Gender Wage Gaps Amongs Professors in UNC-CH Departments

Caleb Sigmon

Abstract

The motivation for this project is to answer the question of whether there is evidence of a wage gap at UNC-Chapel Hill in general between faculty of different genders, and if present, then specifically, which departments aree the most dramatic examples of this. Gap in this context mean whether a professor is likely to make more if they are a man versus a woman. This study used R and JavaScript charts to examine the topic and found there is indeed a general trend of male faculty making more at the university.

1 Introduction

UNC-Chapel Hill is a public university. This means its salaries are guaranteed access to the public under the Freedom of Information Act. The UNC System maintains a website for the public to access their database of salaries, making inquiries simpler and faster for both parties - the inquirer and the data provider - than the typical process of submitting a FOIA request. Looking directly at the salaries in the database is a luxury not every state provides for their own universities, but still it lacks details such as race and gender that would aid in investigating inequity in the system.

2 Research

In the general workforce in the US, "Women earn an average of 16 percent less than men."[1] Academia is no better, with professors that are women making 82 cents for every dollar earned by their male counterparts.[2]

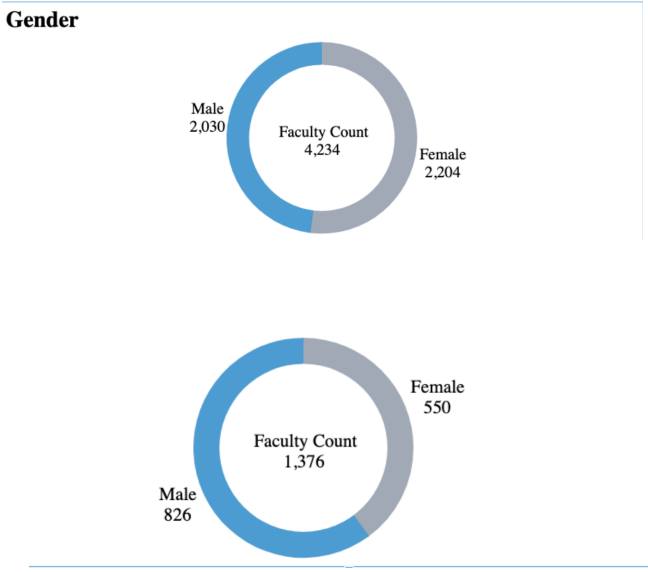
In North Carolina, the average salary for full time faculty is 104.9k; for professors that are tenured or on the tenure track it's 112.6k. The national average for male salaries is 130.8k, but for female salaries it's 109.9k.[3]

One explanation may be difference of ranks held by men and women. UNC's Office of Institutional Research and Assessment maintains a dashboard of statistics across gender for professor ranks and tenure status.[4] While initially this may seem to solve the problem and enable easy investigation into inequity - and to some degree it does - the dashboard lacks the correlating salaries and a proper degree of granularity. The dashboard only lists the statistics across rank and gender, but not by department. This makes it much more difficult to answer the question of which departments experience the worst wage gap.

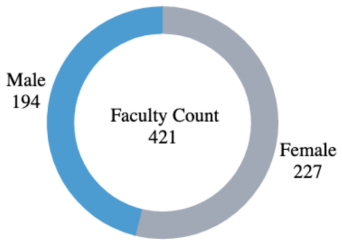
Before arriving on the methods used to make estimates, and HR office in the department of Business, as well as the Office of Research were contacted to investigate if it is possible to access the information on how much men and women make in a particular department. Quite simply, the answer was reported to be no.

UNC's OIRA on its dashboard named "Permanent Full-Time Faculty by Tenure Status and Gender or Race/Ethnicity" does show some key statistics, it shows that overall there are more female full time faculty than male

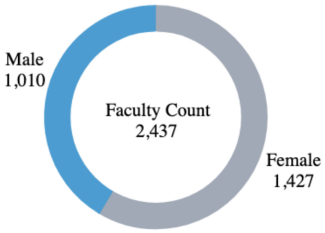
In contrast, there is a greater difference in the opposite difference for tenured professors, with male professors outnumbering female professors by 276.



On tenure track, however, female professors outnumber male ones again.



The fixed term professors have the most dramatic gap of all led by female professors.



Since tenure status corresponds to higher pay, these figures may provide some optimism that as the tenure track professors continue on their track it will lead to a higher equity in pays between male and female professors.

What's interesting about all this is that it actually goes against the expectation from national statistics. "Women make up the majority of nontenure-track lecturers and instructors across institutions, but only 44 percent of tenure-track faculty and 36 percent of full professors."[5] At UNC-Chapel Hill, according to the Trustee Policy definitions,[6] faculty ranks primarily consist of four main positions: Professor, Associate Professor, Assistant Professor, and Instruc-

tor. These ranks encompass both tenure-track/tenured positions and fixed-term appointments, with the latter often distinguished by modifiers such as ”research” or ”clinical.” Professor Rank: This represents the highest level of academic achievement and job security. Both promotion to Professor and initial appointment confer permanent tenure. Associate Professor Rank: Promotion to Associate Professor also grants permanent tenure. Initial appointments are typically probationary for five years, but permanent tenure can be granted upon appointment with department approval. Assistant Professor Rank: Initial appointment as an Assistant Professor is usually probationary for four years. Reappointment decisions are made periodically, and successful completion of the probationary period leads to permanent tenure. Instructor Rank: Instructors are appointed with the expectation of progression to higher ranks. Initial appointments are for one year and can be renewed for up to four terms. Promotion to Assistant Professor may occur during this period.

