Faculty Gender Pay Equity: Division and Academic Rank
Drive Institution-level Differences

Presented at the
Rocky Mountain Association for
Institutional Research
October 30, 2019

Dr. Christopher Wendt
Dr. Lawrence Redlinger
• Overview
  • Study Background and Goal
  • Method and Sample
• Quantitative Analysis
  • Descriptive Associations
  • Regression Analysis
  • Methodological Issues
• Discussion
In Spring 2017, the University of Texas System directed institutions to conduct a Faculty Gender Pay Equity Assessment for Academic Year 2017.

- Assess gender pay equity for tenured/tenure track.
- Assess gender pay equity for non-tenured/tenure track instructors.
- Working group (System + institutional Provost and IR components) prescribed methodology.
- Goal of closing systemic gender gaps within five years.
• Dependent Variable: Total Compensation (in USD).
• Study Methodology:
  • Multivariate linear (OLS) regression analysis to identify statistical associations.
  • Incorporate human capital factors (discipline, rank, experience; Haignere 2002).
  • Identify individuals beyond a “range of expected compensation” for possible adjustments.
    • Look for faculty outside a 95% confidence interval for predicted compensation.
• Sample: Who counts?
  • Included 533 tenured/tenure track Faculty employed in Fall 2016 (stand in for AY17).
    • Excluded primarily administrative positions (e.g. President).
    • Excluded faculty with no compensation or no FTE (e.g. on leave).
The share of female tenured/tenure track faculty is below the national average. Male tenured/tenure track faculty received approximately $20,000 more on average than female faculty. Compensation Ratio: Female tenured/tenure track faculty were compensated $0.86 on average for every $1.00 of compensation to male faculty.

• Full Professors made substantially more than other tenured/tenure track ranks...

UT Dallas, Compensation by Rank (Fall 2016)

$111,350

$121,384

$165,549

Assistant Professor

Associate Professor

Full Professor
ANALYSIS: DESCRIPTIVE ASSOCIATIONS (RANK)

• ...while female faculty were less likely to be Full Professors.

UT Dallas, Share of Female Faculty by Rank (Fall 2016)
- At each rank, female faculty were compensated at lower rates than male faculty.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Compensation Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistant Professor</td>
<td>0.88</td>
</tr>
<tr>
<td>Associate Professor</td>
<td>0.95</td>
</tr>
<tr>
<td>Full Professor</td>
<td>0.90</td>
</tr>
</tbody>
</table>

![ UT Dallas, Female Compensation Ratio by Rank (Fall 2016) ]
• Disciplines divided into seven core Schools.
  • ARHM: Arts and Humanities
  • ATEC: Arts, Technology, and Emerging Communication
  • BBSC: Behavioral and Brain Sciences
  • ENCS: Engineering and Computer Science
  • EPPS: Economic, Political, and Policy Sciences
  • MGMT: Management
  • NSMT: Natural Sciences and Mathematics
• UT Dallas is a “STEM” school.
• Management and Engineering faculty are compensated at substantially higher rates than Arts and Humanities or Arts and Technology faculty...

UT Dallas, Compensation by School (Fall 2016)

ARHM: $96,273
ATEC: $108,332
NSMT: $118,567
BBSC: $124,141
EPPS: $126,488
ENCS: $138,452
MGMT: $199,085
ANALYSIS: DESCRIPTIVE ASSOCIATIONS (DISCIPLINE)

- ...with female faculty concentrated in lower compensation Schools.

UT Dallas, Share of Female Faculty & Compensation by School (Fall 2016)

- R² = 0.21
• As with rank, female faculty were compensated at lower rates than male faculty within each School.
• Categorical Independent Variables:
  • Gender.
  • Rank (Assistant, Associate, Full).
  • Discipline (School).
• Quantitative Independent Variables:
  • Employment status (FTE Percentage).
  • Two measures for “Experience”.
    • Years with Highest Relevant Degree (Professional).
      • Average Male: 20 years; Average Female: 16 years.
    • Years at in a Tenured/Tenure Track position at UT Dallas (Organizational).
      • Average Male: 12 years; Average Female: 8 years.
ANALYSIS: BIVARIATE REGRESSION

- In a bivariate regression, gender had the least explanatory power among statistically significant independent variables.

