

MSCA's Findings on Gender Bias in Full-Time Faculty Salaries

Data Analysis towards a Deeper Understanding

October 2, 2017

Data analysis and executive summary by Virginia Rutter (Framingham State University) and Jenn Berg (Fitchburg State University)

Executive Summary

Part 1: Background and Overview

Introduction and Background:

In summer 2016, the MSCA used salary data of full-time state university faculty from Fall 2015 to respond to ongoing queries from members about gender bias in salaries. Members' questions were prompted by personal interest and shaped, reasonably, by awareness of national trends regarding the persistence of gender gaps in salaries, particularly in higher education.

For example, *The Chronicle of Higher Education* reported (3/22/2017) in [Gender Pay Gap Persists across Faculty Ranks](#) that the gender pay gap persists at the national level, detailing how even though a small reduction in the gap had occurred between 2014 and 2015 as a percentage of salary (0.3%), the difference in the dollar amount has widened because of the ongoing legacy of higher men's salaries. In nominal terms, men's salary increases that year average \$200 more than women's. The same report provided data by state, showing the gender gap in faculty salaries in Massachusetts persists with women's earning 79.5% to 95% of what men earn, depending upon rank. The higher the rank, the higher the gender gap.

There have been no substantive studies regarding gender inequality of salary by the BHE or MSCA salary since the mid-1980s. This study stands as an opportunity for the state university community to investigate whether the problem persists.

While this was a *response* to member requests utilizing data we had available, we are fully aware of what was well stated in this recent [Economic Policy Institute Report](#), "Women's Work and the Gender Pay Gap," and explained in a recent [Atlantic article](#), here, "[Economist Elise Gould explains] 'We wanted to disentangle the question of 'choice' and what's happening between two workers that are sitting right next to each other in a cubicle ... What's going on behind that in terms of cultural norms, expectations, work-family balance—all the different components that might lead women to be in certain kinds of jobs differently than men.'"

The data available show that there is a gender gap that, like the overall Massachusetts and national trends, reveal that gaps are still considerable, and larger up the faculty ranks. However, the data do not measure the well-documented *other* contextual and structural factors that contribute to men's and women's rewards and requirements for work. It does, however, establish a baseline of where men and women state university faculty stand, and areas where institutions can commit to reducing bias from cultural as well as institutional sources through their policies.

Data:

We investigated the largest group possible: full-time faculty (only), and full-time faculty with salaried part-time faculty included with their salaries pro-rated by their full-time equivalent workload. We produced descriptive statistics of faculty by rank, by institution, and by rank and institution. We concluded with tentative analyses of a very simple form: How do the relationships among gender, years of service, and salary operate?

State university salary and rank data, stripped of identifiers such as name and employee ID number, include information about gender, rank, years of service, salary, university, and several details pertaining

to post-tenure review. The data are from July 2015 and were finalized in November 2015. Tables referenced throughout the text in this report are included in the appendix.

Major Findings:

Here is an overview of what we have learned.

- Men's salaries are higher than women's in our system. This is similar to the situation in higher education and other businesses.
- There does not appear to be a salary gender gap at the Assistant Professor rank (past analyses have indicated there may have been). Some of those differences may have been related to years of service. As suggested by economist Elise Gould, we do not believe those differences in years are differences in *individual choice* and seek to continue to look for ways to reward service and excellence that produce non-biased outcomes.
- Notably, however, important cases—such as at **Framingham State University** and **Westfield State University**—reveal differences in salary that are *not* related to years of service.
- When analyzing overall we see that men's and women's rewards as related to years of service are very similar, with the dramatic exception of faculty at the rank of Instructor, a case that appears to be driven by the exceptional situation at **Salem State University**.

Reflections:

Gender inequality persists in the workplace, and it persists at the state universities. Work in recent years has improved equity at the entry level, so at junior ranks there is less inequity.

While across higher education gender inequality in salaries is greater than it is in the state university system, we are interested in the sources that account for this better work in the realm of gender inequality.

Given the absence of any other significant instrument to adjust salaries, we suspect that formulary increases have been an important source not only for reducing inversion and compression, but also for reducing social inequalities like gender inequality (and possibly other categorical inequalities such as race and ethnicity).

Diversity and Inclusion:

Our data do not provide information about race, ethnicity, or immigration/national origin status. Using national trends as a context, however, a parsimonious inference is that the trends we find in gender may be even stronger with respect to these other historically disadvantaged statuses. In other words, the work the formulary increases have done to minimize gender inequality among faculty is likely doing the similar work towards minimizing the amount of racial and other inequalities in the system. As in all topics here, further investigation is essential, but recognizing best available data for social equity is crucial.

