.072
	UNDER_REP_MIN	-.010	.020	-.007	-.503	.615
	prior_exp	.002	.001	.048	2.989	.003
	NLMR	.498	.090	.274	5.510	.000
	PROF_DUMMY	.461	.016	.688	27.997	.000
	ASSOC_DUMMY	.177	.015	.244	11.486	.000
	yrs_asst	-.009	.002	-.084	-4.662	.000
	yrs_assoc	-.005	.001	-.129	-7.331	.000
	yrs_prof	.000	.001	-.016	-.749	.454
	TALA396	-.026	.048	-.008	-.555	.579
	TALA432	-.061	.047	-.019	-1.301	.193
	TALA434	-.091	.073	-.016	-1.247	.213
	TCBS439	-.061	.050	-.017	-1.203	.229
	TCBS440	-.094	.170	-.007	-.551	.582
	TCBS441	-.033	.039	-.013	-.840	.401
	TCBS442	.090	.121	.009	.738	.460

TCBS443	-.177	.047	-.053	-3.757	.000
TCBS445	-.106	.042	-.037	-2.536	.011
TCED298	.066	.047	.020	1.394	.163
TCED299	-.127	.040	-.049	-3.176	.002
TCED300	-.086	.049	-.025	-1.754	.080
TCED301	-.039	.042	-.015	-.940	.347
TCED302	-.037	.050	-.010	-.740	.459
TCED304	-.291	.068	-.060	-4.272	.000
TCED397	-.097	.048	-.028	-1.993	.046
TCED399	-.191	.046	-.059	-4.185	.000
TCED507	-.079	.044	-.026	-1.791	.073
TCLA415	-.177	.051	-.048	-3.464	.001
TCLA446	.206	.192	.015	1.071	.285
TCLA451	-.081	.080	-.013	-1.008	.314
TCLA452	.117	.102	.015	1.139	.255
TCLA453	.094	.060	.022	1.563	.118
TCLA455	-.086	.048	-.025	-1.786	.074
TCLA456	-.112	.064	-.023	-1.747	.081
TCLA457	-.049	.122	-.005	-.401	.688
TCLA459	-.160	.058	-.037	-2.771	.006
TCLA461	.018	.061	.004	.295	.768
TCLA462	-.067	.054	-.017	-1.255	.209
TCLA464	-.156	.064	-.032	-2.417	.016
TCLA465	.363	.055	.127	6.601	.000
TCLA466	-.119	.038	-.051	-3.176	.002
TCLA468	-.095	.055	-.024	-1.706	.088
TCLA469	-.055	.048	-.016	-1.150	.250
TCLA470	-.099	.054	-.026	-1.835	.067
TCLA471	-.092	.035	-.042	-2.610	.009
TCLA477	-.016	.045	-.005	-.349	.727
TCLA481	-.149	.038	-.069	-3.888	.000
TCLA482	-.128	.047	-.039	-2.739	.006
TCLA484	.008	.039	.003	.199	.842
TCLA485	.083	.035	.038	2.373	.018
TCLA492	-.037	.040	-.014	-.933	.351

