Does a Gender Pay Gap Among Faculty Exist at Southern Utah University?

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Abstract

This paper provides an analysis on salaries for female and male faculty members at Southern Utah University. Given all the attention that gender pay gap has gotten in the last years, I have decided to respond to the question if Southern Utah University, the university where I study, has a gender pay gap among faculty members. After gathering information on SUU's faculty education, job position, age, and salary, I used a linear regression model to answer this question. The results of the study suggest that there is not enough evidence to prove that there is a gender pay gap among SUU faculty, probably because the data set is limited to the year 2016.

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Introduction

Gender pay gap has existed for years and we all know that is real. We hear about it in classrooms, we see it in the news, and we read about it in every newspaper; it is something that we learn from a really young age, simply because everyone is talking about it. Studies on gender pay gap have brought data on what the gap is, and the hope is that institutions will take actions to shrink such gap. The gender pay gap is not something new, that has just started to be acknowledged, it is something that has been studied for years. And even though studies on the matter started way back in the XX century, it is still a big issue for society. Data shows that such gap began to increase way back in the 1970s, and then started shrinking in the late 1990s, with women's earnings at 76.5 percent of men's earnings, compared to 61 percent in 1978 (Blau & Khan, 2000). However, the gap hasn't shrunk much in the last twenty-seven years.

According to the Institute for Women's Policy Research, based on the median annual earnings of full- time, year-round workers, women in 2015 earned on average only 80 cents for every dollar earned by men. That is not a big improvement if we consider that twenty-seven years ago the gap was 76.5 cents for every dollar (Blau & Khan, 2000). So yes, the gender pay gap has narrowed since the 1990s, but the gap is narrowing too slowly. It has been estimated that if the gender pay gap keeps shrinking at the current rate, we won't see equal pays before 2119 (Brown & Churches, 2017). While women in the United States earn on average 80 cents per every dollar earned by men, the state of Utah in 2016 ranked #50 out of the 51 federal states in the U.S., with an average earning-ratio of 70%, meaning that on average women in the state of Utah make 70 cents per every dollar earned by men (Brown & Churches, 2017). This is basically saying that female's earnings in Utah are stuck at what the nation's average female earnings were almost thirty years ago. My hope for this research, and future research on this particular topic, is to show that my university does not align with the state's average rate.

The gender pay gap is often excused with the fact that women work different jobs than man, are less educated, and put in different hours at the end of the week. The first excuses consist in saying

that women earn less than man because they tend to specialize in jobs that pay less than jobs that are mainly for men: just think about how many jobs in the society are still perceived as man jobs or women jobs. According to a study conducted in 1982, the myth that job allocation is driven by biological qualifications was already in 1982 just a way for employers to justify low paying jobs for women, and emphasize the physical qualities that allowed man to have certain jobs (Messing). This connects very well with another misconception: men are more educated than women. While, according to the 2015 US Census Bureau Report, sixty percent of women had completed some college education, compared to 58 percent of men; moreover, thirty-three percent of women had at least completed a bachelor's degree, versus thirty-two percent of men (Bauman & Ryan, 2016). The other frequently used excuse is that women tend to take more time off to stay home with their kids, and this will affect their salary because of the reduction of their weekly working hours. This is an idea that has changed dramatically in the last ten years, because there is now a sharing of responsibilities among parents, with more fathers demanding time off to stay with their children and take care of them, and this proves even the last excuse false (Ladge, Humberd, Watkins, & Harrington, 2015).

In order to avoid these justifications, I am answering the gender pay gap question at SUU controlling for years of education, age, type of faculty position, and department. Controlling for those variables will allow me to compare a male faculty member at Southern Utah University with a female faculty member which has the same years of education, works in the same department, has the same job title, and is the same age. This will better allow us to observe how much gender influences the outcome, which in this model is in log points for salary.

Method

In this study, I have estimated one linear multivariate model. In the first regression, I wanted to identify if there is a significant change in the outcome, which is the natural log of salary, when the subject is a female. The first model uses a multivariate linear regression, which is:

(1) $lnsalary = \beta_0 + \beta_1(female) + \beta_2(education) + \beta_3\ (age) + \beta'(jobposition) + \beta'(college) + u$

Where the outcome is the natural log of salary, which allows for a more accurate interpretation for the change in salary, because it is in percent change. The variable female is the key variable in the model, because it allows us to see if there is indeed a difference in salary between male and female professors. The other variables are included in the model to control for years of education, age, job position, and college.