Part 2: Summaries of Data

Tables in Appendix

Who are we?

Table 1: Full-Time Faculty Count and Percentages, Overall, by Gender and by Rank.

The number of women exceeds the number of men overall. At higher ranks the number of men exceeds the number of women. At the lowest rank the number of women exceeds the number of men.

Table 2: Full-Time Faculty Count and Percentages by Institution and by Gender.

The number of women is equal to or exceeds the number of men at all universities except Mass Maritime.

What kind of gender differences are there?

We use statistical tests of difference¹ overall and by institution to establish gross differences and differences by rank in salary and in years of service.

Table 3: MSCA Full-Time Faculty Gender Patterns/Salary and Years of Service

The overall difference in the means for men and for women is \$3,745 in salary and 2.1 in years of service.

Table 4: Salary and Years of Service by Gender and Rank

At the Assistant Professor rank, men and women are on par salary-wise. At the Associate Professor rank men's mean salary is \$1998 higher than women's. At the Full Professor rank men's average salary is \$2,935 more than women's.

Table 5: Salary and Years of Service by Gender and Institution

At Bridgewater State University, Fitchburg State University, and Mass Maritime Academy we found that there are overall differences in salary by gender, all with men earning more than women. At Westfield State University and Mass. College of Liberal Arts we found marginally significant differences in salary by gender.

¹ Any average difference or statistical test of gender difference—whether the test confirms or fails to confirm gender difference—does not give us a final answer to the question of equity or bias. Such tests offer hints about how to continue to investigate the sense of an imbalance that some members have. This report also provides a baseline for looking at this question prospectively and possibly retrospectively.

What are the details by rank and institution?

Summary of statistically significant results by rank and institution²:

- (1) At **Framingham State University**, at the rank of Associate Professor, men earn more on average than women. The difference in the averages is \$5,340. The differences in the average years of service were not significant.
- (2) At **Mass Maritime Academy**, at the rank of Associate Professor, men average 4.2 more years of service than women, yet women's mean salary exceeds men's by \$2,263. There were 11 men and five women at this rank.
- (3) At **MCLA**, at the rank of Full Professor, men earn on average \$7,268 more than women. This difference is marginally significant. Men there also have 7.9 more years of service on average.
- (4) At **Salem State University**, at the rank of Instructor, men earn \$17,252 more than women on average, yet have fewer years of service. There were five men and twelve women at this rank, and the mean salary for men was \$78,695. Women had 4.4 years more years of service than men at this rank. The three highest-paid Instructors—all paid between \$83,000 and \$93,000—were men with one year of service.
- (5) At **Westfield State University**, at the rank of Full Professor, men's mean salary significantly exceeded women's by \$6,627 (significance = 0.029). The difference in means for years of service for men and women was not significant.
- (6) No significant differences were found at Bridgewater State University, Fitchburg State University or Worcester State University when separated by rank. However, these were institutions (along with Mass Maritime Academy) that had institution-wide gender differences in the previous section. Overall, at this point, it appears that the salaries of Assistant Professors and Instructors—with the exception of Salem State University—have no gender differences by institution.

Rank and Institution, in Sum:

Some institutions, such as Westfield State University and Framingham State University, have gender differences in salary without gender differences in years of service, which strongly suggests gender bias. However, other institutions, and some ranks within Westfield State University and Framingham State University, have joint salary and years of service differences. This leads to the question, “Was there gender inequity when these faculty were originally hired?”

Was there gender inequity when these faculty were originally hired?

Figure 1: Scatter Plot by Gender

The trends for men and women track each other closely in this analysis.

² Many of the subgroups (i.e., our class sizes) are quite small. There were 72 separate statistical tests calculated (nine institutions times four faculty ranks times two values). The small N-size means that the *t*-test is unreliable—but could give us hints about patterns in the data. Before proceeding with further analysis (that is, non-parametric testing) we present the *t*-tests as well as histograms related to each subset of the data to facilitate discussion about next steps.

APPENDIX: TABLES AND FIGURES

All tables use the data set that was used to determine formulary increase.

