The University of Western Ontario
Gender-Based Salary Anomaly Study
November 2009

Outline

I. Introduction

The University of Western Ontario has previously undertaken pay equity studies in 1975, 1989-1991, 1995 and 2005. This report summarizes the results of the fifth pay equity study completed in August, 2009. The issue of gender pay equity is covered in provincial legislation by The Pay Equity Act of 1990, and while this act does not require the university to undertake a pay equity study on a regular basis, pay equity is widely seen as a key component in any university compensation structure.

The present study was undertaken pursuant to Letter of Understanding H of the July 1, 2006 to June 30, 2010 Collective Agreement between the University of Western Ontario and the University of Western Ontario Faculty Association (UWOFA). Specifically, the agreement requires that the "Salary Anomalies Committee, established under Clause 37.1 of the Compensation and Benefits Article, shall conduct a study of gender-based salary anomalies and, if gender-based salary anomalies are noted, shall distribute funds available in the 2009-10 Salary Anomalies Fund in accordance with Clauses 39 and 39.1 of that Article."[1] The Salary Anomalies Committee is charged with a responsibility to "consider salary patterns for Members with Probationary and Tenured Appointments and for Members with Limited-Term Appointments using regression analysis where Annual Salary is the dependent variable[2]. Independent variables may include, but need not be limited to: Gender, Highest Degree, Years Since Highest Degree, Years Since First Degree, Years Employed as a Faculty Member at The University of Western Ontario, Age, Rank, Years in Rank, Home Faculty, Department Average Salary."

The issue of this report (which we shall henceforth refer to as the 2009 report) concludes the review of Gender-Based Salary Anomalies as mandated by the 2006-10 Collective Agreement. The results of this study will inform the subsequent work of the Salary Anomaly Committee to determine any individual salary adjustments to be made from the Salary Anomaly Fund in 2009-10. The full amount of the fund is $500,000, and first call on these funds is an allocation to Probationary, Tenured or Limited-Term members whose salaries are deemed to be anomalously low because of their gender. Any remaining amount will be available for Performance Based Anomaly Adjustments as described by clause 38 and 38.1 of the Collective Agreement.

In addition to this Gender-Based Anomaly Fund, there have been two other funds that have provided for salary adjustments during the 2006-10 Collective Agreement. These are the Career Trajectory Fund and the Performance-Based Anomaly Fund. Both of these funds are administered by a committee comprised of two members appointed by the University, two members appointed by the Association, and a jointly appointed chair. While each committee has a different mandate, all three committees necessarily work with similar data sets and similar variables and the result is that the work of these committees is in many ways interconnected. The Gender-Based Salary Anomaly Committee membership was:

[1] See Collective Agreement: Letter of Understanding H:
http://www.uwofa.ca/@storage/files/documents/80/ca_06_10.pdf

[2] The appointment categories of Probationary and Tenured and Limited-Term at the University of Western Ontario, as specified in the Collective Agreement, connote full-time employment. The Salary Anomalies Committee was not given a mandate to consider salary patterns of part-time appointees.

Chair:
Terry Sicular (Professor, Economics)

Association Appointees:
James Davies (Professor, Economics)
Ann Bigelow (Lecturer, Management and Organizational Studies Program)

Employer Appointees:
Julie McMullin (Professor of Sociology and Associate Dean, Social Science)
David Wardlaw (Professor of Chemistry and Dean of Science)

Resource Person:
Jimmy Chien (Analyst, Institutional Planning and Budgeting) assisted the Committee

The present study is undertaken to consider the degree to which gender-based salary differences at Western may continue to persist after the adjustments made in the previous gender equity exercises. In addition to the previous gender-based exercises, since 2006 there have also been three sets of Career Trajectory adjustments, which are gender-blind, and one set of Performance Based Anomaly adjustments that may have also addressed some gender-based salary differences, although the Performance Based Anomaly assessment process, as defined in the Collective Agreement and as implemented, did not have a directive to consider explicitly gender-based anomalies. In the 2005 study of gender-based salary anomalies, in its implementation in 2006, and in the subsequent career-trajectory and performance-based anomaly salary adjustment exercises, the groups of Probationary and Tenured and Limited Term (LT) faculty were treated separately; accordingly these two groups are also analyzed separately in this study.

The most recent study of salary and gender at Western was carried out in 2005.[3] The 2009 report builds on the analytical approach used in 2005, which used a linear multivariate regression analysis. The general approach taken in this study involved first replicating the 2005 regression analysis, using the same variables but with data for 2009. The purpose of this replication is to answer the question of whether or not the gender salary gap in the Probationary and Tenured group identified in the 2005 study has persisted. In view of the substantial gender-based salary adjustments that were implemented for Probationary and Tenured faculty following the 2005 study, our hypothesis is that the gender salary gap in 2009 will be less than it was in 2005 for this faculty group. The 2005 study found no gender salary gap for LT faculty, and we anticipate the same finding to hold for 2009.

A second regression analysis was also carried out for each group and the details are reported here. The second analysis improves on the first in several ways and provides a fuller understanding of the role of gender in Western's salary structure.

[3] See Report of the Faculty Pay Equity Committee, August 2005:
http://www.uwofa.ca/@storage/files/documents/149/2005payequityreport.pdf

In addition to the linear multivariate regression analysis, the 2009 report also includes an outline of the wider context of gender-salary differentials, a review of past pay equity studies here at Western and elsewhere, an outline of the salary structure at UWO, and a variety of descriptive statistics from UWO and comparisons of UWO salaries and gender differentials with comparator institutions.

The 2009 report draws several key conclusions and also makes numerous recommendations. The recommendations pertain to implementation of a gender-based salary anomaly adjustment process in the fall of 2009 by the Salary Anomaly Committee, to future pay equity studies, and to the collection and provision of data not currently available for the analysis of salary anomalies and salary career trajectories.

II. Review of Past Work

A. Gender Differences in Pay: Wider Context

Historically, and on average, women's wages have been lower than men's wages. In 1931 the average wage for employed women in Canada was 60 per cent of an employed man's average wage (Phillips and Phillips 2000). By 2001, among full-year, full-time workers, women earned 71.6 per cent as much as men (Statistics Canada 2003:23). Many factors contribute to these differences including hours of work, education, experience, occupation and industry. Yet, differences in pay remain even when certain variables are taken into account. For instance, in each of the 10 most highly paid occupations in Canada, women earned less than their male counterparts in 2000. As Table 1 shows, women made up 24.1 per cent of the total employment among judges and earned an average of 90.2 per cent of what their male counterparts did. Among senior managers in the goods-producing industrial sector, women accounted for 11.6 per cent of the total employment and earned an average of 62.2 per cent of the average male salary.

Table II.1 Ten Highest-Paid Occupations by Gender, 2000

	Women as % of Total Employment	Female/Male Income Ratio
Judges	24.1	90.2
Physicians—specialists	30.8	61.2
Physicians—general practitioners	30.8	72.5
Senior Managers—financial, communications carriers, other business services	21.5	63.9
Dentists	23.0	63.7
Lawyers and Quebec Notaries	31.0	67.4
Senior Managers—goods production, utilities, transportation and construction	11.6	62.2
Information systems and data processing managers	25.1	83.5
Senior Managers—trade, broadcasting, other services, n.e.c.	17.8	61.9
School Principals and Administrators	45.5	90.7

Source: Adapted from Krahn, Lowe, and Hughes (2007: 192), Statistics Canada data.

B. Gender Differences in Pay: University Professors

Compared to male professors, female professors in Canada have historically had lower average earnings. Although this gender gap in pay has declined over time (Warman, Woolley, and Worswich, 2006), in 2008-09 a gender-gap in pay remained evident among full-time teaching staff at Canadian Universities. Statistics Canada data show that in 2008-09 the average and median incomes for male faculty members were greater than for female faculty members in the 27 universities surveyed. The difference in median income ranged from $3877 at Cape Breton University to $20,268 at McMaster University and the difference in average income ranged from $4,429 at St. Thomas University to $17,433 at the University of British Columbia (Statistics Canada, 2009). Although salaries from the University of Western Ontario were not included in the report, institutional data from Western show that the median income for full-time, male teaching staff in 2008-09 was $111,689 compared with a median income for female full-time teaching staff of $95,392, representing a difference in median income of $16,297. The average income for male teaching staff at Western is $115,611 compared with an average income for female full-time teaching staff of $100,926, representing a difference in average income of $14,685.

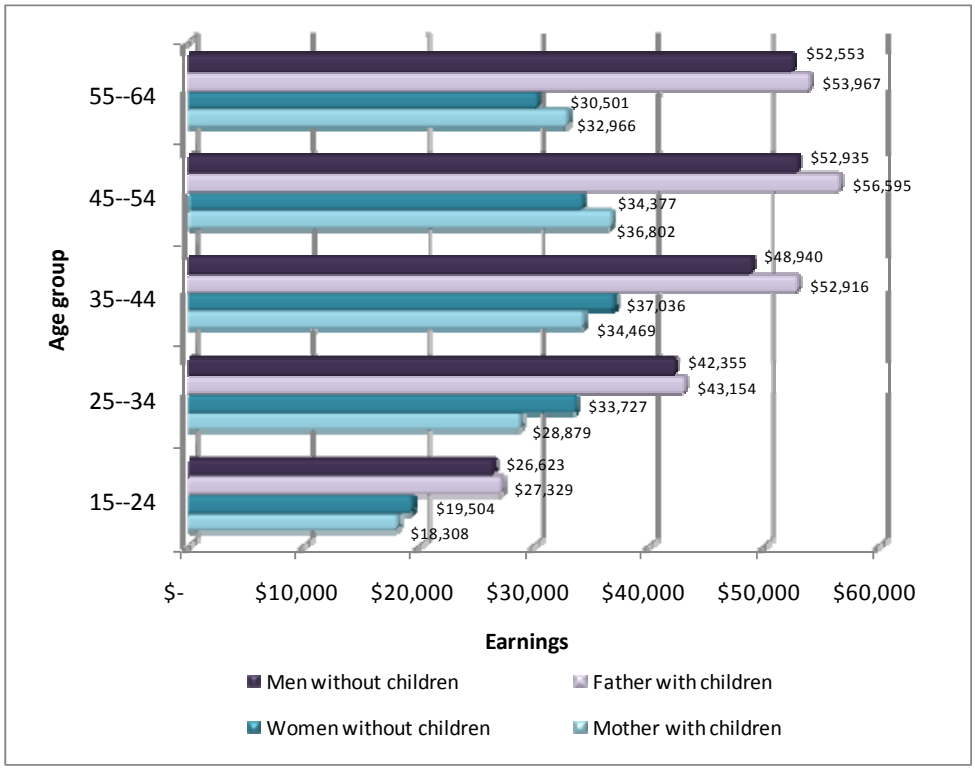
C. Factors That Contribute to Gender Differences in Pay

Many factors that contribute to pay differences between individuals in a work-place are relevant to gender differences in pay. Studies on the gender wage-gap in the university sector have considered factors such as experience (measured through variables such as years since Ph.D.), merit (measured through variables such as rank) and productivity (measured through variables such as number of publications) using regression models that explain upwards of 90% of the variance in pay (Ginther and Hayes 1999, 2003; Warman, Woolley, Worswick, 2006). These variables contribute to pay differences in the ways that one would expect but typically fail to account completely for the gender pay differential (Brown, Prentice and Troutt, 2007).

A challenge for studies that consider the gender-gap in pay is to disentangle the factors that contribute to men and women's pay in the same way from those that may contribute to pay in a different way. For example, rank is often 'controlled' in studies of pay differences, but some research shows that there may be systemic gender differences in promotion (Brown, Prentice, and Troutt 2007; Ginther and Hayes 2003; Modern Languages Association, 2009).

Parental status can also contribute to gender differences in pay. In Canada, among full-time, full-year workers, parental status influences the personal incomes of both men and women but in different ways. Figure 1 shows that younger mothers with children at home have lower incomes than other women or than fathers who have children at home. The difference between the groups of women is greatest between the ages of 25 and 44. In contrast, when compared to the average income of men without children at home, the income of fathers with children at home is higher regardless of age. If we compare fathers and mothers who have children at home, the income difference increases in each age group and is greatest among 45- to 54-year-olds (a $19,793 difference) and 55- to 64-year-olds (a $21,001 difference).

Figure II.1 Earnings of Persons Working Full-Time, by Family Characteristics, 2000 [a]



[a] Women and men in marriages or common-law unions, or lone parent; full-time (30+ hours per week); working for 49–52 weeks
Source: Statistics Canada, 2001 Census, public use data.

One US study reports that having babies within 5 years of being awarded a Ph.D. negatively influences the tenure rates of women to a greater extent than men and that the gap is greater in the sciences than it is in the humanities and social sciences (Mason and Goulden, 2002). Another study finds that for professors working in US modern language departments, responsibilities for child care affect time to promotion to full professor (Modern Languages Association, 2009). Yet, in a US study on gender differences in salary for faculty in the Humanities, parental status did not influence pay (Ginther and Hayes 2003) when other factors are controlled. We are unaware of any studies that have taken parental status into account in the Canadian university system.

