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Why Do Female Faculty Members Still Earn Less? Gender Pay Gap in Higher Education in Science, Health and Engineering Fields

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Abstract

This study investigates faculty gender pay gap in higher education, while controlling for academic, demographic and family factors. By using data from NSF and drawing on various economic theories such as human capital theory, comparable worth theory, and structural theory, this study will build a framework for examining and comparing the differences in wages for full time-faculty in Science, Health, and Engineering Fields. Rank, discipline, hours worked per week, race/ethnicity, employer size, year of award of the highest degree and number of weeks worked per year and family were all variables used to consider the extent of a pay gap. Multiple hierarchical regression results showed that even when controlling for academic, demographic and family factors female faculty members earned 3.0% less than their male counterparts. These findings are consistent with other studies that prove that the gender pay gap still exists in academia.

Key words: gender pay gap, pay disparity, higher education, academia, female faculty, science, health and technology,

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Chapter 1: Introduction

Problem Statement

The gender gap or disparity in pay is an unfortunate reality that persists in today's society; the gender pay gap is the difference between women's and men's median annual earnings for working in the same or a similar position with comparable responsibilities (Hill et al., 2015). According to the United States Census Bureau the female-to-male earnings in 2018 was 0.81 ("Women in the labor force: a datebook," 2018), which means that for every dollar that a man earns, a woman will be paid only 81 cents- when looking at full-time workers only. Additionally, in 2016, 4.1 million women lived below the official poverty level while working at least 27 weeks in a year, in contrast to 3.4 million men ("Women in the labor force: a databook", 2017), which implies that women are considerably more vulnerable than men to being the working poor. According to Proctor et al. (2016), in 1979 women's earnings were 62% of men's; therefore, there was growth in women's earnings throughout the years; in the past half century, the pay gap has been cut in half. Nonetheless, almost 40 years later women still earn considerably less (Proctor, et al., 2016). At the present rate the pay gap is not projected to close until the year 2059 (Milli et al., 2017).

Over the years many policies were created to eliminate the gender pay gap in the United States. The United States was one of the first countries to implement a policy that would provide equal employment opportunities (Blau & Kahn, 2017). The Equal Pay Act of 1963 prohibited employers from discriminating against their employees on basis of gender, such as paying one employee less than another because of their gender, for work which requires equal skill and under similar working conditions (Equal Pay Act, 1963). The following year the Civil Rights Act

of 1964 prohibited employers' discrimination based on race, color, religion, sex or nationality (Civil Rights Act, 1964). Additionally, in 1978 the Pregnancy Discrimination Act was passed, protecting pregnant employees from being wrongfully discriminated against by their employers (Pregnancy Discrimination Act, 1978). And finally, the Family and Medical Leave Act of 1993 provided employees with protected unpaid job leave for medical and family reasons for up to 12 weeks (Family and Medical Leave Act, 1993). As a result of these government protections, significant progress was made in narrowing the pay gap, especially during the 1980s; however, the progress since then has largely stalled (Blau & Kahn, 2006).

Over the years many studies have been conducted to explain the gender pay gap by focusing on factors such as educational attainment, work experience and occupational segregation. However, in all of these studies the researchers found that there is a portion of the gender pay gap that cannot be explained by any of these factors (August & Waltman, 2004; Blau & Kahn, 2000; Blau & Kahn, 2006; Blau & Kahn, 2017; Hart, 2013; Porter et. al, 2008; Renzulli et al, 2013; Roos & Gatta, 2009). It is important to note that the slowly shrinking pay gap has been attributed to gains that women made in each of these factors such as higher educational attainment, more women in the workforce and a higher number of women entering the previously male dominant occupations (Mandel & Semyonov, 2014). As an example, in 2017 43% of women ages between 25-64 achieved a bachelor's degree and higher in comparison to only 11% in 1970 ("Women in the labor force: a datebook", 2018). At present, women hold more college degrees than men. In the 2017-18 academic year women received 58.2% of all conferred degrees in 4-year institutions (Ginder et al, 2018).

