

Task 4A - Bertrand male-female wage gaps estimation by major occupation groups

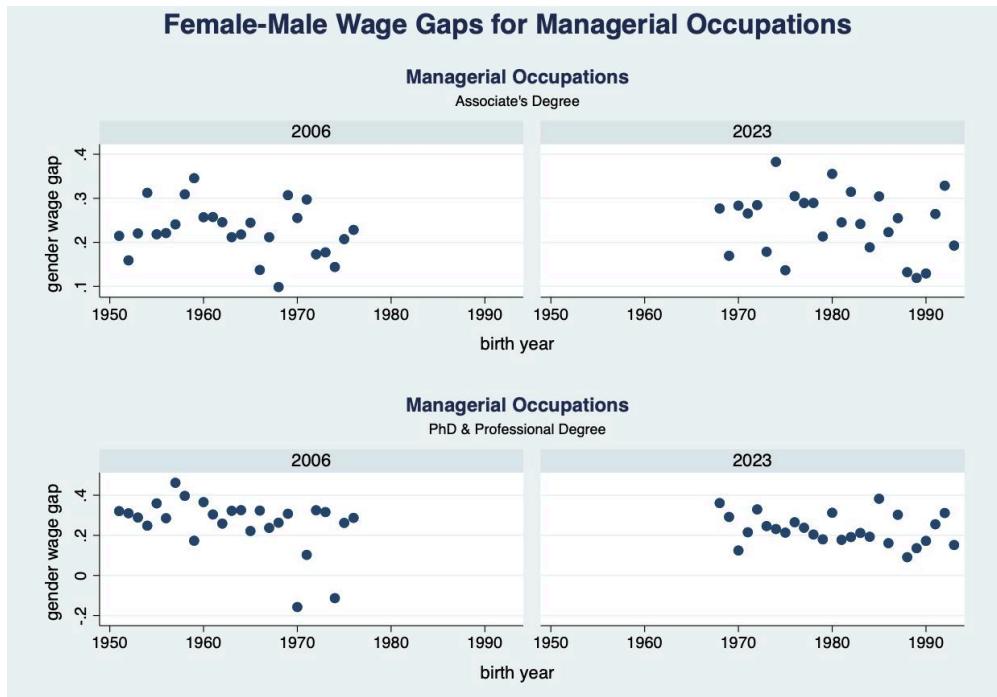


Fig 1. Gender wage gap in managerial occupations (by year and education)

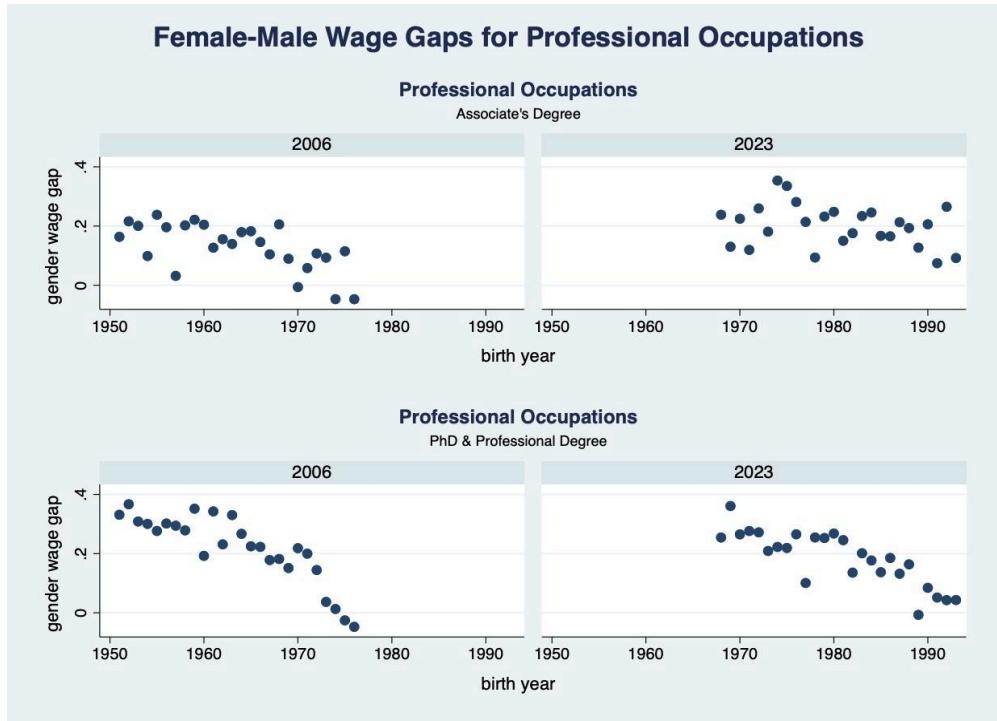


Fig 2. Gender wage gap in professional occupations (by year and education)

