Report on Faculty Salary Equity at the University of California, Santa Cruz

January 2015

The primary goal of this study was to determine the relationships between gender and/or race/ethnicity, and faculty advancement in terms of either promotion or salary, taking into account that these vary by faculty members' department. This analysis is an extension of the Faculty Senate Committee on Faculty Welfare (CFW) analysis of March 2012. Data were updated to include rank, step, and salary as of July 1, 2013, and race/ethnicity and gender were added. Faculty paid on the fiscal year scales and faculty who earned their highest degree three years ago or less were excluded from all analyses. Regular scale and BEE scale faculty were analyzed separately. Following the CFW analysis, we focus on two concepts of equity. The first is promotion growth, which measures how quickly faculty progress through the ranks, and is measured in two ways (one for the total career, one for the time while at UCSC). The second major concept is salary. In all cases, we were concerned with whether there are differences by gender and/or race/ethnicity, after accounting for other relevant factors (particularly time since degree and department).

A cursory analysis that only looks at gender or ethnicity does find differences in both promotion growth and salary. However, further analysis that takes into account the department of the faculty finds that differences can largely be explained by departmental differences, and that after department is taken into account, there are no longer statistically significant differences by gender or ethnicity. We use department primarily as a proxy for discipline, as there are clear differences in salary by discipline (the most obvious example being that the University of California has a separate pay scale for Business/Economics/Engineering). From a statistical perspective, department is the most important explanatory variable, in that the strongest association between promotion and salary is with department.

It is important to note that this statistical analysis does not provide an answer as to why there are differences by department. We note that departmental differences are correlated with gender, so that departments with higher proportions of men tend to have higher salaries and promotion growth (but that there does not appear to be inequity by gender within these departments). In our conclusions, we speculate on a few possibilities for why this is so, and we provide some recommendations on moving towards improved overall equity by gender and ethnicity.

Promotion Growth
In order to quantify rank/step and to take into account overlapping steps we converted rank and step into the normative equivalency in years since earning highest degree implied by the rank and step scales where:

Assistant Professor, Step 1=1 year; 2=3; 3=5; 4=7; 5=9; 6=11;
Associate Professor, Step 1=9 years; 2=11; 3=13; 4=15.5; 5=18.5;
Professor Step 1=15.5 years; 2= 18.5; 3=21.5; 4=24.5; 5=27.5; 6=30.5; 7=33.5; 8=36.5; 9=39.5; and Above Scale=42.5.

Two measures of "Promotion Growth" used in the March 2012 CFW study were considered. Both metrics indicate the actual rate of promotion relative to the normative rate of promotion implied in the scales using the same conversion of rank/step to years equivalency.

The first indicator, PG1, is the normative number of years it takes to achieve each rank and step from the time of highest degree earned, divided by the actual number of years taken. A promotion growth factor of 1 represents "normal" progression through the ranks and steps.

$$PG1 = \frac{time\ equivalence\ of\ rank\&step(years)as\ of\ July\ 2013}{years\ since\ degree}$$

This approach assumes that time spent on other jobs or in post-docs prior to being hired at UCSC is captured by the rank/step at initial hire (e.g., a faculty hired at Assistant Professor Step 3 graduated about 5 years prior).
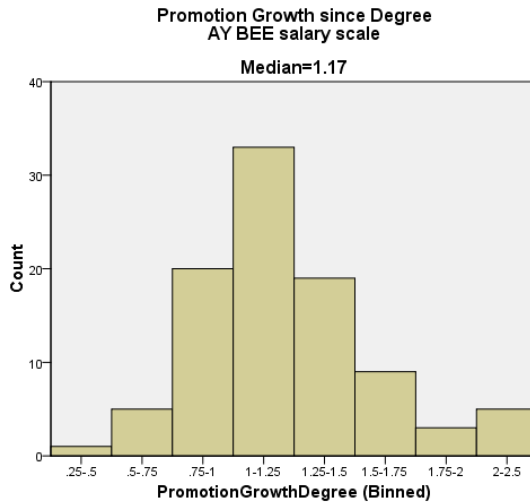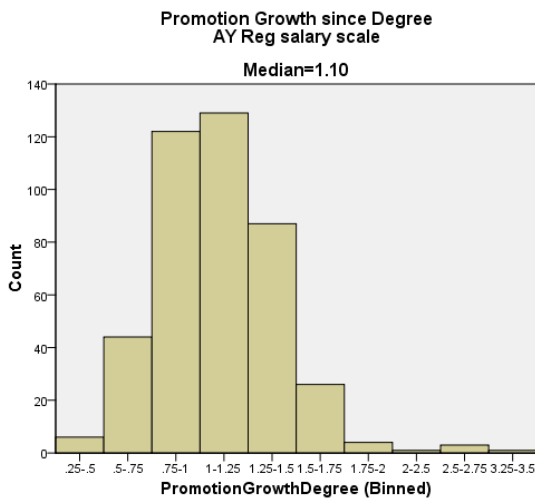

The median promotion growth factor based on the number of years since earning the highest degree (PG1) was 1.1 and 1.17 among regular scale and Business/Economics/Engineering (BEE) scale faculty respectively, indicating that slightly more than half of faculty across departments had been promoted at the "normal" rate or faster than presumed by the ranks/steps and typical years between reviews.

