

Executive Summary: On the Salary Anomalies Report and Response

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FAUW's Status of Women and Equity Committee (SWEC) has written this document to highlight the excellent work of the Salary Anomalies Working group and to recommend further actions to address systemic bias affecting salaries at the University of Waterloo.

Section I. Commending the Salary Anomalies Working Group on several major achievements.

1. The open, transparent and publicly available report.
2. The considerable effort taken to ensure good data.
3. The care and attention given to investigating potential systemic bias in salary.
4. The proposed adjustments to correct the systemic gap, and the proposed follow-up analysis, using similar methodology, every five years.

We also commend the University's decision to make the proposed adjustments and to perform follow-up analysis.

Although faculty have raised legitimate concerns about the time it took before the institution performed this study and the equity work yet to be done, it is important to recognize the major step forward that this report (and response) represents for the University of Waterloo

Section II. Recommendations to address systemic bias in salaries.

Given the findings of the Salary Anomalies Report,

SWEC recommends that U.W. form a working group to identify and report on the sources of systemic bias in salaries (e.g. Working Group on Systemic Bias, or WGSB). We suggest that the WGSB should be tasked to:

1. Investigate potential systemic bias in starting salaries as one possible source of the identified salary gap.
2. Investigate other potential sources of systemic bias, including, but not limited to systemic gender gaps in the characteristics that are used to explain salary differences, such as outstanding performance awards, rank, and merit.
3. Explore and report on methods to address systemic biases for other groups.

Section III. Exploring three further concerns raised in the context of the Salary Anomalies Report.

1. Concerns regarding the exclusion of the most recent cohort of faculty from the bias correction.

We recommend that UWaterloo make the bias correction for the 28 female faculty members who started their appointments on or after 1 May 2015.

2. Concerns regarding the uniform adjustment to salaries for bias correction.

We recommend that the WGSB explore and report on these issues.

3. Concerns regarding higher gender gaps in OCUFA's report relative to the UWaterloo report.

We recommend that the WGSB discuss how the UWaterloo findings are expected to differ from the OCUFA report.

On the Salary Anomalies Report and Response

FAUW's Status of Women and Equity Committee (SWEC) has written this document to commend excellent work by the Salary Anomalies Working group and to recommend further actions to address systemic bias.

Section I. Commending the Salary Anomalies Working Group on several major achievements.

We commend the quality of the report produced by the 2015 Salary Anomalies Working Group, and there are a few key features that we wish to highlight.

1. The report is open, transparent and publicly available.

The 2015 Salary Anomalies Working Group was able to implement a much higher level of transparency than previous salary analyses. The working group clearly outlined the data and empirical methods that they use to identify anomalous salaries. This transparency is the hallmark of good research, and it also reflects the integrity of the process.

2. The considerable effort taken to ensure good data.

The working group ensured that they had the appropriate data and methods with which to conduct a sound analysis. They double-checked the data for accuracy, providing a greater assurance in the reliability of their results.

3. The care and attention given to investigating potential systemic bias in salary.

The investigation of the gender gap in salary is an important step for U.W., and the quality of the report has set the groundwork for future analysis.

4. The proposed adjustments to correct the systemic gap, and the proposed follow-up analysis.

The working group not only proposed that the University rectify the existing gender gap, but also proposed follow-up analysis, using similar methodology, every five years. The follow-up is particularly important to check our progress and ensure that we remain vigilant.

We commend the University's decision to act upon the recommended changes, to make the anomalies corrections, the systemic correction, and to conduct follow-up analysis in five years. These decisions demonstrate U.W.'s commitment to eliminate bias. Moreover, public statements, such as President Hamdullahpur stating that "this is the right thing to do," set an example to the community that will greatly influence cultural change.

There has been a substantial amount of negative commentary (some misinformed) regarding the finding of a systemic bias in salaries, and the positive steps taken to correct an inequity that has likely existed for some time. Although faculty have raised legitimate concerns about the time it took before the institution performed this study and the equity work yet to be done, it is important to recognize the major step forward that this report (and response) represents for the University of Waterloo

Finally, we wish to commend the work of several groups (e.g. FemPhys, He for She) that have encouraged discussion and education of the university community around these salary anomaly decisions.

An administration that continues to portray the salary settlement in a positive light, and a UWaterloo community that offers constructive discussion, are both important in our move toward greater equity on campus.

We commend our administrators and colleagues for their continued commitment.

Section II. Recommendations to address systemic bias in salaries.

