Administrative Issues Journal: Connecting Education, Practice, and Research, Winter 2023, Vol. 13, No. 1: 31-39. DOI: 10.5929/2023.13.1.3

Regression Analysis of the Gender Wage Gap in Academia

Veronika Humphries, J.D.

Tammy Johnston, Ph.D.

Paul Nelson, Ph.D.
University of Louisiana at Monroe

Abstract

According to the Institute for Women's Policy, women in the United States working in the state of Louisiana earn sixty-nine cents on the dollar compared to their male counterparts. This is a substantial discrepancy and has been used as a call for action. However, what is really behind this variance in pay between women and men? For a large part, it is the types of careers that men and women choose to enter. A more valid comparison between men's and women's pay is to look at pay differences within the same chosen career path. This study looks at faculty pay at a regional university to ascertain whether there is evidence of a difference in pay between women and men in academia. This paper's results show that once the area of specialty, rank, and years of experience are considered, male faculty actually, on average, earn less than their female counterparts.

Keywords: *gender pay gap, academia salary study*

Introduction

Gender inequality is prevalent in almost every aspect of life, and its effects on the economy and women's lives can be substantial. The gender wage gap stems from various issues such as children and marriage, the gap in educational attainment, work experience, and occupation choice.

Differences in wages based on gender have been a frequently researched topic with various levels of success in attempting to determine the primary causes of the gender wage gap and its historical evolution. Blau and Kahn (2017) have arguably reviewed the most extensive period of time in the hopes of finding the prevailing trend of wage discrimination based on gender. They looked at the available U.S. data between 1980 and 2010, using Panel Study of Income Dynamics, and reported that the 1980s was the time period that was most progressive in the decline of the gender-based wage gap; however, albeit some progress, in the 1990s and 2000s the narrowing of the gap slowed down substantially. Despite this progress, by 2014, on an annual basis, women working full-time earned 79% of wages compared to men overall and 83% when weekly earnings were examined.

Until 2010, research typically considered education and work experience as key human capital variables when attempting to explain the gender wage gap. However, in the past 10 years, these determinants meant very little because the number of women with higher levels of education and their entry to the labor market were very similar to, if not exceeding, that of their male counterparts. Recently, occupation

and industry appear to be the more relevant factors to examine when seeking to explain wage differences based on gender (Blau & Kahn, 2017).

Wages in Academia

According to the most recent study conducted at Ohio State University (Chen & Crown, 2019), a gender wage gap of 11% was found even when specific criteria were considered, such as years of experience, type of appointment, and department. However, once rank was included in the specification, the gap decreased to 5.23%.

In another study at Dartmouth College (Connley, 2020), a gender wage gap of $33,831 was found in favor of male faculty members. Slightly over half of this gender wage gap amount has been found among professors at Yale University, and nearly a $13,000 wage difference was found at Harvard University (Sasser, 2021). Princeton agreed to pay over one million dollars after a U.S. Department of Labor's Office of Federal Contract Compliance Program found salary disparities favoring male over female professors. The university disagreed with the statistical data but decided to pay to avoid litigation.

A comparison study of the promotion and wage gap of female professors with STEM doctoral degrees with their peers working in the industry found that the wage gap based on gender in academia was one and a half times higher than that of those working in the industry. The issues appeared with non-tenure-track faculty wage disparity and the prevalence of female faculty in non-tenure-track positions (Kelliher, 2021). When controlling for rank, there is evidence of wage disparity. According to an American Association of University Professors data review, 64.5% of all full professors are male, earning $18,370 more on average than their female colleagues at the same rank (AAUP, 2020).

Wage disparities are even further exacerbated when analyzing medical school faculty. According to a 2019 study of nearly 30 public medical schools in 12 different states, the wage gap between department chairs is between $80,000 and $65,000 when adjusted for factors such as grants, publications, and years of experience (Mensah, Beeler, & Rotenstein, 2020). However, institutional salaries do not appear to be the only issue when it comes to higher education in medicine. Gold, Roubinov, and Jia find that in a sample of 1,654 full professors, 411 had endowed chairs. Of those 411, only 18.5% (76) were female (Gold, Roubinov, & Jia, 2020).