Table 1: Faculty Count and Percentages, Overall and by Rank and by Gender

Gender	Instructor	Assistant Prof	Associate Prof	Full Prof	Total	Instructor	Assistant Prof	Associate Prof	Full Prof	Total
Men	18	229	231	365	843	25.4%	45.6%	48.6%	51.5%	48.0%
Women	53	273	244	344	914	74.6%	54.4%	51.4%	48.5%	52.0%
Total	71	502	475	709	1757					

Table 2: Faculty Count and Percentages by Institution and by Gender

	Men	Women	Total	Men	Women
Bridgewater	154	175	329	46.8%	53.2%
Framingham	76	105	181	42.0%	58.0%
Fitchburg	102	88	190	53.7%	46.3%
MassArt	59	60	119	49.6%	50.4%
Mass Maritime	57	25	82	69.5%	30.5%
MCLA	42	42	84	50.0%	50.0%
Salem	159	192	351	45.3%	54.7%
Westfield	112	111	223	50.2%	49.8%
Worcester	82	116	198	41.4%	58.6%

Table 3: Significant Gender Differences in Salary and Years of Service Overall

	Mean Salary	Standard Deviation	Mean Years	Standard Deviation	Salary Range	YOS Range
Men	\$83,919	\$17,794	13.5	11.2	\$48,198 to \$154,085	0.5 to 50
Women	\$80,290	\$16,271	11.4	9.3	\$45,152 to \$132,165	0.5 to 49.5
Difference in means³	\$3,757		2.1			
All Faculty	\$82,031	\$17,111	12.4	10.3	\$45,152 to \$154,085	0.5 to 50
Significance Level	0.000		0.000			

Note: Table 3 displays *t-tests* results on gender by salary and on gender by years of service. A *t-test* is a statistic used to determine whether a difference in the averages is due to chance. A *significant* difference means the difference was not likely due to chance. Both measures—salary and years—were statistically significantly different at the 0.000 level. While the data are not normally distributed our sample sizes are large enough to justify an initial analysis with *t-tests*. In situations where the data are not normally distributed and our sample size is relatively small, we report only descriptive issues.

³ Differences in means are reported only where the differences are significant.

Table 4: Salary and Years of Service by Gender and by Rank

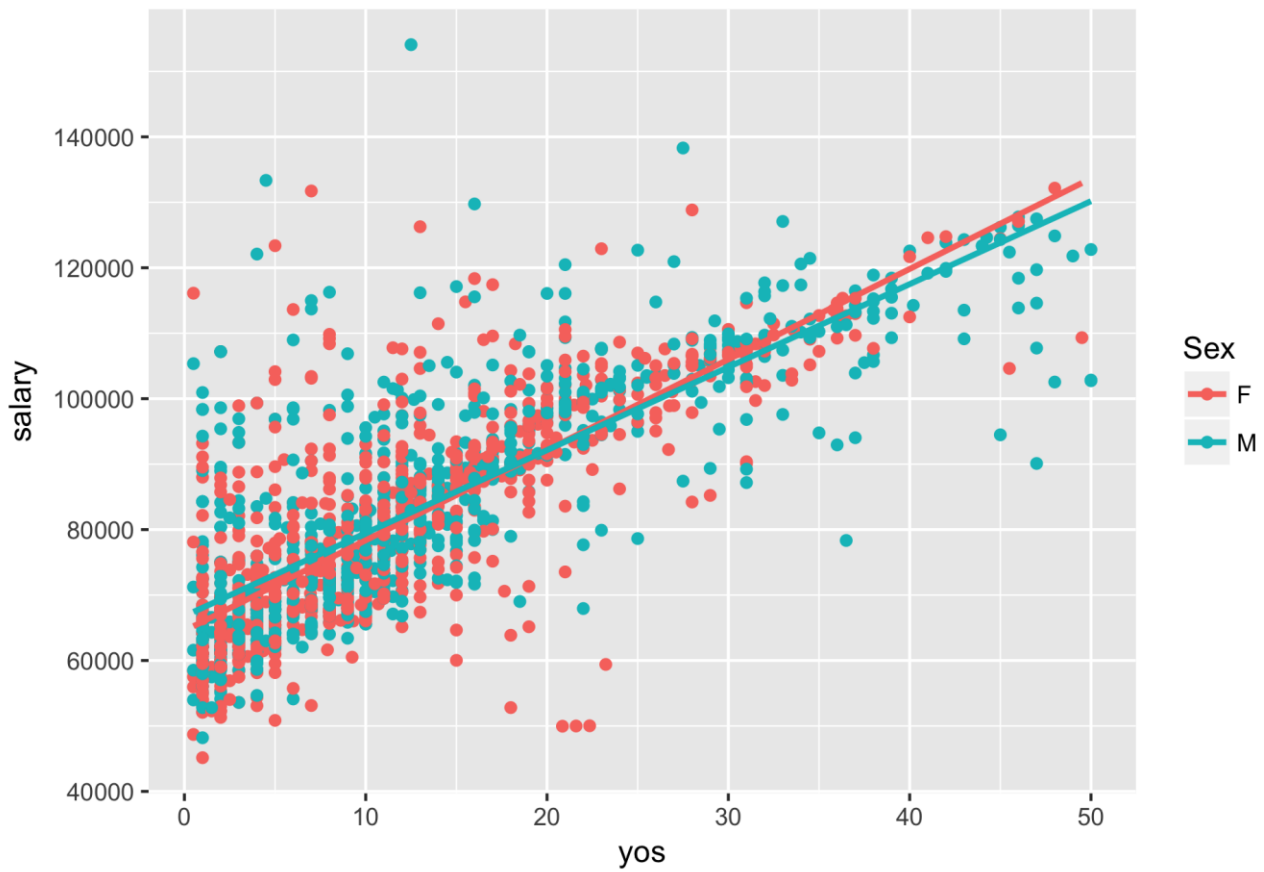
Category	Mean Salary	Standard Deviation	Mean Years	Standard Deviation	Salary Range	YOS Range
Instructor Men	\$62,804	\$13,122	2.3	2.5	\$48,198 to \$94,282	0.5 to 10.5
Instructor Women	\$60,853	\$8,380	5.1	6.3	\$45,152 to \$78,782	0.5 to 23.2
Significance Level	0.5604		0.01			
Assistant Prof. Men	\$67,352	\$8,916	4	4.8	\$53,976 to \$100,942	0.5 to 47
Assistant Prof. Women	\$67,804	\$9,529	3.7	3.4	\$48,700 to \$123,373	0.5 to 31
Significance Level	0.584		0.49			
Associate Prof. Men	\$78,888	\$11,302	11.3	8.1	\$64,168 to \$133,352	1 to 50
Associate Prof. Women	\$76,890	\$10,093	9.9	5.7	\$65,173 to \$131,373	1 to 49.5
Significance Level	0.043		0.022			
Difference in means⁴	\$1,998		1.4			
Professor Men	\$98,539	\$12,992	21.4	10.2	\$74,623 to \$154,085	0.5 to 50
Professor Women	\$95,604	\$11,135	19.5	8.3	\$73,628to \$132,165	0.5 to 48
Significance Level	0.001		0.007			
Difference in means	\$2,935		1.9			