The second indicator of promotion growth (PG2) is the normative number of years since earning the highest degree using the same time equivalencies, minus the normative time to achieve the rank/step at the time of hire, divided by the number of years of service.

$$PG2 = \frac{time\ equiv.\ of\ rank\ \&\ step\ July\ 2013 - time\ equiv.\ of\ rank\ \&\ step\ at\ hire}{years\ of\ service}$$

This indicator focuses only on advancement while at UCSC, while PG1 measures the whole career.
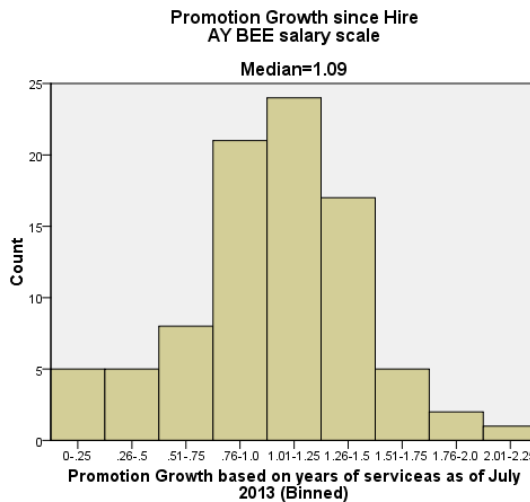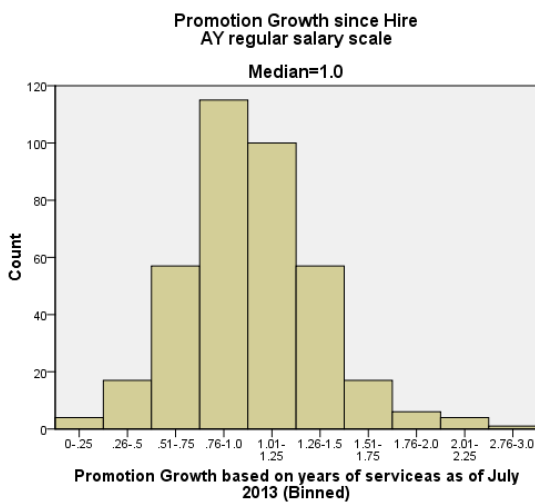
The median promotion growth since initial hire was 1.0 for regular scale and 1.09 for BEE scale faculty indicating that half of the current regular scale faculty advanced more quickly than the normative rate and half less quickly. As with PG1, the ratio of normative time to actual time to rank/step was slightly higher among BEE faculty.
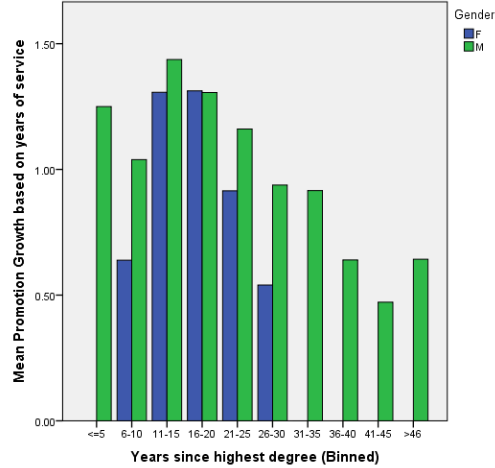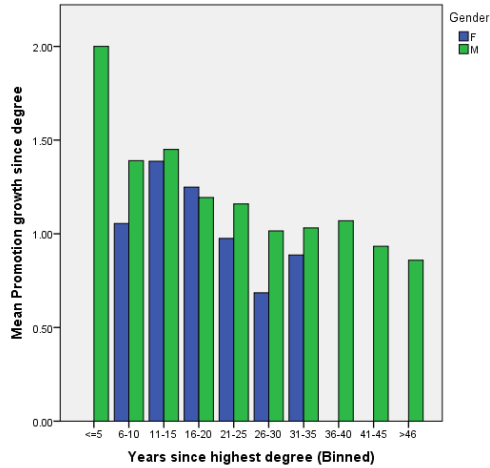
Promotion Growth by Gender