Studies have shown that other, more difficult to measure, factors such as gender discrimination, family caregiving responsibilities and workplace discrimination are contributing

to the overall wage discrepancy (Blau & Kahn, 2000; Blau & Kahn, 2006; Blau & Kahn, 2017; Hart, 2013; Renzulli et al, 2013; West & Curtis, 2007). Unquestionably, there are many factors that must be considered when explaining women's lower earnings. Some factors such as differences in educational attainment and years of experience are justifying the gender pay gap. However, there are some factors that are purely discriminatory. For example, only women are able to bear children and therefore some employers may discriminate against them because of this reason ("Women in the Labor Force a datebook", 2017), even though they are protected under the Civil Rights Act of 1944 and Pregnancy Discrimination Act of 1978 (Civil Rights Act, 1964; Pregnancy Discrimination Act, 1978). Employers may expect that married female employees will have children, and may not return from their maternity leave or if they return, they will be more focused on and/or distracted by their children and therefore be less productive employees. Before World War II many women would leave their jobs or careers after they got married to have children; conversely, now an increasing number of women stay in the labor force even after having children (Blau & Kahn, 2017). Among women with children, the highest labor force participation were women with children 6-17 years old, about 74.6% and the lowest with children under 3 years old, only 61.4% ("Women in the Labor Force a datebook", 2017). Even with the more modern gender role distribution, women are still primarily responsible for housework and childcare in most U.S. households, which increases workforce discrimination against women as well as adds additional constraints that male employees may not necessarily face ("Women in the Labor Force a datebook", 2017). For example, cleaning, cooking, laundry and taking care of children are primarily seen as female or wifely duties. Women who are in committed relationships or who have children may be perceived by their employer as less reliable and less committed to their career in comparison to a male worker who does not have

additional housework or childcare responsibilities. According to Bertrand et al. (2010) having children brings more career interruption, shorter work hours, less career experience and substantially lower pay for women who are working in the business and financial sectors that have a master's in business administration; however, fathers do not experience any of these negative ramifications. Blau and Kahn (2017) state that working mothers are a group that accounts for the majority of the gender pay gap.

Pay gap for mothers can be explained by two different reasons: (1)legitimate, when employers pay less due to less work experience and (2) workplace discrimination, where employers may not want to hire mothers due to preconceptions that mothers are less focused on their career and therefore less productive employees. Women who leave the workforce for several years or more have less work experience and not only lose the income that they would receive if they were working, but also are missing any potential promotions and raises during the time that they were taking care of their families. Additionally, mothers are less likely to be hired or promoted by their employers due to notions that they are less driven, more distracted with their childcare responsibilities and may get pregnant again, therefore leading to more time off from work. According to a Pew Research survey ("The narrowing but persistent gender gap in pay "2017) women are more likely to experience career interruptions to take care of their family, whether they are taking care of children, parents, or other family members. With more and more educated women entering the workforce, it is important to review the existing literature to understand what the empirical studies discovered about the reasons behind the gender pay gap and how to eventually eliminate it.

Studies suggest that the gender pay gap still exists in higher education settings despite the large number of female faculty in academia (Barbezat and Hughes, 2005; Feder, 2017; Hill,

2015; Luna, 2006; Nadler et al, 2016; Perna, 2003; Renzulli et al, 2013; Umbach, 2007). In higher education the gender disparity widens as faculty achieve higher rank. In 2013 49.2 % of all faculty were women; however, at the rank of full professor only 36.1% were women (Finkelstein et al., 2016). Overall, only 9.1% of all women faculty were full professors; the rest of them were either in tenure track or non-tenure track positions (Finkelstein et al., 2016). Not only are female faculty underrepresented in the more prestigious higher paying and higher status positions such as full professor, but they are also being paid less than their male colleagues. In the 2016-17 academic year, an average nine-month salary for a full professor was $115,539. Associate professors earned on average $82,036, and at the same time assistant professors' salary was $69,724 (Ginder, et al., 2017). Men's salaries were higher than the average female faculty member's salary in the ranks of full professor, associate and assistant professor (Ginder, et al., 2017). For example, a female professor working in a 4-year public university will earn on average $106,629 in comparison to her male colleague who will earn about $121,247 (Ginder, et al., 2017). In other words, she will earn $14,618 or 12% less than a male professor in the same rank. The percentage of the pay gap is higher at private non-profit institutions. The same male professor would earn $132,020 while his female colleague would only earn $114,436, which is $17,584 or 13.3% less than her male colleague (Ginder, et al., 2017).

