

# Study of Gender-based Salary Differentials at the University of Manitoba

## Final report

Presented to the University of Manitoba  
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This file provides a summary of key findings based on an analysis of salary data representing the 2018 salaries of UMFA members.

The following files accompanied this report to provide more detailed information.

- UM-equity-v5.do (Stata syntax file to create all results and robustness checks)
- UM-equity-v5.txt (Stata log file)
- Figures.pdf (contains descriptive figures to accompany this report)

In my view, the main takeaways from this report include:

- There is no evidence of a systemic gender-based salary differential once key salary determinants are controlled for.
- There is no evidence of gender differences in career progression among men and women who eventually become Professors.
- There is some evidence that women are less likely to be promoted to Professor, particularly in the Bannatyne campus grouping of departments. There is some evidence of substantial gender differences in other areas as well, particularly Science and Engineering.

### 1. Main findings

In this analysis, I have looked for a systemic gender wage gap on a university-wide basis and within faculty groups. Various models were tested to separately analyze members who are tenure stream and instructors. Only those with permanent/continuing appointments are analyzed here.

At a very high level, it is clear that the average male and female salaries are very different. In Figures 1 and 2 below, I present the salary distribution for male and female tenure stream and instructor members, respectively. The key thing to notice from these graphs is that women typically earn less than men at the University of Manitoba, as their density (dashed orange line, reflecting the frequency at which women are observed at each salary level) generally lies to the left of the men's density (solid blue line) and peaks at a lower salary.

When coupled with the descriptive statistics provided in later sections of this report, however, the lower salaries are not entirely surprising. On average, the characteristics of male and female faculty members tend to differ. Women tend to dominate in lower ranks, have less seniority, and tend to segregate into different disciplines than men.

Figure 1. Salary distribution among tenure stream faculty members

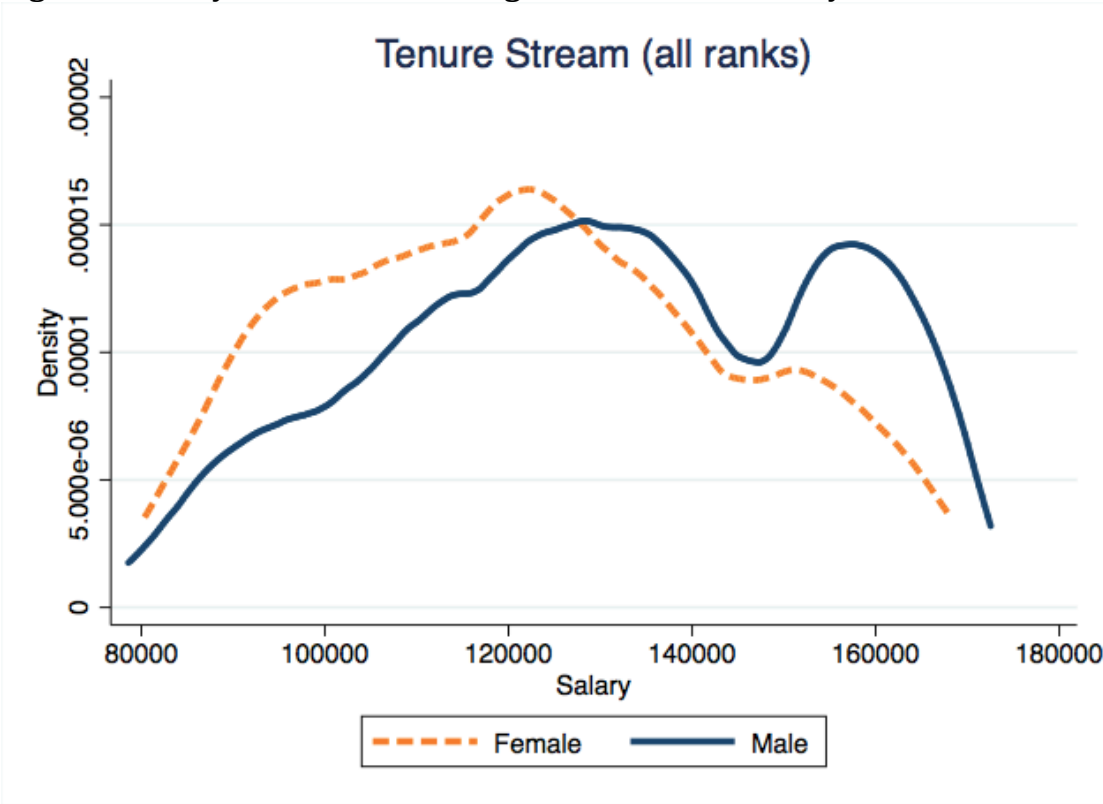
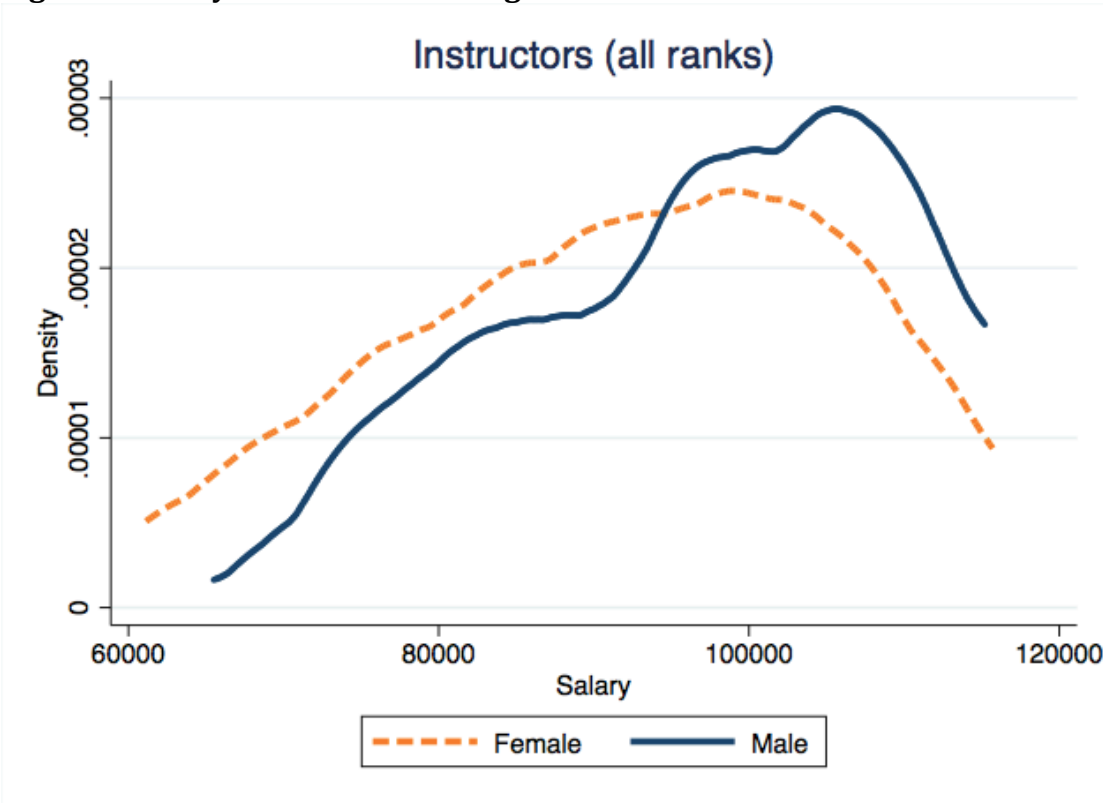