To understand the relationship between gender and promotion through the ranks/steps without regard to faculty department, a factor known to be related to promotion, we conducted linear regression on each of the promotion growth metrics for both regular scale and BEE scale faculty. Among regular salary scale faculty gender was significantly predictive of promotion growth based on time since earning the highest degree (PG1) prior to taking department into account (with women being an average of 1.7 years behind men in advancing through the ranks), but was not significantly associated with promotion growth based on years of service. The differential results of the relationship of gender to promotion growth among regular scale salary faculty based on whether years of service or years since degree was used to calculate growth, suggest that the differences between women and men in rank/step relative to years since highest degree may indeed be the result of differences in rank/step at time of hire as opposed to progression through the steps after hire. As we will see below, this difference can be explained by departmental differences.

Promotion Growth for Regular Scale Faculty for years since degree and years of service by Gender
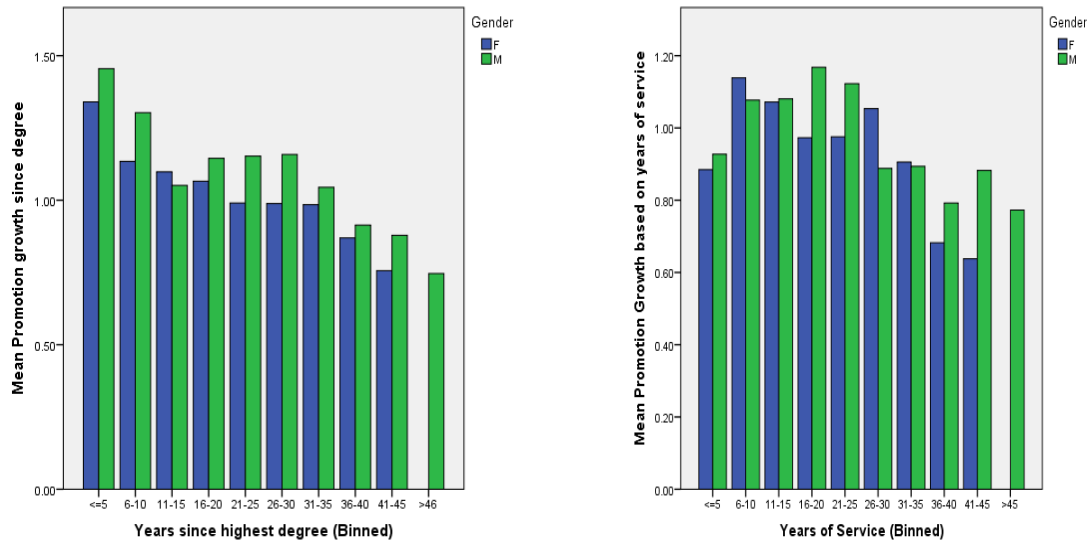
The apparent gender differences in promotion growth whether calculated as a function of years since highest degree (with women being an average of 1.8 years behind men in advancing through the ranks) or years of service across nearly the entire career among faculty on the BEE scale were not statistically significant. This lack of significance may reflect a lack of power related to small and unequal sample sizes.

**Promotion Growth for BEE Scale Faculty for years since degree and years of service by Gender**

Promotion Growth by Race/Ethnicity

The relationship between race/ethnicity and promotion growth without regard to department was also evaluated using linear regression analysis. Among regular salary scale faculty, underrepresented faculty of color were on average 3 years behind white faculty in advancing through the ranks (i.e., a full step behind at the full professor level) relative to years since earning the highest degree (*p=.001)*, while Asian faculty were on average only one year behind and that difference was not statistically significant. A similar pattern did not exist among faculty on the BEE salary scale, where White faculty show slower, although not statistically significant, promotion growth than underrepresented or Asian faculty. As with the gender results, these differences can be explained by departmental differences, which are described below.