Because of how it is defined in the policies in unc I am placing instructors as under the broader category of “tenure track” since they are expected to be a rank that lasts one year and after that year would ordinarily rise to the rank of assistant professor.

3 METHOD

The project uses open source government data from the UNC System salary database.[7] The data was last updated March 31, 2024, and for this was exported in a Mircrosoft Excel format. Each row lists such attributes as first and last name, salary, title and department.

Since this project wants to ask questions of the data from different dimensions - meaning it needs to be grouped by different attributes - it was deemed expedient to solve some preliminary grouping in the language R.

The R “dplyr” package was installed to perform several operations on the data. First, filtering from all the salaries in the UNC System to just those corresponding to UNC-CH. Next the data was filtered to just include people whose titles include “Professor”, “Prof”, or “Instructor”. Since these are the terms defined to encompass the faculty types given in the UNC Chapel Hill Tenure Policies and Procedures. As a brief aside, the policies also mention a few other titles for fixed-term faculty that were not found in the UNC System salaries database under the primary working title columns (These were “Lecturer”, “Senior Lecturer”, “Artist in Residence”, and “Writer and Residence”. The term “Lecturer” did appear in a different column, “Job Category”, but every case of a lecturer in that column corresponded to a value of “Professor of the Practice” in the primary working title column, and vice-versa.

After being filtered down to the full time faculty professors that are either tenured, tenure track or fixed term, two dataframes were made to be converted into JSON objects for the web dashboard. For both, the data was cleaned to combine department groups that have very similar names into their respective joint departments. For example, there are over 25 “departments” that begin with “Psychiatry” then some specific sub field. It was deemed sensible to combine these kinds of departments to prevent the power of skew from extremely small departments. See below for a full listing of the departments beginning with or containing the same broader term that were combined. Basic regular expression terminology to note is up arrow means beginning with and “*” means any amount of any characters. So “grepl(*Health Sciences*)” means any title that contains the substring Health Sciences, for example.

```r
# Combine like departments, which begin with one of the following words.
# Since many of these contain only 1-3 people and are subdepartments.
custom_group <- function(text) {
  case_when(
    grepl("^ASOD", text) ~ "ASOD",
    grepl("^Medicine", text) ~ "Medicine",
    grepl("^Neurology", text) ~ "Neurology",
    grepl("^Anesth", text) ~ "Anesthesiology",
    grepl("^Biomedical Engineering", text) ~ "Biomedical Engineering",
    grepl("^Biostatistics", text) ~ "Biostatistics",
    grepl("^Dermatology", text) ~ "Dermatology",
    grepl("^Emergency Medicine", text) ~ "Emergency Medicine",
    grepl("^Psychiatry", text) ~ "Psychiatry",
    grepl("^ENT", text) ~ "ENT",
    grepl("*Health Sciences*", text) ~ "Health Sciences",
    grepl("^Med", text) ~ "Medicine",
    grepl("^OBGYN", text) ~ "OBGYN",
    grepl("^Opthalmology", text) ~ "Opthalmology",
    grepl("^Orthopaedics", text) ~ "Orthopaedics",
    grepl("^Pathology Lab Med", text) ~ "Pathology Lab Med",
    grepl("^Peds|^Pediatric", text) ~ "Pediatrics",
    grepl("^Radiation Oncology", text) ~ "Radiation Oncology",
    grepl("^Radiology", text) ~ "Radiology",
    grepl("^Surgery", text) ~ "Surgery",
    grepl("^SOP", text) ~ "SOP",
    grepl("^Urology", text) ~ "Urology",
    grepl("*Nursing*", text) ~ "School of Nursing",


    TRUE ~ text
  )
}
```

The first dataframe to JSON exported was simply 2 columns, Department, and “n”, with n corresponding to the number of faculty in that department. This was exported in the project files as ”depts by n.json”. The second export is just every row of the unc salaries dataframe but mutated to now include the predicted gender.

3.1 Predicting Gender

To predict the gender where none was included in the data, a simple R package “predict race”[8] was installed and used. The package includes a “predict gender” function that simply takes in a person’s first name as input and matches it to one of four options. Male Female Female, male NA The package makes its predictions by simply matching the name to US Social Security Administration data and finding if there are more men or women listed with that name. If none are found it returns NA, and if an equal number it returns “female, male”.