Figure 2. Salary distribution among instructors



Once these other factors are reasonably accounted for, there is no clear evidence of a systemic gender wage gap at the University of Manitoba. In Tables 1 and 2, a summary of the main regression results is provided (more modeling details are provided in later sections). Each coefficient in the table represents the estimated wage gap (a log wage regression coefficient, that when multiplied by 100 is approximately the percentage by which women’s wages differ from men’s). A positive coefficient indicates that on average women are paid more than men while a negative coefficient would indicate that on average women are paid less than men. Stars are used to indicate statistical significance.

Within the group of tenure stream members, the estimates are positive, but relatively small, and not statistically significant. In my opinion, the model (1. OLS) for which the female coefficient is statistically significant would not adequately account for the interactions of key control variables with rank.

**Table 1. Wage gap estimates for tenure stream members**

Method	Group	Coefficient	Number of members
1. OLS	All	0.0139**	930
2. OLS	Assistant	0.0217	195
	Associate	0.0091	370
	Professor	0.0107	365
3. HLM	Assistant	0.0202	195
	Associate	0.0126	370
	Professor	0.0098	365

\*\* statistically significant at 1% level.

Note: All models control for years since degree (quadratic), faculty effects, sub-faculty effects, and rank effects. HLM models also include a sub-faculty group interaction with years since degree completion.

**Table 2. Wage gap estimates for instructors**

Method	Group	Coefficient	Number of members
1. OLS	All	-0.0056	109
2. OLS	Instructor I	-0.0766	16
	Instructor II	-0.0077	46
	Senior Instructor	0.0258	47
3. HLM	All	-0.0017	109

Note: All models control for years since degree (quadratic), faculty effects, sub-faculty effects, and rank effects. HLM models also include a sub-faculty group interaction with years since degree completion.

The estimates for instructors in Table 2 suggest a gendered wage gap whereby women are paid less. However, the largest estimates are based on a very small number of members and should not be relied upon to represent the experience of the group. The HLM estimates are notably small in magnitude. More generally, all estimates in Table 2 lack statistical significance.

Given the salary structure described in the next section, and the multi-modal density presented in Figure 1, it seems sensible to examine wage gaps among tenure stream faculty within rank and faculty groups rather than rely on the models presented in Table 1. In Table 3, I present wage gap estimates based on OLS models estimated within rank and broad faculty group, with sub-faculty group fixed effects.

**Table 3. Wage gap estimates for tenure stream members.**

	Science/Eng	Arts/Educ/ Grad/SW	Bannatyne	Business/ Law/Architect	Music/Art
Assistant	0.0216	-0.0127	0.0217	0.0243	-0.0178
Associate	0.00715	0.0054	0.0233	0.0004	0.0499
Professor	0.00232	0.0138	0.0180	-0.0074	0.0472

Note: All OLS models control for years since degree (quadratic), sub-faculty effects.

While sample sizes within some groups are too small to form conclusions based on regression analysis alone, there is no evidence here to suggest a systemic gender wage gap is present at the University of Manitoba.

## **2. The importance of career progression through ranks.**

In this section I review the salary structure embedded in the UMFA collective agreement to consider how the structure may contribute to systemic gender-based salary differentials at the University of Manitoba. I begin with a stylized example before referring to the observed career progression experiences of members.

I put 8 hypothetical individuals through the tenure stream members' salary structure described in section 24.1.2 (Salary grid for April 1, 2018) and 24.2 (scale increments to base salary). They differ in career progression according to the years they spend in each rank, as follows:

