NC State Tenured and Tenure Track Faculty Salary Equity Study – Fall 2012
April 24, 2014

Overview

In 2001 NC State retained Haignere, Inc. to conduct a faculty salary equity study based on Fall 2000 salaries. The 2001 results are reported in the "North Carolina State University Report on the University-Wide Salary Equity Study", which may be found online at http://oied.ncsu.edu/oied/epa_resources/sal_eqty_execsum.php. That year a substantial pool of funds was allocated to remedy salary inequities for women and non-white or international faculty. Using the same methodology, subsequent studies were conducted in 2003 and 2006 by NC State's University Planning and Analysis that found salary inequities remain but were greatly reduced on average. The 2006 study may be found online at http://oied.ncsu.edu/oied/gender_equity/Salary_Equity_Study_2007.pdf.

In Fall 2012, a committee composed of the Past Chair of the Faculty, a Special Assistant to the Provost, the Associate Vice Chancellor for Human Resources, the Vice Provost for Faculty Affairs, the Vice Provost for Institutional Equity and Diversity, the Assistant Vice Provost for Faculty Diversity, and University Planning and Analysis' Assistant Director revisited the study population and updated the methodology based upon newly available data.

The 2012 effort found salary gaps of varying magnitude across colleges and groups of faculty. When compared to salaries of white male faculty who are permanent residents or US citizens (US white males), women's mean salaries were less than expected in the Colleges of Natural Resources, Veterinary Medicine and Management, but higher than expected in the Colleges of Engineering, PAMS, CHASS, and Education. Other male faculty salaries (including all male faculty other than US white males) were less than predicted, on average, in the colleges of Textiles, Engineering, and Education, and were higher than predicted in the colleges of Design, Agriculture and Life Sciences, Veterinary Medicine, and PAMS. Averaged over the entire university, the salaries of non-white and international males and females were very close to their predicted values; the mean residuals were -$200 and $37, respectively. The mean for US white female faculty across NC State was $1097 above the predicted mean.

Methodology

The 2012 NC State Faculty Salary Equity Study employs a regression methodology similar to previous faculty salary equity studies at NC State. A regression equation is used to predict what the salaries for females and non-white and international males would be if their career attributes (such as rank, degree, and years of experience) were rewarded in the same way as those of US white males. Meritorious performance is not included as a factor in the regression analysis. For this study, "US white males" include white male faculty who are permanent residents or citizens of the U.S. and "other" or "non-white or international (NWI)" male faculty include all other male faculty. Note that faculty with named distinguished titles and faculty who served as deans or executive officers within the past five years (called "named distinguished faculty" for the rest of this report) were handled separately from other faculty. Because the range of salaries for this group was much wider than for others and because there are endowment or donor funds

associated with named distinguished faculty titles, this group was not included in fitting the regression model (called the "white male model"). Instead, their salaries, broken out by race/residency and gender, were predicted from the white male model based on their rank, degree and years of experience. To determine whether there are salary disparities for named distinguished faculty, the predicted salaries for women and non-white or international male named distinguished faculty were compared to the predicted salaries for US white male named distinguished faculty.

The white male models were fitted to salary data for 685 US white male faculty. The regression analysis was performed on full-time faculty in academic departments (excluding Division of Student and Academic Affairs) who are permanent, tenured or on tenure track, or on leave with pay as of September 30, 2012, and who are not named distinguished faculty as defined above. Administrators (e.g. department heads and deans) whose primary responsibility is not instruction were excluded from the study.

Regression analyses of the salaries of US white male tenured and tenure-track faculty were done separately for each academic college that employed at least 34 such faculty in the fall of 2012. Some small colleges with similar faculty salary distributions were combined to obtain enough faculty to fit the regression model. The following colleges were combined: (1) PAMS and Textiles; and (2) Design and Education. Faculty salaries were regressed on the following variables:

- Highest Earned Degree – PhD, First Professional, Master's, below Master's
- Tenure Status – not-yet tenured, tenured
- Rank – professor, associate professor, assistant professor
- College – (for PAMS, Textiles, Design and Education only)
- Market Salary – average of comparable institutions' mean salaries for tenured/tenure track faculty, sorted by faculty discipline and rank
- Previous experience – years between highest degree and first NC State hire date
- Years at NCSU Before Current Rank – years between hire date and current rank date
- Years at Current Rank – years between 2012 and current rank date