D. University-Based Pay Equity Studies

The committee contacted several other Ontario Universities (Queens, McMaster, Waterloo, Guelph, York and Carleton) and requested information about the status of recent pay equity studies.[4] While the majority of universities contacted had not completed a pay equity study recently, the committee was able to obtain useful information about a recent study that had been completed at the

[4] It is interesting to note that Western appears to have undertaken pay equity studies on a more regular basis and in greater depth than those Ontario Universities that were asked for and provided access to .their most recent pay equity study report.

University of Waterloo (April, 2009)[5]. Two recent Canadian University-based pay equity studies were reviewed by the Committee, one emanating from the University of Manitoba (Brown, Prentice and Troutt, 2007) and the other from McGill (McGill, 2009). Consistent with the findings presented above in Sections. II.B and II.C, these studies found that men have higher average salaries than women even after controlling for factors such as those mentioned above. In addition, the McGill study noted that female faculty members are promoted to full professor more slowly than are male faculty members.

Western's 2005 pay equity study found that male Probationary and Tenured faculty members earn, on average, $2,162 more than female Probationary and Tenured faculty after other factors were taken into account, but it found no systematic gender differences in salaries among Limited Term faculty. The 2005 study did not analyze differential times to promotion to full professor between male and female faculty members.

Western's 2005 pay equity study made several recommendations for future pay equity studies. Some of these recommendations have been followed, for example that regular reviews of equity in compensation be conducted, while others have not. The 2005 study included a recommendation that systematic data on starting salaries should be gathered. Although starting salaries have been systematically recorded since 2000, these data are not yet available in form suitable for ready inclusion by IPB in the dataset supplied to salary adjustment committees. Also, the mandate of the 2009 committee was not expanded to include all Designated Groups.[6]

Although these studies, and those referred to in previous sections, have informed the committee's approach to the analysis presented in this report, we acknowledge that previous gender-based adjustments to salaries at Western have corrected some of the systemic patterns of gender-based salary differences. We also acknowledge that there may be anomalous cases where men are paid less than women and that the degree and direction of gender-based differences in pay may vary between subgroups within the university. As discussed in section IV, our methods reflect these considerations.

III. Pay Structure and Gender-Related Salary Differentials at UWO and Comparators

A. Salary Practices at UWO

Full-time academic faculty at Western who are Members of the bargaining unit (UWOFA) belong to one of two categories: Probationary-Tenured (ranks: Assistant Professor, Associate Professor, and Professor) and Limited Term (ranks: Lecturer, Assistant Professor, Associate Professor, and Professor). The Limited Term (LT) category includes Permanent faculty, a designation that indicates those who had been long-serving Instructors and were granted permanent contracts at the rank of Lecturer or Assistant Professor by the Collective Agreement of 1998-2002. Also included in the LT

[5] This study took an approach similar to the approach undertaken by this committee: a model salary calculation was undertaken using regression analysis with the independent variables including Selective Increase Units (annual increases), starting salaries, performance ratings and information about date of hire and date of highest degree.

[6] In the Employment Equity Act, Designated Groups comprise: women, aboriginal peoples, persons with disabilities and members of visible minorities.

category for the purposes of salary increases are Basic Scientists in Externally-Funded Appointments, where Basic Scientists are those Members whose home unit is a Clinical Department in the Schulich School of Medicine & Dentistry.

Current salaries are determined by starting salary and subsequent increments. Starting salaries are constrained by salary floors for each rank in the Collective Agreement, ranging from $47,849 for Lecturers to $91,236 for full Professors in 2009-10. Otherwise, they are the result of individual negotiations, which are affected by market conditions, equity considerations[7] and perhaps other factors.

Annual salary increases under the current Collective Agreement (CA) come via Scale, Performance Linked Career Progress (PLCP) increments, Career Trajectory adjustments, and Salary Anomaly awards. The CA also allows the Employer to make market adjustments and to award administrative and other stipends. Administrative stipends generally cause a temporary change in compensation, while a stipend from a research chair or professorship may be ongoing and essentially permanent.

Scale adjustments are the same for all ranks and have been 3% per year under the current four-year CA, except for the final year (2009-10) in which they are 3.25%. Scale keeps the relative salary structure unchanged. PLCP is quite different. As explained in Section IV, its main determinant is the member's Performance Assessment Indicator (PAI) relative to the average in his/her unit (most often a department), which gives the member's Basic Salary Points (BSPs). BSPs have an average of 2.2 within units. Each Dean adds an average of 0.2 Discretionary Salary Points (DSPs) per faculty member. Total Salary Points (SPs) may not exceed 6.0 for any member. PLCP is a non-linear function of total Salary Points (SPs) for those at professorial ranks. An SP is currently (for determination of 2009-10 salary) worth $1,129 for professors earning less than $101,363. Its value falls to $854 for those earning between $101,363 and $123,347, and further to $690 for salaries above this level. This yields a concave relationship between salary and career progress increments, which fights against the tendency of Scale to produce equal percentage increases for all members. Other things equal, lower earners get higher percentage salary increases in the UWO structure. This difference should help to reduce, on average, the (relative) size of salary anomalies somewhat over time. On the other hand, for Limited Term faculty at the rank of Lecturer each salary point (SP) is worth the same amount ($772) in 2009-10.

Over the last four years Career Trajectory adjustments have added $3.5 million to base salaries at UWO, roughly equal to 3% of the current salary mass. Both Probationary and Tenured, and Limited Term faculty have been eligible. In 2006-07 $1.2 million was distributed by a formula that gave all faculty a basic $800 increase and larger amounts for those with between 5 and 25 years of full-time service. In the last three years awards have been made on a systematic basis to individual faculty found by the Career Trajectory Awards Committee to have salaries below "a trajectory appropriate to their career stage, compared to similar faculty at comparator institutions" in the words of the CA.

[7] There is no explicit requirement for gender equity in starting salaries. Equity considerations as they affect starting salaries are more likely to take the form of trying to avoid unjustified salary differences between individuals hired in a unit in the same year, or within a few years of each other.

While Career Trajectory adjustments were introduced for the first time in the current CA, each CA at UWO has featured Salary Anomaly awards. These are recommended by a Salary Anomaly Committee and they are subject to an upper limit ($7,500 in the current CA). Salary Anomaly adjustments are confined to Probationary and Tenured faculty. In the current CA faculty members may either apply for a Salary Anomaly adjustment, or they may be nominated by their Dean. The total amount set aside in Salary Anomaly Fund in the current CA is $700,000. Of this, $200,000 was awarded in 2008-09. Provisions for 2009-10 introduce an important innovation. The 2009-10 Salary Anomaly Fund has $500,000 but the first call on these funds is for Gender-Based Anomalies Adjustments, which will be recommended by the Salary Anomaly Committee. Faculty members are not required to apply, or to be nominated, to receive a Gender-Based adjustment. Any amount left over in the 2009-10 Salary Anomaly Fund after Gender-Based Anomalies Adjustments have been made will be used for regular Salary Anomaly adjustments.

Market adjustments are confidential, and their number and cost are not reported publicly. The committee is therefore unable to provide any information about the incidence of such awards.

There is no requirement under the CA for a gender breakdown of PLCP, Career Trajectory, Salary Anomaly adjustments, market adjustments or stipends to be reported. There is therefore no information available on their gender-based incidence or any differentials in these components of salary. The Committee believes that it would be advisable to have this information regularly collected and reported in the future.

B. Comparisons of UWO Salaries and Gender Differentials with Comparator Institutions

Statistics Canada conducts an annual census of all full-time faculty at Canadian universities known as the Universities & Colleges Annual Salary Survey (UCASS). The most recent complete data available are for 2007-08.[8] The latter allow interesting gender-related comparisons to be made between Western and other Ontario universities, both on faculty composition and salaries. One should keep in mind, however, that more recent data for Western are available from internal sources, and that some definitions differ between UCASS and the internal data that are used in the regression analyses in the later sections of this report. The UCASS data include administrative stipends whereas in using internal data the Committee excluded administrative stipends but included stipends deemed permanent, such as those associated with some professorships and research chairs. Also, UCASS classifies faculty by rank rather than contract status.

There are a variety of ways that Ontario universities could be grouped. The committee looked at the "Bovey 6" and "All Ontario." The Bovey 6 is comprised of Guelph, McMaster, Queen's, Toronto, Waterloo and Western. "All Ontario" is made up of the 19 provincially funded Ontario university-level institutions.

[8] Preliminary results are published by Statistics Canada quite quickly, but generally omit many (late-filing) universities. Final results are published with a lag of between one and two years. Final results for 2007-08 have not yet been published. The results presented here are based on a detailed summary that is purchased from Statistics Canada annually by OCUFA. These data are more detailed than provided in Statistics Canada's publications. See Statistics Canada catalogue no. 81-595-M No. 062, *Salaries and Salary Scales of Full-time Teaching Staff at Canadian Universities, 2007/2008: Preliminary Report*, released in April 2008, for an example of the published data.

For All Ontario, and including all ranks, 35.6% of full-time faculty were female in 2007-08. The proportion was similar for the Bovey 6, at 35.3%, but was just 32.7% at Western. Looking only at professorial ranks (Assistant, Associate and full Professors), however, the comparison is somewhat different. For the province as a whole 34.8% were female, but the fraction of women was lower in the Bovey 6 group. For the Bovey 6 it was 30.9% and for Western 30.4%.

The data also show that the fraction of women tends to decline with age. The decline is mild up to about age 50. Beyond age 55 there is a drop-off, both at Western and the comparators. For faculty aged 55+, the fraction of females was 29.8% for All Ontario, 28.9% for the Bovey 6, and 29.7% for Western.

Composition by Rank

As shown in Table III.1, 41.2% of female professors in All Ontario are Assistants and 19.7% are Full. In contrast 28.1% of male professors are Assistants and 36.6% are Full. The fraction who are Full is a bit higher for the Bovey 6, for both men and women. In contrast, at Western the fraction who are Full is lower than All Ontario for both genders. Among women at UWO 48.4% are Assistants and only 14.3% Full; for men at UWO the corresponding figures are 28.8% Assistants and 35.1% Full.

Table III.1: Composition of Full-Time Faculty by Gender and Rank, 2007-08 (%)

Rank	All Ontario	Bovey 6	UWO
Females:			
% of Professorial Ranks:			
Full Professor	19.7	22.4	14.3
Associate Professor	39.1	39.0	37.4
Assistant Professor	41.2	38.6	48.4
TOTAL	100	100	100
Lecturers as % of All Female Faculty	8.1	11.7	14.8
Males:			
% of Professorial Ranks:			
Full Professor	36.6	42.4	35.1
Associate Professor.	35.3	33.3	36.1
Assistant Professor	28.1	24.3	28.8
TOTAL	100	100	100
Lecturers as % of All Male Faculty	4.8	6.5	6.3

Source: Calculations using Statistics Canada UCASS data.

The lower fraction of faculty at UWO at the Full Professor rank, especially in comparison to the Bovey 6, has been noted before and is likely attributable to several factors. One such factor has been previously identified, namely a practice of slower promotion from Associate to Full at UWO compared to others in the Bovey 6. Accordingly, changes designed to shorten time to promotion to Full were

made to the Promotion and Tenure article of the current CA. In the gender context one may ask whether there is differentially slower promotion for women than men at UWO. To obtain some relevant evidence, the committee looked at the fraction of male vs. female professors who are Full at different ages at UWO and the Bovey 6. As discussed in Section IV, results show that the finding of a lower fraction of women than men being Full holds at all ages both at Western and in the Bovey 6,. suggesting that promotion of women is likely slower than of men at these institutions. Sec. IV reveals that this pattern is more pronounced at Western than in the Bovey 6.

Mean Salaries- Overall Comparisons

As shown in Table III.2 below, for All Ontario female salaries averaged 89.3% of male in 2007-08. For the Bovey 6 this ratio was 88.2%, and at Western it was 86.8%.[9] The lower ratio for Western is at least partly due to compositional effects. This is reflected in the fact that, *within ranks*, UWO shows a higher female/male salary ratio than the Bovey 6 or All Ontario, except at the Associate Professor level. One significant compositional factor is that UWO has a higher proportion of Lecturers than any other Bovey 6 university. When attention is confined to faculty at professorial ranks, Western's female/male salary ratio rises to 87.6% and comes closer to the ratios for the Bovey 6 and All Ontario.

Table III.2: Mean Female Salary as % of Mean Male Salary, All Ontario, Bovey 6 and UWO, 2007-08

Rank	All Ontario	Bovey 6	UWO
Full Prof.	94.5	95.6	97.0
Assoc. Prof.	96.5	96.0	95.1
Assistant Prof.	95.9	94.9	96.8
All Prof. Ranks	89.6	88.8	87.6
Lecturer	98.3	98.4	104.1
All Ranks	89.3	88.2	86.8

The comparisons by rank are also interesting. Note first that within ranks the female/male salary ratio is much higher than for all ranks combined. This does not mean that gender-related salary differentials are all small, as we will explain. However, the fact that the salary ratio is relatively high within ranks does seem significant in the case of Lecturers and Assistant Professors, where the slow promotion problem is likely fairly unimportant. A small difference in the salaries of men and women at the Assistant Professor level may also signal that average starting salaries do not differ greatly by gender.