The original model included two variables for age, which where age and age squared, because age is usually not a linear function and the returns on salary rise at a diminishing rate, until the returns hit a point when they start decreasing at an older age (Mincer, 1975). However, regressing the model that contained both age and age squared, produced not statistically significant results in both age and age squared. For this reason, I decided to drop the variable age squared (Table 3). The relationship between age and salary in this dataset is shown in Figure 1. The variable β'(job position) indicates different dummy variables for the job position, which are assistant professor, associate professor, professor, lecturer, professional in residence, department chair, and dean; where professional in residence is the dummy variable that is left out of the model. The variable β'(college) includes different dummy variables for each college at Southern Utah University: School of Business, College of Humanities and Social Sciences, College of Performing and Visual Arts, and College of Science and Engineering, and College of Education and Human Development, which is the dummy variable left out of the model.

This model allowed me to identify if there is a difference in salary among female and male faculty at Southern Utah University, a difference that indeed exists. Given that this model had

identified this disparity in salary, I proceeded with estimating the same model, omitting the college variable, limiting the sample to the population of a different college for every regression.

To estimate these sub models, I maintained the same variables to control for the same aspects that I used in the first model, which are gender, age, and position, getting rid of the college variables, because I ran each regression limiting the population to the corresponding population for each college. This model describes best the difference in earnings between female and male faculty at SUU, allowing us to see the disparity between earnings for women and men in each college.

Data

The data for this study comes from the Southern Utah University website, where information on last year's salary for each faculty member, where they completed their education, their position at Southern Utah University, and of course, in which department they work, can be found.[1] This information is spread in different pdfs on the website; thus, in order to be able to use this information for my research, I had to create a brand new excel spreadsheet where I imported the data and created new variables that would be useful for this research.

First, I created the outcome variable which is the logarithm of annual salary. After creating the outcome variable, I started focusing on the independent variables. The variable for gender had to be created, and in order to report on the spreadsheet the right sex for each faculty member, I used tools like LinkedIn and the SUU's web site to find each individual and identify their gender. I then created a variable for education, which was created by converting qualitative data into quantitative data, first creating dummy variables for Doctorate Degree, Master's Degree, and Bachelor's Degree, and then converting those variables in numerical variables. I then decided to create a quantitative variable for years of education, following the assumption that an additional year of education would have the same effect on salary regardless if it is an additional year of education that leads to a Master's

[1] Faculty Salary can be found at https://www.suu.edu/ad/hr/pdf/suu-salary-data-as-of-2-3-2017.pdf and Faculty Credentials here: http://catalog.suu.edu/content.php?catoid=3&navoid=138#Faculty

degree or a Doctorate degree. This is shown in Table 1, where regressing the salary with the years of education, we can observe that indeed an additional year of education is correlated with a 2.7 % increase in salary. Regressing the salary with a dummy variable for Master's, J.D, Doctorate, and Bachelors' Degree (as the omitted variable), we find that there is not a statistical difference between an additional year of college to get a Master's Degree, a J.D., or a Doctorate Degree [Table 1 (2)].

To create a variable for age, I used the subjects' bachelor graduation date to approximate their age today. In order to approximate their age, I had to make the assumption that those individuals graduated High School at the age of 18 and graduated college at the age of 23, because nowadays the average time it takes a student to graduate from college is estimated to be five years (Shapiro et al., 2016). I then created a "job position" variable splitting the different professor's positions into different dummy variables, which allowed me to convert qualitative data into numeric data that could be used for a regression. Controlling for the different colleges is fundamental, because the data shows that there are significant differences in earnings depending on the department a professor teaches in (Table 2).

The data in this dataset had some missing variables for the year of college graduation, because I was not able to find that information for some faculty members. The missing values were therefore missing at random, and this is what allowed me to create the variables age_x, which equals to one if the age is missing, or zero if the age is not missing. The missing values in age were then replaced with zero, which will allow the regression to give results that will not be altered by those missing variables (Allison, 2002).

Results

The data shows differences in salary for female and male faculty; the average salary is in fact $55,834.15 for females, while the average salary for males is $66,696.38. The t-stat confirmed that the two salaries are statistically significant.

