Analysis of Gender Differential in Faculty Salaries at Carleton University

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1. Introduction

CUASA is committed to ensuring equity in pay and benefits, working conditions, and tenure and promotion across its membership.

Using salary data of members provided to CUASA for 2014, an analysis of the gender differential in salary was conducted. While there is a substantial raw gap in average (and median) salaries of over $11,000 between male and female faculty, the gap diminished to around $300 once the analysis accounted for rank, years at rank, and unit. The analysis for instructors found a smaller raw gap in average salaries of around $200. This gap was not statistically significant once the analysis accounted for rank, years at rank, and faculty.

The results from this analysis highlight the advantage of a strong union and collective agreement. The salary negotiation and salary rationalization process contained in the CUASA collective agreement have ensured gender pay equity at Carleton University.

2. Salary Practices at Carleton University

Initial salaries are only loosely guided by the collective agreement. For both faculty and instructors, there is a salary floor defined in the collective agreement for each rank. All new appointees must be offered a salary equal to, or greater, than the salary floor of the rank at which they have been hired. Other than the salary floor, the collective agreement does not constrain the starting salary. New appointees negotiate their starting salary with their dean. Starting salaries will depend on the bargaining power of the new appointees versus the dean, which will be influenced by such factors as the average salary in the field, the demand for individuals in the field and the current economic climate.

The salary floor is also binding when members are promoted. At the time of promotion, if a member's salary is below the salary floor of the new rank then the member's salary must be increased to the salary floor of the new rank.

Annual salary increases are guided by the collective agreement and are composed of two parts - a scale increase and a career development increment. Both of these parts are determined in the collective agreement.

There is also the Adjustment Commission whose scope and responsibilities are described in the collective agreement. The Adjustment Commission's responsibilities include making salary adjustment recommendations to the President in two cases. The first case is when a member's salary is deemed to be "anomalously low or high". The second case is when it is "deemed necessary to meet exceptional situations of special merit, market differentials, offers of alternative employment, or obvious inequity."

It is possible for gender differences in pay to be introduced at each of these points in salary determination. First, the initial salary negotiated between the faculty member and the Dean may depend on the member's alternatives and negotiating ability, which may be influenced by gender. Second, gender differences in promotion decisions could result in salary differences. Third, decisions to award the annual CDI may be influenced by gender. Fourth, differences in the decision to appeal to the Adjustment Committee or differences in the Adjustment Committee's may results in gender differences in pay.

3. Data

The CUASA collective agreement requires that CUASA receive annual salary data for all members covered by the collective agreement. The CUASA agreement covers faculty, instructors, and librarians. Due to the small numbers of librarians, they were not included in the analysis. The analysis was conducted for faculty and instructors separately. For 2014, there were 702 faculty and 89 instructor members.

The data used in this analysis is from 2014 and contains all of the variables included in this analysis. The annual salary represents the gross annual salary of the member in 2014 and includes the increases negotiated in the latest collective agreement.

The salary determination at Carleton ensures a progression in salary over time and we want to control for this effect. We use two variables to account for this salary progression - an indicator variable for rank and a variable for years of work. The data includes information on the year first degree was awarded, year started at Carleton, and year promoted to current rank. This information was used to create three variables used to account for years of work. The variables created were:

(i) years at rank,
(ii) years at Carleton, and
(iii) years since highest degree.

Salary differences will also occur because of differences in starting salaries across disciplines. Included in the data was the unit to which the member is assigned. For faculty, we created indicator variables for each unit, which will control for differences in salary across disciplines. Cross-appointed members were assigned to the unit with the greater time allocation. An arguably better variable would be the field of the member's highest degree; however this information was not available in the data. For instructors, we created indicator variables for each faculty rather than unit. The smaller number of instructors means we are not able to control for differences across units.

4. Results

Faculty Salaries

Table 1 presents the average and median salaries for faculty by rank and by gender. The raw gap between male and female faculty is $11,275. Within each rank the difference is smaller, although the difference grows as the rank increases. For Assistant Professors, the gap is $5139, while for Full Professors the gap is $6,351.

The difference in rank explains a significant portion of the raw gap. A useful way to frame the role of rank in explaining the gender gap is to consider a counterfactual scenario. What would the average salary be for men if the proportion in each rank were the same as for females? If men had the same distribution of rank as females and the same current average salary in each rank, then men would have an average salary of $126,948 (rather than $132,543) and the gap would be only $5,681. This decrease in the difference suggests that the difference in rank accounts for 50% of the raw gap. This counterfactual could be estimated by calculating the average salary for women if they had the same distribution in rank as men. In this scenario, women would have an average salary of $126,715 (rather than $121,268) and the gap would be $5827 - suggesting that the difference in rank accounts for 51% of the raw gap.

There are other factors in addition to rank that should influence salary. In addition to rank, two other factors were controlled for in the analysis - years at rank and unit.[1] [2] The results from the multivariate linear regression analysis are reported in Table 2. A linear regression controls for the average effect of the independent variables. For example, the coefficient on the female variable represents the average difference between men and women after accounting for differences in salary due to the other variables in the model.

Table 2: Linear Regression Results on Annual Faculty Salary[a,b]

Variable	Coefficient	Standard Error	p-value	95% confidence interval
Female	-332.39	820.45	0.69	(-1943.43 ;1278.66)
Associate	16998.86	972.88	0.00	(15088.50 ;18909.22)
Full	33092.78	1192.18	0.00	(30751.80 ;35433.76)
Years in Rank	2746.94	161.49	0.00	(2429.82 ;3064.04)
Years-squared	-49.51	6.01	0.00	(-61.31 ;-37.71)

a. Includes indicator variables for department
b. Coefficients are relative to a male assistant professor hired in 2014.