Promotion Growth Equity among Regular Salary Scale Faculty:
Prior analysis by CFW found that both promotion growth and salary varied by department. At least for salary, this makes sense as salary is primarily determined by market forces, with the salaries in some fields being higher than others, and so hiring and retention offers are driven by competing offers from other universities. It could also be the case that certain departments are able to hire more outstanding faculty, who are hired at a higher step than average, or that progress more quickly than average. Mean promotion growth by department is shown in the graph below, and there is clearly variability. (See Appendix for Department codes.) Thus a rigorous analysis needs to take department into account. We now add department to the analysis. For progression through the ranks, a linear regression was fit to predict each of the promotion growth factors from faculty members' department, gender, and race/ethnicity. Because of small sample sizes for some races/ethnicities, race/ethnicity was grouped into three categories: Underrepresented minority, Asian and White. Regular salary scale and BEE salary scale faculty were modeled separately.
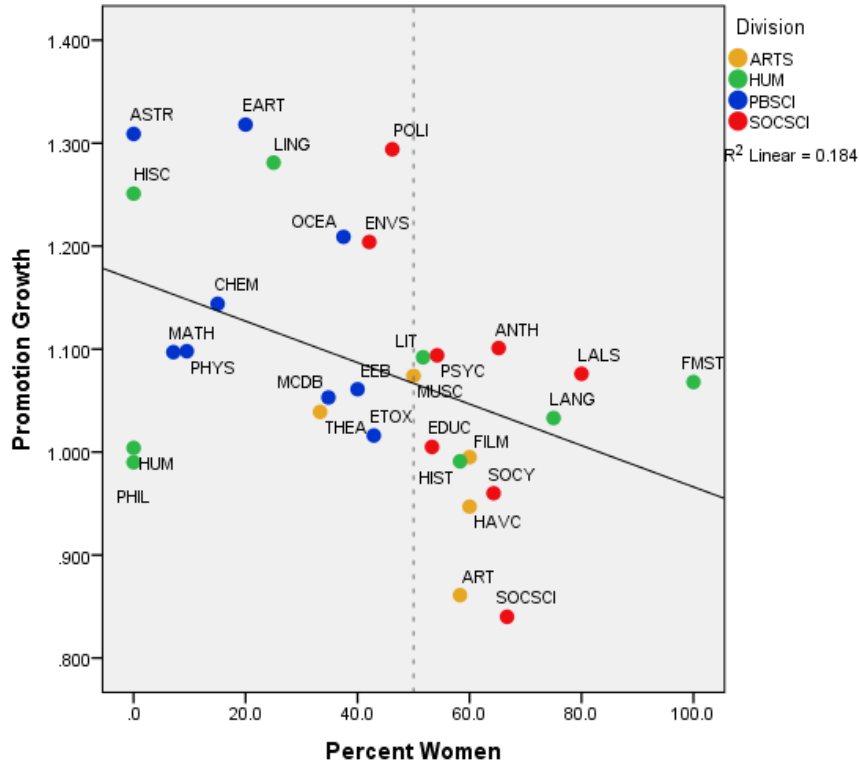
Promotion Growth for Regular Salary Scale Faculty by Department
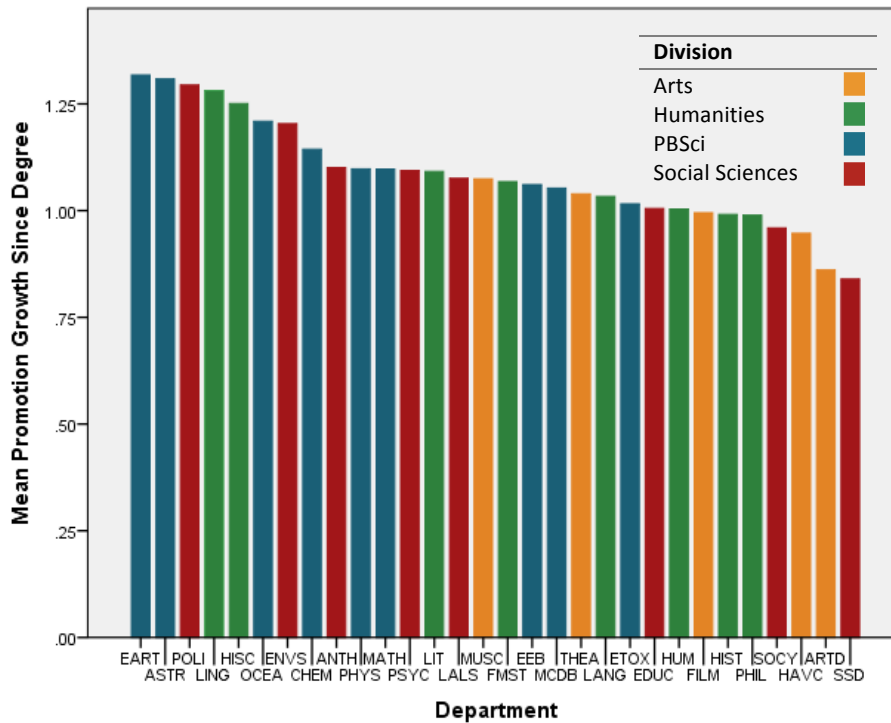
Linear regression results confirm the correlation between department and promotion growth, but neither gender nor race/ethnicity differences were statistically significant after department is taken into account (gender p=.217, Asian p=.151, UR p=.189, with the actual values being about half a month behind on average in advancement through the ranks). Department affiliation explains the average differences in promotion growth. For example, compared to Literature (which is the reference category, with regression coefficient set to 0), regular scale faculty in Art had lower average promotion growth since earning a degree, while faculty in Earth & Planetary Sciences had higher average promotion growth. (See Table 1.)