The gender pay gap in academia can be partially explained by the pay disparities among disciplines. The higher paying disciplines such as business management, engineering and mathematics are largely male-dominated, while the mostly lower paying disciplines such as English, women's and gender studies and social sciences have a large number of female faculty (Shulman, et al., 2017). It is not surprising to see that when male faculty are overrepresented in higher paying disciplines the gender pay gap will be more overt. However, it is important to note

the discrepancies exist not only between disciplines but within disciplines as well. When looking at faculty members in the same discipline; female faculty earn less than their male colleagues and have a lower starting salary (Shulman, et al., 2017). For example, a study by Umbach (2007) showed that after controlling for human capital and disciplinary effects, female faculty earn approximately 10% less than their male counterparts.

Female faculty members are especially underrepresented in the Science and Engineering fields. According to the National Center for Science and Engineering, in 2017 24.9% of all earned doctorates in field of engineering belonged to women ("National Science Foundation Survey of Earned Doctorates", n.d.). Burrelli (2008) suggests that women are still a minority in these fields for a multitude of reasons such as number of women studying in these fields, number of women entering the academia in these fields, and an underrepresentation of women applying and receiving tenure track positions. For these reasons, it is crucial to explore the gender pay gap in these fields in order to examine whether the pay gap exists in the high paying fields with a small percent of women.

There is also an underrepresentation of women in high-ranking tenured positions. In 2015 women held 51.5% of all assistant professor positions, however they only accounted for 32.4% of full professors (IPEDS, 2015). This suggests that a number of female faculty were not able to get tenure or fell off the tenure track. There are many reasons why women are overrepresented in low paying, low status and low ranking academic positions. Research by Mason and Ekman (2009) shows that women with children are 38% less likely to achieve tenure than men with children. Many women and some men accept part-time or non-tenure track positions because of fear that they will not be able to handle the demands of full-time tenure track positions while taking care of young children at the same time (Mason & Ekman, 2009).

This occurrence especially hurts women who happen to have their most optimal childbearing stage at the same time as starting their career in academia. Some women may choose the career path at the cost of being childless in order to compete with their male colleagues (Mason & Ekman, 2009).

While a multitude of studies have examined the factors that contribute to the gender pay gap, very few have examined how these factors vary between male and female faculty in the same rank, institution type and discipline. A study by Toutkoushian and Conley (2005) shows that there still is a pay gap of about 4-6% even after controlling for such characteristics as experience, educational attainment, field, rank and institution type. They used the 1999 National Study of Postsecondary Faculty (NSOPF:99) as their data set, however they did not look at influence of faculty member having children on the pay gap. A study by Barbezat & Hughes (2005) also used the NSOPF:99 but only controlled for the institution, academic field, and publications, but not rank. The researchers found that male faculty members earn about 20.7% more than female faculty, and about 19-23% of that gap can be attributed to discrimination, while the largest portion can be attributed to the salary structure between different institutions. A study by Umbach (2007) also used data from NSOPF:99 but restricted the sample to Research I and II Universities only. The study found that women faculty earn about 6.8% less than men, after controlling for individual characteristics, disciplinary labor market conditions and structural characteristics (Umbach, 2007). Finally, a study by Johnson and Taylor (2018) looked at the pay gap in the science and engineering fields while controlling for rank but not for the specific field of study. The study found that the salary gap persisted at all three ranks, with the largest gap being at the full professor level of an average $10,379.57. Unfortunately, the study shares only

the absolute salary gap and does not provide the percentage that would help in terms of comparability.

Purpose of Study

Historically, men have had more successful careers in academia than women; they are more likely to earn higher salaries, achieve tenure, and work at prestigious institutions in comparison to women (Perna, 2005). If this trend in academia persists, women may continue to choose to work at less prestigious institutions, work outside of academia, or leave the workforce altogether, which will not help the diversity in academia. This is especially worth documenting in well-paying STEM fields, where there is already a small percentage of female professors.