Bivariate Share of Variance Explained, T/TT Faculty Compensation (Fall 2016)

- Gender: 2%
- Years w. Degree: 8%
- Rank: 20%
- Discipline: 33%
• Control Group: New female Assistant Professor in Arts & Humanities.
• Controlling for discipline, rank and experience, the average full time male tenured/tenure track faculty member made ~$3,500 more than the equivalent female faculty.
• This difference was not statistically significant.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-96,287</td>
<td>2,0061</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Male</td>
<td>3,477.6</td>
<td>3,506.2</td>
<td>0.3217</td>
</tr>
<tr>
<td>Experience: Years Highest Degree</td>
<td>1,567.2</td>
<td>213</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Experience: Years at UTD as Tenured/Tenure Track</td>
<td>-2,021.3</td>
<td>193.5</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Rank: Associate Professor</td>
<td>13,477</td>
<td>4,085.8</td>
<td>0.0010</td>
</tr>
<tr>
<td>Rank: Professor</td>
<td>53,224</td>
<td>5,210.7</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>School: ATEC</td>
<td>17,198</td>
<td>8,457.9</td>
<td>0.0425</td>
</tr>
<tr>
<td>School: BBSC</td>
<td>19,002</td>
<td>6,481.5</td>
<td>0.0035</td>
</tr>
<tr>
<td>School: ENCS</td>
<td>32,755</td>
<td>5,529.5</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>School: EPPS</td>
<td>21,943</td>
<td>6,330.4</td>
<td>0.0006</td>
</tr>
<tr>
<td>School: MGMT</td>
<td>102,131</td>
<td>5,760.7</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>School: NSMT</td>
<td>19,043</td>
<td>5,726.3</td>
<td>0.0009</td>
</tr>
<tr>
<td>Employment Status (FTE)</td>
<td>161,727</td>
<td>19,898</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

| N    | 533  | Root MSE | 31,312 |

$R^2 = 0.6790$
• We identified three issues when reviewing our results and conducting subsequent analyses.
  • First, reviewing a plot of error terms indicated heteroscedasticity (unequal variance in errors).
    • More variance in errors at higher levels of compensation.
  • Solution: Use Huber-White ("robust") standard errors (White 1980).
Second, we discovered that one Management faculty was miscoded as tenured/tenure track while analyzing compensation within schools. Removing this observation substantially affected the Management analysis, with implications for the overall analysis.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-72,160</td>
<td>8,1052</td>
<td>0.3756</td>
</tr>
<tr>
<td>Male</td>
<td>21,373</td>
<td>1,0629</td>
<td>0.0472</td>
</tr>
<tr>
<td>Years Highest Degree</td>
<td>1,328.6</td>
<td>655.2</td>
<td>0.0454</td>
</tr>
<tr>
<td>Years UTD Tenure/Track</td>
<td>-2,883.4</td>
<td>746</td>
<td>0.0002</td>
</tr>
<tr>
<td>Rank: Associate Professor</td>
<td>10,674</td>
<td>11,606</td>
<td>0.3601</td>
</tr>
<tr>
<td>Rank: Professor</td>
<td>59,000</td>
<td>14,363</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Employment Status (FTE)</td>
<td>236,922</td>
<td>79,886</td>
<td>0.0038</td>
</tr>
<tr>
<td>N</td>
<td>101</td>
<td>Root MSE: 38,578</td>
<td></td>
</tr>
<tr>
<td>(R^2)=0.4683</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-61,887</td>
<td>78,752</td>
<td>0.4340</td>
</tr>
<tr>
<td>Male</td>
<td>15,416</td>
<td>10,564</td>
<td>0.1479</td>
</tr>
<tr>
<td>Years Highest Degree</td>
<td>1,321.8</td>
<td>635.9</td>
<td>0.0404</td>
</tr>
<tr>
<td>Years UTD Tenure/Track</td>
<td>-2,895.3</td>
<td>723.9</td>
<td>0.0001</td>
</tr>
<tr>
<td>Rank: Associate Professor</td>
<td>6,827.2</td>
<td>11,359</td>
<td>0.5493</td>
</tr>
<tr>
<td>Rank: Professor</td>
<td>56,762</td>
<td>13,964</td>
<td>0.0001</td>
</tr>
<tr>
<td>Employment Status (FTE)</td>
<td>234,864</td>
<td>77,526</td>
<td>0.0032</td>
</tr>
<tr>
<td>N</td>
<td>100</td>
<td>Root MSE: 37,437</td>
<td></td>
</tr>
<tr>
<td>(R^2)=0.4735</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• Taking into account miscodes and robust standard errors:
  • The average full time, male, tenured/tenure track faculty made ~$2,500 more than the equivalent female faculty.
  • This difference was equivalent to ~2% (1.82%) of the average faculty salary and was not statistically significant.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-95,393</td>
<td>19,890</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Male</td>
<td>2,523.21</td>
<td>3,113.94</td>
<td>0.4181</td>
</tr>
<tr>
<td>Experience: Years Highest Degree</td>
<td>1,571.24</td>
<td>282.67</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Experience: Years at UTD as Tenured/Tenure Track</td>
<td>-2,025.4</td>
<td>270.94</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Rank: Associate Professor</td>
<td>12,766.8</td>
<td>3,137.39</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Rank: Professor</td>
<td>52,651.6</td>
<td>4,952.95</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>School: ATEC</td>
<td>17,041.8</td>
<td>6,143</td>
<td>0.0057</td>
</tr>
<tr>
<td>School: BBSC</td>
<td>18,753.3</td>
<td>6,529.82</td>
<td>0.0042</td>
</tr>
<tr>
<td>School: ENCS</td>
<td>32,825.7</td>
<td>4,251.49</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>School: EPPS</td>
<td>21,936.1</td>
<td>5,526.96</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>School: MGMT</td>
<td>103,143</td>
<td>5,353.63</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>School: NSMT</td>
<td>19,063.5</td>
<td>4,968.84</td>
<td>0.0001</td>
</tr>
<tr>
<td>Employment Status (FTE)</td>
<td>162,014</td>
<td>22,733.08</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>N</td>
<td>532</td>
<td>Root MSE</td>
<td>31,043</td>
</tr>
</tbody>
</table>