As Table 2 and the graph below indicate, departments with the highest average promotion growth have lower proportions of women faculty, *p<.05*. (See Appendix for Department codes.) Thus an apparent difference by gender is explained by the difference in department. The statistical analysis does not explain why this difference exists, but we provide some possibilities in our concluding discussion. This finding does point to the importance of additional efforts to move toward demographic balance in all departments.

Mean Departmental Promotion Growth for Regular Salary Scale Faculty by Percent Women

Salary Growth:

Salary growth was calculated using the CFW methodology, where salary growth represents an annualized percentage growth from base salaries of $65,000 and $80,000 for regular and BEE salary scale faculty respectively. These figures represent salaries in current dollars offered to recent Assistant Professors Step 1. Because this method uses a constant base salary the need for inflation adjustment is eliminated.

Median annualized salary growth from the constant base was 2.37 among regular salary scale faculty and 2.35 among BEE faculty. For reference, the average rates implied by the salary scales are 2.7 for regular scale and 2.1 for BEE faculty.

Salary Growth from "Base"
AY Regular salary scale
Median=2.37

Salary Growth from "Base"
AY BEE salary scale
Median=2.35
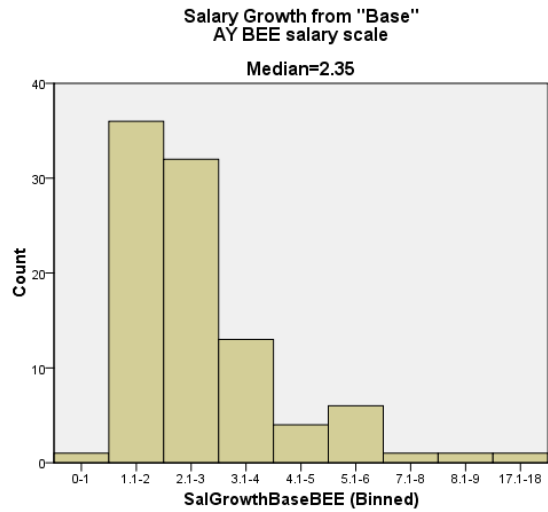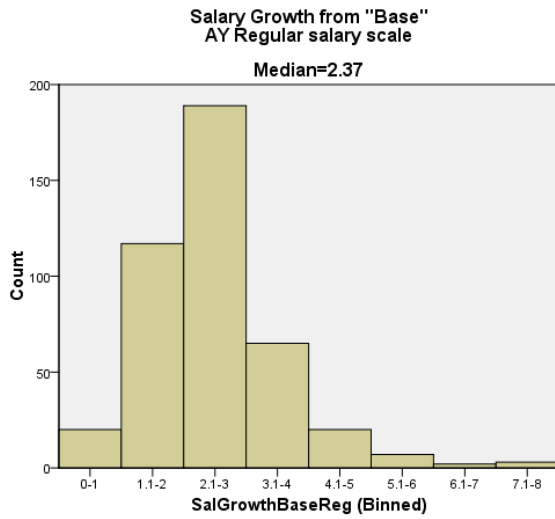
Salary by Gender

For faculty on both the regular and BEE salary scales it appears that on average salaries of men rise more over time compared to women before department is taken into account as measured by time since degree or years equivalence of rank/step.