The Salary Anomalies Report identified a systemic gender gap in faculty members' salaries. Given that systemic bias has been identified, our next step should be to investigate the source of this bias so that we can address gender-based inequities at their root. This step is important because if the source of the bias is left unaddressed and if salary corrections are made only once every five years, then women will face a substantial cumulative earnings difference. (See examples in section III).

Recommendation: SWEC recommends that UWaterloo form a working group to identify and report on the sources of systemic bias in our salaries. (e.g. Working Group on Systemic Bias, or WGSB.)

We suggest that the mandate for the WGSB should include: (1) investigation of potential systemic bias in starting salaries, as one possible source of the identified salary gap; (2) investigation of other potential sources of systemic bias; (3) exploration of methods to address systemic biases for other marginalized groups. Here we elaborate on the investigation of the source of the salary gap identified.

1. Investigate potential systemic bias in starting salaries.

The Salary Anomalies Report, similar to other institutional studies, notes that starting salaries are a key determinant of annual salaries (and career earnings). Therefore, SWEC suggests that the WGSB mandate should specifically include a statistical analysis of starting salaries of a similar calibre to the Salary Anomalies report.

Starting salaries represent one potential source of bias. It is also important that the WGSB explore other potential sources of bias.

2. Investigate other potential sources of systemic bias, including, but not limited to systemic gender gaps in the characteristics that are used to explain salary differences.

The Salary Anomalies Working Group conducted a detailed analysis and conscientiously included a clear set of assumptions which underpinned their analysis and informed how we should interpret the results. Importantly, they note that identification of the systemic bias relies on the assumption that the statistical model is correct, and that the data are accurate. SWEC wishes to further clarify that this identification also relies on the implicit assumption that there is no gender bias in the factors used to explain salary differences. For example, by controlling for Outstanding Performance Awards, by estimating bias “net” of OPAs, the assumption is that salary differences due to OPAs are not part of systemic bias.¹ It implicitly assumes that the allocation of OPAs is without bias. This is a critical assumption and one that should be investigated further.

Although we suggest that it is important to consider all factors that may potentially contribute to gender bias in salaries, there are two factors, in particular, that have raised concerns in the literature: Rank and Merit.

Rank is included as an explanatory variable in the salary anomalies report (in both the salary regression and in the merit scores analysis). Because rank is recognized as a legitimate source of salary difference in most institutions, controlling for this variable can make sense (even if wages among ranks overlap, and many faculty are not affected by the wage floors at each rank). However, as argued in the UC Berkeley 2015 Salary Equity Report, “rank variables are what statisticians would call “tainted.” Rank, like salary, is under the employer’s control. If salary decisions reflected bias, then rank decisions would, it is argued, probably also reflect that same bias.” Given the UW statistics presented in the Salary Anomalies report, as of 1 May 2015 we note that 18.7% of our full professors are women, 31.8% of our associate professors are women, and 39.6% of our assistant professors are women. This lower proportion of women at each increase in rank may reflect greater efforts to hire female assistant professors at UWaterloo in recent years. However, it may

¹ It is worth noting that the coefficient estimate on OPAs, although a bit high, is reassuringly close to the Selective Increase Units that we observe over the past five years, as it should be.

also be important for UWaterloo to explore systemic differences in promotion into more senior ranks. Such exploration is important not only because of equity concerns, but also because UWaterloo wishes to retain and promote high quality faculty.

Regarding merit, we agree with the UC Berkeley 2015 Salary Equity Report that “judgments of merit are as vulnerable to positive and negative implicit associations [biases] as any other kind of judgement, and a large social-science literature demonstrates that such associations [biases] are commonly triggered by such factors as gender or ethnicity.” Indeed, the 2016 UWaterloo white paper, on measuring research output through bibliometrics, cites known biases in quantifiable metrics of research merit such as citation counts and publication counts, and a gender bias has also been documented in the Tricouncil success rate in obtaining grants. Several studies, including a UWaterloo study from 2000, find evidence consistent with gender bias in student course evaluations (see Sinclair and Kunda 2001, and the UW Report of the Course Evaluation Project Team, 2016). This effect could be more pronounced in disciplines in which women are underrepresented. If some faculty systemically receive lower evaluations, then the actual salary anomaly could be significantly different than what is now estimated.

To be clear, SWEC supports the need for a statistical analysis of salaries, and we also support the decision to control for key factors of salary determination. However, we recommend that these factors also be fully investigated as sources of potential systemic bias.

We recommend that the WGSB explore and report on potential sources of bias including, but not limited to, systemic gender differences in: Outstanding Performance Awards (Is there a systemic bias in the distribution of OPAs?), ad hoc salary adjustments (Is there a systemic difference in ad hoc salary increases e.g. to match competitive offers from other institutions?), merit scores (Controlling for individual characteristics, and selection into rank, is there evidence of systemic bias in merit scores? Can we investigate this gap by merit category?), and progression through the ranks (Are some demographic groups more likely to apply for tenure and/or promotion? Are they more likely to receive tenure/promotion? Are they more likely to leave UWaterloo?).