The Equal Pay Act (EPA) was supposed to reduce and in time eliminate the gender pay gap by prohibiting wage discrimination by employers based on gender. This act requires employers to pay the same wage to men and women for doing equal work: *"...for equal work on jobs the performance of which requires equal skill, effort, and responsibility, and which are performed under similar working conditions, except where such payment is made pursuant to (i) a seniority system; (ii) a merit system; (iii) a system which measures earnings by quantity or quality of production; or (iv) a differential based on any other factor other than sex"* (Equal Pay Act, 1963). The wording "a differential based on any other factor other than sex" (Equal Pay Act, 1963) unfortunately is very ambiguous and makes it very difficult for women to prove that they were paid less because of their gender and not due to other factors ("The Paycheck Fairness Act: Closing the "Factor Other than Sex" Loophole to Strengthen protections Against Pay Discrimination", 2019). It is important to note that the statute of limitations for underpaying an employee is two years, three if there was a willful violation. As an example, in 2017, 1,225 Equal Pay Act charges were filed with the U.S. Equal Employment Opportunity Commission

(EEOC), 798 were determined by EEOC that discrimination did not occur and only 229 cases had outcomes favorable to charging parties which included negotiated settlements, withdrawals with benefits, and both successful and unsuccessful conciliations ("Equal Pay Act Charges", n.d.).

This study will explore if the gender pay gap still exists for faculty in Science, Health, and Engineering (SHE) while taking into consideration human capital attributes, institutional factors, and family factors; utilizing the most recently released data from the National Science Foundation (NSF). Faculty in an academic setting provide unique advantages when studying wage inequality, since full-time faculty members are a relatively homogenous group when it comes to their education, training and tasks that are expected to be fulfilled by their employers: scholarship, teaching, and service. While there might be different qualifications required from different academic fields, the majority of assistant professors on the tenure track have obtained a doctoral degree and their work includes teaching specific number of courses, conducting and publishing research, and various service duties to their department and/or institution. The data used in this study was taken from the NSF Survey of Doctorate Recipients (SDR) from 2018 cycle ("National Science Foundation", n.d.). The SDR is a longitudinal study of persons who obtained a doctoral degree in fields such as science, engineering, and health field and collects information about the degree holder's demographic characteristics, employment information, educational background, and salary information ("National Science Foundation", n.d.). I will be looking at data and responses provided by participants as of February 1, 2017.

The purpose of this study is to build on the previous research (Barbezat and Hughes, 2005; Bellas, 1994; Carr et al., 2015; Claypool et al., 2017; Cress & Hart, 2009; Renzulli et al, 2013; Umbach, 2007) and fill in the research gap, looking specifically at the gender pay gap in

higher education in SHE fields for faculty, while controlling for academic factors. This study strives to provide additional insight and data to policymakers and administrators and encourage them to create policies that will protect the faculty, close any pay gaps that exist, and establish an equal and fair workspace in higher education. Despite the substantial literature on the gender pay gap in higher education (Barbezat and Hughes, 2005; Bellas, 1994; Carr et al., 2015; Claypool et al., 2017; Cress & Hart, 2009; Renzulli et al, 2013; Umbach, 2007), there is limited research on specific fields of study. Most of the research looks at higher education as a whole and not smaller and unique divisions and subdivisions.

Significance of the study

In fall of 2017 there were 1.8 million graduate students enrolled in certificate, master's or doctoral programs in U.S. and 57.9% of them were women. Nowadays, women are earning more doctorate degrees than men at U.S. universities (Okahana & Zhou, 2018). In the 2016-17 academic year 53% of students who earned their doctorate degrees were women (Okahana and Zhou, 2018); this can be translated into an increasing number of women entering the workforce in many different fields, one of which is academia. According to the National Center for Science and Engineering (NSF), in 2017 only 24.9% of all doctorates in engineering were awarded to women, which shows the underrepresentation of women in the science fields or the fields that historically were occupied by men only ("National Science Foundation Survey of Earned Doctorates", n.d.). Similarly, women earned only 25.4% of all doctorates in math and computer science and 33.1% of physical sciences and earth sciences doctoral degrees. While colleges and universities ignore and tolerate the pay gap within their own institution based on gender, they contribute to the overall gender pay gap and slow the progress toward pay equity. Additionally,

pay equity in academia will help successfully attract and retain the best and brightest faculty members, especially in male-dominated STEM disciplines. (Okahana & Zhou, 2018).