In contrast to average salaries of Assistant Professors, those of Associate and Full Professors may be significantly influenced by speed of promotion. Slower promotion tends to lead to higher mean

[9] These numbers are all based on mean salaries. The committee also looked at comparisons using median salaries and found that patterns were similar.

(and median) salaries at adjacent ranks than would be observed with faster promotion, as we pointed out earlier. We have seen above that there is some evidence that promotion to Full is slower for women than for men both at Western and across Ontario. This slower promotion acts to boost the female/male salary ratios at the Associate and Full ranks, as we see in Table III.2. At these ranks high female/male salary ratios should not be taken as an indication of a true lack of significant gender differences in salaries. One strategy for overcoming the distorting effects of differential promotion speeds is to group all professors together, ignoring rank distinctions between Assistant, Associate and Full Professors. This is particularly revealing when one looks at salary differentials according to age or years of experience. Next we examine salary differentials within age groups, which can be readily calculated from Statistics Canada's UCASS data.

Mean Salaries by Age

How does the gender salary gap vary by age? For Lecturers, there is something of a U-shaped pattern with age, for both All Ontario and UWO (see Figure III.1). The female/male salary ratio is lowest for faculty aged 45-49. Figure III.2 shows a different pattern for those at professorial ranks. For Full Professors there is a downward trend in the female/male salary ratio at least up to age 60. This is a mild trend for Ontario as a whole, but a fairly strong trend at UWO. For Assistant Professors there is not a strong consistent trend. In contrast, for Associate Professors the male/female salary ratio shows an "inverse U" or humped age profile, and the hump is particularly marked at UWO. At Western the female/male salary ratio rises up to ages 45-49, reaching 105%, before beginning a decline that continues through to normal retirement age. This is consistent with a pattern of slower promotion from Associate to Full Professor for women than for men.

Figure III.1: Lecturers, Mean Female Salary as % of Mean Male Salary by Age, 2007-08

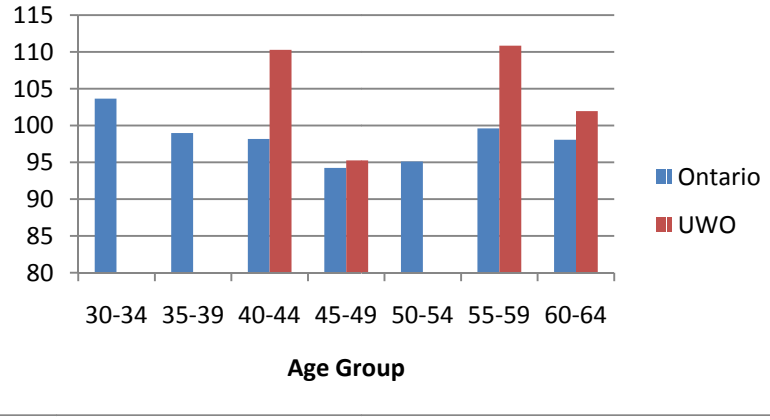


Figure III.2a: Full Professors: Mean Female Salary as % of Mean Male Salary, by Age, 2007-08

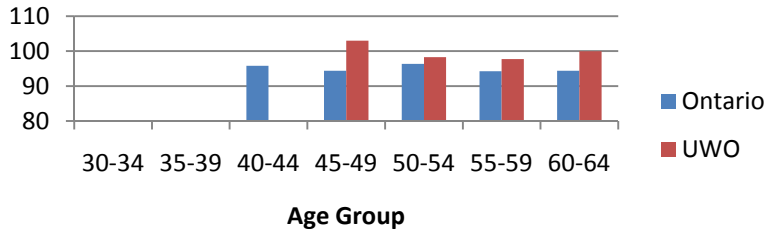


Figure III.2b: Associate Professors, Mean Female Salary as % of Mean Male Salary, by Age, 2007-08

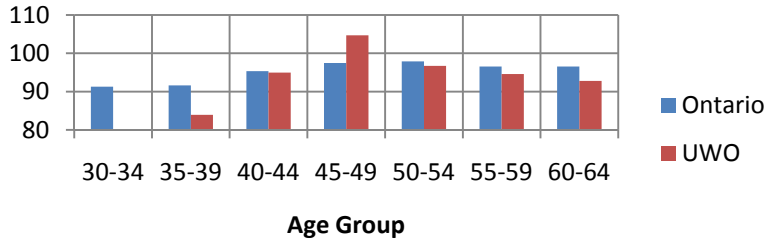


Figure III2.c: Assistant Professors, Mean Female Salary as % of Mean Male Salary, by Age, 2007-08

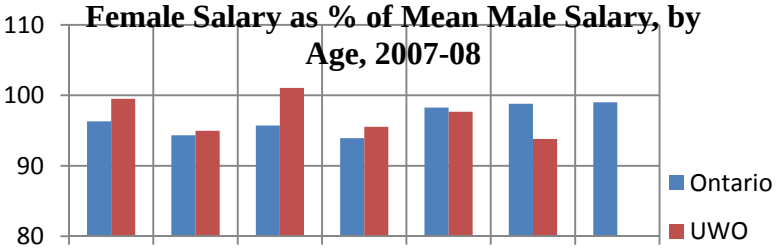
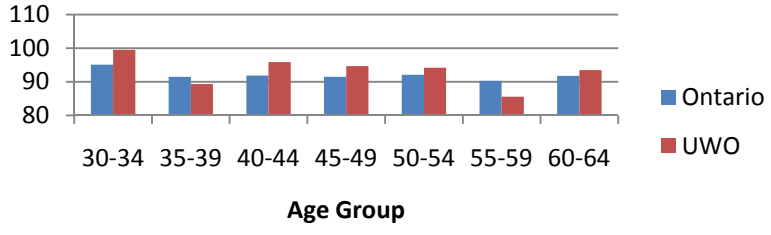


Figure III.2d: All Professorial Ranks, Mean Female Salary as % of Mean Male Salary by Age, 2007-08



Above we pointed out that differences in promotion rates between the genders can make salaries within the Associate and Full Professor ranks a questionable indicator. In Figure III.2d we aggregate all the professorial ranks, which avoids this problem. The chart shows a downward trend in the female/male mean salary ratio up to age 60 at both Western and, to a lesser extent, for Ontario as a whole. Male and female salaries are near parity at Western for faculty aged 30-34, but by age 55-59 the female/male ratio is down to 85%. There are a variety of possible reasons for this decline, some of which are illuminated by the regression studies reported in the next section of this report.

IV. Probationary and Tenured Faculty: Empirical Analysis and Results

A. Approach

In this section of the report we use multivariate linear regression analysis of salary data for probationary and tenured faculty at Western to investigate pay differences between women and men. Multivariate linear regression analysis was the methodology used in the past two UWO Pay Equity exercises (1995 and 2005) as well as the 2005 Pay Equity implementation analysis. This methodology is widely used in the literature on gender pay differences.

Multivariate linear regression analysis yields estimates of the relationship between salaries and observed characteristics of individuals. One of those characteristics is gender. An advantage of this approach is that it can identify pay differences that are associated with differences in the characteristics of men and women. For example, if more women than men faculty are new hires, and if new hires have lower salaries than faculty with more seniority, then average salaries for women may be lower than average salaries for men even though women and men with similar years of employment may have similar pay. Multivariate regression analysis can control for such differences and so allow one to determine whether men and women with similar observable characteristics such as years of employment, professorial rank, discipline, etc., receive similar pay or not.

Of course, gender discrimination could be embedded in some observed characteristics. For example, suppose that women are promoted through the ranks more slowly than men as the result of discriminatory processes. In this case professorial rank may reflect gender bias. If women are promoted more slowly than men, equal pay for men and women of the same rank would not ensure pay equity. In the analysis, then, one should consider whether any observed characteristics are affected by, or reflect, gender bias.

We must also be alert to problems associated with measurement error. Some relevant characteristics are difficult or impossible to measure, for example, performance, effort and ability. The presence of measurement error or lack of data on relevant characteristics can bias the estimates of regression analysis. Where possible, we identify and try to address measurement problems, and our interpretation of the empirical findings is done with attention to such problems.

Regression analysis reveals associations or correlations between a dependent variable, in this case salary, and observed characteristics, but these associations are not necessarily causal relationships. For example, the salary regression results discussed below find a positive and significant association between professorial rank and salary. This does not mean that promotion leads to a higher salary.

Indeed, such is rarely the case at Western, where most faculty who are promoted already have salaries that are above the salary floors for their new ranks, and faculty do not in general receive any special salary increase at the time of promotion. Nevertheless, rank's estimated coefficient in the regression is significant and positive, because rank is associated with other unobserved characteristics such as experience and productivity that do affect salary. The regression results reported here, then, should be understood in these terms. Interpretation of the results should reflect that some variables such as the Performance Assessment Indicator (PAI) scores and years at Western are directly related to salary mechanisms (performance-based salary increases, scale salary increases), while other variables such as professorial rank and gender are not.

Multivariate linear regression analysis provides information on average trends and patterns using data for a group of individuals. In this section the group of individuals in our analysis is the population of probationary and tenured faculty members at Western. As will be discussed below, the analysis does reveal certain gender-related patterns in salaries for this group. From this one should not conclude that all women or men fit the pattern. The distribution of individuals around the average pattern displays variance, and it is possible that few or no individuals are "average."

B. Salary Determination and Possible Sources of Gender Bias at UWO

Multivariate regression analysis of salaries involves specifying a model of the relationship between earnings and the variables that influence or determine earnings. Such a model should reflect the underlying processes that determine the salaries of men and women. Studies of academic salaries in the literature such as Ginther and Hayes 1999, 2003; Warman, Woolley, Worswick 2006; and Brown, Prentice and Troutt 2007 provide guidance on the sorts of variables that should be included. These studies inform our approach. Our approach also reflects specific features of salary determination at Western, which shares some features found more generally in academia, but also has some features that are not widely shared.

At Western and elsewhere the process of salary determination begins at the time of hire. Starting salaries have long term effects, as an individual's salary at hire is the starting point for his or her ensuing salary trajectory. Starting salaries reflect a mix of factors including discipline, experience and performance prior to appointment, the state of the job market at the time of hire, and the particular negotiating skills of the employee and employer representative. Gender bias can occur in starting salaries if, for example, discrimination exists in the wider job market or if the process of salary negotiations is different for men and women. Gender bias could also arise in the case of spousal hires if spousal hires alter the bargaining power of new hires in a way that affects starting salaries differentially between genders.

Changes over time in an individual's salary reflect processes related to seniority, experience, merit and performance. At Western, salary trajectories after hire are primarily influenced by parameters laid out in the CA (and, for those hired prior to unionization, by the earlier Conditions of Appointment). The CA provides for uniform annual scale increases that apply equally to men and women. Scale increases are calculated in percentage terms, and they compound over time. Years of employment at

Western is thus an important variable affecting current salary. Although scale increases are the same for men and women, over time they can exacerbate gender differentials in starting salaries.

Salaries are also related to performance or merit. Western's CA provides for performance-based pay increases calculated on the basis of PAI scores. It is possible that the assignment of PAI scores within units,[10] or in the Dean's allocations of Discretionary Salary Points (DSPs), could be influenced by gender. This could occur if APE committees, Chairs, or Deans have biased perceptions about performance that are reflected in PAI scores. Gender differences in PAI scores could also arise due to the effects of parenting and parental leaves. Parenting responsibilities could affect the performance of women and men differently, and parental leaves may provide different opportunities for men and women with respect to maintaining research and productivity.[11] Even in the absence of differences in productivity, parental leaves can influence the assessment of performance. At Western the criteria for evaluating performance and assigning PAI scores after parental leaves is unclear, and APE committees sometimes have difficulty determining appropriate PAI scores for faculty members who have recently returned from a parental leave.

While both men and women take parental leaves, at Western the proportion of women who take such leaves is higher, and the average length of women's leaves is longer. In the five-year period spanning 2004-05 through 2008-09, probationary and tenured women took 55 parental leaves, which number is equivalent to 23%% of the total number of female Probationary and Tenured faculty at the ranks of Assistant and Associate Professor at Western in 2008-09.[12] During the same period probationary and tenured men took 43 parental leaves, equivalent to 10% of the total number of male Probationary and Tenured faculty at the ranks of Assistant and Associate Professor in 2008-09. The average length of parental leaves for women who took parental leaves was 7.5 months, as compared to 5.1 months for men.[13] These differences are large enough to raise questions about the effects of parental leaves on performance assessments, as well as promotion, for men versus women.

Merit and productivity can influence salaries through processes other than APE and PAI scores. Professorial rank is typically included in analyses of academic salaries, as promotion is related to performance and experience. Many universities, including Western, have salary floors by rank, so that promotion can directly affect salaries in cases where an individual's salary prior to promotion is below the salary floor for the next rank. Studies in the literature indicate that promotion processes can differ between men and women (see Section III). If so, then promotion could be associated with gender differentials in pay. At Western the salary floors are relatively low, so that promotion *per se* usually

[10] For departmentalized Faculties, the unit is the home Department; for non-departmentalized Faculties it is either the Faculty as a whole or sub-units of the Faculty based on sub-disciplinary or organizational groupings that are recognized within the Faculty that have differentiated pay scales based on market forces. A list of units used in the principal regression analyses of this study (Models II and III) is provided in a footnote to Table IV.2.