Figures 1 and 2 above replicate the graph illustrating the gender wage gap shown in Figure 2 of Bertrand's paper, "The Glass Ceiling." The gender wage gap represents the disparity in earnings between women and men, and is an important measure used to study gender discrimination in labor markets. Bertrand calculates the gender wage gap by subtracting male earnings by female earnings then taking the natural logarithm. Our measure however, calculates the wage gap by dividing female earnings by male earnings and then subtracting it from 1.

$$\text{Bertrand's Gender Wage Gap} = \ln(\text{male earnings} - \text{female earnings})$$

$$\text{Our Gender Wage Gap} = 1 - \left(\frac{\text{female earnings}}{\text{male earnings}} \right)$$

The reasoning behind the different calculation methods used was due to variation in data which resulted in differing gender wage gap values from the paper. Therefore, adopting a different calculation method which yields similar values and can be interpreted the same was preferred for better comparison. The lower the value, the smaller the earnings gap between men and women, and a negative value implies that women earned more than men.

Data from 2006 and 2023 was taken from the American Community Survey (ACS) which was available on IPUMS. In terms of data cleaning, each observation was first job categorized using the 1990 census of population classification system. Then degree types were categorized, focusing only on an associate's degree level and beyond. Observations were dropped if they were unemployed, earned zero income, were not between the ages of 30-55, or did not belong to an occupation category in the paper. These decisions were made to replicate the methodology adopted in the paper for better comparison. To allow more accurate comparisons between 2006 and 2023, Inflation was also adjusted for between the two time periods by calculating an adjusted hourly wage.

Then, data was cut for only the 80th and 90th percentile earnings, as the goal is to examine the "glass ceiling" phenomenon where female earnings stagnate at higher income levels. Finally, a cohort was generated based on unique degree and occupation combinations. This allows exploration of the gender wage gap based on each unique cohort. For this task, I have chosen to examine the gender wage gap in managerial and professional occupations. The former because it is a large field that most people enter, and the latter as it includes STEM occupations that are historically male dominated.

First examining the gender wage gap in managerial occupations in Figure 1, there seems to be a very weak negative to no decline in the gender wage gap for associate degree holders in both 2006 and 2023. In addition, our wage gap values are also higher than in Bertrand's findings which found a gender earnings gap no larger than 0.25, whereas our data contains observations experiencing a wage gap up to 0.40. When examining results for PHD and professional degree

holders however, a stronger negative relationship between birth year and the gender earnings gap can be observed. Despite still experiencing a larger average wage gap than in Bertrand's findings, on an individual level, a few observations experience a negative wage gap, implying that female earnings were higher than male earnings. There is also a small but noticeable average shrinkage in the wage gap between 2006 and 2023 for all birth years.

Based on results from Figure 1, there is significant divergence from Bertrand's results. Our data shows that for associate degree holders, the wage gap has not improved between 2003 and 2026, thereby challenging the claim that the gender wage gap is declining. For PHD and professional degree holders however, there is a decline in the gender wage gap between 2006 and 2023, but the gap estimated in our data is still higher than Bertrand's findings.

Now onto examining the gender wage gap in professional occupations in Figure 2. Both associate and PHD/professional degree holders experience a negative relationship between the gender wage gap and birth year in 2006 and 2023. However, when comparing between the two time periods, the gender wage gap appears to have worsened for associate degree holders. Take the 1970 birth cohort as an example. In 2006, the gender wage gap was between 0, however in 2023, the gender wage gap grew to 0.2. This growth in the gender wage gap can be observed for all birth cohorts older than 1970. As for PHD and professional degree holders, a stronger negative relationship between the gender earnings gap and birth year can be observed in both time periods. However, through a historical comparison again, 2023 shows a larger gender wage gap, especially for birth cohorts in 1970-1980.

Results in Figure 2 yield a similar moderately strong negative relationship as Bertrand's findings. However, based on values, our data illustrates a larger wage gap than in Bertrand's paper. In addition, a historical comparison between 2006 and 2023 also reveals a growing gender wage gap that was not shown in Bertrand's one time period study.

Discussing data limitations, Bertrand mentions risk aversion, willingness to work long hours, and child responsibilities as significant factors that may contribute to the gender wage gap. The first two can be accounted for through Bertrand's methodology which observes earnings of individuals in the same occupation and degree type. This eliminates gender discrepancies in behavior such as women being less inclined to enter industries/occupations that promote individual competition or are time intensive. However, child care is a highly significant factor contributing to divergences in gender gap that is not accounted for. In future surveys, including questions such as the amount of time spent on children may help measure this and account for this data limitation.

Both our and Bertrand's results show that the gender wage gap still exists and has stopped shrinking, despite claims that the gender wage gap has closed significantly. Historical

comparisons between 2006 and 2023 even show a growing gap, thereby indicating negative progress (for higher income percentiles). Better design of surveys to promote data collection such as on time spent on childcare can help produce better comparisons and identify other possible factors contributing to the gender earnings gap.