3. Explore and report on methods to address systemic biases for other groups.

Throughout this document we have referred to gender biases; however, systemic biases exist and should also be addressed for other groups. SWEC understands that complete identification data was not available for any identification other than male-female. We recommend that WGSB explore potential avenues to address systemic biases for all groups, including, but not limited to, faculty members that identify as aboriginal, disabled, across all sexual identifications, religion, nationality, language, race, and ethnicity.

Section III. Exploring 3 further concerns raised in the context of the Salary Anomalies Report.

Faculty members have approached SWEC with concerns about the salary adjustments made pursuant to the anomalies report. We highlight three key concerns, and make recommendations to address them.

1. Concerns on the exclusion of the most recent cohort of faculty from the bias correction.

The Salary Anomalies Working Group excluded the most recent cohort of faculty from the recommended salary correction because this cohort was not among the data used in the analysis. However, if gender bias is systemic, then recent faculty (hired after May 2015 but before the report) may face a similar salary gap to those hired before May 2015.²

Some have suggested that a current salary gap of \$2,905 would have arisen from a small gap that grew over time. However, using salary projections based on the memorandum of agreement, we show that a salary gap of \$2,905 in 2015 could arise from a gap of \$2,658 in 2010.³ Now, consider the 28 faculty that did not receive the salary correction: we project that a gap of \$2,905 in 2016 would result in gaps of \$2949, \$2993, \$3038, and \$3083, for a total five year loss of \$14,967⁴ over 2016-2020, prior to the next review.⁵

In addition to concerns over lifetime earnings losses, loss of excellent female faculty could result from excluding these 28 individuals from the salary correction. The exclusion of this group increases the probability of poor worker morale, and could then increase the probability that these excellent faculty will seek positions at other institutions.

Recommendation: SWEC recommends that UWaterloo provide the \$2,905 adjustment to the 28 female faculty who started their appointments on or after 1 May 2015.

2. Concerns on the uniform adjustment to salaries.

There are arguments for and against a uniform salary correction. As noted above, there is a high probability that the characteristics used to explain gender differences in salary may be subject to bias themselves (e.g. Rank). For this reason, some institutions have elected to not account for specific characteristics in their salary equity analyses (or at least to consider the analysis both with and without controls for these characteristics). If the underlying characteristics are biased, then a fully uniform adjustment can help to overcome the bias.

However, a uniform adjustment does not account for the disproportionate salary gaps that can occur for women in different stages of their career and across different faculties.

² The underlying assumption here is that factors which influence wage early in a career (e.g. starting salaries) are one possible component of the identified gender gap in salaries. This assumption is consistent with the fact that, given our salary structure, starting salaries represent a key determinant of actual salary levels.

³ This projection is based on the salary structure outlined in the Memorandum of Agreement (see Appendix A, part 1, for the formulae). For our projections, we assume that the individual's merit rating is 1.6 (for all years). We use the actual scale increase for all years in which it is known and assume that it remains at 1.5% for all future years. We assume the salaries remain below thresholds T1 and T2.

⁴ The salary projections are in nominal dollars. If we were to look at total earnings losses in real (2016) dollars, we would discount the nominal amounts by the consumer price index. If the scale increase exactly equals inflation, then the predicted gap would remain at \$2,905 for each year, resulting in a five-year loss of \$14,525 in real dollars. The higher the scale increase relative to inflation, the greater the five year loss in real dollars.

⁵ The Salary Anomalies Report regression analysis predicts that salaries grow (nonlinearly) in the range of 2,000 each year. This is not inconsistent with our calculations above. Note that we are looking at changes in the gap, which are substantially smaller than changes in full salary. So while the *rate* of change is small (in our baseline example, the rate of change is 1.5% for the gap and in the range of 4% for the full salary), the level of the gap does not increase substantially.

One concern raised about the uniform adjustment is that female faculty who have been at UWaterloo longer may face a substantially different annual salary gap. (This group may also face large cumulative differences in earnings). We construct salary projections under several scenarios to explore this concern. Our examples, provided in Appendix A part 2, illustrate that projected salary gaps (and cumulative earnings gaps) can vary substantially, based on the position of the salaries relative to the thresholds, and based on the assumptions used to make the projection. Specifically, we note that an annual salary gap of \$2,905 could, 20 years later, result in an annual salary gap of \$3,855, \$1,298, or \$19 (with cumulative earnings gaps of \$67,174, \$27,484, or \$7,638, respectively).