[11] Here and below we use the term parental leave in the broad sense to include pregnancy leaves, parental leaves and adoption leaves.

[12] We do not include Full professors in calculating the percentages as parental leaves are largely taken by faculty members at lower ranks. If we include all ranks in the denominator, the percentages are 19% for women and 6% for men.

[13] The parental leave data cited here include pregnancy leaves, parental leaves, and adoption leaves and were provided by the Office of Faculty Relations. A pregnancy leave followed by a parental leave is counted as a single leave. The data count the number of leaves, not the number of individuals who took leaves. If some individuals took more than one parental leave during this five year period, then the number of leaves would be larger than the number of faculty members who took leaves.

does not lead to a pay raise. Nevertheless, promotion may be associated with other factors that are difficult to measure and influence salaries.

Western's CA allows for market adjustments and stipends. Faculty members may receive salary increases in response to outside offers or "to accommodate other market forces." Market adjustments go into base salary and so are permanent. Faculty members may also receive stipends that are not part of base salary but increase total compensation. Stipends are typically associated with holding administrative positions such as Department Chair, or research-intensive positions such as a Canada Research Chair. While some stipends are temporary, others are in effect continuing. Market adjustments and continuing stipends could potentially be sources of gender bias in salary outcomes.

The literature discussed in Section III identifies certain other factors that are associated with gender pay differentials. Some studies find that family obligations have different effects on men and women faculty members, for example, that the presence of children tends to delay promotion for women but not for men. The impact of family considerations likely depends on provisions in the terms of employment such as those for pregnancy and parental leaves or for elder care. Western's current CA contains provisions for parental leaves for both men and women, and also for salary maintenance for both men and women during parental leaves. Previous CAs provided salary maintenance only for women. For older cohorts parental and pregnancy leave provisions were more limited. These historical changes mean that the impact of such provisions on gender pay differentials has likely changed over time.

While certain aspects of Western's salary process could generate gender-based salary differences, Western has salary adjustment processes that have the potential to correct them. Like previous agreements, the current CA contains provisions that are intended to correct individual or shared salary anomalies, specifically, Career Trajectory adjustments, Salary Anomaly adjustments, and Gender-Based Salary Anomaly adjustments.[14] In principle both the career trajectory and anomalies processes should be gender-neutral, but if gender differences underlie rank or other variables used in the evaluation processes, or if men (or women) are more likely to apply for individual anomaly adjustments, or if more women have anomalous salaries, the outcomes could affect the salaries of men and women differently.

As discussed elsewhere in this report, Western has twice carried out salary adjustments with the aim of eliminating or reducing gender-based differences in salaries. The most recent of these gender-based salary adjustments took place in 2006. Such adjustments have reduced gender pay differentials, but may not have entirely eliminated them. In addition, gender bias may have arisen for individuals hired since the last gender-based salary adjustment.

C. The Salary Regressions: Model Specification

We employ three regression models, denoted as Models I, II and III. Model I replicates the regression analysis of the most recent UWO Pay Equity Report (2005) using data for 2009. Replication

[14] Career Trajectory adjustments were a new feature in the current Collective Agreement. Previous agreements have had salary anomaly adjustments and gender salary anomaly adjustments, however.

of the 2005 regression analysis provides direct information about how the role of gender (and other variables) in salary determination has changed since 2005.

In Model I the determinants of salary include: gender, years since highest degree, years since first degree, years at Western, rank, years at current rank, relative PAI in the prior year, unit average salary, and Faculty.[15] The variables used in this regression are summarized in Table IV.1.

Table IV.1: Variables Used in Probationary and Tenured Salary Regression Model I

Variable	Description
Salary	base salary plus continuing stipends
Gender (*Female*)	=1 if female, =0 if male
Years since highest degree	2009 minus year of highest degree
Years since first degree	2009 minus year of first degree
Years at UWO	2009 minus year of hire at UWO
Years in current rank	2009 minus year in which current rank was attained at UWO
Relative PAI, 2008	PAI relative to the unit mean PAI score, 2008
Rank—full professor	= 1 if full professor, = 0 otherwise
Rank—associate professor	=1 if associate professor, =0 otherwise
Unit average salary	average salary in the unit of the individual
Faculty	category variables indicating home Faculty

Note: The rank of assistant professor is the omitted or reference category for the professorial rank category variables.

Model II builds upon and makes improvements to the first model. Variables used in the second model are shown in Table IV.2. The time-related variables have been reconfigured to remove overlap. Years since highest degree is a measure of experience and stage of career, but it overlaps with years at UWO. This overlap could confound the measured contributions of these two variables to salaries. For this reason, in Model II we use a modified variable that eliminates the overlap by subtracting years at UWO from years since highest degree to obtain years since highest degree prior to appointment at UWO. Similarly, years in rank can overlap with years at UWO, so we subtract it from years at UWO to obtain the number of years at UWO prior to promotion to the current rank. Years since first degree overlaps with the other time-related variables, so again we subtract from it years since highest degree. This yields four distinct, non-overlapping time-based variables: years between first degree and highest degree, between highest degree and hire at UWO, between hire and most recent promotion, and in current rank.

[15] We use relative PAI in this and all our models, rather than the PAI as assigned within the APE process in the member's unit since relative PAI is used to determine Basic Salary Points in the PCLP system.

Table IV.2: Variables Used in Probationary and Tenured Salary Regression Models II and III

Variable	Description
Salary	base salary plus continuing stipends
Gender (*Female*)	=1 if female, =0 if male
Years between highest degree and hire at UWO	year of hire at UWO minus year of highest degree
Highest degree received four or more years after hire at UWO	=1 if highest degree received four or more years after hire at UWO; =0 otherwise
Years between first and highest degrees	year of highest degree minus year of first degree
Years at UWO prior to current rank	year in which current rank was attained at UWO minus year of hire
Years in current rank	2009 minus year in which current rank was attained
Hired on or after July 1, 2005	=1 if hired after July 1, 2005; =0 otherwise
Relative PAI, average over past four years	PAI divided by the unit mean PAI score, four-year average ('08, '07, '06, '05)
Interaction between years at UWO and relative PAI average	years at UWO times relative PAI average
Square of interaction between years at UWO and relative PAI average	years at UWO times relative PAI average, squared
Rank—full professor	=1 if full professor; = 0 otherwise
Rank—associate professor	= 1 if associate professor; =0 otherwise
Unit	category variables indicating home unit (see footnote to this Table for list of units)

Notes:

(a) The rank of assistant professor is the omitted or reference category for the rank category variables, and the Department of History is the omitted or reference category for the unit category variables.

(b) The units used in the Model II regression and the Model III stepwise regression procedure were: Classics, English, Film, French, Modern Languages and Literature, Philosophy, Visual Arts, Women's Studies, Ivey Accounting, Ivey Finance, Ivey Global Environment of Business, Ivey Information Systems, Ivey Management Science, Ivey Marketing, Ivey Operations, Ivey Organizational Behavior, Ivey Strategy, Education, Chemical Engineering, Civil Engineering, Electrical Engineering, Mechanical Engineering, Health Sciences, Communication Science and Speech Disorders, Kinesiology, Nursing, Occupational Therapy, Physical Therapy, Information and Media Studies, Law Business Taxes and Trusts, Law Other, Anatomy, Biochemistry, Epidemiology, Medical Biophysics, Microbiology, Pathology, Physiology and Pharmacology, Dentistry, Music Education, Music Performance, Music Theory, Applied Math, Biology, Chemistry, Computer Science, Earth Sciences, Math, Physics, Statistics and Actuarial Sciences, Anthropology, Management and Organizational Studies, Economics, Geography, Political Science, Psychology, and Sociology.

Some faculty members obtain their highest degree after appointment at UWO. For these individuals, years since highest degree prior to appointment at UWO is negative. This is not a problem for the analysis unless late completion of the highest degree has an impact on salary determination. Late completion of highest degree may be beneficial in certain units where historically a faculty appointment has required a professional or other degree, but where some faculty members go further and acquire a Ph.D. or additional degrees after working at Western for some time. For such cases, late completion of the highest degree may be associated with higher, rather than lower, levels of pay. More generally, though, slow completion of the Ph.D. has been associated with penalties such as demotion or slow promotion, salary reductions, etc. Such penalties are a long-standing practice at Western and are now specified in the CA.[16] In order to allow the empirical analysis to capture such factors, Model II includes an indicator variable for individuals who completed their degrees four or more years after appointment.

Model II also includes a category variable for faculty members hired on or after July 1, 2005. Following submission of the report of the Pay Equity Committee in August 2005, a Pay Equity Implementation Committee was struck to advise on how gender-based salary anomalies might be corrected. This committee reported in March 2006.[17] By agreement with the Faculty Association, salaries of those female Probationary and Tenured faculty members whose salaries were determined to be anomalously low based on gender were adjusted effective May 1, 2006.[18] A total of $643, 047 was disbursed to female faculty members and was distributed by rank as follows:

Rank	Fraction of rank receiving a correction	Average correction
Assistant	91 %	$3,986
Associate	57 %	$2,356
Full	73 %	$2,760

The category variable for individuals hired on or after July 1, 2005, allows us to identify whether gender-based salary differences differ between faculty members hired before and after this date. Such could be the case if, for example, gender differences exist in starting salaries and if the May 2006 gender salary adjustment corrected those differences for existing faculty covered by this adjustment but not for subsequent hires.

The 2005 Pay Equity Report included relative PAI as an explanatory variable to capture performance, but at that time PAI information was only available for the then most recent year. Relative PAI scores are now available for the past 4 years. In order to reflect a longer history of performance and smooth out year-to-year variability, Model II uses the average of relative PAI over the past four years. In addition, it contains an interaction between years at UWO and relative PAI. This captures the fact that the effects of PAI on salary are compounded over time due to scale increases. Since the relationship

[16] Appointments, Clause 4.3.2.1, states that probationary faculty members who do not complete their highest degree within three years of the appointment date are subject to penalties in terms of appointment status, salary, etc.
[17] See Report of the Implementation Committee, March 2006: http://www.uwo.ca/pvp/facultyrelations/documentation/PEI%20report%20FINAL.doc
[18] The adjustments are summarized in a joint administration-UWOFA letter that can be found at the following link: http://www.uwo.ca/pvp/facultyrelations/documentation/Pay%20Equity%20Joint%20Statement%20April%2024%202006%20WN.pdf

between salary and experience is typically nonlinear in labor market studies and is explicitly nonlinear in the CA, we also include the squared value of this interaction.[19]

Model II includes unit category variables that identify each individual's home unit. This set of category variables controls for differences in average salaries among units; consequently, the unit average salary variable used in Model I is not needed.[20] The set of unit category variables also effectively controls for salary differences among Faculties. Consequently, separate Faculty category variables are unnecessary.

Model III is a parsimonious version of Model II that includes only those variables that are identified as being significant by a stepwise analysis.

D. Data, Variables, and Descriptive Statistics

The data used for this analysis were provided by the UWO Office of Institutional Planning and Budgeting (IPB). The dataset contains individual information as of January 2009 for all probationary and tenured faculty members who were in the bargaining unit in January 2009 and who were employed at Western as of June 30, 2008. Faculty members with administrative appointments at the level of Associate Dean and above and any faculty members serving on the Board of Governors or on long-term disability were not included. Whenever salary and related data were made available or presented to the Committee, the names of all faculty members were masked so as to maintain confidentiality and impartiality.

Information is available from the IPB database for most but not all variables of interest. With respect to salaries, the current database contains current base salary and stipends, but not starting salaries. Starting salaries have been recorded since 2000 but are not currently in the IPB database (although it is feasible to add them in the future). Market, Gender-Based Anomaly, Performance-Based Anomaly, and Career Trajectory salary adjustments have apparently not been recorded in the Human Resources database and thus cannot be included in the IPB dataset. Since starting salary information is only (potentially) available for the subset of faculty hired since 2000 and the record of salary adjustments is not available at all, these aspects of salary were not included in our dataset and thus could not be analyzed directly. They are, however, part of current base salaries and so are captured indirectly in the analysis.

[19] For example, the 2008-09 value of a salary point in the current Collective Agreement is $1093 up to a salary of $98,172; $827 for salaries between $98,173 and $119,464; and $668 on salaries above $119,464. See Compensation and Benefits, Clause 31, for the salary point values for all years of this agreement. A pattern of reduction of salary point values with increasing rank has been in place under all collective agreements. The result can be expected to be a concave rather than linear relationship between salary and years of experience at Western, holding other things constant. Including a square term allows this concavity to be approximated by a quadratic, reflecting standard practice in empirical studies of wage and salary determinants by social scientists.

