SALARY EQUITY ANALYSIS AT ARL INSTITUTIONS

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EXECUTIVE SUMMARY

The following report analyzes 35 years of ARL Salary Survey data to measure any gender or minority based wage gaps. Included are graphs and tables showing changes in the ARL population and salaries from 1980 to 2014. Regression-based analyses found evidence of an existing gender wage gap, with an estimate that females earn 97.82% of what males earn on average. Similar analyses found no evidence of a minority based wage gap. Comparisons in the report are between males and female, minorities and nonminorities, across multiple racial groups, and between public and private universities.
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ABOUT THIS REPORT

This report contains five sections of analyses:

1. Analysis of the Gender Wage Gap
2. Analysis of the Minority Wage Gap
3. The Combined Effect of Gender and Minority Status
4. Analysis of the Wage Gap Across Racial Groups
5. Differences Between U.S. Public and Private Universities

The first section uses data from U.S. and Canadian universities, while the other sections only use data from U.S. universities as Canadian law prohibits the identification of Canadians by ethnicity.

The terms raw wage gap and adjusted wage gap are used frequently throughout this report to describe differences in pay between groups. The gaps are reported as what one group earns as a percent of another. Thus, a gap of 100% means that there is no pay difference between two groups and the smaller the percentage, the larger the wage gap. The raw wage gap, in this context, refers to a comparison of median salaries. For example, if the median male salary was $100,000 and the median female salary was $95,000 then the raw gender wage gap would be reported as 95%. While this number is informative, it does not by itself establish the existence of a disparity in pay. Differences in human capitol could explain why a group appears to be paid less. If in the previous example it was found that the average male had 20 years of experience, and females averaged 15 years of experience, this could explain some of the difference in salary. An adjusted wage gap was computed to control for such differences.

The adjusted wage gap is an estimate of what a person of one group would make compared to a person of the comparison group with the same characteristics. For example, if the adjusted wage gap was reported as being 98% then that would mean on average a female would make 98% of what a similar male would make. Note that this 2% difference does not necessarily indicate discrimination; it is the difference in salaries that cannot be explained using the characteristics measured. While it is possible that part of the unexplained gap could be due to discrimination, it is impossible to be certain as there are many factors that impact one’s salary that cannot be accounted for. The characteristics that have been used to compute the adjusted wage gap in this report are: the university a person works at, whether or not they work in a law or medical library, what position they currently hold, and how many years of experience the person has. The full methodology used to compute this number can be found in the appendix.

The data used are from the data collected by ARL for the annual salary survey. However, the numbers reported here are slightly different from the annual publications due to a few minor differences. First, the data shared with researchers did not include any Deans/Directors, and for consistency Heads of Law or Medical libraries were then removed as well. Second, only those who were working full-time were included. The annual publications included part-time librarians with salaries converted to their full-time equivalent, while they are not used in this report.
ANALYSIS OF THE GENDER WAGE GAP

FIGURE 1: DISTRIBUTION OF ARL LIBRARIANS BY GENDER

Comments: Figure 1 shows the makeup of the ARL population by gender. While the overall population has grown from 6,406 in 1980 to 9,337 in 2014, the percentage of male librarians has stayed around 36%. The highest percentage was in 1980 when 37.3% of librarians were male. The number reached a low in 1987 when only 34.2% were male. Since then, the number has been slowly increasing over the years reaching 37.1% in 2014.
**Figure 2: Raw Gender Wage Gap**

![Graph showing the median female salary as a percentage of the median male salary each year. The number rose about 5% from 1980 to 2000 but has stayed at around 97% for the past 15 years.](image)

<table>
<thead>
<tr>
<th>Year</th>
<th>Median Female Salary</th>
<th>Median Male Salary</th>
<th>As Percent of Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>$70,368</td>
<td>$72,943</td>
<td>96.47%</td>
</tr>
</tbody>
</table>

**Comments:** Figure 2 displays the median female salary as a percentage of the median male salary each year. The number rose about 5% from 1980 to 2000 but has stayed at around 97% for the past 15 years. It is important to note that this number is simply the comparison of median salaries and does not take into account other variables.
FIGURE 3: ADJUSTED GENDER WAGE GAP