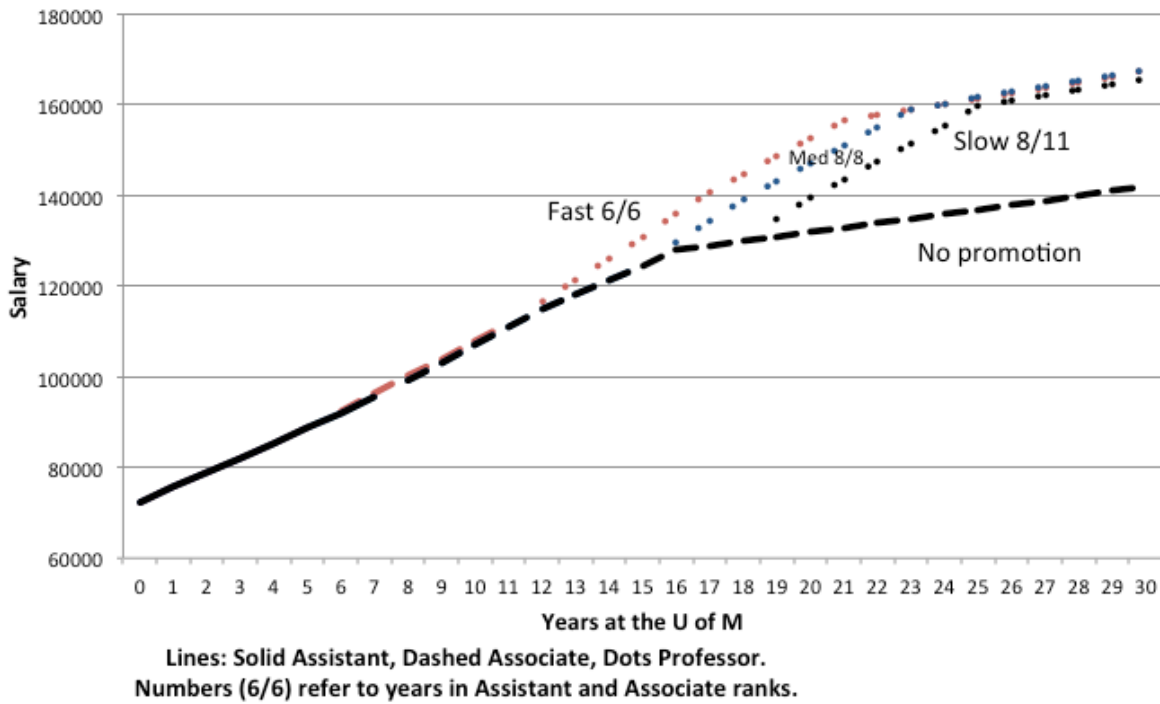
- Fast: 6 years as Assistant, 6 years as Associate, then Professor
- Medium: 8 years as Assistant, 8 years as Associate, then Professor
- Slow: 8 years as Assistant, 11 years as Associate, then Professor.
- No promotion: 8 years as Assistant, then Associate, no further promotion

For each progression, I consider a person who begins with a low salary (set at the floor for Assistants) and a person who begins with a high salary (set at the middle threshold for Assistants)

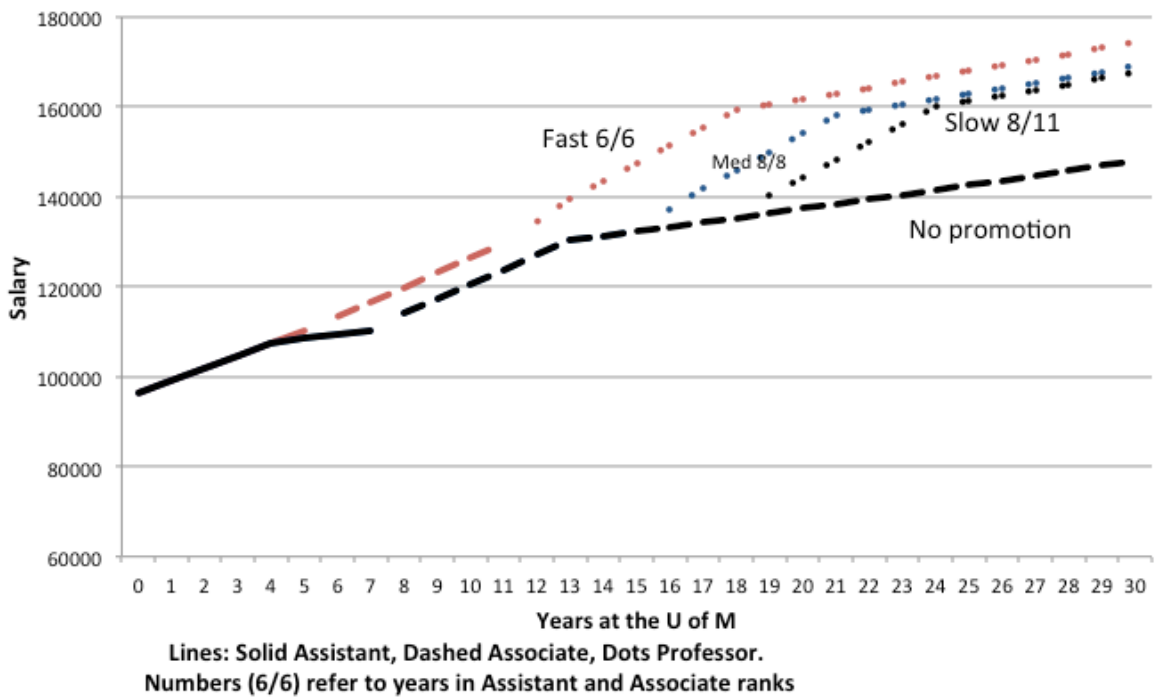
Figure 3 presents the salary projection for the lower paid members. Mid-career differences arise for those who progress to full professor, however, these differences are eventually diminished as salaries exceed thresholds after which only scale increases are applied. The differences are amplified for higher paid members (as in Figure 4) as they reach maximum thresholds within each rank (after which only scale increases are applied).

If there existed gender differences in progression to Professor, we would expect to find at least some gender wage gap at higher ranks. The results suggest this is not the case. However, as the regressions control for years since degree completion, it is worth looking deeper for gender differences in progression.

**Figure 3. Salary structure, low starting salary & different career progression**



**Figure 4. Salary structure, high starting salary & different career progression**



From the main sample of tenure stream members (as represented in Table 1), I take a subsample of full Professors and estimate the time taken to reach Professor in two ways. First, I measure the time as an UMFA member less years in their rank as Professor. Second, I measure the time since their degree completion less years in their rank as Professor. The resulting time before promotion for men and women is presented as densities in Figures 5 and 6.

The results in Figure 5 suggest that women take only slightly longer to be promoted to Professor, by just over one year. That small difference could result in small differences in salary that would be impossible in this context to measure separately from rank and years in rank.

One might expect that the small observed difference in time taken before promotion to reflect maternity and parental leaves earlier in one's career. While this is clearly an issue for gender equity most broadly (as women generally bear the cost of having children), this is not clearly an issue that can be easily addressed by the University of Manitoba within its collective agreement. Moreover, men are also able to take parental leave and may have been more likely to do so in more recent years. Given recent research examining academic economists (H. Antecol, K. Bedard and J. Stearns. 2018. "Equal but Inequitable: Who benefits from gender-neutral tenure clock stopping policies" *American Economic Review*, 108(9): 2420-41) we also have reason to believe that men are likely to use parental leave time as research time, boosting career progression opportunities, as opposed to causing delays in progression. The source of the gender differences in time before promotion requires further study.