Professional Occupation Wage Disparities

Kleinjans et al. (2017) argue that occupational prestige is another factor contributing to wage disparities between genders. Houser and Warren (1997) define occupational prestige as "the general level of social standing enjoyed by the incumbents of an occupation." The term occupation prestige should not be confused with societal status, typically determined by wealth. Men are more likely to choose employment that is not necessarily beneficial to society or that provides fewer external benefits than occupations chosen mostly by women. For example, women are more likely to become teachers, whereas there are more male stockbrokers than their female counterparts. However, a teacher's salary is typically substantially less than a stockbroker's. The preference difference between genders is only relative because ideally, both genders would prefer an employment opportunity that provides occupational prestige and higher wages. Which of the two factors prevail after a choice must be made for either higher occupational prestige but lower salary, or lower occupational prestige but higher salary is a factor in differences between wages (Kleinman’s, Krassel, & Dukes, 2017).

A study examining The University of Michigan Law School graduates and their differences in earnings after 15 years from graduation demonstrated that a wage gap exists in the legal profession, often solely on the basis of clients' preferences for retaining male attorneys. A contributing factor in wage earnings differences was women's inability to work as many billable hours as their male coworkers, based on their role as the primary caregiver in the family (Noonan, Corcoran, & Courant, 2005). An issue with the opportunity to work a higher number of hours per week when compared to greater time flexibility on the job also resonated in a study by Schaffer et al. (2015), demonstrating that once again, women's role as primary caretakers is a contributing factor of wage differences between men and women. The inability to work overtime or the necessity to choose employment not based on the offered salary but rather on the flexible work schedules contributes to wage inequality. In other words, although direct discrimination has largely disappeared thanks to laws and regulations prohibiting discriminatory practices by employers, indirect discrimination stemming from occupational status and family roles can negatively affect women's wages earned (Schaffer & Westenberg, 2019).

Methodology and Data

The current study looks at salary data from 297 faculty at a regional university located in the U.S. in the state of Louisiana for the academic year 2020-2021. The data is comprised of 172 women and 125 men. Faculty are either 9-month or 12-month employees. The salary data is a 9-month salary. Faculty on 12-month contracts are included at the 9-month rate. The average salary of the 172 women was $64,316, and the average salary of the 125 men was $66,431. When considering all 297 faculty at the university, men earned an average of $2,115 more than women, or 3.3% more. The average total years of experience of the 172 men was 20.57 years compared to 19.3 years for women. That is, men had on average 6.6% more total years of experience. In terms of years of experience specifically at the current university, the men averaged 13.66 years and women averaged 11.14 years, a difference of 22.6%. Therefore, one could reasonably attribute the 3.3% lower overall women’s pay to the lower overall years of experience of women compared to men (see Table One).

The university being analyzed for this study has a pharmacy school that pays its faculty noticeably more on average than other faculty on the campus. These salaries, both male and female, could be considered outliers. If we calculate averages without these specific salaries, the comparisons could be considered more representative overall, and we can analyze the male and female differences within the pharmacy school separately. Table One presents the average data for all faculty, all faculty excluding the pharmacy school, and faculty of the pharmacy school only.

When comparing all salaries with the pharmacy school excluded, men overall still earn more than women, but the difference decreases from 3.3% to 2.6%. When comparing the salaries of just the pharmacy school, it is interesting to note that women on average earn more than men by 2.0% even though the men’s average years of experience is substantially higher (43.33% for total experience and 49% for university-specific experience). Despite pharmacy being a STEM program, the gender wage gap is not shown to be experienced by women at this university. On the contrary, men experience a gender wage gap despite having significantly more experience.