<table>
<thead>
<tr>
<th>Year</th>
<th>Adjusted Wage Gap</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>97.82%</td>
<td>96.93% - 98.71%</td>
</tr>
</tbody>
</table>

Comments: Figure 3 shows the adjusted gender wage gap over the years. In 2014 the raw wage gap was 96.47% and the adjusted wage gap is 97.82% meaning that 1.35% of the gap was explained by the variables used. The 95% confidence interval indicates the uncertainty in the estimate, giving a range of numbers the estimate is believed to be between. The range does not include 100% which indicates that there is a statistically significant difference in the pay of men and women. This is evidence for the existence of a gender wage gap, but the difference cannot be solely attributed to discrimination or any other one factor, as there are many unknown factors which contribute to the difference.
Figure 4 shows the makeup of the U.S. ARL libraries by minority status. In 1984 only 10.0% of librarians were minorities, the lowest point in the data. This number has been increasing since then by about .17% a year, reaching a high of 15.1% in 2014.
Figure 5 displays the median salary of minorities as a percentage of the median salary of nonminorities. From 1980-1986 the median salary of minorities was higher than that of nonminorities. The raw wage gap then increased over the next 20 years before beginning to shrink the last 8 years or so.
Figure 6 displays the adjusted minority wage gap over the years. The gap has shrunk from around 97% in 1980 to 99.8% in 2014. Compared with Figure 5, it is clear that the difference is a lot less than what the raw numbers suggest. As the confidence interval contains 100%, there is no statistical evidence of a minority-based wage gap today.
THE COMBINED EFFECT OF GENDER AND MINORITY STATUS

FIGURE 7: DISTRIBUTION OF U.S. ARL LIBRARIANS ACROSS GENDER AND MINORITY STATUS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014 Nonminority Male</td>
<td>2711</td>
<td>33.33%</td>
</tr>
<tr>
<td>2014 Minority Male</td>
<td>387</td>
<td>4.76%</td>
</tr>
<tr>
<td>2014 Nonminority Female</td>
<td>4194</td>
<td>51.57%</td>
</tr>
<tr>
<td>2014 Minority Female</td>
<td>841</td>
<td>10.34%</td>
</tr>
</tbody>
</table>

Comments: Figure 7 shows the makeup of U.S. ARL librarians across the following four groups: nonminority male, nonminority female, minority male, and minority female. It is still the case that the majority of librarians are nonminority females, though their share has been slowly decreasing.
Figure 8 displays the median salaries of the four groups as a percentage of the median salary of nonminority males.
Figure 9 uses the same data as Figure 8 but smooths the lines using localized regression. The smoothing helps distinguish the lines, but it should not be assumed that the most recent trends will continue.
**FIGURE 10: ADJUSTED WAGE GAP ACROSS GENDER AND MINORITY STATUS**

<table>
<thead>
<tr>
<th>Group</th>
<th>Adjusted Wage Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014 Nonminority Male</td>
<td>100.00%</td>
</tr>
<tr>
<td>2014 Minority Male</td>
<td>100.63%</td>
</tr>
<tr>
<td>2014 Nonminority Female</td>
<td>98.13%</td>
</tr>
<tr>
<td>2014 Minority Female</td>
<td>98.46%</td>
</tr>
</tbody>
</table>

**Comments:** Figure 10 displays the adjusted wage gap for the groups compared against nonminority males. The findings here match up with what was explained in Figures 3 and 6, that gender has an effect on salary while minority status does not. The male lines are similar to each other and indicate that it is possible that minority males make more than nonminority males. Similarly, the female lines are close together and indicate that minority females could make more than nonminority females.
FIGURE 11: ADJUSTED WAGE GAP ACROSS GENDER AND MINORITY STATUS (SMOOTH)

<table>
<thead>
<tr>
<th>Group</th>
<th>Adjusted Wage Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014 Nonminority Male</td>
<td>100.00%</td>
</tr>
<tr>
<td>2014 Minority Male</td>
<td>100.63%</td>
</tr>
<tr>
<td>2014 Nonminority Female</td>
<td>98.13%</td>
</tr>
<tr>
<td>2014 Minority Female</td>
<td>98.46%</td>
</tr>
</tbody>
</table>