Moreover, it is important to consider the results in Figure 6, which suggests men take just as long, and potentially slightly longer, to reach full Professor when we consider the time since their degree completion. This may reflect a greater tendency for men to take Post-Doctoral positions (especially in more male-dominated fields) and for men to be more mobile (perhaps having started their careers at another institution before joining the University of Manitoba). Again, however, it is impossible to form conclusions here without further study.

Without further information, we cannot speak to the mechanisms underlying any gender differences in time to promotion. However, it appears that overall, while men may be moving through the ranks more quickly after arriving at the University of Manitoba, they appear to have done so in part because they have put in time developing their careers elsewhere first.

To summarize, within the group of men and women who eventually became Professors, I do not find evidence of meaningful or substantial gender differences in career progression that measurably affects salaries.

Figure 5. Years in UMFA before promotion to Professor

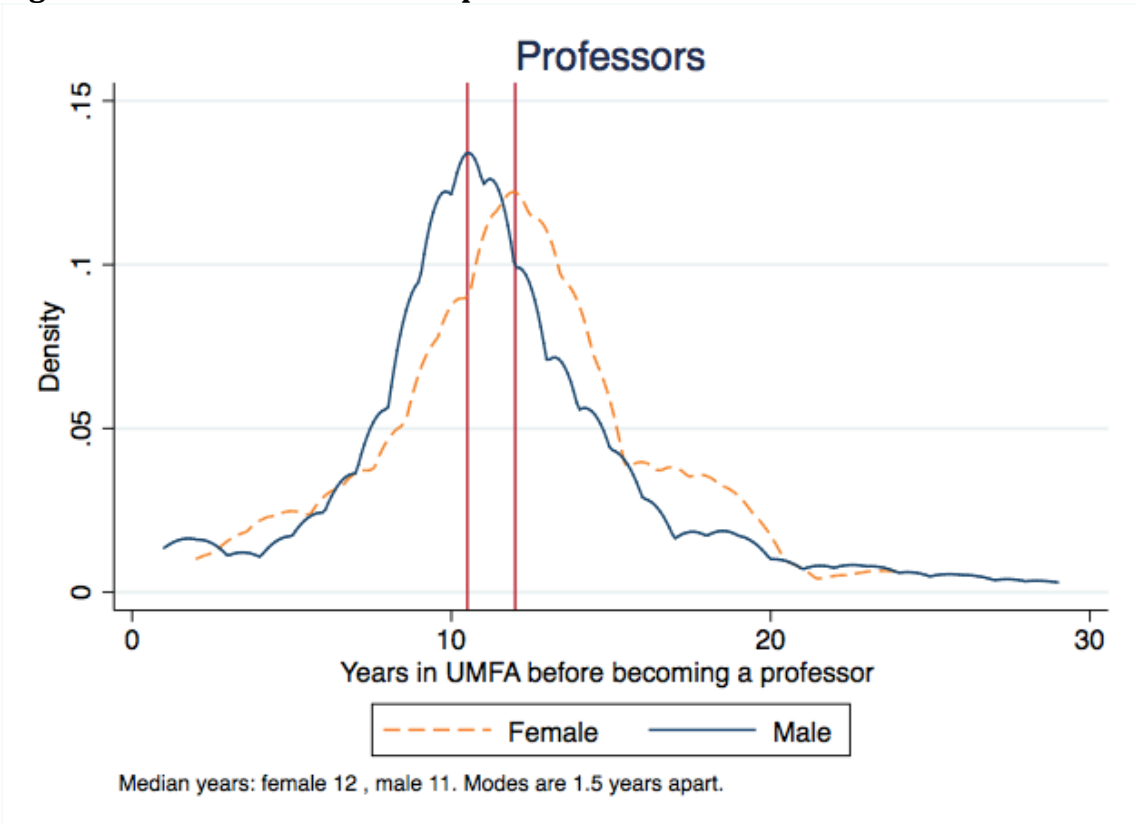
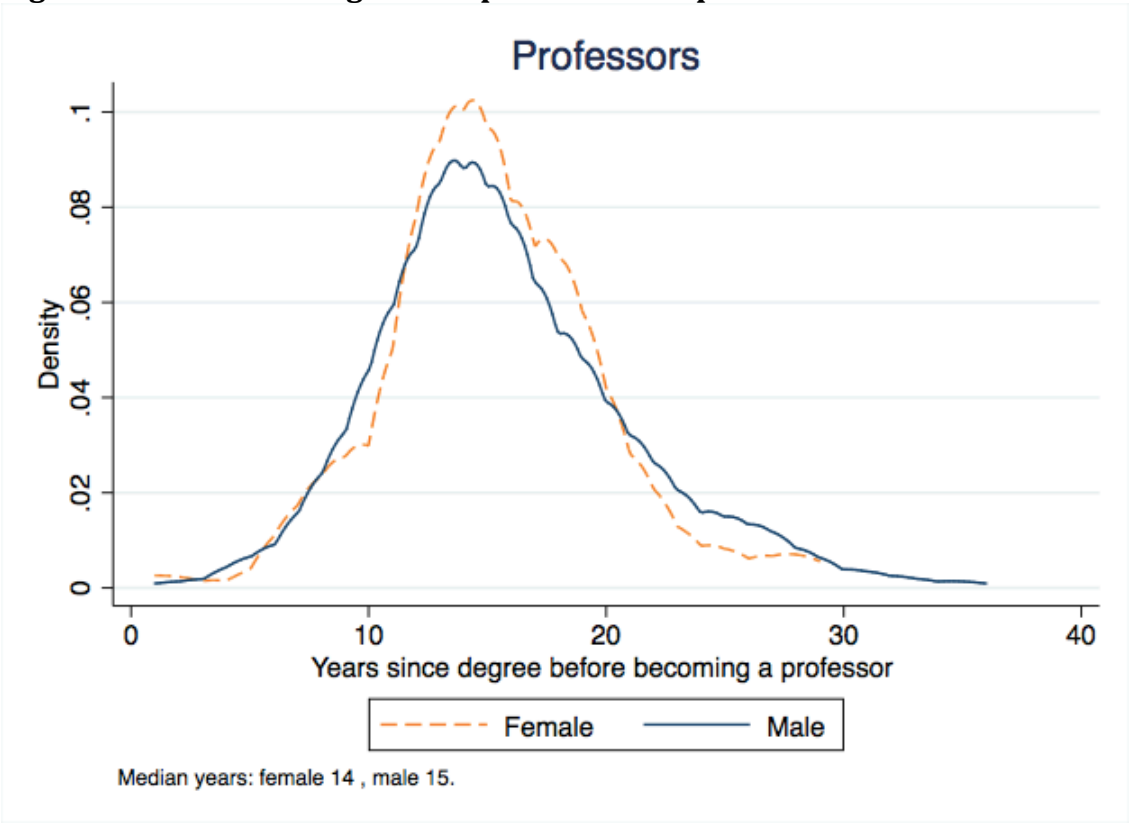