Research Questions

1. What are the salary patterns among full-time faculty in SHE fields?
2. To what extent is there a pay gap after controlling for academic and demographic factors?
3. To what extent is there a pay gap after controlling for academic, demographic and family factors?

Organization of Study

This study is broken into five chapters. The first chapter provides an introduction to the study. The second chapter delivers reviews of the related literature and offers historical context first on issues of women and work in general and second on specific issues that women faculty face today. Chapter three provides the methodology of the study: the chosen sample, the variable descriptions and the overview of the statistical methods used. Chapter four presents the findings and results of the study. Finally, chapter five offers policy implications and discusses future research.

Chapter 2: Review of the Literature

In order to better understand the gender pay gap in academia, I will provide a review of history, relevant laws, and theories used to understand the gender pay gap labor market in the United States. In the second part of this chapter, I apply the theories specifically to salary equity issues for female faculty. The purpose of this review of literature is not only to show what is known about the topic but also to demonstrate that there is still substantial work and research to be done. Research in this area will not only advance gender salary equity, but will also enhance understanding of the relationship between salary and gender within higher education.

Historical Context: Gender Pay Gap

Before proceeding to review relevant theories and previous research it is important to establish an understanding of the history of women in the American workplace as well as the relevant policy background. The degree of discrimination that women in the United States are facing can be affected by the different equal employment opportunity laws, regulations, and policies regarding managing work and family life. In this section, I will present a brief history of women participating in the workforce and the different type of policies passed by the United States government to support gender equity in the workplace.

Women in the Workforce

From 1950 to 1980 there was a remarkable increase of women in the U.S. participating in the workforce; employment of women increased from 34% in the year 1950 to 52% in 1980 (U.S. Department of Labor, 1983). During the 1960s, both mature women and women of childbearing age were entering the workforce. This developed a pattern for women to start employment before having children, stay at home for number of years after childbirth, and then

return to the workforce once children entered school full-time (England & Farkas, 2017). Afterwards women started spending fewer years at home as homemakers and instead returned more quickly to full-time employment; by the 1980s, almost half of the women with children under six were back in the workforce (England & Farkas, 2017). During the 1980s, women tended to enter occupations that were deemed more appropriate for females, such as secretaries and teachers (England & Farkas, 2017). Throughout the 1970s women slowly started to cross over to traditional male occupations such as accountants, bank officers, janitors, and financial managers. The greater desegregation was found in the younger cohorts, where some women would become computer programmers, pharmacists, office managers, and bus drivers (England & Farkas, 2017). The labor force participation for women stagnated during the late 1980s and early 1990s and hit its peak of 60% in 1999. According to the U.S. Census Bureau (2017), during the Great Recession in 2008 the women labor force participation fell to 59.3 % and then 56.7% in 2015. The Bureau of Labor Statistics is predicting that this number will fall to 55.8% in the year 2024 (Toosi & Morisi, 2017). One of the explanations for the decline, was the severe impacts of the 2007-09 recession and the baby boomer generation leaving the workforce (Toossi & Morisi, 2017).

Some researchers suggest that the absence of paid maternity leave, the high cost childcare and a lack of family friendly policies in the United States may force women to stay home after having children (Black et al., 2017). Additionally, there is a lesser demand for low-skilled workers which can explain poorer labor force participation among women with lower educational attainment (Black et al., 2017). It is important to note that the share of the labor force held by women continues to grow; in the 1950s women only accounted for about 33% of the

total workforce, but this percentage increased to 46.5% in 2000, and it is projected to increase (U.S. Census Bureau, 2017).

According to the National Women's Law Center (NWLC, n.d.) a woman on average will have to work an additional 4 months in order to earn the same dollar amount as a man would in one year (NWLC, n.d.). Historically, women always earned less than men, however the U.S. government provides several statutes that protect women against gender-based discrimination in the workplace; the Equal Pay Act, Title VII of the 1964 Civil Rights Act, Title IX, Lilly Ledbetter Fair Pay Act, and Family Medical and Parental Leave Act. The main rationale for these laws was that race, sex, religion, and age should not influence an employer's decision regarding hiring, promotion, or salary. In the following paragraphs I will summarize all the laws mentioned earlier as they are important protections for women in the workplace, however they all have flaws that may need to be rectified in the near future.