[20] The use of unit average salary is, in fact, a bad specification. This can be illustrated by the following example. Suppose people of the same age are paid $10,000 more in unit X than in unit Y, but that members of X are much younger than those of Y. There then might be no difference in average salaries between the two units, and the regression would have no way of capturing the large difference in salary conditions between them. Use of unit category variables avoids this, and reflects standard methods in empirical studies of salary determinants. While unit average salary was used in the regressions of the 2005 Pay Equity committee, it was replaced by unit category variables in the work of the 2009 Pay Equity Implementation committee.

The analysis uses as the dependent variable a measure of permanent salary equal to the sum of base salary plus continuing, long-term stipends. Continuing stipends were defined as stipends received by faculty members that are both renewable and typically renewed, e.g., stipends for some Research Chairs. Temporary stipends such as those for Department Chairs or for short-term Fellowships and Professorships are not included. We note that the dependent variable does not include non-salary benefits, some of which are related to salary (most notably, employer pension contributions).

Table IV.3 gives mean values of key variables used in or relevant to the analysis. Women make up 29% of probationary and tenured faculty. The mean salary of women is 88% that of men. This percentage is the same for base salaries and for base salaries plus continuing stipends.

The numbers in Table IV.3 reveal that men and women faculty members have somewhat different characteristics. The proportion of women faculty at the rank of full professor is lower than that of men, and the proportion at assistant rank is higher. Women tend to have been hired more recently and to have fewer years of service at Western. Also, women on average have fewer years between obtaining their highest degree and starting work at Western, but more years between obtaining their first and highest degrees.

Table IV.3: Number of Probationary and Tenured Faculty in Different Categories and Mean Values of Selected Variables in the Salary Regression Models

Variable	Women	Men	All
Number of faculty	292	702	994
Number by rank: Full (%) Associate (%) Assistant (%)	 52 (18%) 119 (41%) 121 (41%)	 280 (40%) 269 (38%) 153 (22%)	 332 (33%) 388 (39%) 274 (28%)
Number with highest degree received four or more years after hire at UWO (%)	7 (2%)	8 (1%)	15 (2%)
Base salary	104,829	118,509	114,490
Base salary + continuing stipends	105,386	119,479	115,339
Hired on or after July 1, 2005 (%)	86 (29%)	133 (19%)	219 (22%)
Years at UWO	9.0	13.7	12.3
Years at UWO prior to current rank	4.1	6.0	5.4
Years in current rank	4.9	7.7	6.9
Years between highest degree and hire at UWO	3.2	4.9	4.4
Years between first and highest degrees	10.6	7.8	8.6
Relative PAI, average over past four years	1.0048	1.0038	1.0041

Source: IPB dataset, 2009.

Inclusion of unit category variables in the multiple regression analysis controls for disciplinary differences. In view of the large number of units, we do not include in Table IV.3 the breakdown of

women versus men by unit. We note, however, that the proportion of women varies among units. This could be a factor underlying differences between men and women in mean salaries as well as in other characteristics.

The IPB dataset does not contain information on several potentially important non-salary variables. These include time to promotion, household composition (presence of a spouse or of children), pregnancy and parental leaves, and spousal employment. Information on these variables would allow fuller analysis of the effects of gender on salaries, and we recommend that where possible UWO collect such information prior to the next gender pay equity study.

E. Estimation Strategy and Results

We estimate the models using ordinary least squares regression. Models II and III include some interacted and squared variables so as to capture nonlinearities. We estimated a semi-log version of Model II as well as the linear specification. Econometric analyses of earnings often use a semi-log specification because it allows for a curved relationship between salary and its determinants in which the slope is initially steeper and then becomes flatter. The results of the linear and semi-log specifications of Model II were similar. Since past pay equity analyses at UWO use the linear rather than semi-log specification, here we follow past practice and report results for the linear specification. We recommend that future salary analyses estimate both linear and semi-log specifications.

The regressions were run including and excluding outliers (outliers were defined as those individuals whose salaries were 20% higher or lower than those predicted by the analysis; 13 individuals were classified as outliers). The results with and without outliers were generally consistent; levels of significance changed for a few variables, but not for any gender variables. In the end, we decided to include outliers because dropping them could eliminate information relevant to gender bias.

Some regressions were also run excluding faculty in the Ivey School of Business and those Robarts faculty who recently joined the bargaining unit. It is possible that the salary determination process for these groups differs from that for Western as a whole. In general the results of the regressions with and without the Ivey and Robarts faculty were similar, except in one regard which we mention below in the section on gender and rank.

Regression analysis is typically used to analyze data for a sample drawn from a larger population. Our data are not for a sample, but for the population of probationary and tenured faculty at Western hired on or before June 30, 2008, and present as of January 31, 2009. The fact that the data are for the population and not a sample affects interpretation of the results. Some disagreement exists among statisticians about the use of confidence intervals and hypothesis testing when using population data. One view is that the estimated coefficients are true population means, and so confidence intervals are not relevant. Another view is that the population of faculty members at a particular university like Western is a probabilistic sample out of a larger pool of the population of academics, and consequently confidence intervals can and should be used for hypothesis testing. We have chosen to follow the latter

approach, but in view of these concerns we use a relatively generous cutoff of 10% for the statistical significance level, and we pay attention to cases where significance levels approach this cutoff.[21]

Gender is a key variable in our analysis. Past gender studies at UWO have included a category variable for gender. We do so here in all the models. A category variable for gender captures the average gender salary difference that occurs independently of other variables, but it may not reveal gender salary differences that operate through or in interaction with other variables. Recognizing this possibility, the 2006 Pay Equity Implementation Committee ran separate regressions for men and women. Separate regressions allow the estimated coefficients of all the variables to differ between men and women.

Here we use a similar approach, which is to include in the regression equation interactions between the gender category variable and all other explanatory variables.[22] The interactions are equal to the gender category variable times each of the other variables. If the estimated coefficient of an interaction variable is not statistically significantly different from zero (at the chosen cutoff level), then one can conclude that the estimated coefficient for this variable is not significantly different for men and women. Otherwise, one can conclude that the estimated coefficient is significantly different for men and women. Note that interpretation of estimated parameters for gender interactions with category variables is not straightforward, as will be discussed below.

Salary Regression Model I: Results and Comparison with 2005

Table IV.4 shows the results of Model I and, for comparison, the results of the same regression equation estimated using 2005 data as reported in the 2005 pay equity study. Model I has high explanatory power; the R^2 statistic (which quantifies how well the regression model fits the data) indicates that the regression equation explains 83.4% of the variation in salaries. The level of explanatory power is similar to that for 2005 ($R^{2=}$83.8%).[23]

The estimated coefficient for gender (female) is small and not statistically significant. This result suggests that on average and after controlling for characteristics such as years since highest degree, rank, PAI, etc., in 2009 the pay of men and women at UWO was not significantly different. This finding is different than that for 2005, when the estimated coefficient on gender was significant and negative, indicating that women probationary and tenured faculty on average earned less than men.

All other variables in Model I are significant and of the same sign as in 2005, although the magnitudes of some coefficients change a bit. Salary rises with years since highest degree and years since first degree, rank, relative PAI, and unit average salary; it decreases with years at UWO.

[21] The 2005 Pay Equity study used a significance cutoff of 5%, but it includes no discussion of the issue of population versus sample.

[22] This approach yields the same estimated coefficients as separate regressions for men and women, but with differences in the distribution of the error term and thus the estimated standard errors. Gender interactions could not be included for units that had no men or no women, as estimation of the coefficients for these variables requires that there be at least one individual of each gender within the unit. Also, gender interactions were not included for units with only one man or only one woman, as in such cases the estimated coefficients would measure the salary differential for a single individual rather than a systematic pattern.

[23] The R^2 is equal to the square of the correlation coefficient between the dependent variable, salary, and its predicted values from the estimated regression equation. If the predicted values are identical to the actual values, then the R^2=100%.

Table IV.4: Results of Probationary and Tenured Salary Regression Model I, with Comparison to 2005

Variable	2009	2005
Intercept	-2541.79	na
Gender (*Female*)	183.62	-2082.80**
Years since highest degree	433.62***	272.47***
Years since first degree	251.53**	379.86***
Years at UWO	-634.64***	-486.28***
Years in current rank	1174.14***	850.14***
Relative PAI (most recent year)	25552.00***	12384.00***
Rank—Professor	33278.00***	26733.00***
Rank—Associate Professor	13398.00***	11357.00***
Unit average salary	0.54***	0.62***
Number of observations	994	918
R^2 (adjusted R^2)	.834 (.831)	0.838 (na)

Note: *** indicates significance at the 1%, ** at the 5%, * at the 10%, and † at the 20% level. No asterisk or † indicates that the estimated coefficient is not significant at the 20% level. "na" indicates not available. To conserve space, and because they are not directly relevant to gender issues, we do not report the estimated parameters for the constant term and unit category variables here. The parameters for 2005 are from the Report of the Faculty Pay Equity Committee, August 2005, table 3 (p. 11). The adjusted R^2 is a corrected version of the R^2 that accounts for the number of variables in the regression equation. Econometricians prefer the adjusted R^2 because the R^2 generally increases (and never decreases) when more variables are added to the regression equation, even when the added variables account for very little of the unexplained variation in the dependent variable.

Salary Regression Models II and III: Results

Table IV.5 shows the results of Models II and III. Model II includes the full set of variables that could, in theory, explain or be related to salary levels, as well as gender interactions with all these variables. Model III is a parsimonious version of Model II that includes the female indicator variable plus only those other variables that were identified by stepwise regression as having explanatory power.[24] Models II and III have somewhat better fit than Model I.[25] The R^2 statistics for Models II and III are about the same and indicate that they account for 89% of the variation in salaries.

[24] In addition to the variables shown in Table IV.5, the stepwise regression included the subsets of the unit category variables and of the interactions between unit category variables and the gender category variable selected by the stepwise procedure.
[25] The adjusted R^2 statistics for Models II and III are somewhat higher than that for Model I. See the notes to Table IV.4 for an explanation of the adjusted R^2.

Table IV.5: Results of Probationary and Tenured Salary Regression Models II and III

Variable	Model II		Model III	
	Base parameter	Interaction with gender	Base parameter	Interaction with gender
Intercept	48981.00***	na	62109.00***	na
Gender (*Female*)	11896.0	na	-789.6	na
Years since highest degree prior to UWO	405.3†	-465.2		
Years between first and highest degree	91.1	105.5		
Years at UWO prior to current rank	-320.3	-379.8	-704.7***	
Years in current rank	813.8***	-84.4	449.8***	407.8***
Highest degree four or more years after hire at UWO	11535.0***	-5397.8	8902.9***	
Hired on or after July 1, 2005	-468.2	-2362.2		-2357.0†
Relative PAI, 4-year average	23720.0***	-12936.0	14783.0***	
Interaction between years since highest degree and relative PAI	582.3†	610.1	1013.1***	
Square of interaction between years since highest degree and relative PAI	-4.1	1.4	-5.6*	
Rank—Professor	31643.0***	-7137.0†	32535.0***	-3293.0*
Rank—Associate	13713.0***	-2413.2	13480.0***	
Number of observations	994		994	
R^2 (adjusted R^2)	.891 (.875)		.885 (.880)	

Notes:

(a) *** indicates significance at the 1%, ** at the 5%, * at the 10%, and † at the 20% level. No asterisk or † indicates that the estimated coefficient is not significant at the 20% level. "na" indicates not applicable.

(b) The regression equations also included constant terms, unit category variables, and the interactions between unit category variables and the gender category variable. To conserve space, we do not report the estimated parameters for these variables here.

(c) Model II contained the full set of unit category variables (see Table IV.2) and all their interactions with the gender category variable, with History as the omitted reference category. Model III included the subset of these variables selected by the stepwise procedure, which included English, Film, French, Visual Arts, Ivey Accounting, Ivey Finance, Ivey Global Environment of Business, Ivey Information Systems, Ivey Management Science, Ivey Marketing, Ivey Operations, Ivey Organizational Behavior, Ivey Strategy, Education, Chemical Engineering, Electrical Engineering, Mechanical Engineering, Communication Science and Speech Disorders, Nursing, Occupational Therapy, Physical Therapy, Law Business Taxes and Trusts, Law Other, Anatomy, Biochemistry, Epidemiology, Medical Biophysics, Physiology and Pharmacology, Dentistry, Music Theory, Computer Science, Management and Organizational Studies, Economics, and Psychology, plus gender interactions with three unit category variables. Please see the text for discussion of gender/unit interactions that were significant.

Model II contains a very large number of variables and many of these turn out not to be statistically significant. The results of Model II are useful as they indicate which gender-related variables could be important; however, they are difficult to interpret because of mutual correlations among the many variables and the multiple layers of categorical variables. For these reasons, our discussion below focuses largely on Model III.

In both Models II and III the results for the non-gender variables are generally consistent with expectations. Salary is positively and significantly associated with professorial rank and relative PAI score. Also significant are the interactions between PAI and years since highest degree as well as its square, indicating that the effect of PAI on salary compounds over time, but at a decreasing rate.

Several of the years variables are significant. Years in rank has a positive, significant coefficient, while years at UWO prior to promotion to current rank has a negative, significant coefficient. The positive coefficient for years in rank, combined with the positive coefficients for professorial ranks, indicates a stepwise salary pattern where salary increases year by year within each rank. In other words, the salary pattern resembles a staircase with steps between ranks, and the treads of the steps are upward sloping.