The primary source of market salary data is the annual CUPA-HR (College and University Professional Association for Human Resources) Faculty Salary Survey. CUPA-HR's surveys are considered the authoritative salary surveys in higher education, with more than 1,800 participating colleges and universities. Comparative analysis is conducted using NC State's 16 designated peer institutions. Where an insufficient number of institutions is available, a combined group of NC State's + UNC-Chapel Hill's designated peer institutions is utilized. Where necessary, such as for unique or specialized disciplines, HR will utilize a grouping of all public land-grant universities and/or all institutions with the same Carnegie designation of "Research Universities with Very High Research Activity." Draft ranges for the Colleges are vetted with each Dean and the Provost. Final ranges are approved by the Chancellor and reported annually to the Board of Trustees. In five cases, faculty were omitted from the regression because their discipline had no corresponding market salary.

The difference between the predicted salary and an employee's actual salary is called the salary residual. The mean residual for a gender/race/residency group measures the difference between the actual salaries of those in a group and a statistical estimate of what they would have been paid if they had been US white males. A negative mean residual indicates that, on average, the actual salaries of faculty members in the group (e.g., female faculty) are lower than salaries of US white males. A positive mean residual indicates that, on average, the actual salaries of those in the group are higher than those of US white males.

Predicted salary levels and residuals were computed for 247 US white women, 93 other women, 199 other males, and for 104 named distinguished faculty.

The salary equity study population and models differ from previous salary equity studies in several ways. The important new features are that (1) the 2012 model includes market salary information by discipline and rank obtained from a national survey of faculty salaries and, (2) some groups of faculty such as named distinguished faculty and those who have recently served as dean or executive officer have been removed from the US white male regression analysis and handled separately. In addition, the groupings of colleges have been changed slightly for 2012. In 2006, separate regression models were fit to data from CALS, Engineering CHASS and PAMS, but Design, Natural Resources and Education were grouped together into one model and Textiles, Management, and Veterinary Medicine were grouped together into another model. In 2012, PAMS + Textiles were grouped together and Education + Design were grouped together, but all other colleges had their own regression models. Finally, the 2012 study is restricted to tenured faculty and pre-tenure faculty on the tenure track, whereas the previous studies included non-tenure track faculty. A separate salary equity study of non-tenure track faculty will be conducted on 2013 data.

Results by Race/Ethnicity/Residency and Gender

The regression models explained 65% to 80% of the total variation in salaries of US white male faculty, except in the College of Agriculture and Life Sciences, where the model explained only 40% of the total variation in salaries. Table 1 provides the number of US white males used to fit each model as well as the R^2 for each model.

On average, women's salaries were about $6300 higher than predicted by the white male model in the College of Engineering, $2800 higher in PAMS, $2500 higher in CHASS, and $1500 higher than predicted in the College of Education (Table 1). On the other hand, women's salaries averaged $4500 less than predicted in the College of Natural Resources, about $2500 less than predicted in the College of Veterinary Medicine, and $1700 less than predicted in the Poole College of Management. For all female faculty combined, the mean of the residuals is about +$1100, which is to say that salaries averaged across all women in all disciplines are about $1100 greater than predicted (Table 1).

For US white women the average residual, $1500, is higher than for all women combined. US white women's average salaries are higher than predicted in six colleges, all but Management, Natural Resources, Veterinary Medicine and CALS. Other (non-white or international) women do not see this advantage. For this group, the average salary is about $5000 less than predicted

in the College of Veterinary Medicine and about $2000 less than predicted in the College of Education. Several of the colleges have too few women to report results separately (Table 1). Five colleges have fewer than 5 non-white and international women or fewer than 5 non-white or international men. The average salary of the 16 non-white and international faculty in these cases is about $3500 less than their predicted values. On the other hand, non-white or international women make about $4900 more than predicted in the College of Engineering. Across all non-white or international women at NC State, the salary average differs from the predicted value by just $37.