Table One

	9-month Salary			Total Yrs of Experience			Yrs of Experience at Univ		
	F	M	% diff	F	M	% diff	F	M	% diff
All	$64,316	$66,431	3.3%	19.3	20.57	6.6%	11.14	13.66	22.6%
All except Pharmacy School	$60,744	$62,297	2.6%	19.87	20.41	2.7%	11.26	13.39	18.9%
Pharmacy School only	$91,466	$89,713	2.0%*	15.0	21.5	43.33%	10.21	15.21	49%

"*" Represents a % difference that favors women

Table Two presents salary and experience information divided by disciplines. In five of the six disciplines, men earn higher than women (averaging 0.5% more to 9.8% more). In the Business discipline (similar to the "Pharmacy School only" reported in Table One), women earn more than men, specifically 7.3% more despite fewer years of experience.

Table Two

Discipline		Gender	Salary	Total Years Experience	Years Experience at University
Education		F	56,520	18.4	11.76
		M	59,927	18.6	6.45
	% diff		6.03%	1.1%	82.33%*
Humanities		F	49,411	16.75	13.88
		M	53,901	21.13	16
	% diff		9.1%	26.15%	15.3%
Science		F	50,426	21.82	17.48
		M	55,351	17.42	11.58
	% diff		9.8%	25.3%*	46.9%*
Arts		F	56,784	18.11	10.77
		M	57,071	24.83	15.91
	% diff		0.5%	37.11%	47.7%
Social Science		F	54,343	21	12.83
		M	58,997	18.42	15.27

	% diff		8.6%	14.0%*	19.0%
Business		F	87,383	17.09	12.13
		M	81,436	20.91	12.66
	% diff		7.3%*	22.4%	4.3%

"*" Represents a % difference that favors women

An ordinary least squares regression analysis was performed that included variables representing gender, rank, administration, discipline area, current experience, total experience, and ethnicity.

Salary = f (Intercept, Gender, Assistant rank, Associate rank, Full rank, Administration, Business/Social Science, Health Studies, Pharmacy, Current Experience, Total Experience, Black, Hispanic, Other Ethnicity).

Where Gender = 0 for females and 1 for males; rank includes Assistant, Associate, and Full with Instructor as the default; Administration = 0 for non-administrative positions and 1 for administrative positions; discipline area includes business and social science, health studies, and pharmacy with humanities, science, and education as the default. The discipline areas in the regression follow the makeup of individual schools within the university being studied. Current experience is the number of years the faculty member has been at the current university; total experience is the total number of years of career experience; and ethnicity includes Black, Hispanic, and Other (which included Asian), with Caucasian as the default.

Results

The R-squared was 0.64, and the adjusted R-squared was 0.62. These indicate a good fit for the data to explain salaries. The number of usable observations was 250. Some ethnicities were unknown and were excluded from the regression analysis. The regression results are presented in Table Three.

Table Three

Variable	Coefficient	T-Statistic	p-value
Intercept	39,069.25	14.44	0.000
Gender	-3,216.43	-1.82	0.069
Assistant	11,072.86	4.30	0.000
Associate	15,637.86	5.91	0.000
Full Professor	26,949.66	9.47	0.000
Administration	12,337.34	4.46	0.000
Business/Social Science	23,549.61	11.02	0.000
Health Sciences	3,979.77	1.71	0.088
Pharmacy	21,075.17	5.97	0.000
Current Experience	-123.79	-1.00	0.317

Total Experience	162.46	1.44	0.150
Black	1,967.33	0.58	0.561
Hispanic	-1,115.06	-0.13	0.900
Other	5,035.17	1.72	0.087

The Intercept value of $39,069.25 is statistically significant at less than the 1% level. The intercept provides the baseline salary of a Caucasian female instructor in the discipline area of liberal arts, science, and education with zero experience. The Gender variable indicates that holding everything else constant, a male faculty member is paid less than the female faculty member by $3,216.43, and this variable is statistically significant at the 6.9% level. This indicates a gender pay gap; however, the gap favors females. If a strict 5% level of significance is applied, then no gender pay gap is found for either males or females in this study.