Once rank, years in rank, and departmental differences in salary are controlled for, female faculty members have an annual salary that is on average $332 less than their male colleagues. This difference is not statistically significant although the analysis is conducted on the population, not a sample, so sampling variance is not an issue. The coefficients on the rank variables are measured relative to the average salary of an Assistant professor. Associate earns on average $16,999 more than Assistant and Full

[1] Following the analysis done for UBC by including these two variables. See reasoning in UBC report as for which years variable to use - age, years since PhD, years at Carleton. All provide same qualitative results.
[2] Discrimination that results in females acquiring degrees in areas that are less well paid is not addressed in this study. The estimated gender gap is the average distance from a male in the same department (with same rank and years in that rank).

Professor earns $33,093 more than Assistant. Each additional year at rank is related to an increase of $2,747 for each additional year, although the term years-squared modifies the effect. Salary increases with years in rank, but at a decreasing rate.

The analysis also included indicator variables for department. The coefficients on the departmental variables are not reported because the small sample size of some departments creates that possibility that a member's salary would be disclosed.

Structural Discrimination

Controlling for rank and department assumes that there are no barriers faced by women in achieving a higher rank or when choosing their field of specialization. Analysis of whether gender bias exists in the promotion decision is not possible with the given data. While women are disproportionately represented at the lower ranks (see Table 1), this distribution could be the result of changes in hiring decisions or increased participation by women in academia over time.

Controlling for departments accounts for a significant portion of the raw gender gap. Structural bias, social norms or gender bias in education could result in women being in lower paying fields. There is substantial variation in average salaries across departments and substantial variation in the proportion of women across departments. The correlation between average department salary and proportion of faculty who are female is -0.36 indicating as average salary increases the proportion of female faculty falls.

Another counterfactual might be helpful to understand the importance of discipline in salary. First, let's assume that there is no gender wage gap and the male and female faculty have the same salary equal to the departmental average. Second, let's assume the genders are distributed across departments as they currently are. Then the expected average salary for women would be $124,442 and for men $130,654 and the salary gap would be $6212. If instead of assuming the current distribution across departments, we assume that each department had 34% female and 66% male faculty (men and women are distributed equally across departments) and kept the salaries the same, then the expected average salary for women would be $130,214 and for men $128,011 and the salary gap would be $-2202. If women were equally represented across departments, there would not be the typical pay gap. Instead, the average male would be less than the average female salary.

Instructor Salaries

We conducted a similar analysis of instructor salaries. The smaller number of instructors increases the likelihood of disclosing a member's salary, thus restricting the details that can be released. It is not possible to provide summary statistics of instructor salary by rank.

In contrast to faculty where 34% of members are female, for instructors 61% are female. The mean salary for female instructors is $101,701 and for males the mean salary is $101,937 with a gap of $235. The median salary reverses the pay gap with females having a higher median than males - $103,763 for females and $96,474 for males. The

multivariate analysis controlling for rank, years in rank, years in ranks squared, and faculty finds a gap of $2687, which is not statistically significant.

5. Recommendations and Conclusions

Recent decisions at the University of British Columbia (UBC) and the University of Victoria to award salary adjustments to female faculty highlighted the necessity of conducting a similar analysis at Carleton University. Using salary data provided to CUASA for 2014, an analysis of the gender differential was conducted following the same analysis as in the UBC report. While there is a substantial raw gap in average (and median) faculty salaries of over $11,000 between male and female faculty, the gap diminished to around $300 once the analysis accounted for rank, years at rank, and department. For instructor salaries, the raw gap was around $200 and while the multivariate analysis found a larger gap of nearly $2700, it was not statistically significant.

The results from this analysis highlight the advantage of a strong union and collective agreement. The salary negotiation and salary rationalization process contained in the CUASA collective agreement have ensured gender pay equity at Carleton University. In contrast, both UBC and UVic have Faculty Associations and a portion of annual increments are based on so-called "merit pay", that is, an amount determined at the discretion of chairs or deans. UBC, after controlling for the same factors, had a gender gap of nearly $3000 in annual salary.

Field of study is an important determinant of salary. What role does CUASA in ensuring that men and women are given equal opportunity to study in their areas of interest? CUASA members clearly have a role. What role does the Employer to ensure that men and women receive equal pay for equal work?

Table 1: Average and Median Salaries, by rank and gender

Gender	Rank	#	Average Salary	Mean Difference[a]	Ratio of Means[b]	% of Gender	% of Rank Female	Median Salary	Ratio of Median[c]
Male	All	466	132543	11275	0.91			135435	0.88
Female	All	236	121268				34	119555	
Male	Assistant	86	106554	5139	0.95	18		105732	0.95
Female	Assistant	68	101415			29	44	100540	
Male	Associate	229	128977	5740	0.96	49		129230	0.93
Female	Associate	124	123236			53	35	119879	
Male	Full	151	152752	6351	0.96	32		153807	0.93
Female	Full	44	146401			19	23	143597	

a. Difference between Mean Male Salary and Mean Female Salary
b. Mean Female Salary as Percentage of Mean Male Salary
c. Median Female Salary as Percentage of Median Male Salary