The Equal Pay Act

The Equal Pay Act (29 U.S.C. 26) prohibits businesses from paying different wages based on gender to men and women who perform jobs that require equal or similar skill and responsibility under comparable working conditions. The Equal Pay Act states that:

> No employer having employees subject to any provision of this section shall discriminate, within any establishment... between employees on the basis of sex ... for equal work on jobs the performance of which requires equal skill, effort, and responsibility, and which are performed under similar working conditions.... (29 U.S.C. 8 Sec. 206(d))

Under this act plaintiffs must try to establish that a person in the same establishment of the opposite sex is being paid more for doing equal work, however the meaning of equal work has

many ambiguities, which can make the determination about whether the jobs are equal difficult (Kaplin & Lee, 1995). Employers are able to use this broad general exception that is not limited to job evaluation systems to their advantage when in court, or in other terms employers can list any factors other than the employees' gender to result in unequal pay such as previous salary of a woman or lack of salary history. Some states such as California, Delaware, and Massachusetts and some cities such as New York, Philadelphia, and Pittsburgh prohibit all employers from asking about a candidate's pay history (Pelisson & Gal, 2018). This is an additional effort to eliminate the gender wage gap, as salary offers will be made based on the skills and capability of the candidate instead of their previous salary. Women as a group are most vulnerable to the previous salary questions, as they might leave or delay entering the workforce in order to take care of children or family members, which in turn translates into lower salary offers.

Title VII of the Civil Rights Act of 1964

Title VII of the Civil Rights Act prohibits employers from discrimination based on race, religion, color, sex, and nationality (42 U.S.C. § 2000e-2(a)). In 1972 this act was extended to include both public and private institutions. This act is often used in court cases where employees in businesses or institutions are segregated by race, color, religion, sex, or nationality and are being paid less than other workers who perform similar work (Luna, 2006). This act prohibits discrimination in all different aspects of employment, such as hiring, firing, training, promotion, and fringe benefits and covers all businesses with 15 or more employees.

This act states:

> It shall be an unlawful employment practice for an employer- (1) to fail or refuse to hire or to discharge any individual, or otherwise to discriminate against any individual with respect to his compensation, terms, conditions, or privileges or

> employment, because of such individual's race, color, religion, sex or national origin; or (2) to limit, segregate, or classify his employees or applicants for employment in any way which would deprive or tend to deprive any individual of employment opportunities or otherwise adversely affect his status as an employee, because of such individual's race, color, religion, sex, or national origin. 42 U.S.C. § 2000e-2(a).

It is important to note that Title VII does not limit higher education institutions from hiring faculty based on job related qualifications or paying faculty based on seniority, promotion and tenure policies (Kaplin & Lee, 1995). However, it does prohibit universities and colleges from hiring a faculty member based on sex, race, color, religion, or nationality. In the recent 2016 Equal Employment Opportunity (EEOC) v. University of Denver case a group of female law school professors filed a complaint regarding unlawful compensation practices where male faculty were being paid higher salaries in the same department and in the same rank and sometimes even lower rank (Equal Employment Opportunity v. University of Denver, 2016). The University of Denver settled with EEOC and agreed to pay the group of female faculty $2.66 million and make significant changes to the faculty compensation polices (Equal Employment Opportunity v. University of Denver, 2016).

Title IX

In 1972 Congress passed the Educational Amendments. Title IX specifically prohibits gender discrimination in all federally-funded institutions (Title IX of the Education Amendments Act of 1972, n.d.). This title states: “No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under

any education program or activity receiving Federal financial assistance." 20 U.S.C. § § 1681-1688

All educational institutions that receive federal funding must act in a non-discriminatory manner when it comes to recruitment, counseling, admissions, financial assistance, athletics, treatment of pregnant and parenting students, sex-based harassment, single sex education, and employment (Title IX of the Education Amendments Act of 1972, n.d.).