Annual Salary of Regular Scale Faculty by Gender for years since degree and Rank/Step Equivalence
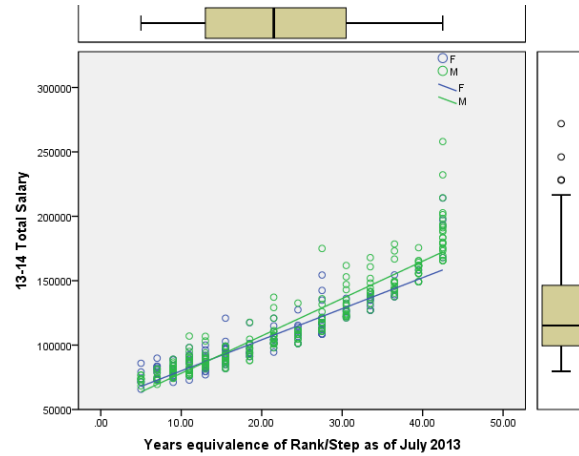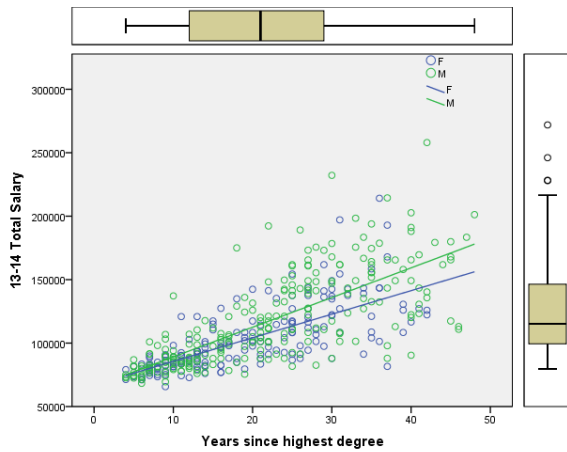
Annual Salary of BEE Scale Faculty by Gender for years since degree and Rank/Step Equivalence
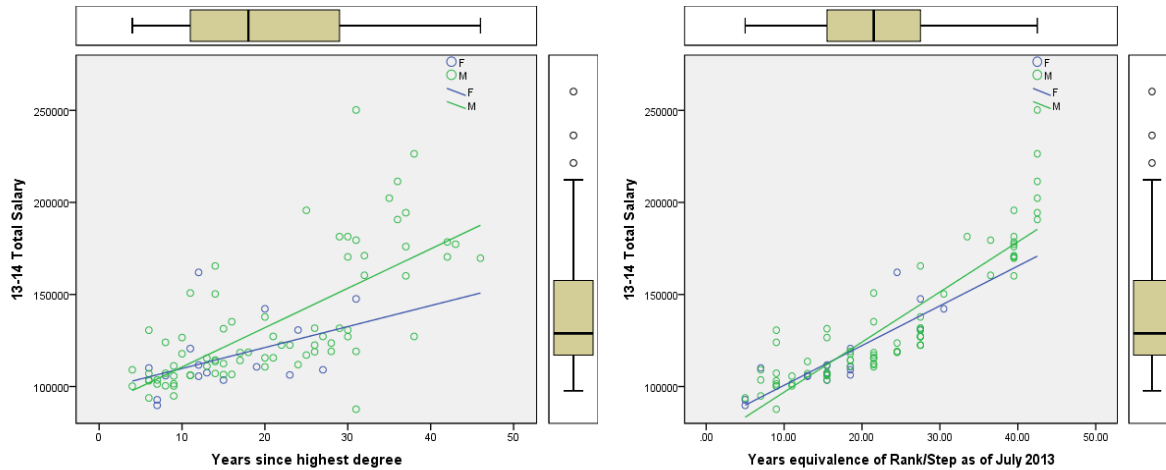
Salary Equity:
As with promotion growth, department has a known relationship with salary. For that reason we included department in the regression of (log) salary on years since degree. Department, gender, and race/ethnicity were included as additional covariates, with interaction terms with years since degree. Regular scale and BEE salary scale faculty were analyzed separately. (See Tables 3 and 4.)

As with promotion growth, no statistically significant differences were found. While years and department are important in the statistical prediction of salary, gender and race/ethnicity are generally not. The one exception is that on the BEE scale, the interaction effect for years since degree and Underrepresented minority is positive and statistically significant (p=0.042). This means that Underrepresented minorities experience larger average salary growth compared to Whites, of faculty on the BEE scale. It is worth noting that the coefficient for the intercept (a measure of base salary) is negative for Underrepresented minorities, although it is not significant. The implication here is that of BEE faculty, Underrepresented minorities appear to be hired at slightly lower salaries, but they experience larger salary growth over the time they are at UCSC.

Conclusions:
Both salary and promotion growth vary by department, in some cases with statistical significance. Thus it is important to control for department when looking for potential differences by gender or race/ethnicity. After taking into account department, regression analysis did not find statistical evidence of any systematic difference in promotion growth by gender or race/ethnicity, nor by gender or race/ethnicity in salary, either for a measure of salary at hire or for a measure of salary growth over time.

While differences in salary and advancement appear to be well-explained by department, it is important to note that some of the higher paid and faster advancing departments are not particularly diverse, such as Astronomy and Astrophysics, Earth and Planetary Sciences, and Economics. Our statistical analysis does not provide any answers as to why promotion and salary differ by department, but we can speculate on a few here. It could be that higher ranked departments are better able to hire faculty near the top of their fields, meaning that we hire them with larger initial salaries and that they continue to excel and get promoted faster. It could be that departments that are primarily male have a culture of more aggressive starting salary offers and of faster internal promotion, or that departments with more women have internalized sexisms that affect the culture of faculty putting themselves up for promotion. It is possible that departments with more women have stronger cultures of service, with more faculty doing excessive service that takes time away from their research. It might be entirely market-driven, and the fields that have higher market salaries tend to attract more men than women.

