DA2 - Gender Wage Gap Analysis

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Introduction

In this project, we analyze the **cps-earnings dataset** to investigate the unconditional gender wage gap between advertising, promotions, marketing and sales managers. Moreover, we also analyze how the gender wage gap varies with the level education for which we test multiple different models.

Descriptive statistics

Table 1: Wage Metrics of Advertising and Sales Managers

	Mean	Median	SD	Min	Max	P05	P95
Weekly earnings	1489.93	1346.15	776.55	1.00	2884.61	440.00	2884.61
Weekly hours worked	44.50	40.00	9.05	2.00	99.00	35.00	60.00
Hourly wage	33.33	30.00	16.56	0.03	100.00	11.52	64.10

What we can infer from the descriptive table is that there many individuals doing overtime beyond 40 hours per week (which is the median value), creating a mean higher than 40, which makes the sample distribution right-skewed. Regarding hourly wage, we can observe a relatively high average dispersion (standard deviation is USD 16.56). An extreme value can also be detected after taking the range of hourly wages into account, as according to our sample, there is someone who earns USD 0.03 per hour. We do not believe that its possible in the US, therefore we will exclude extreme datapoint(s) that have lower than USD 1 as their hourly wage.

Gender Wage Gap

Next, we run regressions to test if a statistically significant gender wage gap exists in this particular collection of professions, and if so, its magnitude and relation to education level. We first fit a log-level regression of hourly wages on gender (dummy variable that is 0 if male and 1 if female) to get the unconditional gender wage gap. Then, we extend this by including the level of education as a categorical variable with the highest education level (Doctorate) as our base. We chose that one because it is the easiest to compare to (the lowest level is much more arbitrary). We run three different models to analyze this relationship. First, a level-level regression (hourly wage as the LHS variable), second, a log-level regression (log wage as the LHS variable). Finally, a regression with all interaction terms of gender(female) and the levels of education.

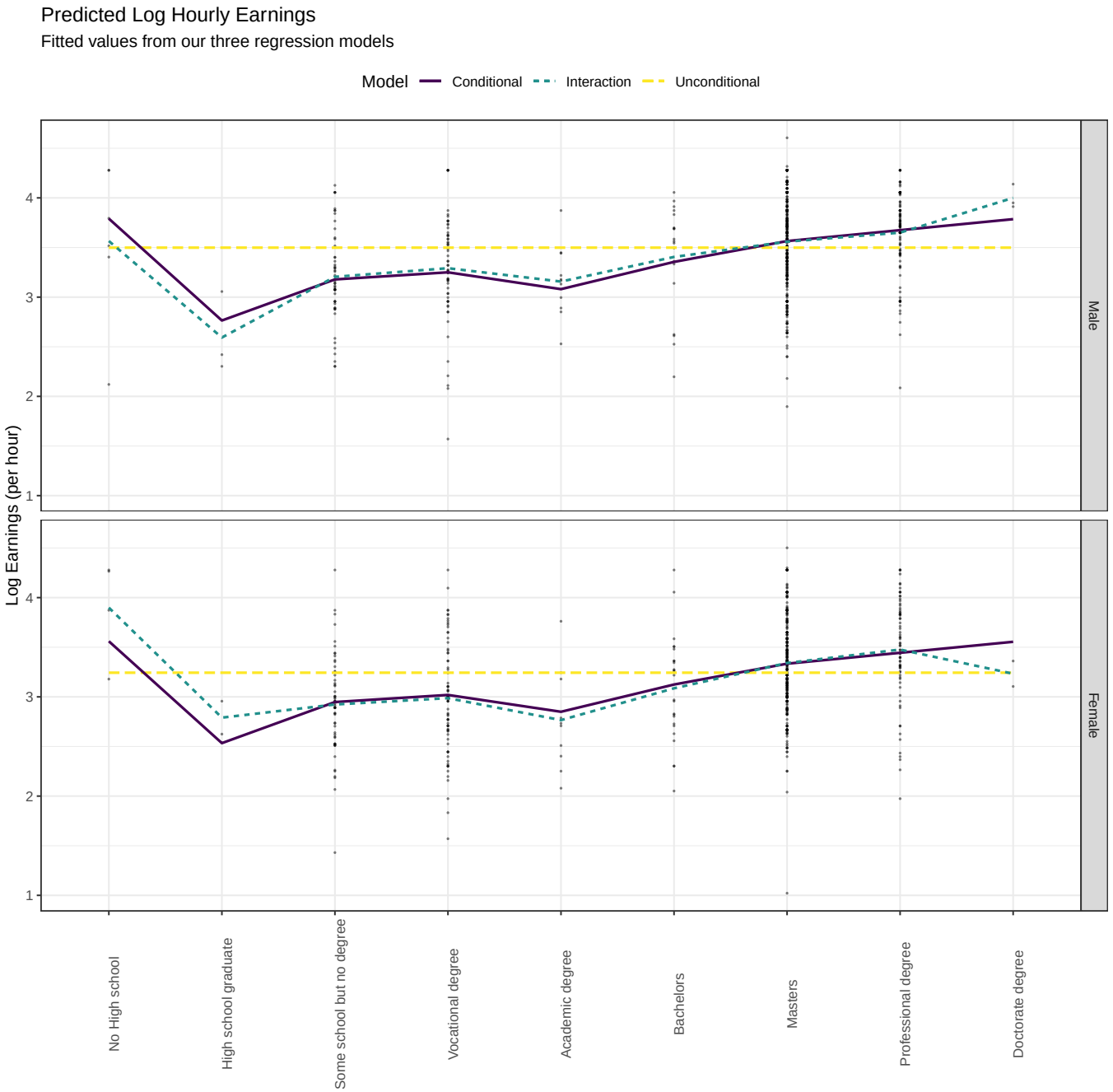
Based on our first model a female is expected to earn on average around 26% less than a male in our chosen professions. This wage gap is significant at 5% significance level (and even at 1%). Based on our second model, a female is expected to earn on average around 6.69 USD less hourly wage than a male with the same education level in our chosen professions. This statistic is also significant at 5% significance level (and even at 1%). In our third model, which is comparable with the first one, the gap appears to be smaller (23%) by including the levels of education as control variable, but it remains highly statistically significantly different from 0. The standard error also became lower, and our goodness-of-fit multiplied (17.2% of the log hourly wage's variance can be explained by the RHS variables). As we chose Doctorate as our base, it is unsurprising that all categories of education have a negative coefficient that indicates that they earn less hourly wage (e.g. high school graduates 6.1% less). However, in only the lower half of these education levels are the coefficients significant at the 5% level. Finally, in our fourth model, we can see that the female coefficient turned statistically insignificant indicating an absence of significant gender gap in wages. Though the R squared of this model is the highest, among the coefficients, only that of not finishing high school and the