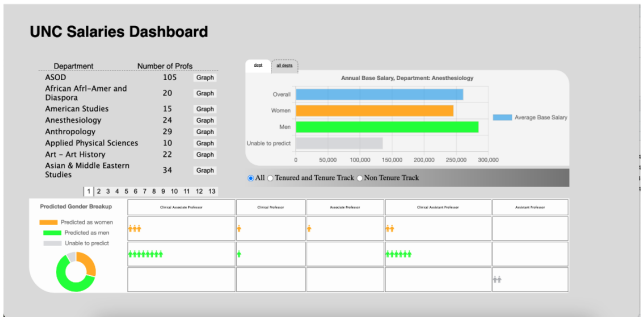
3.2 Visualizations

With these JSON exported visualizing is pretty simple. The grouped departments object is used first, to render a 13-page table, each with a button to render the visualizations on the rest of the page based on that department’s professors. On the top right is a bar graph that utilizes all the rows in the other JSON object with professors whose department match the selected one, and displays the average salary in that department for women, men, names the R package was not able to predict, and the overall average.

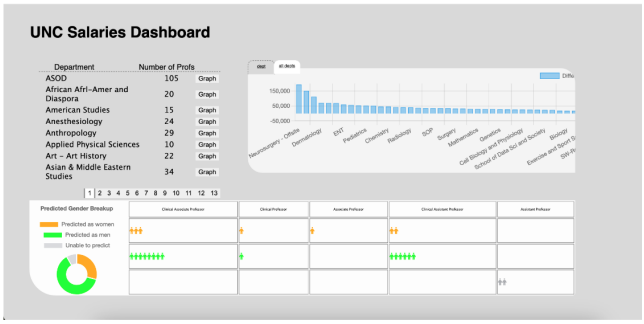
Clicking a graph button on the table also renders two more visualizations - a simple donut chart that shows the divide of the gender prediction counts (by sheer number of professors matching that prediction in the department, not by salary proportion), as well as the specific amounts of that predicted group when the mouse hovers over a donut sector.

The table to the right of the donut chart breaks things down even further, showing where the individual professors line up across gender and rank. Across the board, orange is used to represent professors predicted as women and green is used for professors predicted as men. The simple reason for this is that using blue or a red-adjacent color might unnecessarily give a viewer a reason to insinuate there is a message on gender norms by color (since blue is stereotypically a boyish color and pink a girlish one). So on the chart below, you can see that in the Anesthesiology department male professors make more on average[9], the department has a larger proportion of male professors, and that most of the faculty have a fixed-term modifier in their titles (“Clinical”).

There is also a few buttons to filter the data, labeled “All”, “Tenured and Tenure Track” and “Non Tenure Track” which perform the obvious operation on the data.



Lastly there is a visualization to enable easy spotting of the department with the worst wage gap. By clicking the “all depts” tab at the top of the bar chart section, a new horizontally-scrollable bar chart displays showing the differences in average male and female salaries for every department. The difference is just (average male salary) - (average female salary) so whatever bars have higher amounts have the worst equity in men’s favor.



4 Findings

While we could go department by department to answer our research question of which department has the worst wage gap, we can now simply glance and see the answer is Neurosurgery. Hovering through we can see all the top four are related to medical fields, and the number five worst disparity belongs to the Kenan-Flagler Business School.

5 References

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[3] L. Allen, “Full-Time Faculty Avg. Salary, by Academic Rank,” *AAUP Data*, Jul. 08, 2022. https://data.aaup.org/fcs-ft-faculty-salaries/ (accessed May 02, 2024).

[4] Office of Infortmation & Assessment, “Analytic Reports — OIRA,” *Unc.edu*, 2018. https://oira.unc.edu/reports/

[5] K. Palmer, “Workplace climate pushing women out of the professoriate,” *Inside Higher Ed — Higher Education News, Events and Jobs*, 2023. https://www.insidehighered.com/news/faculty-issues/diversity-equity/2023/10/24/workplace-climate-pushing-women-out-professoriate#:~:text=Women%20make%20up%2044%20percent (accessed May 02, 2024).

[6] Board of Trustees of The University of North Carolina at Chapel Hill, “Trustee Policies and Regulations Governing Academic Tenure in the University of North Carolina at Chapel Hill Section 1. Academic Freedom,” Sep. 2020. Accessed: May 02, 2024. [Online]. Available: https://facultyaffairs.unc.edu/wp-content/uploads/sites/1353/2023/07/UNC-Chapel-Hill-Tenure-Policies-and-Procedures.pdf

[7] UNC System, “UNC Salary Information Database,” *Northcarolina.edu*, Mar. 31, 2024. https://uncdm.northcarolina.edu/salaries/index.php

[8] J. Kaplan, “Package ‘predictrace’ Title Predict the Race and Gender of a Given Name Using Census and Social Security Administration Data,” Jul. 2023, doi: https://doi.org/10.1038/sdata.2018.25].

[9] The College and University Professional Association for Human Resources, “Tenured/Tenure-Track Faculty Salaries,” *Higheredjobs.com*, 2024. https://www.higheredjobs.com/salary/salaryDisplay.cfm?SurveyID=24