Salary residuals for non-white or international males also vary considerably across colleges. The average salaries are about $4100-$4200 higher than the predicted values from the white male model in the Colleges of Design and Agriculture and Life Sciences, and about $2500 higher than predicted in the College of Veterinary Medicine. On the other end of the spectrum, the salaries of non-white or international males average $3400 less than expected in Engineering and $2500 less than expected in Education. Across the university, non-white or international males also make very close to their predicted salaries on average; the mean of the residuals for this group is -$200.

Table 1. Regression Results. Number of observations used to fit white male regression model and R^2 value for each college. Means of residuals for other males, U.S. White females, and other females. Residuals are computed as actual salary minus salary predicted by the white male model.

	U.S. White Males		Other Males		All Females		U.S. White Females		Other Females	
	N	R^2	N	Mean Residual	N	Mean Residual	N	Mean Residual	N	Mean Residual
CALS	189	0.40	29	4124	73	-216	53	-405	20	286
Design	13	0.80	8	4195	13	338	10	*	3	*
Education	26	0.80	7	-2512	34	1483	26	2565	8	-2035
Engineering	113	0.76	70	-3359	28	6250	18	6992	10	4915
CNR	34	0.63	11	-882	14	-4493	11	*	3	*
CHASS	110	0.72	15	1036	90	2458	65	3079	25	846
PAMS	94	0.65	41	1673	34	2816	21	4831	13	-439
Textiles	15	0.65	4	*	16	-874	13	*	3	*
CVM	53	0.60	5	2464	25	-2455	20	-1826	5	-4974
PCOM	38	0.67	9	80	13	-1741	10	*	3	*
University Average	685		199	-200	340	1097	247	1498	93	37

* If the number of non-white and international female or male faculty in a given college is less than 5, mean residuals are not displayed. The mean of the residuals of the 16 non-white and international faculty in the 5 omitted entries is -$3508.

 A total of 104 named distinguished faculty are omitted from the salary equity study population (Table 2). In most of the academic colleges the named distinguished faculty make up a small fraction of the total faculty, ranging from 0 in Design to 9 in PAMS. However, in two colleges, Engineering and CALS, the group of named distinguished faculty and former administrators constitutes a large fraction of the faculty. In Engineering, named distinguished faculty make up 14% of all (33/244) tenured and tenure track faculty, and 24% of all tenured full professors. In the College of Agriculture and Life Sciences, named distinguished faculty make up 15% (44/291) of all tenured and tenure track faculty and 25% of the tenured full professors.

Seventy eight, or 75%, of the named distinguished faculty are US white males compared to 57% of all tenured and tenure track faculty and 69% of tenured full professors. White women, other women, and non-white or international males appear in the ranks of named distinguished faculty in slightly lower proportions, but not statistically significantly lower, as in the tenured full professor rank (12% of named distinguished faculty vs 14% of full professors, 1% vs 3%, and 13% vs 14%, for US white women, other women, and non-white or international males, respectively). Note that although the percentages of named distinguished faculty are similar across demographic groups, it would take increasing the number of US white women by 25% (3 faculty) and the number of non-white or international males by 15% (2 faculty) to increase their representation to 14% of the named distinguished faculty, and to increase the representation of non-white or international named distinguished women from 1% to 3% would require tripling their number from one to three named distinguished faculty.

Table 2 Demographics and Mean, Median, Minimum and Maximum of Residuals for Named Distinguished Faculty and Former Upper Administrators

		Number (Percent)			Residuals of Named Distinguished Faculty			
		Named Distinguished Faculty	All Tenured and Pre-Tenure Faculty	Tenured Full Professors	Mean	Median	Minimum	Maximum
Males	US White Males	78 (75%)	762 (57%)	431 (69%)	$29,787	$27,175	-$18,558	$102,091
	Other Males	13 (13%)	212 (16%)	89 (14%)	$29,397	$20,910	$353	$99,955
Females	US White Females	12 (12%)	259 (20%)	87 (14%)	$44,064	$44,386	-$6,870	$102,040
	Other Females	1 (1%)	95 (7%)	20 (3%)				
Total		104	1328	627				

The mean of the residuals for non-white and international male named distinguished faculty was similar to US white males, although the median was about $6000 lower than white males. This indicates that other males are clustered at the lower end of the distribution. The mean residuals for named distinguished women faculty, on the other hand, averaged $14,000 higher than US white males.