This example can speak to differences across faculty in the sense that the gender gap may vary because some faculties will have starting salaries closer to the thresholds. But the gender-gap may vary across faculties because of underlying differences in gender representation and implicit bias as well.

3. Concerns on the higher gender gaps in OCUFA's report relative to the U.W. report.

Faculty are concerned that the annual earnings gaps reported by Ontario Confederation of University Faculty Associations (OCUFA) are substantially higher than the systemic bias found in the UWaterloo analysis. For example, OCUFA's 2014-2015 median earnings data indicates a gap of \$14,000 and \$15,025 for assistant professors with 0-4 and 5-9 years of experience, respectively. The UWaterloo analysis will produce a smaller estimate of the gap because it controlled for a wide set of characteristics which could have increased the bias (e.g. female faculty members are more concentrated in arts, which tends to have lower salaries). However, we expect other minor differences, as well, because the UWaterloo analysis used base salary (which excludes administrative stipends and was adjusted to annual full time equivalent amounts), whereas OCUFA used actual earnings. Therefore, gender differences in the full or partial leaves, or in administrative appointments that carry stipends, could generate a larger gap with the OCUFA data. Interestingly, the OCUFA data show a gender salary gap that is much smaller at the full professor level, which we attribute to UWaterloo salary thresholds. We suggest that a more complete analysis by WGSB could explain the differences between the UWaterloo findings and the OCUFA data.

Recommendation: SWEC suggests further analysis of the data to assess potential variation in the gender wage gap across different faculties and different cohorts of faculty members. Specifically we suggest that future analysis consider additional specifications, which allow interaction of the gender indicator variable with other covariates (e.g. faculty, academic group, years at UWaterloo), and include additional explanatory variables (e.g. an indicator if the faculty member's salary exceeds thresholds T1 or T2, administrative positions). The gaps identified from this new analysis may not vary enough to outweigh the benefits of a uniform salary bias correction. However, this extended analysis has the benefit of transparently assessing the full range of sources of the gender salary gap.

Conclusion:

In summary, SWEC recommends the appointment of a new working group whose additional analysis will give insights into the sources of the gender wage gap found at the University of Waterloo. Once identified, these sources (biases) should be addressed. Proactive measures are likely to include widespread training in implicit bias (currently undertaken as a best practice in many Canadian companies). With these interventions, the identified gender wage gaps should decrease in the future.

References

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Appendix A

On the Salary Anomalies Report and Response

For the salary projection examples used to support our recommendations, we use a series of formulae, based on the Memorandum Of Agreement (section 13). We also make simplifying assumptions. These assumptions are necessary given that we do not have full information on the components that determine salary at U. Waterloo.

Part 1: Formulae and Assumptions used to project individual salaries

An individual faculty member's salary is determined according to the following formula:

$$Annual\ salary_{i,2016} = (Salary_{2015}) * (1 + scale_{2016}) + \frac{FSIP}{N} * \frac{(R_{adj})_{i,2015}}{faculty\ average\ R_{adj}} \quad (1)$$

Where the scale increase is the negotiated amount for the year 2016, FSIP is the total Faculty Salary Increase Pool for the year 2016 for a given faculty, N is the number of Full-Time Equivalent faculty in that faculty, faculty average R_{adj} is the average of all adjusted performance rating (merit scores) within that faculty in 2015. The adjustment of R depends solely on where the faculty member sits relative to the salary thresholds. So, an individual faculty member, i, has an $(R_{adj})_i$ that equals:

$$\begin{aligned} R_i, & \quad \text{if the individual 's salary} < T1 \\ R_i - 0.75, & \quad \text{if the individual 's salary is between } T1 \text{ \& } T2 \\ R_i - 1.25, & \quad \text{if the individual 's salary exceeds } T2 \end{aligned}$$

$$\text{where the rating } R_i = R_{i\text{teaching}} * weight_{i\text{teaching}} + R_{i\text{research}} * weight_{i\text{research}} + R_{i\text{service}} * weight_{i\text{service}}$$

The FSIP is calculated using the SIU, Selective Increase Unit, in the following manner:

$$FSIP = 0.25 * N * SIU + 0.25 * N_{<T2} * SIU + 0.5 * N_{<T1} * SIU$$

$$FSIP = (0.25 * N + 0.25 * N_{<T2} + 0.5 * N_{<T1}) * SIU$$

or perhaps more clearly

$$FSIP = (1 * N_{<T1} + 0.5 * N_{T1-T2} + 0.25 * N_{>T2}) * SIU$$

where $N_{<T2}$ & $N_{<T1}$ are the number fulltime equivalent number of faculty below thresholds $T2$ & $T1$ respectively, and N_{T1-T2} is the number of fulltime equivalent number of faculty between thresholds $T1$ & $T2$

(Note 1: If all faculty salaries are below $T1$, then $FSIP = N * SIU$)

(Note 2: Thresholds rise over time. Currently, the scale increase is applied to $T1$, $T2$ & SIU unless negotiated otherwise)

We don't have the actual FSIP nor do we have the actual faculty average adjusted R.