The binary variables for rank indicate statistically higher pay as rank increases. Specifically, the results show an additional $11,072.86 for Assistant Professors, an additional $15,637.86 for Associate Professors, and an additional $26,949.66 for Full Professors as compared to Instructors. All of these rank variables are statistically significant at less than the 1% level.

To allow for premiums paid to faculty administrators, a binary variable was included. Faculty administrators are paid 12 months, so their 12-month salary was converted to 9 months. The results indicate a $12,337.34 premium paid to administrators for their equivalent 9-month salary, which was statistically significant at less than the 1% level.

The binary variables to catch differences in salaries due to different academic areas of employment were all statistically significant at least the 10% level. The added salary for faculty in the discipline areas of business and social sciences was $23,549.61 as compared to the faculty in the discipline areas of liberal arts, science, and education with statistical significance at less than the 1% level. The discipline area of health sciences was found to have an additional $3,979.77 salary above the base discipline area and was statistically significant at an 8.8% level. Pharmacy yielded an additional $21,075.17 salary over the base discipline and was statistically significant at less than 1%.

Two variables were included to capture how years of experience affected salaries. One variable was years of experience at the current institution, and the other variable was total years of experience. Both experience variables were found to be statistically insignificant. The current experience variable has a negative signed coefficient that was unexpected but was statistically insignificant. The total experience variable had the expected sign but was a smaller than expected coefficient ($162.46). It, too, was statistically insignificant.

Variables for ethnicities were statistically insignificant except “other.” The designation of “other” included persons who were non-White, non-Black, and non-Hispanic. The “other” variable had a coefficient of $5,035.16 and was statistically significant at the 10% level. The Black variable has a coefficient of $1,967.33 but was statistically insignificant. The Hispanic variable has a negative coefficient of $1,115.06 but was statistically insignificant. It should be noted that in the sample, only one known Hispanic faculty member existed.

Some other variables were tested in the model, but are not presented in the results because they were found to be statistically insignificant and did not enhance the model. These variables included a binary variable to account for persons hired before 2008 versus after 2008. At this particular university, a noted shift in terms of the regularity of pay raises occurred at that time. It would be expected that faculty hired prior to 2008 had suffered from salary compression due to a lack of yearly pay raises. The coefficient was -$3,670.91, which does indicate a loss of expected salary of those hired prior to 2008 as compared to newer hires; however, the coefficient was not found to be statistically significant. Additionally, the number of years of work experience squared for both years of experience variables were tested but were found to be statistically insignificant.

Conclusion

Other studies found a gender pay gap with males making more than females. That is not the case at the institution studied here. In fact, when other variables were accounted for, the gap was in favor of women though the difference was marginally significant. This is one university and therefore not fully generalizable to other institutions. Yet, these results are in contrast to earlier studies that found that men out-earn women. Clearly, the discipline that faculty are in and their rank have a predominant role in wage levels. In this study, faculty in a college containing education, liberal arts, and sciences were the lowest paid of all colleges. To the extent that wage disparity exists, that may be a function of discipline choice rather than explicit discrimination. Systemic factors may affect discipline choice among men and women, but those questions are beyond the scope of this study.

The result that women are paid more than men could be peculiar to this institution for a variety of reasons. One distinction between these data and other studies reviewed is that this is a public institution while several other studies investigated institutions that are private. However, a comparison should be made with Chen and Crown (2019) Ohio study. Chen and Crown found male faculty salaries to be 5.23% higher than females once discipline, experience, and rank were included. Their finding is lower than other gender pay gap studies and could indicate a trend, of which our paper continues, of a declining gender pay gap. Additionally, salaries are a matter of public record making discrepancies more visible.