TCLA493	-.084	.055	-.021	-1.515	.130
TCLA495	-.158	.054	-.040	-2.944	.003
TCLA499	.030	.048	.009	.614	.539
TCLA501	-.078	.049	-.025	-1.593	.111
TCLA502	-.132	.050	-.039	-2.616	.009
TCLA504	-.033	.068	-.006	-.488	.626
TCLA757	-.193	.061	-.042	-3.175	.002
TCOA403	-.160	.052	-.042	-3.064	.002
TCOA405	-.049	.046	-.016	-1.061	.289
TCOA407	-.094	.037	-.039	-2.524	.012
TCOA408	-.115	.042	-.041	-2.765	.006
TCOA409	-.095	.050	-.028	-1.898	.058
TCOA410	-.218	.044	-.078	-5.000	.000
TCOA411	-.226	.046	-.072	-4.950	.000
TCOA412	-.093	.043	-.033	-2.148	.032
TCOA413	-.115	.046	-.039	-2.487	.013
TCOA414	-.127	.051	-.036	-2.493	.013
TCOA416	-.086	.054	-.025	-1.606	.109
TCSM323	-.851	.174	-.063	-4.900	.000
TCSM327	.290	.081	.071	3.590	.000
TCSM330	.312	.077	.088	4.047	.000
TCSM331	.291	.062	.064	4.674	.000
TCSM332	.260	.061	.060	4.266	.000
TCSM333	.212	.067	.062	3.178	.002
TCSM338	.145	.075	.034	1.931	.054
TCSM339	.223	.063	.067	3.545	.000
THHH349	.014	.045	.005	.314	.753
TIOT514	.062	.051	.017	1.211	.226
TIOT518	.078	.042	.030	1.867	.062
TIOT519	-.070	.037	-.030	-1.892	.059
TIOT520	-.017	.038	-.007	-.453	.651
TIOT521	.053	.040	.023	1.321	.187
TIOT522	.079	.038	.035	2.067	.039
TIOT524	-.133	.044	-.043	-3.043	.002
TIOT530	.048	.037	.021	1.302	.193

TIOT533	.008	.035	.004	.226	.822
TIOT844	.020	.062	.004	.317	.752
TLAW363	.178	.052	.081	3.437	.001
TPHR655	-.043	.035	-.020	-1.241	.215
TPHR657	-.170	.170	-.013	-1.002	.316
TPHR658	.120	.121	.012	.993	.321
TPHR659	-.042	.169	-.003	-.251	.802
TPHR819	.005	.121	.001	.045	.964
TPHR897	-.088	.060	-.019	-1.450	.147
TPHR936	.473	.170	.035	2.787	.005
TPUB_biostat	.053	.051	.015	1.022	.307
TPUB_EnvHS	-.099	.049	-.028	-2.016	.044
TPUB_Epid	-.018	.038	-.008	-.476	.634
TPUB_HlthMgmt	.198	.043	.068	4.554	.000

a. Dependent Variable: NAT_LOG_SAL_9mo

Aggregate Model Excluding Rank

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.865[a]	.748	.733	.173245532760104

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	138.166	96	1.439	47.952	.000[a]
	Residual	46.432	1547	.030		
	Total	184.598	1643			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	11.520	.026		438.517	.000
	FEMALE	-.025	.010	-.035	-2.449	.014
	UNDER_REP_MIN	-.011	.021	-.007	-.542	.588
	prior_exp	.005	.001	.092	5.869	.000
	NLMR_ALL	.840	.027	.735	30.891	.000
	FAC_EXP	-.001	.001	-.019	-.996	.319
	TALA396	-.012	.048	-.004	-.257	.797
	TALA432	-.059	.048	-.018	-1.211	.226
	TALA434	-.042	.075	-.007	-.556	.578
	TCBS439	-.082	.052	-.022	-1.582	.114
	TCBS440	-.152	.175	-.011	-.868	.386
	TCBS441	-.029	.041	-.011	-.697	.486
	TCBS442	.041	.125	.004	.331	.741
	TCBS443	-.225	.048	-.068	-4.679	.000
	TCBS445	-.083	.043	-.029	-1.922	.055
	TCED298	.049	.048	.015	1.021	.308
	TCED299	-.096	.041	-.037	-2.350	.019