In 2014, Jane Meyer, an athletic administrator, and Tracey Griesbaum, a coach for women's field hockey, brought discrimination claims against their former employer- University of Iowa (Tracey Griesbaum v. The University of Iowa, 2017; Meyer v. University of Iowa). A male athletic director transferred many of Meyer's responsibilities to a new position in the athletic department. Meyer was informed that she was not qualified for that position and the position was given to a male employee instead who was paid $70,000 more than she was. After finding out about the pay gap, she complained about the apparent sex discrimination. Meyer was immediately transferred to a different position and later laid off without the pay gap being addressed (Tracey Griesbaum v. The University of Iowa, 2017; Meyer v. University of Iowa). Griesbaum was suddenly fired from her position as field hockey coach in 2014 due to supposed complaints from her players. Upon hearing this the players filed their own Title IX discrimination claim against the university (Tracey Griesbaum v. The University of Iowa, 2017; Meyer v. University of Iowa). The jury awarded Meyer $1.43 million, without deciding on amounts for attorney fees and any punitive damages, the University agreed to settle and paid out $2.33 million to Meyer, $1.49 million to Griesbaum and $2.68 million in attorney's fees to both women (Tracey Griesbaum v. The University of Iowa, 2017; Meyer v. University of Iowa).

The above victories clearly demonstrate that the Title IX not only protects students against sex discrimination, but also protects employees of federally-funded higher education institutions. It is important to note that this law is viewed by the public as a sports-equity law only, however it also addresses sexual assault and harassment as a form of sex discrimination, as well as gives additional protections to the LGBT community.

Family and Medical Leave Act of 1993

The Family and Medical Leave Act of 1993 (FMLA) mandates that eligible workers (employees who have worked for covered employers for at least 12 months, have at least 1,250 hours of service for that employer during the 12 months right before the leave, and the employer has at least 50 employees within 75 miles) can take up to 12 weeks of unpaid leave for birth, adoption, fostering a child or care for an ill child, spouse, parent, or their own illness (Family and Medical Leave Act of 1993, n.d.). Additionally, the workers protected under this act are entitled to their jobs when they return from leave (Family and Medical Leave Act of 1993, n.d.). Some studies (Thomas, 2016) suggest that the FMLA increased the gender gap in promotion as it diminishes women's opportunities and increases an employer's cost of hiring women, therefore providing incentives to discriminate against them. Studies by Baum (2003) and Waldfogel (1999) found that the FMLA has a very small positive effect on employment and instead has a negative effect on wages.

It is important to note that the United States is the only country out of 41 highly developed OECD countries that does not have paid parental leave (New Jersey, California and Rhode Island are the only states that have state-level mandated paid leave for eligible workers), in comparison to Estonia, which has 87 weeks of paid leave and New Zealand, which has 4 weeks (OECD, 2017). Therefore, it is important to look at the positive effects of parental leave in

different countries that have more generous leave. As an example, Ruhm (1998) found that female workers' wages in Europe were unaffected by short leaves, while leaves that were 5 months or longer reduced women's wages. Women are the main recipients of the parental leave and consequently they are most affected by the wage loss, however in some countries there are parental leave entitlements specifically for fathers. For instance, in Japan, half of all available leave can only be used by fathers ("Among 41 nations, U.S. is the outlier when it comes to paid parental leave", 2016). Sweden is another country that has very generous paternal leave; parents are entitled to 480 days of paid parental leave, in which each partner is warranted to use 240 days (Akinmade-Åkerström, n.d.). The long-term effects of these policies on gender pay gap should be studied, as it would be valuable to see if they assist in diminishing the gender pay gap by encouraging more fathers to take parental leave.

Lilly Ledbetter Fair Pay Act

The Lilly Ledbetter Fair Pay Act (2009) extended the time frame for filing discrimination claims under Title VII. The expectation of this act was to make it easier for plaintiffs to file discrimination claims regarding pay. This legislation extends the window of time for filing the discrimination claim. Before this act went into effect a plaintiff had only 180 days, after the first time that the discrimination occurred in order to file a discrimination claim. This made it difficult for a person to file a claim, since many employees were not able to discover and report the discrepancies within the set time period (Lilly Ledbetter Fair Pay Act, 2009). Now, a person still has 180 days to file the claim, however the 180 days is being reset after each discriminatory paycheck.