Comments: Figure 11 shows the same data as Figure 10 but smooths the line using localized regression. The smoothing helps distinguish the lines, but it should not be assumed that the most recent trends will continue.
ANALYSIS OF THE WAGE GAP ACROSS RACIAL GROUPS

FIGURE 12: DISTRIBUTION OF U.S. ARL LIBRARIANS BY RACE

Comments: Figure 12 displays the makeup of U.S. ARL librarians across the following four groups: American Indian or Native Alaskan, Asian or Pacific Islander, Black, and Hispanic. Caucasian/Other is not displayed on the graph so the differences between the other groups can be seen.
Figure 13: Raw Wage Gap Across Racial Groups

Comments: Figure 13 displays the median salaries of the different racial groups as a percentage of the median salary of the Caucasian/Other group. Salary information is not displayed for the American Indian or Native Alaskan group due to the small sample size.
FIGURE 14: RAW WAGE GAP ACROSS RACIAL GROUPS (SMOOTH)

<table>
<thead>
<tr>
<th>Group</th>
<th>Median Salary</th>
<th>As Percent of Caucasian/Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014 Caucasian/Other</td>
<td>$69,780</td>
<td>100.00%</td>
</tr>
<tr>
<td>2014 Asian or Pacific Islander</td>
<td>$69,010</td>
<td>98.90%</td>
</tr>
<tr>
<td>2014 Black</td>
<td>$67,286</td>
<td>96.43%</td>
</tr>
<tr>
<td>2014 Hispanic</td>
<td>$66,251</td>
<td>94.94%</td>
</tr>
</tbody>
</table>

Comments: Figure 14 uses the same data as Figure 13 but smooths the lines using localized regression. The smoothing helps distinguish the lines, but it should not be assumed that the most recent trends will continue.
Figure 15 shows the adjusted wage gap across the racial groups. While it appears that Hispanics are making less than the other groups, their small sample size results in a wider confidence interval meaning that there is more uncertainty associated with the estimate. All the groups’ confidence intervals include 100% meaning that race does not have a significant effect on pay.
FIGURE 16: ADJUSTED WAGE GAP ACROSS RACIAL GROUPS (SMOOTH)

<table>
<thead>
<tr>
<th>Group</th>
<th>Adjusted Wage Gap</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014 Caucasian/Other</td>
<td>$69,780</td>
<td>100.00%</td>
</tr>
<tr>
<td>2014 Asian or Pacific Islander</td>
<td>99.93%</td>
<td>98.21% - 101.61%</td>
</tr>
<tr>
<td>2014 Black</td>
<td>100.82%</td>
<td>98.77 - 102.83%</td>
</tr>
<tr>
<td>2014 Hispanic</td>
<td>97.65%</td>
<td>95.04% - 100.20%</td>
</tr>
</tbody>
</table>

Comments: Figure 16 uses the same data as Figure 15 but smooths the lines using localized regression. The smoothing helps distinguish the lines, but it should not be assumed that the most recent trends will continue.
Differences Between U.S. Public and Private Universities

Figure 17: Distribution of Population Across U.S. Public / Private Universities

<table>
<thead>
<tr>
<th>Year</th>
<th>Private (N)</th>
<th>Private (%)</th>
<th>Public (N)</th>
<th>Public (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>3158</td>
<td>38.83%</td>
<td>4975</td>
<td>61.17%</td>
</tr>
</tbody>
</table>

Comments: Figure 17 displays the distribution of U.S. ARL librarians across public and private universities. While the majority of the population still works at public universities, this number has shrunk approximately 5% in the last 35 years.
FIGURE 18: MEDIAN SALARIES OF U.S. PUBLIC / PRIVATE UNIVERSITIES

<table>
<thead>
<tr>
<th>Year</th>
<th>Median Private Salary</th>
<th>Median Public Salary</th>
<th>As Percent of Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>$73,195</td>
<td>$66,929</td>
<td>91.44%</td>
</tr>
</tbody>
</table>

Comments: Figure 18 shows the growth of median salaries at public and private universities over time. Salaries at private universities have grown at a slightly faster rate than those at public universities.
Comments: Figure 19 shows the percentage of librarians who are members of minority racial groups at public and private universities. Both types of schools have had fairly similar numbers of minorities, currently around 15% of the population being minorities.
FIGURE 20: MALE POPULATION AT U.S. PUBLIC / PRIVATE UNIVERSITIES