Years at UWO prior to promotion to current rank influences the height or "rise" of each step. For each additional year prior to promotion, the height of the step is reduced by roughly $700. If the number of years to promotion is long enough, the height of the step can be reduced to zero or become negative. This reflects a pattern in salaries at Western where, holding all else equal, faculty members who were promoted earlier tend to have higher salaries then those who were promoted later.

With respect to gender, in a regression model that contains female interactions with all other variables, the estimated coefficient on the base female category variable measures the difference between male and female salaries for the "control" group, that is, for the group of individuals in the base categories for all other variables. This coefficient, then, measures the salary difference between men and women for the (hypothetical) group of Assistant Professors in History with zero years between highest degree and hire, zero years in current rank, zero years at UWO prior to current rank, relative PAI of zero, etc. For the hypothetical control group, the female category variable is statistically insignificant in both Models II and III. Indeed, the stepwise procedure eliminates this variable. We include it in Model III anyway because of its importance as a base for the gender interactions.

The finding of an insignificant coefficient on the female category variable was robust across many different exploratory regression runs, including regressions that contained no gender interactions with other variables. In a model with no gender interactions the coefficient can be interpreted as measuring the average difference between male and female salaries, which was not significant. The female category variable remained insignificant when regressions were run excluding one or more of the following: all gender interaction variables; outliers; and the Ivey and Robarts faculty. The magnitude of the estimated coefficient on the female category variable was sensitive to whether or not all gender interactions with units were included in the model, reflecting the interrelationship between these variables, but it remained statistically insignificant.

Although the estimated coefficient on the female category variable was not significant, certain interactions with the female category variable were significant. This points to the possibility of gender salary differences within certain subgroups or linked with particular characteristics. First, the interaction of female with full professor rank is large, negative and significant. This implies that the salary differential between assistant professor (the omitted or reference category) and full professor is significantly smaller for women than for men.[26] In other words, the height of the full professor "step" is smaller for women than for men. The regression results do not suggest the presence of significant gender differences in the salary differentials between the associate and assistant professor ranks.

Second, in Model III the coefficient of the interaction between gender and the category variable for date of hire on or after July 1, 2005 is negative, large, and statistically significant at the 20% confidence level. This result, in combination with the other estimated parameters of Model III, indicates that women hired since mid-2005 have lower salaries than similar men. We note that although this coefficient was not highly significant in Model III, it was significant in many of our exploratory regressions. This finding is noteworthy and hints at the possibility that gender-related salary differentials may have arisen for new hires since the last pay equity salary adjustment. This could be due to gender differences in starting salaries, but we did not have access to data on starting salaries for this study and so cannot explore this hypothesis further.

Third, in Model III the gender interaction with years in current rank is positive and significant. This means that within any rank, holding all else constant, over time the salaries of women increase faster than the salaries of men. In other words, the slopes of the treads in the salary staircase for women are steeper than the slopes of the treads in the salary staircase for men. This does not mean that women's salaries are higher than men's of the same rank. That would depend on the initial heights of the steps, i.e., on the levels of women's versus men's salaries at the time of promotion. If women's salaries at the time of promotion are on average lower than men's, then this result implies that within ranks women's salaries tend to catch up with men's over time. The negative, significant coefficients on gender interactions with recent hires and Full professor rank suggest that the average salaries of women Assistant and Full professors may in fact start off at a lower level than those of men. Also relevant is whether time to promotion is the same for women and men. As we discuss below, this is not the case.

For most units the interactions with gender are not significant. From this we conclude that gender bias does not in general arise from unit-specific processes. There are three units for which the interaction with gender is significant (two have a positive coefficients and one has a negative coefficient); the units are not named here due to the small number of women faculty in each. Due to the small numbers of faculty, and especially of women faculty, within these units, these interaction coefficients could reflect unmeasured individual characteristics rather than a pattern of gender bias in these units. Further investigation would be required to verify if this is the case.

[26]The significant coefficient on the gender interaction with full professor rank does not imply that women full professors earn less than male full professors; rather, it implies that the salary differential between full professor rank and assistant professor rank is smaller for women than for men.

F. Gender and Professorial Rank

Regression analysis of salaries may not reveal gender bias if such bias is embedded in explanatory variables in the regression equation. In this regard the variables of primary concern are professorial rank and PAI. One way to investigate whether gender bias is embedded in an explanatory variable is to omit that variable from the regression to see if the estimated coefficient on the gender indicator variable changes. We estimated a version of Model II excluding all professorial rank variables (full and associate, as well as their interactions with gender). All other variables and gender interactions were included. The gender variable's estimated coefficient remained insignificant.

Another approach is to examine the variable directly to see if there is evidence of gender bias. Here it is important to have the rank data broken down by years since highest degree or age, as the proportion of faculty at higher ranks increases from younger to older cohorts. We prefer the breakdown by years since highest degree, because academic careers generally proceed in relation to when one completes the relevant highest degree, but we also show the breakdown by age group.

Table IV.6 shows the number and percent of tenured and probationary faculty at Western who hold the rank of full professor, grouped by years since highest degree and by age. Our analysis of these data focuses on full professors. This allows us to look solely at promotion as distinct from the granting of tenure. Also, full professor is the professorial rank that represents the culmination of an academic career and that is associated with the largest salary increment in the regression results. In calculating the percentages of full professors, in the denominator we exclude assistant professors and use the sum of associate and full professors.

We confine our attention to years since highest degree ranging from 10 through 39 (and, for age groups, from 40 through 64 years). The numbers of full professors in younger cohorts are too small to reveal any systematic patterns; due to retirement, data for older cohorts will be unrepresentative as they include only those faculty members who choose not to retire. Also, the number of women with more than 35 years since highest degree is very small.

In general, one would expect the probability of having been promoted to full professor to rise systematically with years since highest degree. Such appears to be the case for male faculty at Western up through the 25-29 years since highest degree cohort. As shown in Table IV.6 and Figure IV.1, the proportion of men who are at the rank of professor rises continuously up to that cohort, where it reaches its maximum of nearly 80%.

The lower (red) line for female faculty members shows a different pattern, rising through the 20-24 years since highest degree cohort, but then declining and thereafter showing no clear trend. In all cohorts, whether grouped by years since highest degree or age, the percentage of women full professors is lower than that for men, with the largest discrepancy for women with 25 or more years since highest degree.

Table IV.6: Full Professors at UWO by Gender, Years since Highest Degree, and Age Group

	Women Full Professors		Men Full Professors	
	Number	Percent of women full and associate profs in this cohort	Number	Percent of men full and associate profs in this cohort
By years since highest degree				
10-14	6	11%	14	14%
15-19	17	35%	45	49%
20-24	15	54%	50	62%
25-29	4	44%	61	78%
30-34	6	60%	69	78%
By age				
40-44	2	6%	11	13%
45-49	10	24%	44	43%
50-54	20	51%	54	59%
55-59	9	32%	81	76%
60-64	10	46%	86	70%

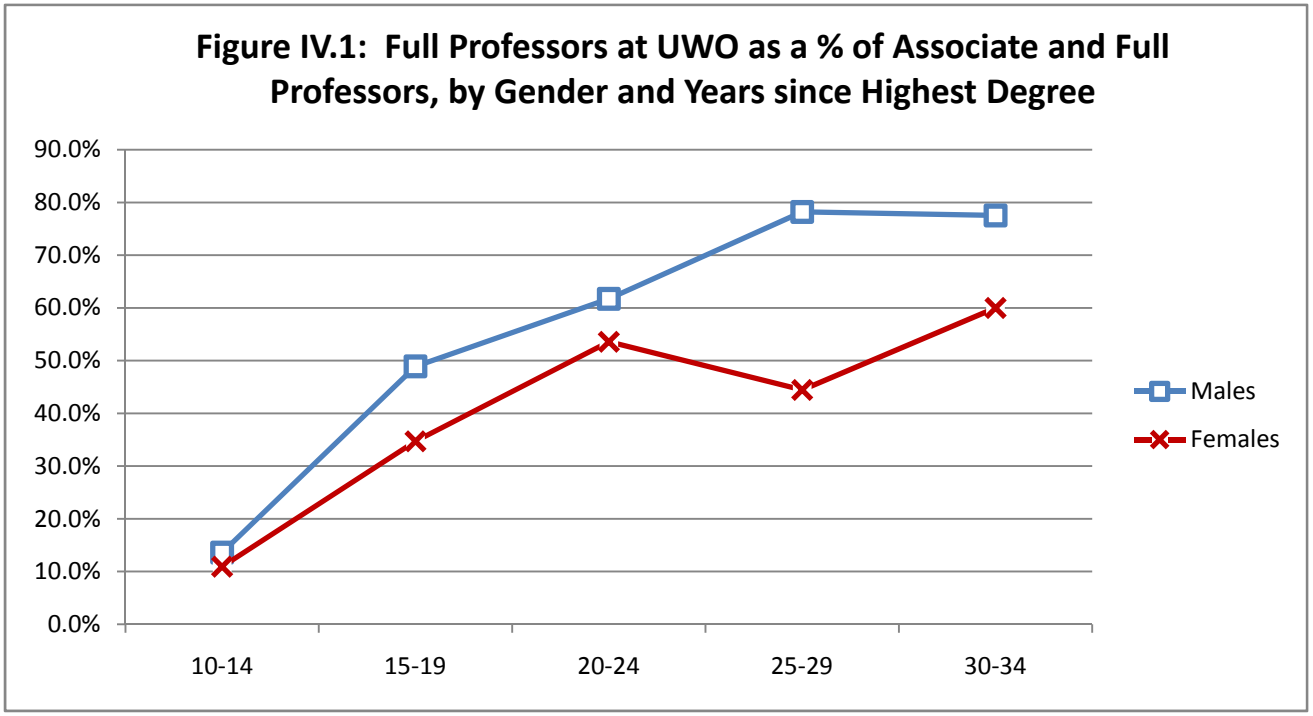
Source: IPB data as of November, 2007. Data are for probationary and tenured faculty only. Percentages are calculated by dividing the number of full professors in each cohort by the number of associate and full professors of the same gender in that cohort.

It is possible that lower proportion of women full professors is the result of unobserved differences between men and women such as delays in the careers of women due to childbearing and family obligations. In these regards women at Western should resemble women at other similar universities similar to Western, so we compare women at Western with women at the Bovey 6 universities using UCASS data collected by Statistics Canada. The UCASS data provide a breakdown by age but not by years since highest degree, so for this comparison we must use age groups.

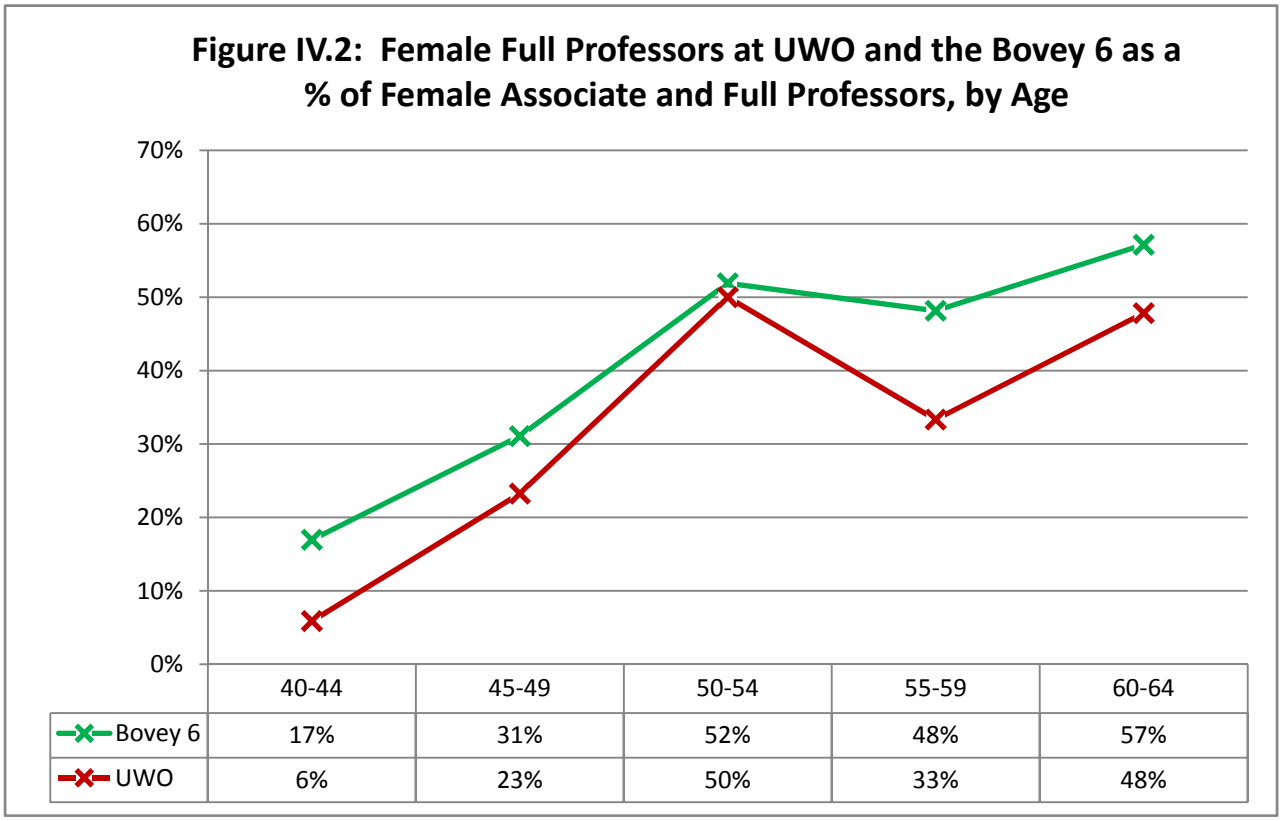
Figure IV.2 shows the percentages of women full and associate professors who hold the rank of full professor at Western and, on average, at the Bovey 6 universities (including Western). The upper (green) line is for the Bovey 6. The lower (red) line is for Western.[27]

For all but ages 50-54 the percentage of women full professors at Western is lower than the average for the Bovey 6. The gap for most age groups is about 10 percentage points. The largest gap is for ages 55-59 at 15 percentage points. For this age group, half of women at the rank of associate and higher at the Bovey 6 are full professors, but only one-third of women at UWO. The Bovey 6 numbers include Western; if the comparison were between Western and the Bovey 5 (excluding Western), the gap would likely be larger.