Regardless of why promotion and salary differ by department, it is clear that they do, and thus it is imperative for our campus to work hard to improve our diversity across all fields on our campus. Such efforts include pipeline efforts, helping graduate students that are more demographically representative. Over time, faculty hires should be more representative in all departments. We also need to help our faculty reach their potential, so improved mentoring can increase faculty success and try to ensure that there are not gender or ethnicity differences in when faculty put themselves up for promotion. We encourage the campus to consider annual monitoring of promotion and salary differences.

Table 1

Regression Model Predicting Promotion Growth of Regular Salary Scale Faculty

		Standardized Regression Weights
Department	Anthropology	.011
	Art	-.132*
	Astronomy & Astrophysics	.097
	Chemistry & Biochemistry	.024
	Earth & Planetary Sciences	.143*
	Education	-.047
	Ecology and Evolutionary Biology	-.035
	Environmental Studies	.071
	Microbiology & Environmental Toxicology	-.042
	Film & Digital Media	-.057
	Feminist Studies	.006
	History of Art & Visual Culture	-.066
	History of Consciousness	.052
	History	-.077
	Humanities Division	-.030
	Latin American & Latino Studies	.018
	Language Studies	-.017
	Linguistics	.098
	Mathematics	-.008
	Molecular, Cell, & Developmental Biology	-.033
	Music	-.011
	Ocean Sciences	.053
	Philosophy	-.057
	Physics	-.015
	Politics	.108
	Psychology	.002
	Sociology	-.077
	Social Sciences Division	-.075
	Theater Arts	-.041
	Literature (ref)	-
Gender	Women	-.065
	Men (ref)	-
Race/Ethnicity	Underrepresented of Color	-.073
	Asian	-.071
	White (ref)	-
	R^2	.144**
	N of respondents	415

*$p<.05$; **$p<.01$; ***$p<.001$

Table 2
Promotion Growth & Gender Distribution by Department of Regular Salary Scale Faculty

		Promotion Growth since Highest Degree		Gender
	N	Mean	Std. Deviation	Percent Women
Earth & Planetary Sciences	20	1.318	.244	20.0
Astronomy & Astrophysics	10	1.309	.388	0.0
Politics	13	1.294	.277	46.2
Linguistics	12	1.281	.285	25.0
History of Consciousness	3	1.251	.189	0.0
Ocean Sciences	8	1.209	.212	37.5
Environmental Studies	19	1.204	.528	42.1
Chemistry & Biochemistry	20	1.144	.234	15.0
Anthropology	23	1.101	.230	65.2
Physics	21	1.098	.212	9.5
Mathematics	14	1.097	.258	7.1
Psychology	24	1.094	.264	54.2
Literature	29	1.092	.305	51.7
Latin American & Latino Studies	10	1.076	.345	80.0
Music	14	1.074	.238	50.0
Feminist Studies	7	1.068	.183	100.0
Ecology and Evolutionary Biology	20	1.061	.217	40.0
Molecular, Cell, & Developmental Biology	23	1.053	.249	34.8
Theater Arts	12	1.039	.345	33.3
Language Studies	4	1.033	.285	75.0
Microbiology & Environmental Toxicology	7	1.016	.197	42.9
Education	15	1.005	.325	53.3
Humanities Division	2	1.004	.083	0.0
Film & Digital Media	15	.995	.237	60.0
History	24	.991	.305	58.3
Philosophy	7	.990	.243	0.0
Sociology	14	.960	.246	64.3
History of Art & Visual Culture	10	.947	.263	60.0
Art	12	.861	.402	58.3
Social Sciences Division	3	.840	.507	66.7

