Update on Gender Equity in MUFA Faculty Salaries Analysis

Background:

In April 2015, the McMaster University Joint Administration/Faculty Association Committee released a statement announcing the decision to apply an adjustment of $3,515 to the base salary of each female faculty member on the CP/M scheme as of July 1, 2015. The decision was based on a study carried out by the Office of Institutional Research and Analysis with the input of the executive members of the McMaster University Faculty Association (MUFA) that revealed a gender pay gap in salaries of McMaster faculty. The original analysis considered two datasets: the MUFA CP/M dataset of full-time and part-time faculty and the University and College Academic Staff System (UCASS) dataset of full-time faculty. The results of both analyses showed the salary difference between Male and Female faculty is statistically significant at the 0.05 significance level. Follow-up studies were provided on September 2017, September 2018, and September 2020 using UCASS data as of August 31, 2016, August 31, 2017, and October 1, 2019, respectively. All prior follow-up analyses showed that the adjustment resolved the average annual salary disparity between gender in the initial study. In this report, we provide another update to this analysis using UCASS data for full-time faculty as of October 1, 2023 to see if the salary adjustment applied in 2015 continues to equalize salary between male and female full-time faculty at McMaster University.

Results:

The characteristics of the sample of full-time MUFA faculty as of October 1, 2023 are shown in Tables 1-4. A comparison of the median and average salary of the 1,015 full-time MUFA faculty showed lower salary for females relative to male colleagues (Table 1). To explore the possibility of a full-time MUFA faculty gender pay gap, a multiple linear regression model was used to determine if gender accounts for the salary difference. The dependent variable was Annual Salary, and the independent variables were Gender, Rank, Years in Rank, Years in Rank Squared, Faculty, Appointment Stream, and Highest Degree earned (Table 5). The Student's t-test was used to test the null hypothesis that gender does not influence the salary of full-time MUFA faculty once other pay-determining variables are controlled for in the model. The results of the multiple linear regression model showed that 71.2% of the total variability in annual salary was accounted for by the variables in the model and that the null hypothesis could not be rejected at the 5% significance level (Table 6, p value=0.50, Adjusted R^2 = 0.7154). Thus, the results of the analysis indicated that gender does not influence the salary of full-time MUFA faculty.

The result of no relationship between gender and salary was tested further using an F-test of the multiple linear regression models that differed by only the presence (full model) or absence (reduced model) of the gender variable. The null hypothesis for the F-test was that the model without gender (reduced model) explained annual salary as well as the full model. The F-test revealed that there is insufficient evidence to reject the null hypothesis at the 5% significance level (Table 7, p value=0.4997) and that gender does not influence salary once other pay determining characteristics are considered. Moreover, the results showed that the reduced model without gender performed well, accounting for 71.6% of the variability in annual salary (Table 7, Adjusted R^2 = 0.7156). This analysis supports the result obtained using the Student's t-test (above) and the finding that any gap in pay for MUFA faculty as of October 1, 2023 may not be attributed to gender. It is also in keeping with the follow-up analyses conducted using data from August 31, 2016, August 31, 2017, and August 31, 2019, which showed that the adjustment of $3,515 to the base salary of each female faculty member on the CP/M scheme in 2015 resolved the influence of gender on gaps in pay for full-time MUFA Faculty. Subsequent analysis demonstrated that the salary of full-time MUFA faculty was most influenced by Rank and Years in Rank and that there was not a significant gender interaction with either of these variables (data not shown).

Table 1: Headcount, Median Salary and Average Salary of Full-time Faculty Members by Gender

Gender	Headcount	Median Salary ($)	Female/Male Median Salary Ratio	Average Salary ($)	Female/Male Average Salary Ratio
Male	598	198,764	0.84	192,707	0.87
Female	417	166,072		167,737	
Total	1,015	185,300		182,448	

Table 2: Headcount and Average Salary of Full-time Faculty Members by Rank and Gender

Rank	Gender	Headcount	% of Rank by Gender	% of Female	Average Salary ($)	Female/Male Salary Ratio
Full	**Male**	291	48.7		225,907	0.95
	Female	113	27.1	28.0	213,625	
Associate	**Male**	176	29.4		178,835	0.98
	Female	134	32.1	43.2	174,940	
Assistant	**Male**	128	21.4		137,494	0.96
	Female	166	39.8	56.5	132,084	
Lecturer	**Male**	3	0.5		141,790	0.77
	Female	4	1.0	57.1	109,648	
Total	**Male**	598	100		192,707	0.87
	Female	417	100	41.1	167,737	

Table 3: Headcount by Appointment Stream, Gender and Rank

Appointment Stream	Gender	Total	% of Female	Rank			
				Full	Associate	Assistant	Lecturer
Tenure	**Male**	467		276	126	65	
	Female	252	35.05%	104	89	59	
Special	**Male**	38		11	24	3	
	Female	38	50.00%	8	17	13	
Teaching	**Male**	49		2	19	27	1
	Female	66	57.39%	1	23	42	
CLA	**Male**	44		2	7	33	2
	Female	61	58.10%		5	52	4