Salary	Obs	Mean	Std. Error	Sts. Dev
Male	179	66696.38	1664.718	22272.41
Female	85	55834.15	1351.772	12462.72
Combined	264	63199.07	1248.028	20278.06
Difference		10862.23	2590.703	5760.978

*T-stat: 4.20

This disparity between female and male salaries is what led me to conduct this research, to finally understand if there is indeed a disparity in salaries when we look at two professors of different gender with similar characteristics.

Another aspect that emerges from the data, even without a regression, is that there is not a clear correlation between salary and years of education. Looking at the graph we can see that there is not much difference in salary between faculty with a Doctorate degree and a Master's degree (Figure 2). The figure also highlights how different earnings are for men and women with the same years of education.

Estimating model (1) shows that there is a gender disparity in earnings, even when controlling for the type of position, which is a really important variable since it could be argued that women end up earning a lower salary at the end of the year because they work less total hours. It is really interesting though how, when controlling for position, the p-value changes, and even if the coefficient for female is still statistically significant, it is now significant at the 95% level [Table 3 (4)]. Moreover, when controlling for each different college, we observe that the coefficient for female is still statistically significant, but the level of confidence has now dropped to 90% [Table 3 (5)]. The results of regressing model (1) thus suggest that the average salary for female faculty members at SUU is 4.51% lower than the average salary of an SUU male faculty member. This shows that controlling for age, years of education, type of position, and different colleges at Southern Utah University, there is indeed a gender pay gap.

Furthermore, when we regress model (1) limiting the population for each different college, we observe that the coefficient female is not statistically significant, except for the College of Science

and Engineering. Table 4 shows, in fact, that there is a statistically significant difference in female salary compared to male salary among faculty in COSE[2], with a female faculty earning on average 7.63% less than the counterpart in the same college [Table 4 (5)]. Controlling for more variables, and then limiting the population size, has decreased the level of confidence in proving that there is a gender pay gap at Southern Utah University, and has shown that there is no difference in female and male earnings inside most colleges, besides COSE.

The results of this study have shown some limitations. The model is based on salaries for the year 2016, because a report of faculty salaries for previous years is not available on line. The assumptions I made, taking the risk of observing changes in salary only for the year 2016, are that the changes would be constant throughout the years, or even less dramatic due to the gender pay gap shrinking year after year. The results, however, have shown to be strong only when controlling for years of education and age, but they have weakened in significance when more control variables were added to the model. This might be a sign that SUU doesn't have a gender pay gap, or that the population size is too small, given that the dataset only contains salaries for the year 2016, and gets smaller and smaller when we regress the model for each different college.

Another limitation to the model is the lack of a control variable for how many years each individual had been teaching. This is one of the reasons why I have included the variable age in the model, with the assumption that an individual working as a faculty member would start teaching during the completion of a Doctorate Degree, or a Master's Degree; I recognize that this is a strong assumption that might not hold, since there are faculty members that prior to being part of academia, did not hold a teaching position. Adding another control variable to this model would have been counterproductive because of the limited size of the population.

Related to the limitation of the dataset regarding the data only coming from the year 2016, the population size of the study might simply be too small. The results, in fact, have shown to be strong

[2] COSE: College of Science and Engineering.

only when controlling for years of education and age, but they have then weakened in significance when more control variables were added to the model; this might be a sign that SUU does not have a gender pay gap, or that the population size is too small and cannot be restricted in all those sub-categories (position and college). Further research should attempt to show if the results in this paper are the product of a small population size, or the actual relationship between gender and salary at Southern Utah University.

Conclusion

The analysis suggests that controlling for more variables, and then restricting the sample to the different colleges, makes the variable female drop in statistical significance, and this could lead to different conclusions.

It could be said that given the results of this study, there is not enough evidence to suggest that there is a gender pay gap among faculty at Southern Utah University, except for the college of Science and Engineering. This however, would be a misinterpretation of the results, and therefore of this study, because it suggests that the results could be caused by the population taken into consideration, which gets smaller and smaller when we add more variables to control for, and this could be what causes the results to be statistically non-significant.

In conclusion, with the data set used for the study, we cannot prove that there is a gender pay gap among faculty at Southern Utah University, but it is advised to conduct the study a second time with a broader population in the data set.