Figure 6. Years since degree completion before promotion to Professor





A major concern that remains is whether there are gender differences in the likelihood of reaching the rank of Professor. As in Figure 3 and 4, there is a large salary gap that evolves if one does not move to the next rank, providing members with the incentive to work toward promotion.

To investigate further, I take a subsample of tenure stream members who have been with UMFA for at least 12 years and reached either the rank of Associate or Full. I then estimate a linear probability model (LPM) to determine if women are more or less likely to be Professor, having controlled for the smaller faculty group to which they belong.

The resulting coefficients on a female indicator are presented in Table 4, whereby each estimate is based on a separate regression using a different sample each time. Each column indicates the group of faculty members represented in the sample. Each row indicates the years with UMFA required to be a part of the sample. The reported coefficient, multiplied by 100, reports the number of percentage points women are more or less likely to be Professor.

**Table 4. Promotion to Professor LPM female coefficients**

Years UMFA	All	Science/Eng	Arts/other	Bannatyne	Bus/Law/Arch
12-25 years	-0.151**	-0.170	-0.0647	-0.348**	-0.108
12+ years	-0.155***	-0.162*	-0.0948	-0.257**	-0.231
15+ years	-0.116*	-0.113	-0.0978	-0.191*	-0.169

\*\* 1%, \* 5% level of significance. Controls for sub-faculty grouping

Overall, it appears high seniority women are less likely to be Professors. For example, among all members with 12 or more years in UMFA, women are 15.5 percentage points less likely to be Professors. However, the results are largely driven by gender differences within the Bannatyne group of members. There is some (weaker) evidence of a gender difference in Science and Engineering as well.

The results here should be viewed in the context that we have pooled several cohorts of professors together in a single cross section to obtain these estimates.

Without further information, it is difficult to say much more on this issue. Within groups, there are not enough observations or information to offer generalizations based on the data. A qualitative study of individual cases of high seniority men and women who have not moved to promotion may be warranted. In particular, if there appear to be many women eligible for promotion to Professor who have not put forward their application, the University may want to take steps to reduce the gender differential in this regard. If, however, it appears women were disproportionately nudged towards University service activities that do not lead to promotion, the University and UMFA may want to review the salary and other incentives for each type of work done by Associate Professors.

### 3. Descriptive Statistics

In the appendix 1 I have provided simple tables with average salary, years since degree completion, in current rank, and since becoming an UMFA member within small faculty groupings of tenure stream members and instructors, by rank and gender. The file figures.pdf provided with this report has scatterplots of member salaries against years since degree completion, offering a graphical representation of salary structure.

In figure 7 below, I provide the average salaries of tenure stream men and women within small faculty groups. Generally, we see that women on average are earning less than men. The average salaries presented here, however, do not also condition on important aspects of salary structure, such as the rank, years with the university, or departments within each faculty group.

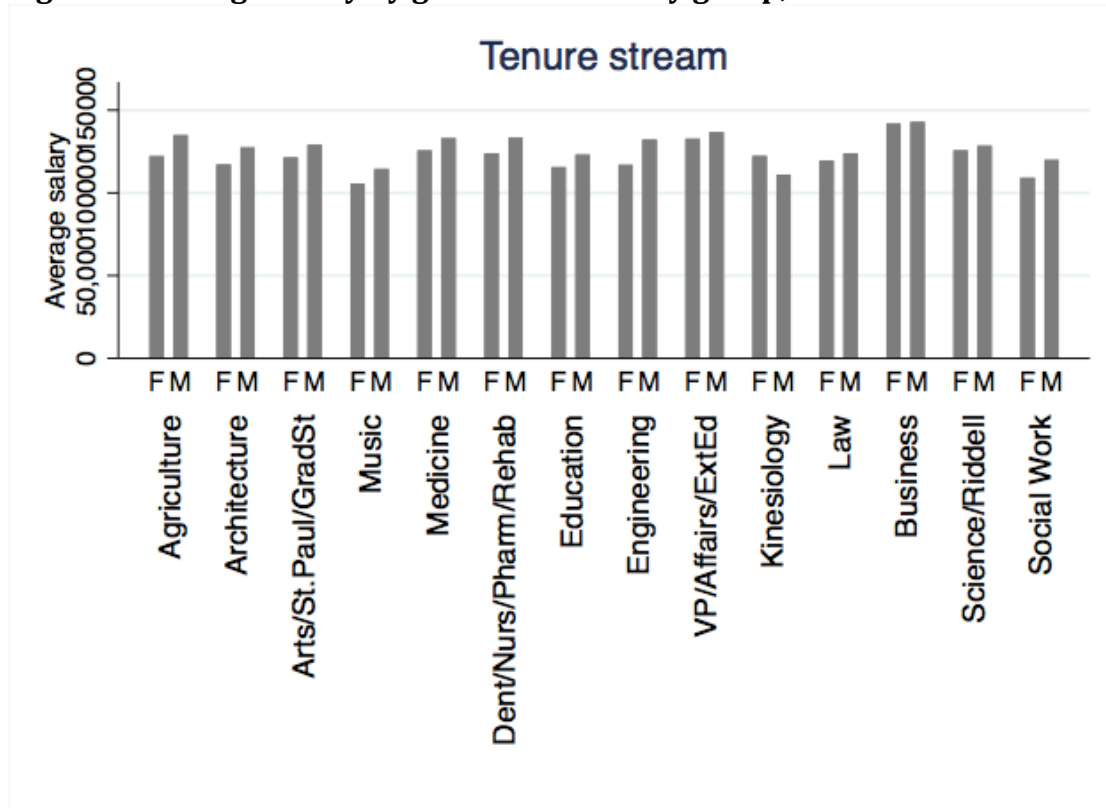
I highlight these points that follow from a review of the descriptive statistics.