Table 4: Average Years in Rank by Faculty, Gender and Rank

Faculty	Gender	Average Years in Rank	Rank			
			Full	Associate	Assistant	Lecturer
Business	Male	9.9	15.1	6.4	4.2	5.0
	Female	4.9	5.8	6.0	3.2	
Engineering	Male	8.3	11.3	6.5	4.4	14.0
	Female	4.7	7.9	3.4	3.7	4.5
Health Sciences	Male	9.1	13.4	6.5	4.4	
	Female	6.2	9.6	4.6	5.9	
Humanities	Male	10.6	13.2	10.2	4.9	3.0
	Female	6.3	5.0	8.6	4.9	
Science	Male	11.2	13.8	10.8	3.8	
	Female	7.8	11.7	6.3	4.7	0.0
Social Sciences	Male	10.5	13.6	8.7	7.2	
	Female	5.3	4.3	6.3	4.8	10.0
Total	Male	9.8	13.1	8	4.6	7.3
	Female	6.1	8.2	5.8	5	4.8

Table 5: Dataset Variables

Variable	Description
Dependent variable (response):	
Annual Salary	Annual rate of salary. Not reduced by sabbatical or other leaves. Excluded administrative stipends.
Independent variable (predictor):	
Gender	Male=0, Female=1
Canada Research Chair	No=0, Yes=1
Years in Rank	Years since staff member attained their current rank
Highest Degree	Highest degree earned
Faculty	Faculty individual staff member belongs to
Appointment Stream	Tenure, Special, Teaching, CLA
Rank	Full, Associate, Assistant, Lecturer

Table 6: Summary of Regression on Annual Salaries (Full Model)

Variable	Label	Parameter Estimate	Standard Error	t value	p-value	Variance Inflation
Intercept	INTERCEPT	193078.00	3116.58	61.95	<.0001	0.00
Gender (base=Male)	GENDER	-1237.19	1832.19	-0.68	**0.50**	1.23
Canada Research Chair	CRC	11389.00	3345.81	3.40	0.00	1.05
Years in Rank	YAPRANK	3364.33	294.53	11.42	<.0001	7.56
Years in Rank2	YAPRANK2	-58.42	10.15	-5.75	<.0001	7.13
Highest degree (base=PhD)	DEG_PRO	-6327.47	8889.27	-0.71	0.48	1.05
	DEG_MAS	2751.56	4289.89	0.64	0.52	1.08
	DEG_BAC	-12374.00	13029.00	-0.95	0.34	1.01
Faculty (base=Social Science)	FAC_BUS	38140.00	3522.20	10.83	<.0001	1.48
	FAC_ENG	1137.59	2857.23	0.40	0.69	2.03
	FAC_HUM	-5167.74	3200.87	-1.61	0.11	1.60
	FAC_SCI	-3435.67	2805.71	-1.22	0.22	2.07
	FAC_HSCI	501.12	3075.73	0.16	0.87	2.49
Appointment Stream (base=Tenure-stream)	APTP_SPECIAL	-5180.87	3808.88	-1.36	0.17	1.53
	APTP_CLA	-15292.00	3224.06	-4.74	<.0001	1.46
	APTP_TEACH	6085.01	2932.88	2.07	0.04	1.31
Rank (base=Full professor)	RANK_ASOC	-36952.00	2131.81	-17.33	<.0001	1.46
	RANK_ASST	-70739.00	2505.04	-28.24	<.0001	1.96
	RANK_LECT	-78479.00	10338.00	-7.59	<.0001	1.11

R-Square = 0.7205
Adjusted R-Square = 0.7154

Table 7: Summary of Regression on Annual Salaries (reduced Model)

Variable	Label	Parameter Estimate	Standard Error	t value	p-value	Variance Inflation
Intercept	INTERCEPT	192426.00	2962.24	64.96	<.0001	0.00
Canada Research Chair	CRC	11293.00	3341.86	3.38	0.00	1.05
Years in Rank	YAPRANK	3380.49	293.48	11.52	<.0001	7.51
Years in Rank2	YAPRANK2	-58.47	10.15	-5.76	<.0001	7.13
Highest degree (base=PhD)	DEG_PRO	-6333.97	8886.84	-0.71	0.48	1.05
	DEG_MAS	2703.95	4288.14	0.63	0.53	1.08
	DEG_BAC	-12623.00	13020.00	-0.97	0.33	1.01
Faculty (base=Social Science)	FAC_BUS	38390.00	3501.72	10.96	<.0001	1.46
	FAC_ENG	1535.05	2795.17	0.55	0.58	1.94
	FAC_HUM	-5232.22	3198.58	-1.64	0.10	1.60
	FAC_SCI	-3255.58	2792.24	-1.17	0.24	2.05
	FAC_HSCI	326.25	3063.97	0.11	0.92	2.48
Appointment Stream (base=Tenure-stream)	APTP_SPECIAL	-4970.22	3795.04	-1.31	0.19	1.52
	APTP_CLA	-15294.00	3223.18	-4.75	<.0001	1.46
	APTP_TEACH	5966.36	2926.81	2.04	0.04	1.31
Rank (base=Full professor)	RANK_ASOC	-37007.00	2129.68	-17.38	<.0001	1.46
	RANK_ASST	-70924.00	2489.29	-28.49	<.0001	1.94
	RANK_LECT	-78815.00	10323.00	-7.64	<.0001	1.11

R-Square = 0.7204
Adjusted R-Square = 0.7156

Table 8: F-test Results for Full Model vs. Reduced Model

Source	DF	Mean Square	F Value	Pr > F
Numerator: $(SSE_R - SSE_F) / df_1$	1	304724089	0.46	0.4997
Denominator: SSE_F / df_2	996	668304790		

SSE_R = Sum of Error Square of Reduced Model

SSE_F = Sum of Error Square of Full Model