⁴ Differences in means are reported only where the differences are significant.

Table 5: Salary and Years of Service by Gender and by Institution

Category	Mean Salary	Standard Deviation	Mean Years	Standard Deviation
Bridgewater Men	\$83,415	\$15,926	12.6	9.9
Bridgewater Women	\$79,970	\$14,851	10.2	8.6
Significance Level	0.33		0.026	
Size of Difference	\$3,445		2.4	
Framingham Men	\$76,929	\$15,360	9.5	9.7
Framingham Women	\$77,314	\$15,782	11.1	9.4
Significance Level	0.914		0.22	
Fitchburg Men	\$83,349	\$18,283	14	10.8
Fitchburg Women	\$76,013	\$15,182	11.1	8.9
Significance Level	0.002		0.037	
Size of Difference	\$7,336		2.9	
MassArt Men	\$88,785	\$15,871	14	10.6
MassArt Women	\$88,923	\$14,102	15	10.4
Significance Level	0.80		0.75	
Mass Maritime Men	\$86,464	\$20,059	14.6	12.7
Mass Maritime Women	\$76,651	\$15,139	8.8	8.6
Significance Level	0.018		0.018	
Size of Difference	\$9,813		5.8	
MCLA Men	\$83,862	\$20,495	17.5	13.6
MCLA Women	\$76,190	\$18,492	12.5	10
Significance Level	0.061		0.056	
Salem State Men	\$86,781	\$15,414	14.1	10.6
Salem State Women	\$83,945	\$15,955	12.4	9.4
Significance Level	0.076		0.083	
Worcester Men	\$80,807	\$18,045	13.2	12.8
Worcester Women	\$79,534	\$17,774	10.8	9.4
Significance Level	0.727		0.207	
Westfield Men	\$84,254	\$21,311	14.1	11.8
Westfield Women	\$79,170	\$16,609	10.9	8.9
Significance Level	0.065		0.025	

Figure 1: All Full-Time Faculty (N = 1757)



In **Figure 1** the program used draws the “best fitting line” through the data—and these help us to think about trends in the relationship between years of service and salary. In general, the data are scattered as expected across the upward diagonal, and best fit line for women (red) and the best fit line for men (blue) follow each other closely. The pattern is that increased years of service is associated with increased salary. The red (women's) line has a steeper slope than the blue (men's) line indicating that men started at slightly higher salaries but that women's salaries are increasing more quickly.