Comments: Figure 20 shows the percentage of librarians who are male at public and private universities. Since 1988, a higher percentage of librarians are male at private schools than public schools. Currently the difference is 4.35%.
**Comments:** Figure 21 displays the adjusted gender and minority wage gaps for both public and private universities. The blue lines represent the adjusted minority wage gap computed separately for public and private institutions, while the pink lines represent the adjusted gender wage gap computed separately for public and private institutions. The adjusted minority gap is the amount earned by minorities compared to nonminorities at the same type of university. The adjusted gender gap is the amount earned by females compared to males at the same type of university. While the minority wage gap is similar between public and private universities, the gender wage gap has been consistently larger at private universities than at public universities. However, as the confidence intervals overlap for year 2014, the current difference is not statistically significant.
Figure 22 uses the same data as Figure 21 but smooths the lines using localized regression. The smoothing helps distinguish the lines, but it should not be assumed that the most recent trends will continue.
APPENDIX

The following methodology was used to compute the adjusted differences. Regression models were developed so that salary differences could be analyzed accounting for a number of different variables. The models followed the general format:

\[ \ln(\text{salary}) = \alpha + \beta \cdot X + \varepsilon \]

where \( \ln(\text{salary}) \) is the natural logarithm of the respondents yearly salary, \( \alpha \) is the intercept of the equation, \( X \) is a vector of explanatory variables that could affect salary for a respondent, \( \beta \) is a vector of coefficients that tie each of the explanatory variables to salary, and \( \varepsilon \) is a random error term. Each model was run separately for each year.

GENDER WAGE GAP METHODOLOGY

The gender wage model used the following variables in the \( X \) vector: years of experience, years of experience squared, institution worked at, job position, whether or not law librarian, whether or not medical librarian, and gender. Dummy variables were used for each institution, and job position. Minority status was not included as it did not have any effect on the results. The standard errors were clustered at the institutional level, and used to compute confidence intervals and determine significance of variables. Clustering was used as it allows for arbitrary correlation among respondents at the same institution, but assumes independence between institutions. The coefficient for the gender variable was then converted to a percentage by the formula \( 100 - 100 \times \exp(\beta_{\text{gender}}) - 1 \).

MINORITY WAGE GAP METHODOLOGY

The minority wage model used the following variables in the \( X \) vector: years of experience, years of experience squared, institution worked at, job position, whether or not law librarian, whether or not medical librarian, gender, and minority status. Dummy variables were used for each institution, and job position. As gender was found to have an effect on pay, it was also included in the model. The standard errors were clustered at the institutional level, and used to compute confidence intervals and determine significance of variables. Clustering was used as it allows for arbitrary correlation among respondents at the same institution, but assumes independence between institutions. The coefficient for minority variable was then converted to a percentage by the formula \( 100 - 100 \times \exp(\beta_{\text{minority}}) - 1 \).
COMBINED EFFECT GENDER / MINORITY METHODOLOGY

A slightly different methodology was followed in order to compute the combined effects. The model was run on a subset of the data which only contained nonminority males. The model had the following variables in the $X$ vector: years of experience, years of experience squared, institution worked at, job position, whether or not law librarian, and whether or not medical librarian. The coefficients were then used to make predictions on the entire data set. The average difference between actual and predicted salary was taken for each of the groups, representing the difference in returns compared to nonminority males. No confidence intervals were computed for this section, as the purpose was to observe the combined results of the previous sections and not to draw new conclusions.

RACIAL WAGE GAP METHODOLOGY

The racial wage gaps were adjusted by comparing each of the minority racial groups against the Caucasian/Other group. The method was the same as that of the minority wage gap, but ran separately for each of the three race groups. For example, the Hispanic wage gap was computed using a subset of the data containing only respondents who identified as Hispanic, or Caucasian/Other. The minority coefficient then only measured the differences between those two groups. This was done for each of the races.

PUBLIC / PRIVATE METHODOLOGY

Gender and minority differences were computed following the same methodologies as above, but were run on subsections of the data. For example, the methodology for gender was followed, but was run first on a subsection containing only data from public universities, then run again on a subsection containing only private universities’ data. A list of which institutions are public or private is available in the appendix of the ARL Annual Salary Survey.