Table 3
Regression Models Predicting (log) Salary of Regular Scale Faculty

		Standardized Regression Weights
Years	Years since highest degree	.575***
Department	Anthropology	-.049
	Art	.031
	Astronomy & Astrophysics	.131
	Chemistry & Biochemistry	-.089
	Earth & Planetary Sciences	-.068
	Education	-.166
	Ecology and Evolutionary Biology	-.095
	Environmental Studies	-.010
	Microbiology & Environmental Toxicology	-.157
	Film & Digital Media	-.061
	Feminist Studies	-.120
	History of Art & Visual Culture	-.024
	History of Consciousness	-.270
	History	-.081
	Humanities Division	.156
	Latin American & Latino Studies	-.155*
	Language Studies	-.023
	Linguistics	-.032
	Mathematics	-.058
	Molecular, Cell, & Developmental Biology	-.106
	Music	-.120
	Ocean Sciences	-.127
	Philosophy	-.113
	Physics	-.127
	Politics	-.088
	Psychology	-.161
	Sociology	.026
	Social Sciences Division	.066
	Theater Arts	-.009
	Sociology	.026
	Literature (ref)	-
Gender	Women	.012
	Men (ref)	-
Race/Ethnicity	Underrepresented of Color	.076
	Asian	-.060
	White (ref)	-
Years from degree X Department Interaction	Years from degree X Anthropology	-.033
	Years from degree X Art	-.079
	Years from degree X Astronomy & Astrophysics	.015
	Years from degree X Chemistry & Biochemistry	.152
	Years from degree X Earth & Planetary Sciences	.188*
	Years from degree X Education	.177
	Years from degree X Ecology and Evolutionary Biology	.105
	Years from degree X Environmental Studies	-.012
	Years from degree X Microbiology & Environmental	.183*

	Toxicology	
	Years from degree X Film & Digital Media	.005
	Years from degree X Feminist Studies	.114
	Years from degree X History of Art & Visual Culture	-.009
	Years from degree X History of Consciousness	.292
	Years from degree X History	.077
	Years from degree X Humanities Division	-.126
	Years from degree X Latin American & Latino Studies	.184*
	Years from degree X Language Studies	.015
	Years from degree X Linguistics	.089
	Years from degree X Mathematics	.093
	Years from degree X Molecular, Cell, & Developmental Biology	.135
	Years from degree X Music	.118
	Years from degree X Ocean Sciences	.187*
	Years from degree X Philosophy	.070
	Years from degree X Physics	.227*
	Years from degree X Politics	.079
	Years from degree X Psychology	.234**
	Years from degree X Sociology	-.032
	Years from degree X Social Sciences Division	-.148
	Years from degree X Theater Arts	-.041
Years from degree x Gender Interaction	Years from degree X Women	-.072
Years from degree x Race/Ethnicity Interaction	Years from degree X Underrepresented of Color	-.142
	Years from degree X Asian	.030
	R^2	.702***
	N of respondents	415

*$p<.05$; **$p<.01$; ***$p<.001$

Table 4
Regression Models Predicting (log) Salary of BEE Scale Faculty

		Standardized Regression Weights
Years	Years since highest degree	.608**
Department	Applied Mathematics & Statistics	-.226
	Biomolecular Engineering	-.403*
	Computer Engineering	-.140
	Economics	.027
	Electrical Engineering	-.261
	School of Engineering	-.148
	Computer Science (ref)	-
Gender	Women	.074
	Men (ref)	-
Race/Ethnicity	Underrepresented of Color	-.285
	Asian	-.169
	White (ref)	-
Years from degree X Department Interaction	Years from degree X Applied Mathematics & Statistics	.030
	Years from degree X Biomolecular Engineering	.337
	Years from degree X Computer Engineering	-.164
	Years from degree X Economics	-.051
	Years from degree X Electrical Engineering	.171
	Years from degree X Technology & Information Management	-.069
Years from degree x Gender Interaction	Years from degree X Women	-.083
Years from degree x Race/Ethnicity Interaction	Years from degree X Underrepresented of Color	.357*
	Years from degree X Asian	.185
	R^2	.639***
	N of respondents	93

*p<.05; **p<.01; ***p<.001

Appendix
UC Santa Cruz Academic Departments

Dept. Abbreviation	Department Name
ANTH	Anthropology
ART OR ARTD	Art
ASTR	Astronomy & Astrophysics
CHEM	Chemistry & Biochemistry
EART	Earth & Planetary Sciences
EDUC	Education
EEB	Ecology and Evolutionary Biology
ENVS	Environmental Studies
ETOX	Microbiology & Environmental Toxicology
FILM	Film & Digital Media
FMST	Feminist Studies
HAVC	History of Art & Visual Culture
HISC	History of Consciousness
HIST	History
HUM	Humanities Division
LALS	Latin American & Latino Studies
LANG	Language Studies
LING	Linguistics
LIT	Literature
MATH	Mathematics
MCDB	Molecular, Cell, & Developmental Biology
MUSC	Music
OCEA	Ocean Sciences
PHIL	Philosophy
PHYS	Physics
POLI	Politics
PSYC	Psychology
SOCY	Sociology
SSD OR SOCSCI	Social Sciences Division
THEA	Theater Arts