- a. A review of the scatterplots suggests there is no clear separation of men and women in terms of their salary, when conditioning on a measure of seniority and faculty group.
- b. While some differences between men and women appear in average salaries, these are generally coupled with differences in seniority.
- c. Within smaller grouping there are often not enough observations to offer generalizations about the experience of men and women. In some cases, regression analysis is not advised or even possible.

Among the figures provided (pdf), there is additional information not discussed elsewhere in this report. For example:

- The timing of degree completion and becoming an UMFA member are closely tied. It would be difficult to separately identify the importance of these factors. For instructors, there are more differences in timing, indicating a different career progression for this group.
- Consider the density graph of age by gender. Among tenure stream faculty, the men are surprisingly older, and there is a significant portion of men over age 70 (about 8%). I recall Frances Woolley making an argument that removing mandatory retirement policies was likely to benefit male faculty more than women, contrary to arguments made at the time.

**Figure 7. Average salary by gender and faculty group, tenure stream**



#### 4. Specification of OLS and HLM models

Generally speaking, I estimate linear regressions whereby the dependent variable is the natural logarithm of salary and the main control variable of interest is an indicator set equal to one when the individual is female and zero when male. The female coefficient that results from this linear regression (multiplied by 100) provides an approximation of the percentage difference between the average salaries of men and women, after controlling for other factors included in the regression. In each regression, a quadratic term for the number of years since the completion of degree is included.

When estimating the models, only members of the 5 main faculty groups are included. That is:

- i. Science and Engineering
  - C.H.RIDDELL FAC.ENV/EARTH/RESR
  - FACULTY OF AGRI & FOOD SCIENCE
  - FACULTY OF ENGINEERING
  - FACULTY OF SCIENCE
- ii. Arts, Education, Graduate Studies, and Social Work
  - FACULTY OF ARTS
  - FACULTY OF EDUCATION

- FACULTY OF GRADUATE STUDIES
- FACULTY OF SOCIAL WORK
- ST. PAUL COLLEGE
- iii. Bannatyne campus groups, including Kinesiology
  - COLLEGE OF DENTISTRY
  - COLLEGE OF NURSING
  - COLLEGE OF PHARMACY
  - FACULTY KINESIOLOGY & REC MGMT
  - MAX RADY COLLEGE OF MEDICINE
  - REHABILITATION SCIENCES
- iv. Music and Art
  - M.A.DESAUTELS FACULTY OF MUSIC
  - SCHOOL OF ART
- v. Business, Law and Architecture
  - FACULTY OF ARCHITECTURE
  - FACULTY OF LAW
  - H. ASPER SCHOOL OF BUSINESS

Models were not estimated for Librarians, or members associated with Extended Education, Student Affairs, and the Vice-Provost (Academic affairs).

Among members that were instructors, only those with “continuing” or “probationary” appointments are included. For tenure-stream members, only those with “probationary” or “tenured” appointments are included.

With reference to Tables 1 and 2, the following models represent the main models estimated for this report;

**Model 1. OLS (tenure stream)**

$$\ln(\text{salary}) = \beta_0 + \beta_1 \text{Female} + \beta_2 * \text{Associate} + \beta_3 * \text{Professor} + \beta_4 * \text{YearsDegree} + \beta_5 * \text{YearsDegree}^2 + \text{subfaculty effects} + \text{Faculty effects} + \varepsilon$$

Model 1 includes faculty fixed effects (as a factor variable, or more simply a set of indicators, for each of the 5 main faculty groups) and subfaculty groups (smaller groupings of departments within faculties, made large enough to ensure some representation of men and women within each smaller group).

The model is estimated using a pooled sample of all tenure stream members.

**Model 1. OLS (instructors)**

$$\ln(\text{salary}) = \beta_0 + \beta_1 \text{Female} + \beta_2 * \text{InstructorII} + \beta_3 * \text{SeniorInstructor} + \beta_4 * \text{YearsDegree} + \beta_5 * \text{YearsDegree}^2 + \text{subfaculty effects} + \text{Faculty effects} + \varepsilon$$

Model 1 includes faculty fixed effects (a set of dummies for each of the 5 main faculty groups) and subfaculty groups (smaller groupings of departments within faculties, made large enough to ensure some representation of men and women within each smaller group). The subfaculty groups for instructors may not entirely match the subfaculty groups for tenure stream members.

**Model 2. OLS (tenure stream and instructors)**

$$\ln(\text{salary}) = \beta_0 + \beta_1 \text{Female} + \beta_2 * \text{YearsDegree} + \beta_3 * \text{YearsDegree}^2 + \text{subfaculty effects} + \text{Faculty effects} + \varepsilon$$

For model 2, the equation above is estimated within samples of members in each rank separately. This allows for different estimates of all coefficients for each rank.

**Model 3. Mixed Model (HLM, tenure stream)**

$$\ln(\text{salary}) = \beta_0 + \beta_1 \text{Female} + \beta_4 * \text{YearsDegree} + \beta_5 * \text{YearsDegree}^2 + \alpha_{\text{subfaculty}} * \text{YearsDegree} + \text{subfaculty effects} + \text{Faculty effects} + \varepsilon$$

The multilevel model allows for random coefficients on the covariate for years since degree completion. This is intended to capture the fact that rates of salary increases with respect to years since degree completion will vary by smaller department groups. For tenure stream members, this model is estimated within each rank separately

**Model 3. Mixed Model (HLM, instructors)**

$$\ln(\text{salary}) = \beta_0 + \beta_1 \text{Female} + \beta_4 * \text{YearsDegree} + \beta_5 * \text{YearsDegree}^2 + \alpha_{\text{subfaculty}} * \text{YearsDegree} + \text{subfaculty effects} + \text{Faculty effects} + \text{rank effects} + \varepsilon$$

The multilevel model allows for random coefficients on the covariate for years since degree completion. This is intended to capture the fact that rates of salary increases with respect to years since degree completion will vary by smaller department groups. For instructors, rank effects are included in the model, since all ranks are pooled to estimate this model given my concerns for having adequate samples of men and women within smaller groupings,

## 5. Oaxaca-Blinder results

For the Oaxaca-Blinder decompositions, it appeared most useful to present results based on OLS regressions similar to Model 1 in section 4, pooling together ranks, so that I can get a sense of the importance of rank in understanding the higher-level wage gaps. The results for tenure stream members are presented in Table 5. The results suggest the importance of rank and seniority for explaining the observed gender difference in average wages.