R²=0.6843
• We identified a third issue while reviewing predicted compensation.
  • Generated new regression coefficients by re-analyzing the model without gender.
  • Used coefficients to assign predicted compensation.
  • Look at cases more than two standard deviations (SD) from their predicted compensation for possible adjustment.
• Results:
  • The expected number of faculty (28 - 5.3%) fell outside two SD.
  • 25 exceptional cases were >2 SD above their prediction, while only three were below.
  • Indicates that errors are not normally distributed (violates OLS).
• Solution One: Transforming the DV (compensation) to its natural log.
  • No change in outcome; male faculty made 1.75% more on average than female faculty (p=.37).
  • $R^2$ increased from .68 to .75.
• Solution Two: Find omitted variable(s). What differentiates high compensation cases?
  • 88% Full Professors (vs. 45% of all T/TT faculty), 12% Associate Professors.
  • 20% were Behavioral and Brain Sciences (BBSC), vs. 10% of institution.
  • Full Professors had more experience in their field than average (35 years, vs. 30 overall).
  • 92% male, but in line with distribution by Rank (23 observed, vs. 21 expected).

• What are some potential omitted variables?
  • Change the discipline measure to Department? Clusters of Departments?
  • “Productivity”? “Prestige”?
• Is pay equity the best way to look at gender equity in academia?
  • Equal compensation without equal composition = institutional gap.
  • What is compositional parity?
• Discipline effects already evident at the undergraduate level.

DISCUSSION: WHAT IS EQUITY?

Example: Engineering/Computer Science

Primary & Secondary Education

Undergraduate Degree

Doctoral Degree

Hiring

Tenure & Promotion

= 21% (National)

= 23% (National)

Industry: 21%

UTD Non-TT: 24%

UTD Assistant: 14%

UTD Associate: 10%

UTD Full: 11%

1American Society for Engineering Education (2016).
Many possible mechanisms drive composition (discipline, rank) effects.

**Discipline:**
- Early mentorship (parents, teachers, advisors) and social cues/peer culture (Pope and Sydnor 2010; OECD 2015).
- Institutional preferences and competitiveness in hiring.
- Disciplinary compensation may be driven down as female representation increases through “crowding” (Sorenson 1989) or “devaluation” (Levanon, England, and Allison 2009).

**Promotion (Tenure Track Status, Rank):**
- External demands (e.g. childcare; Goldin 2014).
- Organizational culture (hiring, mentorship, access to administration/networks/funding, promotion; Hewlett et. al 2008).
DISCUSSION: TAKEAWAYS

• Gender was not a significant predictor of compensation; discipline and rank drive differences in compensation.
• Complex institutional studies raise methodological issues related to model and variable specification.
• The institutional context (size, region, discipline specialization) will influence how you interpret and respond to findings.
• Pay equity within ranks and disciplines is only one policy for achieving gender equity.
• For additional information, please email us at spa@utdallas.edu.