The institution in the current study is part of a larger public university system. A logical extension of this research would be to broaden the research to other universities within the system. Additional studies of public universities could provide support that gender pay gaps are reduced when salaries are public information and that gender pay gaps are declining over time when discipline and rank are considered in the models.

References

AAUP. (2020, December 9). *Data Snapshot: Full-Time Women Faculty and Faculty of color. American Association of University Professors.* https://www.aaup.org/news/data-snapshot-full-time-women-faculty-and-facultycolor#.YVNr8q9KiUm

Blau, F. D., & Kahn, L. M. (2017). The Gender Wage Gap: Extent, Trends, and Explanations .*Journal of Economic Literature*, 55(3), 789-865.

Chen, J. J., & Crown, D. (2019). The Gender Pay Gap in Academia: Evidence from the Ohio State University. *American Journal of Agricultural Economics*, 101(5), 1337-1352.

Connley, C. (2020, October 14). *Princeton agrees to pay over $1 million to female professors after federal review finds pay gaps.* CNBC. https://www.cnbc.com/2020/10/14/princeton-to-pay-over-1-million-to-female-professors-for-gender-pay-gap.html

Gold, J. A., Roubinov, D., & Jia, L. S. (2020). Gender Differences in Endowed Chairs in Medicine at Top Schools. *JAMA Internal Medicine,* 180(10), 1391-1394.

Humphries, V., Johnston, T., Parker, H. (2021) An Empirical Exposition of the Gender Wage Gap in Academia. *Empirical Economics Letters*, *20*(10), 1679-1687.

Kelliher, R. (2021, August 25). *Gender Pay Gap Greater in Academia Than Industry Among Non-Tenured Faculty*. Diverse Issues in Higher Education. https://www.diverseeducation.com/faculty-staff/article/15114192/gender-pay-gap-greater-in-academia-than-industry-among-nontenured-faculty#:~:text=Gender%20Pay%20Gap%20Greater%20in%20Academia%20Than%20Industry%20Among%20Non%2DTenured%20Faculty,-Rebecca%20K

Kleinjans, K. J., Krassel, K. F., & Dukes, A. (2017). Occupational Prestige and the Gender Wage Gap. KYKLOS, 70(4), 565-593.

Mensah, M., Beeler, W., & Rotenstein, L. (2020). Sex Differences in Salaries of Department Chairs at Public Medical Schools. *JAMA Internal Medicine*, 180(5) 789-792.

Noonan, M. C., Corcoran, M. E., & Courant, P. N. (2005). Pay Differences Among the Highly Trained: Cohort Differences in The Sex Gap in Lawyers' Earnings. *Social Forces,* 84(2), 853-872.

Sasser, A. (2021, July 2). *Professor gender pay gap greater at Dartmouth than at peer institutions*. The Dartmouth https://www.thedartmouth.com/article/2021/07/professor-gender-pay-gap-greater-at-dartmouth-than-at-peer-institutions

Schaffer, D. L., & Westenberg, J. M. (2019). Time Flexibility, Women's Wages, and the Gender Wage Gap. *Atlantic Economic Journal*, 47(2), 217-239.

About the Authors

Dr. Veronica Humphries is an Assistant Professor of Business at the University of Louisiana at Monroe (ULM). She obtained a Master of Laws and a Doctor of Laws degree from universities in Europe and a Master of Laws degree from the LSU Law Center. Her professional experience includes working in banking, real estate, insurance, and the legal field in the United States and in Europe. Her research interests include international business, international law, and business communication.

Dr. Tammy Johnston is a Professor of Economics at the University of Louisiana at Monroe (ULM). She received her Ph.D. in Economics from Southern Illinois University in 1996. Her research interests include macroeconomics, monetary economics, and international economics.

Dr. Paul Nelson is a Professor of Economics and Director of the Center for Economic and Business Research at the University of Louisiana at Monroe (ULM). He came to ULM from Western Illinois University. He received his Ph.D. in Economics from Texas A&M University in 1985.