[27] UCASS data are rounded to the nearest multiple of 3, which is especially problematic when analyzing data for an individual university with small numbers of women or men in certain age groups. We therefore use the IPB data for Western, in comparison to the UCASS data for the Bovey 6.



Source: IPB data, November 2007. Data are for probationary and tenured faculty only.



	40-44	45-49	50-54	55-59	60-64
Bovey 6	17%	31%	52%	48%	57%
UWO	6%	23%	50%	33%	48%

Sources: UWO data are from IPB, November 2007. Bovey 6 data are from UCASS, 2007-08. The UCASS data include full-time faculty who are not probationary or tenured, so in this figure the UWO numbers are for all full-time faculty in the Bargaining Unit, including limited-term, permanent, and externally funded. UCASS numbers are rounded to the nearest multiple of 3, so percentages based on these numbers may under- or over-state the actual percentages. The extent of under- or over-statement is relatively small for these aggregate numbers for six universities.

We note that men at Western also have a lower proportion of full professors for almost all age groups than the average for the Bovey 6. For the youngest and oldest age groups the gap is about 10%, similar to that for women in those age groups, but on average the gap between men at Western and men at the Bovey 6 is smaller than that for women.

In sum, the UCASS data suggest that the likelihood of attaining the rank of full professor is lower for women than for men at Western, and also is lower for women at Western than on average for women at the Bovey 6 universities. The discrepancy is largest for women ages 55 through 64. We conclude that the results of the salary regressions must therefore be interpreted with care, as the variables for rank in these regressions could reflect processes that are not gender neutral. Further analysis using better data is needed to understand better differences in promotion between men and women at Western.

One aspect of the relationship between gender and promotion that should be explored further is whether the relationship differs among faculty subgroups. When exploratory salary regressions were run without the Ivey and Robarts faculty, the estimated coefficient for the gender interaction with full professor fell below the 10% significance level, although not by much. This result points to the possibility that differences in promotion for men and women may be concentrated in certain Faculties or subgroups. Further analysis is needed to determine if this is indeed the case.

G. Gender and PAI

As shown in Table IV.3, on average the PAI scores of men and women are similar. The average relative PAI score (4-year average) for women faculty members is 1.0048, as compared to 1.0038 for men. The difference between these two numbers is small and not significant.[28]

As in the case of professorial rank, similar averages may mask underlying differences in PAI scores because women and men have different characteristics. In the case of PAI, we were able to carry out a regression analysis of PAI scores using the IPB data. Our target variable is the average relative PAI score over the past four years (2005-08), which provides a measure of performance assessment in research, teaching and service over a relatively long time frame and relative to others in the same unit.

The variables included in the regression reflect factors that could influence underlying performance or the assessment and assignment of PAI scores. Performance is partly a reflection of underlying factors, such as effort and talent, that cannot be easily measured and for which direct data are unavailable. If the distribution of talent and effort is similar for men and women, omitting these unobserved variables from the regression need not cause bias in the estimated parameters. It would, however, reduce the overall explanatory power of the regression.

It is possible that the distribution of effort or talent differs between men and women in some cases. For example, in fields that are overwhelmingly male, the few women may be above average in their abilities or effort. Also, in such fields women may be called upon to disproportionately assume committee and other service responsibilities, or be disproportionately burdened with student supervision, with consequences for their performance. Similar considerations may apply for men in predominately

[28] Simple t-tests did not show a statistically significant difference between the average relative PAI scores between men and women.

female disciplines. In order to try to capture this possibility, in the regression we include variables that indicate gender imbalance within units. Specifically, we differentiate among units as follows:

- with very few women (fewer than 15% of faculty in the unit)
- with few women (15-33%)
- with equal numbers of men and women (34% to 66%)
- with many women (67% to 85%)
- with very many women (more than 85%)

In the regression we include indicator variables for each of these types of unit except for units with equal numbers of men and women, the reference category.

PAI scores may differ between men and women if family responsibilities and parental leaves have different effects on PAI outcomes for men and women. This could occur because family responsibilities affect women's performance in research, teaching and service differently than men's. It could also occur simply because of confusion regarding how to assign PAI scores for faculty members who have recently taken parental leaves. Data presented above indeed show that a higher proportion of women take parental leaves, and that their leaves are longer, than for men. Ideally we would want to include a variable or variables capturing such factors in the regressions, but unfortunately individual-level data on family structure and parental leaves are not available. We therefore try a crude approach, which is to include in the regression category variables indicating whether the individual is between the ages of 25 and 34, or between the ages of 35 and 44, as these are the ages during which it is most likely that a faculty member would have young children or take a parental leave.

Differences in PAI scores could also, of course, simply reflect gender bias by APE Committees, or by Chairs and Deans who are involved in the APE process. While direct information on such bias is unavailable, it is possible that such bias is related to the gender balance within the unit. That is, gender bias may be more likely to occur in disciplines or units that are overwhelmingly male or overwhelmingly female. If so, then such bias may be picked up by the category variables for very few, few, many and very many women.

Table IV.7 gives the results of the PAI regression. The regression includes a gender category variable (female=1) as well as interactions between the gender category variable and all other variables. unit category variables are not included in this regression because the PAI scores emanating from a unit are scaled so that every unit's PAI average is 2.2, and thus there will not be systematic differences in average PAI scores among units. The number of individuals in the regressions is 903, lower than for the salary regressions, because we exclude faculty members who were appointed in 2007-08. This exclusion is made because those appointed in 2007-08 received their first meaningful PAI scores, i.e., scores assigned through the APE processes in the home units, in the spring of 2009 whereas the PAI data available to the Committee at the time the dataset was established included PAI scores for 2005 through 2008. (Recent hires are automatically assigned a PAI score equal to 2.4 which consists of the universal unit average value of 2.2 plus the average DSP value of 0.2 to account for the fact that recent hires are not considered for DSP. Thus the scores of recent hires reflect neither underlying performance nor bias in the APE process.) Overall the regression is statistically significant, but it only explains a quarter of

the variation in PAI scores (the R^2 is 0.245). In other words, most of the variation in PAI scores is not explained by the regression analysis.

The regression results show a statistically significant relationship between gender and PAI scores. The estimated parameter on the gender category variable is negative and statistically significant. The interpretation of this statistic must take into account the fact that the regression includes gender interactions with other variables, and so the predicted difference in PAI between similar men and women will be the net effect of several estimated coefficients, rather than that of this or any other single coefficient in isolation. Nevertheless, the magnitude of this coefficient is large compared to the mean value of PAI scores (1.0041), suggesting a potentially important gender effect.

Table IV.7: Results of PAI Regression for Probationary and Tenured Faculty

Variable	Parameter Estimates	
	Base parameter	Interaction with gender
Intercept	1.0593***	na
Gender (*Female*)	-0.1679*	na
Years since highest degree	-0.0084**	0.0001
Square of years since highest degree	0.0000	0.0001
Years between first and highest degree	-0.0075***	0.0076**
Hired on or after July 1, 2005	-0.0096	0.0314
Rank—Professor	0.3294***	0.0269
Rank—Associate	0.1410***	0.0619†
Very few women in unit	-0.0511***	0.0248
Few women in unit	-0.0428**	0.0293
Many women in unit	0.0337	-0.0412
Very many women in unit	0.2025	-0.1566
Age 25 to 34	-0.317	0.098
Age 35 to 44	0.0121	0.0625
Number of observations	903	
R^2 (adjusted R^2)	.245 (.223)	

Note: *** indicates significance at the 1%, ** at the 5%, * at the 10%, and † at the 20% level. No asterisk or † indicates that the estimated coefficient is not significant at the 20% level. "na" indicates not applicable.

The gender interaction with years between first and highest degrees has a significant and positive estimated parameter. The base parameter for this variable is negative and significant, indicating that men who take more years between their first and highest degrees tend to have lower PAI scores than men who take fewer years. The coefficient on the gender interaction with this variable is of similar magnitude but of opposite sign, indicating that the length of time between the two degrees has no effect on women's PAI scores. It is not clear how to interpret this result. We note, however, that the sizes of these coefficients are relatively small (less than 1% of the average relative PAI score), and women on average have more years between their first degree and highest degree (10.6 for women and 7.8 for men; see Table IV.3).

The only other gender interaction that is statistically significant is that with Associate rank, although only at the 20% cutoff. The estimated coefficient on this interaction is positive. This result must be interpreted in the context of the estimated coefficients on other gender-related variables. It implies a positive differential between the PAI scores of women Assistant and Associate Professors, and that this PAI differential is larger than that between men Assistant and Associate Professors.

The effects of all other variables do not differ significantly between men and women. Years since highest degree and the professorial ranks are all significant and positively related to PAI, as expected. The category variable "very few" or "few" women is significant in the PAI regression analysis. In both cases the effect is negative, and it is the same for men and women.

The finding of significant relationships between gender and PAI scores is relevant to interpretation of the salary regressions. The salary regressions indicate a positive, large and significant effect of PAI scores on salary, with no significant difference between men and women in this effect. The PAI regressions, however, suggest that after controlling for other characteristics, women have different, and perhaps lower, PAI scores than men. To the extent that this is the case, the gap in PAI scores will translate into a gap in salary. This PAI-based differential does not occur on average, because the average PAI scores for men and women are not significantly different. It is only revealed by regression analysis that controls for differences in characteristics between men and women.

As in the case of promotion, the factors underlying the differences in PAI scores for men and women are not known. The regression analysis unfortunately reveals little information on the sources of the difference, but it does suggest that the size of this difference varies among groups with different characteristics. Further work using a parsimonious regression specification would be helpful to gain a clearer picture of the size of the differentials for key groups. This could, in turn, shed some light on whether PAI differences between men and women reflect actual differences in performance, differences in the evaluation of performance due to bias, and differences in evaluation arising because of the absence of consistent guidelines for evaluating performance after pregnancy and parental leaves.

V. Limited Term Faculty

A. Approach

This section presents regression results for the salaries of Limited Term (LT) faculty that parallel those shown in Section IV for Probationary and Tenured faculty. The LT label is here used as a short form to refer to Limited Term faculty, Permanent faculty and Basic Scientists (see Sec. III above for explanations of the latter two groups).

As in Section IV we first replicate the 2005 Pay Equity regression using 2009 data in Model I, and then present our Model II. These exercises find no evidence of systematic gender effects on salary, which is in line with the findings of the 2005 Pay Equity report. In view of this result, and bearing in mind the finite time available to undertake the study and to prepare a report, and constraints on the availability of IPB technical support for data analysis, it was decided not to pursue the additional

investigations that the committee carried out for Probationary and Tenured faculty, namely Model III (stepwise regression), promotion analysis, and PAI regressions.

B. Characteristics of Limited Term Faculty

The variables used here are the same as in the Probationary and Tenured case, with the exception that the list of ranks now includes Lecturers. LT faculty can be of any rank, although a Ph.D. is required for an appointment at the Assistant Professor level or above. Lecturer is the omitted category in the regression analyses.

Table V.1: Number of Faculty in Different Categories and Mean Values of Selected Variables in the Limited Term 2009 Salary Regression Models

Variable	Women	Men	All
Number	71	91	162
Number by rank:			
Full (%)	0 (0%)	4 (4%)	4 (2%)
Associate (%)	4 (6%)	8 (9%)	12 (7%)
Assistant (%)	23 (32%)	39 (43%)	62 (38%)
Lecturers (%)	44 (62%)	40 (44%)	84 (52%)
Number with highest degree received four or more years after hire at UWO	5 (7%)	1 (1%)	6 (4%)
Base salary	82,583	85,773	84,375
Base salary + continuing stipends[a]	82,583	85,773	84,375
Hired on or after July 1, 2005 (%)	24 (34%)	29 (32%)	53 (33%)
Years at UWO	6.7	7.7	7.3
Years between highest degree and hire at UWO	8.7	10.1	9.5
Years between first and highest degrees	8.5	7.0	7.6
relative PAI, average over past four years	.992	.962	.975

Source: IPB dataset, 2009.
a. No Limited Term faculty members were assessed as holding continuing stipends.