Appendix

Figure 1

Change in Salary Given Age for SUU faculty

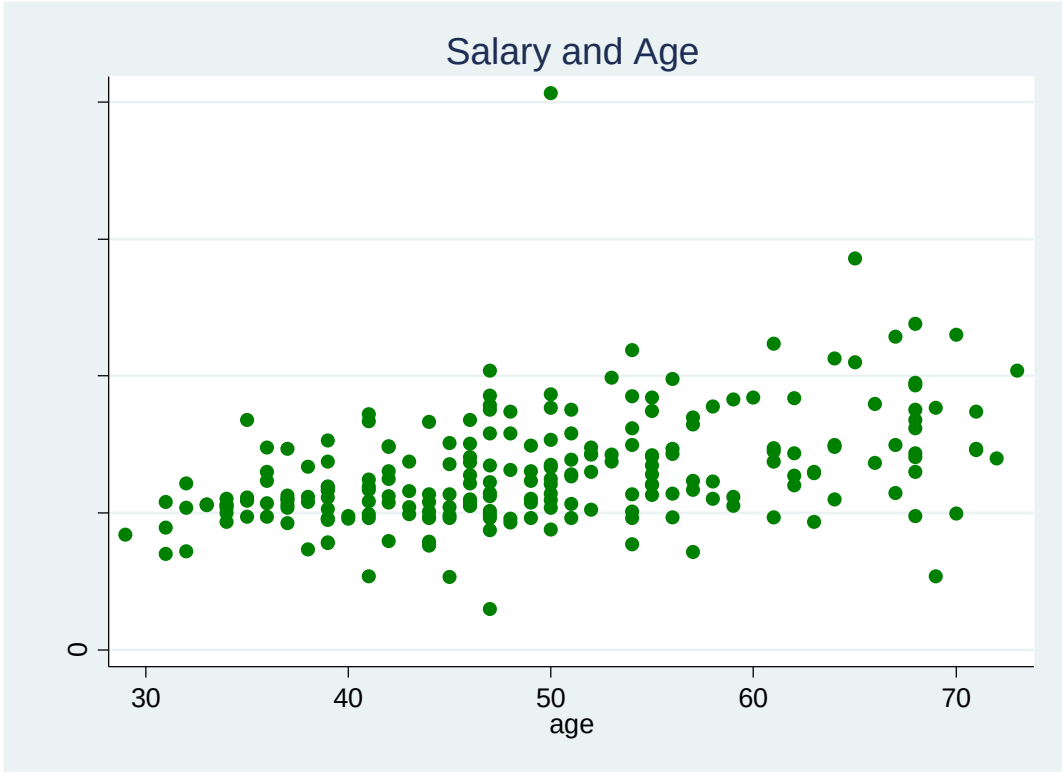

Figure 2

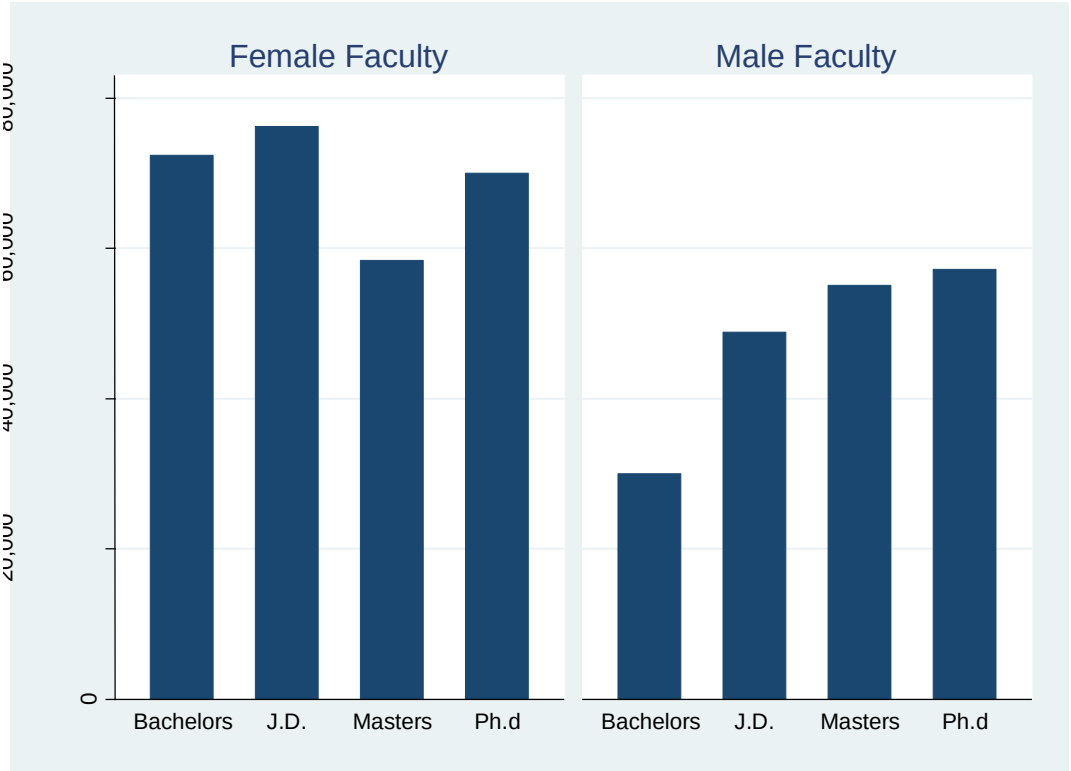

Table 1

VARIABLES	(1) lnwage	(2) lnwage
master		0.0227
		(0.173)
jd		0.223
		(0.208)
doctorate		0.160
		(0.172)
education	0.0274***	
	(0.00756)	
Constant	10.46***	10.90***
	(0.153)	(0.170)
Observations	264	264
R-squared	0.048	0.051

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2

VARIABLES	(1) lnwage
Art	-0.485***
	(0.0667)
Education	-0.442***
	(0.0701)
Humanities	-0.501***
	(0.0577)
Science	-0.433***
	(0.0576)
Constant	11.43***
	(0.0500)
Observations	264
R-squared	0.238

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3

VARIABLES	(1) lnwage	(2) lnwage	(3) lnwage	(4) lnwage	(5) lnwage
female	-0.152***	-0.136***	-0.105***	-0.0624**	-0.0451*
	(0.0386)	(0.0382)	(0.0345)	(0.0307)	(0.0263)
educyears		0.0241***	0.0251***	0.00413	-0.00216
		(0.00745)	(0.00666)	(0.00646)	(0.00610)
age			0.0114***	0.000848	0.000430
			(0.00163)	(0.00188)	(0.00165)
age_x			0.368***	-0.0287	-0.0744
			(0.0924)	(0.0941)	(0.0818)
Controlling for position				Yes	Yes
Controlling for College					Yes
Constant	11.06***	10.57***	10.00***	10.66***	10.76***
	(0.0219)	(0.153)	(0.163)	(0.160)	(0.152)
Observations	264	264	264	264	264
R-squared	0.056	0.092	0.281	0.466	0.617

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4 The table shows multiple regressions for model (1) limiting the sample to a different college for every regression.