TCED300	-.086	.051	-.024	-1.698	.090
TCED301	.014	.041	.005	.354	.724
TCED302	-.011	.051	-.003	-.224	.822
TCED304	-.423	.066	-.088	-6.433	.000
TCED397	-.061	.050	-.018	-1.223	.222
TCED399	-.188	.047	-.058	-3.989	.000
TCED507	-.090	.045	-.029	-1.979	.048
TCLA415	-.146	.052	-.040	-2.809	.005
TCLA446	-.145	.177	-.011	-.820	.412
TCLA451	-.123	.082	-.020	-1.493	.136
TCLA452	.190	.103	.024	1.844	.065
TCLA453	.150	.061	.035	2.475	.013
TCLA455	-.069	.049	-.020	-1.397	.163
TCLA456	-.095	.066	-.020	-1.452	.147
TCLA457	-.030	.126	-.003	-.236	.814
TCLA459	-.194	.060	-.045	-3.256	.001
TCLA461	.048	.063	.011	.768	.443
TCLA462	-.086	.055	-.022	-1.554	.120
TCLA464	-.107	.066	-.022	-1.631	.103
TCLA465	.237	.045	.083	5.289	.000
TCLA466	-.088	.038	-.038	-2.341	.019
TCLA468	-.070	.056	-.018	-1.246	.213
TCLA469	-.054	.049	-.016	-1.093	.275
TCLA470	-.055	.054	-.015	-1.028	.304
TCLA471	-.071	.036	-.033	-1.970	.049
TCLA477	-.031	.045	-.010	-.686	.493
TCLA481	-.104	.037	-.048	-2.836	.005
TCLA482	-.119	.048	-.036	-2.468	.014
TCLA484	-.053	.040	-.021	-1.341	.180
TCLA485	.075	.036	.034	2.070	.039
TCLA492	-.051	.041	-.019	-1.254	.210
TCLA493	-.046	.056	-.012	-.815	.415
TCLA495	-.141	.055	-.036	-2.555	.011
TCLA499	-.001	.049	.000	-.012	.991
TCLA501	-.038	.048	-.012	-.797	.426

TCLA502	-.083	.050	-.024	-1.664	.096
TCLA504	-.004	.070	-.001	-.052	.958
TCLA757	-.184	.063	-.040	-2.934	.003
TCOA403	-.122	.053	-.032	-2.288	.022
TCOA405	.004	.046	.001	.084	.933
TCOA407	-.105	.038	-.043	-2.741	.006
TCOA408	-.098	.042	-.035	-2.320	.020
TCOA409	-.046	.049	-.013	-.934	.350
TCOA410	-.158	.042	-.056	-3.722	.000
TCOA411	-.193	.046	-.062	-4.196	.000
TCOA412	-.051	.043	-.018	-1.180	.238
TCOA413	-.062	.045	-.021	-1.396	.163
TCOA414	-.083	.050	-.023	-1.639	.101
TCOA416	.020	.050	.006	.398	.691
TCSM323	-.958	.175	-.070	-5.466	.000
TCSM327	.063	.060	.015	1.052	.293
TCSM330	.094	.053	.027	1.757	.079
TCSM331	.252	.063	.056	4.010	.000
TCSM332	.174	.062	.038	2.784	.005
TCSM333	.042	.053	.012	.798	.425
TCSM338	-.030	.061	-.007	-.495	.620
TCSM339	.053	.050	.016	1.063	.288
THHH349	-.060	.043	-.021	-1.374	.170
TIOT514	.008	.052	.002	.163	.871
TIOT518	.019	.041	.007	.465	.642
TIOT519	-.096	.038	-.041	-2.552	.011
TIOT520	-.046	.039	-.019	-1.185	.236
TIOT521	-.029	.038	-.013	-.771	.441
TIOT522	.020	.037	.009	.536	.592
TIOT524	-.136	.045	-.044	-3.008	.003
TIOT530	.007	.037	.003	.179	.858
TIOT533	-.004	.036	-.002	-.116	.908
TIOT844	-.048	.063	-.011	-.765	.444
TLAW363	.049	.039	.022	1.246	.213
TPHR655	-.066	.036	-.030	-1.821	.069

TPHR657	-.140	.175	-.010	-.799	.425
TPHR658	.131	.125	.014	1.051	.294
TPHR659	-.049	.175	-.004	-.283	.777
TPHR819	-.007	.125	-.001	-.055	.956
TPHR897	-.098	.062	-.022	-1.570	.117
TPHR936	.449	.176	.033	2.558	.011
TPUB_biostat	.003	.051	.001	.066	.948
TPUB_EnvHS	-.140	.050	-.040	-2.779	.006
TPUB_Epid	-.068	.037	-.030	-1.822	.069
TPUB_HlthMgmt	.153	.044	.053	3.506	.000

a. Dependent Variable: NAT_LOG_SAL_9mo