Limitations of the Study

The average residual salaries from the 2012 salary equity study are not directly comparable to the previous salary equity study results, because named distinguished faculty were omitted from the 2012 study, but were included in previous studies. There are three other differences from the previous studies that would affect attempts to compare results from the 2012 study to previous years: (1) In 2012, the median market salary from a nationwide survey of peer institutions was included as a covariate for each department and rank, which was not done in previous years; (2) different colleges were grouped together in 2012 than in 2006; and (3) in the models that included data from more than one college (i.e, for PAMS + Textiles and for Education + Design) a college indicator variable was included in the 2012 model, which had not been done in previous studies.

Several factors may confound analysis of salary equity. Of particular note are two factors, rank and tenure status, which may also be affected by race and gender and have a direct effect on salary. Consider the case of two faculty with the same length of service and the same salary, one an associate professor and one a full professor. The associate professor may appear to be highly paid for that rank, where the full professor with the same salary would be considered underpaid. Thus salary residuals of those who are not promoted will appear higher using this model than they would if rank and tenure status were omitted from the model.

Another factor, year of hire, may play a large role in faculty salaries during the recent economic recession, because there were several years of very small raises or none at all from 2008 to the present. The effects of the lack of raises persists for several years even when the faculty member is promoted. Faculty who were hired at the beginning of this period and then promoted to associate professor received the usual proportionate raise, e.g., 5%, but the percentage was based on a salary that was low, resulting in a low salary for an associate professor. If higher proportions of women and minority faculty were hired and promoted during recent years, the effects of the recession could disproportionately affect women and minority faculty. This study does not investigate this issue of salary compression. Neither does this study does address issues of salary adequacy or market-appropriate salaries; whether faculty groups are over- or underpaid relative their colleagues at other institutions was not considered.

Finally, this study's methodology does not address many college-specific salary considerations, which need to be evaluated outside this study's parameters. For example, in the College of Veterinary Medicine three college-specific issues skew the results but are not evaluated in this study: 1) differences in average age of white males and females/minority males; 2) faculty specialty status, which is not tracked in NCSU institutional personnel data; and 3) faculty possessing multiple doctoral degrees (PhDs with an DVM is common). Other colleges have their own distinct salary considerations.

Caution should be exercised in applying these results to individual salary determinations. Statistical analysis is useful for showing salary differences in the aggregate for factors included in the model, but it is important to remember that the model does not fully explain all variations in salary. For example, important quantitative measures of merit in teaching, research and service are not included. So while the model helps us identify individual circumstances requiring further analysis and review, salary adjustments must still be evaluated on a case-by-case basis.

Analysis

Salary equity for women and non-white or international male faculty is highly variable across academic colleges and must be addressed by each college. Averaged across all colleges, US white women's salaries are higher than US white men's, but there are some colleges where women's salaries lag men's by $2500 to $4500 on average, and some in which women's average salaries exceed men's by $2800 to as much as $6300. With respect to race, ethnicity, and citizenship, non-white or international male average salaries lag US white male salaries by $2500 to $3500 on average in some colleges, but there are also colleges in which they exceed the mean salaries of U.S. white males by $4100 to $4200. An important point to note is that in almost every college the mean salaries for non-white or international women are less than for US white women.

The salaries among named distinguished faculty and former administrators vary more widely than among other faculty, with some in this group making $100,000 more than the white male model would predict. The salaries among non-white or international male named distinguished professors appear to be more concentrated at the lower end of the salary range for named distinguished faculty. Women and non-white and international faculty appear to be slightly underrepresented among the named distinguished faculty. The mean salary of women who do hold named distinguished faculty titles or are former administrators is higher than that of similarly situated men.

Next Steps

To gain a better understanding of the different circumstances leading to the salary patterns in different colleges, the Salary Equity Study Team plans to follow up with more detailed analysis of the factors related to salaries in a small set of selected colleges, using the most current salary data available. Focusing on individual colleges will allow more detailed study of some factors such as subdiscipline, teaching load or emphasis on teaching vs research, and how year hired is related to salary compression. The first step of each college study will be to consult with the dean of the college for guidance on factors that would be of particular interest and explanatory value for the college. The goal of this detailed analysis will be to gain a better understanding of where there may be salary gaps between demographic groups that cannot be explained by other factors.