	College of Performing and Visual Arts	School of Business	College of Humanities and Social Sciences	College of Education and Human Development	College of Science and Engineering
	(1)	(2)	(3)	(4)	(5)
VARIABLES	lnwage	lnwage	lnwage	lnwage	lnwage
female	-0.00920	-0.0668	-0.0326	0.110	-0.0763*
	(0.0910)	(0.100)	(0.0430)	(0.0871)	(0.0396)
educyears	-0.00155	0.0275	0.000896	-0.00703	0.00432
	(0.0218)	(0.0181)	(0.0128)	(0.0202)	(0.00878)
age	-0.00172	0.00656	0.00167	-0.00365	0.00544*
	(0.00587)	(0.00442)	(0.00270)	(0.00420)	(0.00299)
age_x	0.0142	0.275	-0.0234	-0.198	0.135
	(0.297)	(0.243)	(0.134)	(0.267)	(0.139)
o.associate	-				
assistant	0.355**	0.00166	0.227***	0.197	0.253***
	(0.171)	(0.175)	(0.0695)	(0.144)	(0.0542)
professor	0.653***	0.0194	0.630***	0.789***	0.638***
	(0.208)	(0.141)	(0.0938)	(0.193)	(0.135)
dean	1.143***	0.351	0.462**		
	(0.300)	(0.204)	(0.197)		
depchair	0.677***	0.119	0.494***	0.519**	0.486***
	(0.199)	(0.147)	(0.111)	(0.222)	(0.116)
associate		-0.0113	0.372***	0.200	0.398***
		(0.0987)	(0.0847)	(0.160)	(0.0637)
o.dean				-	-
Constant	10.61***	10.49***	10.56***	11.03***	10.45***
	(0.565)	(0.438)	(0.265)	(0.476)	(0.241)
Observations	36	28	85	29	86
R-squared	0.502	0.641	0.646	0.618	0.621

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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