As shown in Table V.1, in 2009 there were 162 LT faculty (including Permanent faculty and Basic Scientists). The corresponding figure in the 2005 Pay Equity study was 137. Of the 2009 LT group 71, or 43.8%, were female, a higher fraction than for Probationary and Tenured (29.4%). The mean salary for the LT group as a whole in 2009 was $84,375. The salary means by gender were $82,583 for women vs. $85,773 for men, giving a gender salary ratio of 96.3%. Note that while a majority of LT faculty are Lecturers (52% of the LT complement), it is a bare majority. The next largest group is Assistant Professors, (38% of the LT complement), meaning that the vast majority (90%) of the LT group have the rank of Lecturer or Assistant. The fraction of women LTs who are above the Lecturer rank (38%) is substantially lower than for men (56%). Also note that fully one third of LT faculty in 2009 had been hired on or after July 1 2005. Finally, relative PAI, at a mean of 0.975, was a little lower

for LT than for Probationary and Tenured faculty. However, the difference was smaller for women, whose relative PAI averaged 0.992.

C. Results

Salary Regression Model I

Table V.2 compares the 2005 Pay Equity full regression results for LT faculty with our 2009 replication. The most important result in the present context is that the Female category variable is insignificant in both regressions. In our 2009 regression its p-value is, in fact, 0.76, indicating that it is not even close to conventional levels of significance. Other aspects of note are that the regression fits less well in 2009 than in 2005 (R-squared is only .526 in 2009 vs. .656 in 2005), and that results for non-gender variables are in some cases very different in 2005 and 2009.

Table V.2: Results of Salary Regression Model I for Limited Term Faculty, with Comparison to 2005

	Parameter Estimates	
Variable	**2009**	**2005**
Intercept	33253.00†	na
Gender (*Female*)	951.75	112.55
Years since highest degree	463.20†	-164.48
Years since first degree	190.54	745.28***
Years at UWO	492.14	505.08**
Years in current rank	1439.51**	1682.31**
Relative PAI (most recent year)	22043***	7598.04†
Rank - Professor	39569***	na
Rank—Associate Professor	12180*	3003.71
Rank—Assistant Professor	21400***	4810.07*
Unit average salary	-.1132	0.74***
Number of observations	162	137
R^2 (adjusted R^2)	.526 (.462)	0.656 (na)

Note: *** indicates significance at the 1%, ** at the 5%, * at the 10%, and † at the 20% level. No asterisk or † indicates that the estimated coefficient is not significant at the 20% level. To conserve space, and because they are not directly relevant to gender issues, we do not report the estimated parameters for the constant term and unit category variables here. The parameters for 2005 are from the Report of the Faculty Pay Equity Committee, August 2005, table 6 (p. 19).

Salary Regression Model II

Aside from unit category variables, Model II LT regressions use the same variables as the Probationary and Tenured regression, but with the additional rank of Lecturer being taken into

consideration. (See Table V.3.) As in previous regression studies by Salary Anomaly Committees and the Career Trajectory Awards Committee, we did not use the list of unit category variables employed in the Probationary and Tenured regressions but instead a shorter list of disciplinary groupings. This change is necessary since many units have small, or zero, numbers of LT faculty. The 2008 Career Trajectory Awards Committee studied how LT faculty could be divided into disciplinary groupings that would be meaningful for salary purposes. The 2008 Salary Anomaly Committee used those same groupings, and we do so again here. Using these groupings improves the fit of the regression.

Table V.3: Results of Limited Term Salary Regression Model II for 2009

Variable	Parameter Estimates	
	Base parameter	**Interaction with gender**
Intercept	65016***	na
Gender (*Female*)	26,727	na
Years since highest degree prior to UWO	-1,250.0*	-1,241.5
Years between first and highest degree	-85.3	57.1
Years at UWO	-265.2	-1,630.9
Highest degree four or more years after hire at UWO	990.9	-4848.2
Hired on or after July 1, 2005	-5,186.0†	2,710.9
Relative PAI (4-year average)	-8,401.7	-25,897.0
Interaction between years since highest degree and relative PAI	1,360.3†	1,796.0
Square of interaction between years since highest degree and relative PAI	3.0	-15.1
Rank—Professor	50,079***	na
Rank—Associate Professor	21,544**	-9,509.9
Rank – Assistant Professor	17,064***	-3201.8
No disciplinary grouping category variables had significant gender interactions.		
Number of observations	162	
R^2 (adjusted R^2)	.890 (.842)	

Note: *** indicates significance at the 1%, ** at the 5%, * at the 10%, and † at the 20% level. No * or † indicates that the estimated coefficient is not significant at the 20% level. "na" indicates not applicable. No women Limited-Term faculty were at the rank of full professor, so the regression does not include a female interaction for this category variable. The regression equation also included a constant term, disciplinary grouping category variables, and interactions between disciplinary grouping category variables and the gender category variable. To conserve space, we do not report the estimated parameters for the disciplinary grouping category variables and their interactions with gender here.

In this regression we find again that the gender category variable is insignificant at conventional significance levels. (The p-value is 0.288.) None of the gender interaction variables shown in the table are significant either, and the same applies to gender interactions with disciplinary grouping category variables (not shown in the table). Putting this together with the Model I

results, we conclude that gender did not have a significant effect on LT salaries. This is the same conclusion that was reached by the 2005 Pay Equity committee.

VI. Conclusions and Recommendations

A. Conclusions

The main finding of this report is that, after controlling for differences in years of experience, rank, performance scores, discipline, and other observed characteristics, there is on average no statistically significant salary difference between male and female faculty at Western. This is true for both Limited Term and for Probationary-Tenured faculty. For certain subgroups among probationary and tenured faculty, however, gender effects on salary appear to exist. Also, evidence indicates the possibility of gender differences for probationary and tenured faculty in the APE and post-tenure promotion processes.

When placed in the context of past pay equity studies at Western, our findings provide evidence that gender pay equity for probationary and tenured faculty has improved at Western over time, and that no gender salary gap has emerged for limited-term faculty. The 1995 pay equity analysis found a significant overall gender salary differential for probationary and tenured faculty, and no salary differential among male and female limited term faculty. The 2005 pay equity analyses again found a significant overall salary differential for probationary and tenured faculty, with the largest differentials concentrated among assistant and full professors. It found no gender differential for limited term faculty. This study finds no significant overall salary differential for either Probationary and Tenured or limited term faculty, but it shows evidence of gender effects among Probationary and Tenured faculty for new hires and full professors.

This committee concludes that, due probably to the combined effect of past gender salary adjustments and other salary mechanisms at Western, the overall average gender salary difference has been eliminated. The significant gender effects for Probationary and Tenured faculty associated with recent hires and full professor rank, however, suggests the presence of some underlying processes that cause gender salary differentials in these subgroups of probationary and tenured faculty. Information on possible underlying processes is unfortunately limited. The persistent gender effects for younger probationary and tenured faculty—assistant professors in the 2005 study and recent hires (in last 4 years) in the 2009 study—points to starting salaries as a possible culprit. Due to the absence of starting salary in the available dataset, the committee could not investigate this point.

The significant interaction between full professor rank and gender in the Probationary and Tenured regression model points to the presence of a systematic difference in the salaries of men and women full professors, where the size of the difference depends on years in rank. The reasons for this measured gender effect are not entirely clear. Gender bias is a possible reason, but other explanations are also possible. As mentioned earlier, Western salary floors are relatively low and promotion typically does not bring about a salary increase. Full professor rank is likely associated with other, unobserved or imperfectly measured individual characteristics that are correlated with salary, and these characteristics may differ between men and women full professors. Also, the number of female full professors is relatively small, especially in older cohorts, and it is possible that this result is driven by the situation in

a particular Faculty or a few Departments, or by individual differences rather than systematic gender bias.

We have noted that gender processes for probationary and tenured faculty may be embedded in key variables in the regression equation, specifically, rank and PAI. Analysis of available data on rank for this group reveals that a much lower proportion of women than men have attained the rank of full professor, even after controlling for age/years since highest degree. Comparison with similar universities indicates that this pattern is not unique to Western. The reasons for this gender difference in rank are not clear; they could include unmeasured differences in performance, longer time to tenure for women, the impact of family responsibilities and parental leaves, discrimination, or a combination of such factors.

While the simple average PAIs for men and women are nearly identical, gender differences in PAI emerge for probationary and tenured faculty when we control for characteristics such as years since hire, rank, etc. Although further analysis is needed, it appears that PAI scores tend to be lower for women than for men. Again, the reasons for the gender differences are not entirely clear. One possible contributing factor is the treatment of parental and other leaves in the APE process.

Understanding the reasons for these patterns requires further investigation. More generally, our findings point to the need for ongoing monitoring of gender salary differentials in the future.

B. Recommendations for Implementation of Gender-Based Salary Anomaly Adjustments in 2009-10

In view of the findings of this report, our recommendations regarding the implementation of gender-based salary anomaly adjustments are as follows:

- Overall, university-wide gender-based salary adjustments are not required for Limited Term or probationary and tenured faculty
- For Probationary and Tenured faculty, some gender-based salary adjustments may be appropriate for recent hires and full professors. Attention should also be paid to Associates in view of the longer time to promotion to Full for women.
- The Salary Anomaly Committee should carry out a regression-based analysis of gender-based salary differences for each of these two faculty groups to determine the appropriate amounts of any such salary adjustments. With respect to the methodology used for implementation, we suggest that the committee run salary regressions for men and women in each of these two groups and then analyze the patterns of predicted salaries, along the lines of the 2005 pay equity implementation analysis. This may require combining Departments/Units due to small numbers of women or men in some Department/Units. Available data on starting salaries should be examined in the analysis if possible. The Salary Anomaly Committee can then use the predicted salaries from such regression analyses as the basis for determining the amounts of any salary adjustments. Use of predicted salaries as the basis for salary adjustments will ensure that those adjustments correct for systematic gender-based differences and not individual anomalies.

C. Recommendations for Future Gender Equity Studies and Salary Analyses

The committee raises the following suggestions for future pay equity studies and salary analyses:

- The university should in the future continue to carry out periodic gender equity analyses. Given that gender-based salary differences have arisen since implementation of the most recent gender-based salary adjustments in 2005-06, it is recommended that the next such study be done within 5 years.

- Consideration should be given to the provision of funding to address any systematic salary differences identified by future analyses.

- The 2006-10 CA contains deadlines for the timing of this gender-based anomaly study and report and a subsequent gender-based salary anomaly adjustment, followed by a performance-based salary anomaly process in fall 2009/winter 2010. This timing has arguably proven to be too compressed. At the time of issuance of this report, the Salary Anomaly Committee had received approval for an extension of 6 weeks on the timelines for the 2009-10 performance-based salary anomaly process. It is recommended that this situation be taken into account in any renewal of this trio of processes in a future CA.

- The possible significance for gender-based salary differences of the following factors would benefit from further investigation:

    - promotion and tenure
    - APE
    - parental and other leaves
    - the distribution of Salary Anomaly and Career Trajectory awards
    - the distribution of market adjustments
    - starting salaries
    - spousal hiring

- With respect to future regression-based analyses of Western salaries,

    - the semi-log functional form should continue to be considered.
    - to the extent possible, future regression analyses should employ starting salaries as an independent and/or dependent variable (starting salaries, which have been recorded since 2000, should be included in the dataset provided by IPB, and should continue to be recorded for new hires). Unjustified gender-related differences in starting salaries can potentially lead to gender salary anomalies throughout the career.

- With respect to the collection of additional data that might provide further insight on any gender-based salary differences,

- it is desirable that IPB begin to track Career Trajectory, Performance-Based Anomaly, Gender-Based Anomaly, and market adjustments beginning July 1, 2009. If collection of these data is infeasible, it is recommended that future Salary Anomaly and Career Trajectory Awards Committees (or their equivalents) review any salary adjustments emanating from their recommendations for possible gender-based differentials. The review should be carried out only after the salary awards have been approved by the Provost and these reviews should be archived and made available to any future committee charged with undertaking a study on gender-based salary differentials. In the case of market adjustments, for which the data are sparse on an annual basis, the accumulated market adjustment data, if available, should be made available to any future committee undertaking such a study.
- interpretation of the results of regression analysis should pay attention to possible gender bias embedded in variables included in the regressions such as rank and PAI.

D. Recommendations on Monitoring of Future Starting Salaries and on Treatment of Leaves in APE

- It is recommended that Deans/Chairs/Directors be made aware of the possibility of starting salaries being susceptible to gender bias, that proposed starting salaries for new hires be scrutinized on a case-by-case basis at the Faculty and unit level for possible gender bias, and that appropriate changes to proposed salaries be made based on this "local" scrutiny.
- It is recommended that a consistent set of guidelines and practices be developed to guide APE Committees in the assignment of PAI scores for faculty members who have recently returned from parental and other leaves.

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