**Table 5. Oaxaca-Blinder Decomposition Results, Tenure Stream.**

	Science/Eng	Arts/other	Bannatyne	Bus/Law/Arch	Music/Art
Difference (Male-Female)	0.0591	0.0721	0.0561	0.0624	0.0873
Explained by:					
Years since degree	0.0269	0.0522	0.0286	0.002	0.02743
Rank	0.03619	0.0282	0.0519	0.0318	0.0681
Subfaculty	0.007272	-0.002535	0.003288	0.02644	0.00983
Unexplained	-0.0114	-0.00607	-0.0277	0.00213	-0.0180

For instructors, the samples sizes were too small to estimate the decomposition within faculty group. Instead, I estimated a single model pooling faculty groups.

**Table 6. Oaxaca-Blinder Decomposition Results, Instructors.**

	Pooled faculties
Difference (Male-Female)	0.0335
Explained by:	
Years since degree	0.0067
Rank	0.0132
Subfaculty	0.00451
Unexplained	0.00894

## Appendix 1. Descriptive Statistics by faculty group, rank and gender

Groups are:

- Agriculture
- Architecture
- Arts/St.Paul/GradSt
- Music (and School of Art)
- Medicine (Max Racy College of Medicine only)
- Dent/Nurs/Pharm/Rehab (Bannatyne campus excluding medicine)
- Education
- Engineering
- VP/Affairs/ExtEd (and Student Affairs)
- Kinesiology and Recreation Management
- Law
- Business
- Science and C.H. Riddell
- Social Work
- Library

Statistics in each group are:

- Average salary
- Average years since degree completion
- Average years in current rank
- Average years since becoming a UMFA member
- Number of observations in the group

Statistics for (i) instructors are provided first, then (ii) for tenure stream faculty.

Note that only 6 outliers were excluded from the data for these descriptive statistics (and the regression models). These outliers included one person in Medicine that was a former administration and five individuals in Dentistry with unusually high salaries.

**i. Instructors by small faculty grouping, rank and gender**

Statistics in each group are:

- Average salary
- Average years since degree completion
- Average years in current rank
- Average years since becoming a UMFA member
- Number of observations in the group

Gender	fac_small and RANK		
	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F			114686
			30
			16
			23
			1
M	81647	91085	97199
	25	12	25
	13	3	7
	13	9	13
	1	1	3

Gender	fac_small and RANK		
	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F	67672	84945	
	8	21	
	1	6	
	1	9	
	1	1	
M		90418	
		23	
		9	
		9	
		1	



Gender	fac_small and RANK Arts/St.Paul/GradSt		
	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F		88980	106574
		18	25
		6	12
		10	22
		7	5
M		92018	104424
		17	29
		10	8
		10	16
		3	3

Gender	fac_small and RANK Music		
	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F	72375	78053	
	22	21	
	2	4	
	2	10	
	1	1	
M		82854	
		8	
		7	
		7	
		1	

Gender	fac_small and RANK Medicine		
	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F	67699		
	8		
	4		
	4		
	1		
M		103065	
		29	
		11	
		12	
		2	

Gender	fac_small and RANK		
	Dent/Nurs/Pharm/Rehab		
	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F	82225	96748	106504
	29	20	19
	9	7	3
	9	7	13
	1	5	7
M		98543	110027
		26	28
		9	0
		9	15
		3	2

Gender	fac_small and RANK		
	Engineering		
	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F	76908	103884	
	6	11	
	2	8	
	2	19	
	2	1	
M	78908	102644	113968
	2	20	24
	0	11	14
	1	16	14
	3	2	2

Gender	fac_small and RANK		
	VP/Affairs/ExtEd		
	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F	68027	93383	
	10	17	
	3	8	
	3	12	
	6	15	
M	75339	100026	99789
	8	25	23
	5	12	2
	6	16	8
	1	3	2

fac_small and RANK			
----- Kinesiology -----			
Gender	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F			106888
			18
			4
			14
			2
M			114385
			34
			12
			32
			2

fac_small and RANK			
----- Law -----			
Gender	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F		105159	
		34	
		3	
		4	
		1	
M			

fac_small and RANK			
----- Science/Riddell -----			
Gender	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F	73734	88899	109977
	12	16	28
	3	5	8
	3	10	17
	5	9	4
M	78839	88122	106449
	6	11	22
	1	5	6
	2	9	17
	2	7	13

Gender	fac_small and RANK		
	INSTRUCTOR I	INSTRUCTOR II	SENIOR INSTRUCTOR
F		94703	109334
		18	19
		10	14
		11	14
		6	2
M	65514		113433
	2		21
	1		14
	1		18
	1		1

**ii. Tenure stream faculty**

Statistics in each group are:

- Average salary
- Average years since degree completion
- Average years in current rank
- Average years since becoming a UMFA member
- Number of observations in the group

Gender	fac_small and RANK		
	ASSISTANT PROFESSOR	ASSOCIATE PROFESSOR	PROFESSOR
F	91637	113129	149346
	7	13	25
	5	4	10
	5	11	21
	5	7	8
M	91340	117246	149365
	10	18	27
	4	8	11
	4	14	21
	4	16	32

Gender	fac_small and RANK		
	ASSISTANT PROFESSOR	ASSOCIATE PROFESSOR	PROFESSOR
F	90090	120707	153673
	8	23	25
	5	8	12
	5	16	20
	3	13	1
M	90740	122173	157974
	15	18	19
	3	9	10
	4	15	20
	2	9	4