However, Metin Renksizbulut, former chief negotiator for FAUW, notes that $\frac{FSIP}{N * faculty\ average\ R_{adj}} \approx 2,000$ for each faculty.

With this simplification, we make projections of faculty salary increases using only public information with the following formula:

$$Annual\ salary_{i,2016} = (Salary_{2015}) * (1 + scale_{2016}) + 2,000 * (R_{adj})_{i,2015}$$

Of course, 2,000 is a rough approximation. Some faculties will have slightly higher values than others. Moreover, this amount can vary (slightly) depending on the current value of the current SIU and the proportions of faculty below each salary threshold. We re-run all our examples assuming that the scale increase is applied to this 2,000, and results are substantively similar.

Note that salary trajectories could deviate from equation (1) for several reasons, including:

1. Moving to a higher ranked position (with a different salary floor).
2. Obtaining an Outstanding Performance Award (OPA amount equals one selective increase unit).
3. Adjustments based on anomalies identified in annual reviews.
4. Other adjustments (e.g. UW may match a competitive offer you receive from another institution)
5. Taking on administrative roles that include a stipend. (These stipends have no impact on salary trajectories and are removed once the role is completed.)

So for the purposes of making salary projections, unless specifically included in the case by case comparison, we assume that these 5 conditions do not apply.

Part 2: Examples of 20-year salary projections

Suppose two individual faculty members, F1 and F2 are hired at \$100,000 and \$102,905 respectively, for a salary difference of \$2,905. Assuming both F1 and F2 have constant merit scores of 1.6 in each year, and assuming the scale increase remains fixed at 1.5%, we project that within five years the annual earnings gap will be \$3,083. In ten years, the annual earnings difference will have increased to \$3,322. In twenty years, the gap in annual salaries is \$3,855 (a 33% increase on the original gap¹, and a cumulative earnings difference of \$67,174).²

In this first example, neither F1 nor F2 will have crossed the salary thresholds³ by the 20-year mark, so we consider another example to illustrate how the salary thresholds can dampen the gap. Consider faculty members F3 and F4 that start with \$195,000 and \$197,905 (above T1 but below T2), the annual earnings gap shrinks to \$1,993 in the 3rd year when F4 crosses T2, but F3 has not yet crossed, and only climbs to \$1,298 by year 20 (with a 20-year cumulative difference of \$27,484).

Thus, reductions in the annual earnings gap (as well as cumulative earnings losses), depend critically on when faculty cross the earnings thresholds. If the faculty cross at the same time, or if they both start above T2, then the gap never shrinks. The earlier one faculty member crosses over relative to another, the smaller the gap. Some faculty may even close the gap entirely, for example, with an alternative set of assumptions⁴, faculty starting with salaries of \$195,000 and \$197,905 could see their gap shrink to \$15 by the 3rd year and \$19 by year 20, with a cumulative difference of \$7,638.

Playing around with the projections, provided the faculty members cross one or both of the thresholds over the course of 20 years, the higher the scale increase, the larger the growth of the annual salary gap and the larger cumulative earnings difference. Whereas the a higher faculty selective increase pool (relative to the aggregate of their adjusted merit rating), will result in a smaller annual earnings gap cumulative earnings differences. There are some cases where the gap can become negative.

1 Note that the gap has increased in absolute dollar terms (\$3,855 is 33% higher than \$2,905), but in percentage terms, the gap represents a slightly decreasing percent of the annual salary over time – starting at 2.905% and falling to 2.59% over the course of five years if the salaries are \$100,000 and 102,905 at the start of the five year period.

2 The results we present are in nominal dollars. Note that the annual gap (in 2016 dollars) would be constant at 2,905 if the scale were exactly equal to inflation. Note also that the Canadian consumer price index is the starting point for bargaining over changes in the scale value. So the scale should always equal or exceed inflation.

3 The 1.5% scale increase is applied to the T1 and T2, just as it is to the base salary, to predict the threshold values across time

4 Assumption change: \$3,000 (instead of \$2000) for the ratio of the faculty selective increase pool to the aggregate adjusted merit score for that faculty.