Table 2: Gender Wage Gap | Level of Education

	Unconditional	Level-Level	Conditional	Interaction
(Intercept)	3.50 (0.02)**	50.29 (7.40)**	3.79 (0.22)**	3.57 (0.30)**
Female	−0.26 (0.03)**	−6.69 (0.93)**	−0.23 (0.03)**	0.33 (0.37)
No high school		−32.50 (7.89)**	−1.03 (0.27)**	−0.97 (0.36)**
High school graduate		−22.70 (7.48)**	−0.61 (0.22)**	−0.36 (0.31)
College no degree		−20.17 (7.49)**	−0.54 (0.22)*	−0.27 (0.31)
Associate degree vocational		−25.46 (7.68)**	−0.71 (0.24)**	−0.41 (0.32)
Associate degree academic		−17.59 (7.70)*	−0.44 (0.23)	−0.16 (0.32)
Bachelor's degree		−11.64 (7.42)	−0.23 (0.22)	−0.01 (0.30)
Master's degree		−8.20 (7.48)	−0.12 (0.22)	0.08 (0.30)
Professional school		−4.46 (9.17)	−0.01 (0.25)	0.43 (0.31)
F x No high school				−0.14 (0.44)
F x High school graduate				−0.62 (0.39)
F x College no degree				−0.64 (0.39)
F x Associate degree vocational				−0.72 (0.42)
F x Associate degree academic				−0.65 (0.41)
F x Bachelor's degree				−0.55 (0.38)
F x Master's degree				−0.51 (0.38)
F x Professional school				−1.10 (0.39)**
Num.Obs.	1090	1090	1090	1090
R2	0.057	0.150	0.171	0.178
Std.Errors	Heteroskedasticity-robust	Heteroskedasticity-robust	Heteroskedasticity-robust	Heteroskedasticity-robust

interaction of gender and professional school are significant. We can interpret it as: among those with professional school education, women tend to earn less than men by a whopping (0.33 - 1.1 =) 77%, but within other levels of education, such difference does not prove to be significant.

We also compare the predicted values of our models with the same LHS variable (log hourly wage) visually for females and males. The general pattern is very similar for the two sexes. The predicted values of our univariate regression show a slightly increasing line, while the multivariate models follow the variance in the data more precisely. The conditional and interaction models move closely together and diverge only for the lowest and highest levels of education. The difference between wages whether people finish high school is not intuitive, but sample size is very low. From high school graduate to academic degree category only slightly higher values can be detected across categories. In higher education, however, higher-level degrees tend to have higher wages with only the effect of a Doctorate being less certain. We also considered the possibility of using a spline with a cutoff at whether the observations have a degree in higher education. However, we decided not to include it, as those who did not finish high school would have distorted the first line and we already had three different models to analyze. But it can be another possibility for later research.



Conclusion

To conclude, we find a significant unconditional gender wage gap of 26% in favor of males among advertising, promotions, marketing and sales managers. As for its relationship with education level, we find a smaller overall gap (6.69 USD or 23%) within these managers with the same education level. Using also interaction terms to understand the gap within each level of education, we only find significant difference among managers with a Professional degree (77%).