Gender	fac_small and RANK		
	ASSISTANT PROFESSOR	Arts/St.Paul/GradSt ASSOCIATE PROFESSOR	PROFESSOR
F	91844	114750	143260
	7	15	23
	5	7	8
	5	12	20
	12	45	30
M	98342	117169	148842
	12	20	31
	7	11	15
	8	18	27
	15	44	50

Gender	fac_small and RANK		
	ASSISTANT PROFESSOR	Music ASSOCIATE PROFESSOR	PROFESSOR
F	89295	108591	146695
	13	12	27
	4	6	9
	5	11	22
	8	3	3
M	88782	111841	137256
	10	22	23
	5	7	3
	5	15	19
	5	11	7

Gender	fac_small and RANK		
	ASSISTANT PROFESSOR	Medicine ASSOCIATE PROFESSOR	PROFESSOR
F	96830	115121	155376
	12	18	30
	4	6	14
	4	12	24
	11	15	16
M	94404	118661	152538
	11	20	29
	4	6	15
	4	12	26
	17	19	48

Gender	fac_small and RANK Dent/Nurs/Pharm/Rehab		
	ASSISTANT PROFESSOR	ASSOCIATE PROFESSOR	PROFESSOR
F	112655	129225	149141
	11	18	22
	5	8	11
	6	16	23
	21	26	4
M	126076	127742	147893
	15	19	26
	5	5	8
	5	11	20
	9	14	10

Gender	fac_small and RANK Education		
	ASSISTANT PROFESSOR	ASSOCIATE PROFESSOR	PROFESSOR
F	91379	118288	143950
	6	14	21
	3	5	6
	4	13	15
	8	9	6
M	86300	114905	147984
	5	12	26
	1	8	12
	1	14	24
	2	6	5

Gender	fac_small and RANK Engineering		
	ASSISTANT PROFESSOR	ASSOCIATE PROFESSOR	PROFESSOR
F	98285	126400	144486
	7	23	20
	3	13	7
	3	20	18
	5	4	2
M	96742	121385	149038
	8	18	25
	4	7	11
	4	12	21
	9	20	32

Gender	fac_small and RANK		
	ASSISTANT PROFESSOR	ASSOCIATE PROFESSOR	PROFESSOR
F	100945	129418	168108
	5	18	22
	5	10	12
	7	14	33
M	1	1	1
		126322	158062
		26	25
		14	15
		17	38
		2	1

Gender	fac_small and RANK		
	ASSISTANT PROFESSOR	ASSOCIATE PROFESSOR	PROFESSOR
F	87215	111779	156467
	6	12	27
	2	4	16
	2	8	25
M	2	3	3
	91799	108221	161235
	8	12	28
	4	2	19
	4	6	27
	2	4	1

Gender	fac_small and RANK		
	ASSISTANT PROFESSOR	ASSOCIATE PROFESSOR	PROFESSOR
F	94932	118866	152876
	10	14	24
	4	5	9
	4	11	22
M	4	3	3
	86208	111891	156250
	6	11	38
	1	3	25
	1	7	32
	3	4	5



Gender	fac_small and RANK		
	----- Business -----		
	ASSISTANT PROFESSOR	ASSOCIATE PROFESSOR	PROFESSOR
F	136776	141388	153628
	3	12	20
	4	5	8
	4	10	19
	6	8	3
M	129514	141430	159929
	7	14	27
	6	5	14
	6	9	24
	11	14	10

Gender	fac_small and RANK		
	----- Science/Riddell -----		
	ASSISTANT PROFESSOR	ASSOCIATE PROFESSOR	PROFESSOR
F	97257	117539	145937
	9	16	26
	5	6	9
	5	13	21
	7	15	16
M	91820	116468	147912
	7	17	27
	3	6	10
	3	12	21
	19	46	65

Gender	fac_small and RANK		
	----- Social Work -----		
	ASSISTANT PROFESSOR	ASSOCIATE PROFESSOR	PROFESSOR
F	89736	118927	
	4	14	
	2	7	
	5	16	
	4	8	
M	93739	125780	123277
	20	19	11
	3	12	5
	3	20	16
	1	4	1

## **Appendix 2. Background note**

### **My view with respect to studying gender-based salary differentials**

I would like to recognize the fact that while we are referring to gender-based differentials, we are really referring to differentials between those who identify as male and those who identify as female, as in the data provided to me. I think it's important to recognize this might not be the only dimension of gender that is relevant for salary differentials, but other dimensions will not be considered here.

The purpose of this section is to briefly explain my own perspective when starting this project—to offer a sense of what I am looking for, my priors, and the jargon I tend to use.

Within a university setting, it is common to find large differentials between the salaries of men and women. I think of these differentials in two general parts – the part that is explained by factors largely outside the university's control, and the part that is systemic to the university. In this report, I am most interested in estimating these parts separately.

What is outside the university's control? This often reflects historical circumstances and social norms that are, at least in part, beyond the control of the university. As an example of historical circumstances, entry to PhD programs and early hiring practices tended to favour men, resulting in seniority differentials today. As such, higher salaries among more senior members and lower salaries for more junior members will explain part of a gender-based differential at an institution. As an example of contemporary social norms, we know that many fields of study generally associated with higher salaries tend to be dominated by men. While the university may be interested in policy that promotes equity in terms of the students enrolled within male or female dominated fields, or ensure their hiring practices are not biased toward one gender or another, the fact that men dominate the finance field across Canada is not the sole responsibility of the University of Manitoba. With this perspective, I think it is important to control for things like where individuals are in their career (years since degree or starting at the University of Manitoba) or what field they are in when examining gender-based differentials in salary.

So what is systemic? In part, this will reflect how salaries are structured within the collective agreement, with an expectation that some provisions may have differential effects on average for male and female members. It will also reflect the extent to which salaries are determined outside the collective agreement—in terms of negotiating starting salaries, or any increments during one's career that allows for the discretion of the employer or union as well as the willingness or opportunity that employees have to negotiate—which again may have differential effects on average for male and female members.

Ultimately, I am most focused on how to estimate this systemic part, and therefore have an unobservable counterfactual in mind that I would like to estimate. E.g. If I could take a particular female faculty member and, without changing things like seniority or field, suddenly make her male—would her salary change?