This Act is also protecting faculty members; for example, in 2009, a female faculty member brought action against Jackson State University, alleging that she was denied tenure and

in essence the salary increase that comes with it, because of her gender (Gentry v. Jackson State University, 2009). The plaintiff was able to use the recently-enacted at the time Lilly Ledbetter Fair Pay Act and file the claim even after the previous 180-day filing period passed. Furthermore, this case suggests that being denied tenure can be treated as compensation decision- denying tenure equals denying the related salary increase, which makes it easier for faculty members to file discrimination claims. In a more recent case Southeastern Oklahoma State University discriminated against Rachel Tudor, a transgendered professor of English, by denying her tenure; the institution was ordered to pay her $1.165 million under Title VII of the Civil Rights Act of 1964 (Dr. Rachel Tudor v. Southeastern Oklahoma State University and the Regional University System of Oklahoma). Tudor was hired in 2004 and at the time identified as male; in 2007 she presented herself as a female and started experiencing discrimination by her dean and the vice president of the university (Dr. Rachel Tudor v. Southeastern Oklahoma State University and the Regional University System of Oklahoma). The tenure review and her department chair recommended her for tenure after meeting all the university's criteria, but both the dean and vice president denied her tenure without offering explanation and refusing to meet to discuss the case in order for her to start her appeal process (Dr. Rachel Tudor v. Southeastern Oklahoma State University and the Regional University System of Oklahoma). This ruling was an important win for the rights of all transgendered professors who are being extended protection under the federal law.

Explaining the Gender Pay Gap

The gender pay gap is the difference in salary between men and women that cannot be explained by differences such as education level, tenure, or experience (Blau and Kahn, 2000; Blau & Kahn, 2006; Blau & Kahn, 2017). Labor-force participation is an important factor in

understanding the history of women's wages. In 2017, 57% of all women participated in the workforce in comparison to 34% in 1950 (Toossi & Morisi, 2017). Currently the number of women in the labor force grows at a faster rate than men, and the U.S. Bureau of Labor Statistics is projecting that from 2014 to 2024 women's growth will be 5.8% in comparison to 4.4% for men. The women's labor market participation is highest in the 25-54-year-old age group due to gained experience and necessary skills that are strongly connecting the individual to the labor market. The U.S. Bureau is projecting 75.2 % of women in this age group to be working by 2024 (Toossi & Morisi, 2017).

Women in the United States of America "*have rights and opportunities that their foremothers could only dream about*" (Rudman & Glick, 2008, p.180), however women today are still facing challenges regarding equal pay. In academia, research shows that women throughout all academic ranks still earn less than men (Carr et al., 2015; Toutkoushian & Conley, 2005). According to American Association of University Professors (AAUP, 2018) 93% of participating institutions pay men more than women within the same rank. Research shows that even after controlling for education, productivity, institution type, rank, and academic discipline, female faculty members still earn less than their male counterparts (Barbezat, 2002, 2005; Perna, 2003, 2005; Toutkoushian & Conley, 2005; Umbach, 2007). A study conducted by Umbach (2007) shows that in uncontrolled models women earn on average 22% less than male faculty. However after controlling for experience, research productivity, seniority, teaching, and education, the wage gap dropped to less than 8%; finally when controlling for disciplinary differences the gap was reduced even further to 6.8%, which can translate to approximately $5,400 in lost wages annually (Umbach, 2007). Moreover, research also shows that female faculty members receive fewer resources in comparison to male faculty, such as research space

and research funding (Chisholm et al., 1999), while still being responsible for majority of the housework at home (Schiebinger & Gilmartin, 2010) and having a more difficult time achieving work-life balance (O'Laughlin & Bischoff, 2005).

Salaries naturally vary across all employees due to justification that better employees will receive higher salaries, which in turn reinforces better performance and encourages productivity in employees (Leventhal, 1976). Since the Equal Pay Act was signed in 1963, there has been a dramatic increase in women attending college and earning advanced degrees such as Master's, Ph.D.'s, and J.D.'s. Although education level is related to increases in salaries, research shows that higher education is still more advantageous for men than for women (Nadler et al., 2016). Faculty compensation is closely associated with research productivity by producing peer reviewed publications, grants and contracts, and book publishing (Barbezat & Hughes, 2005). At many four-year universities there is a strong emphasis on research productivity, generally faculty in science and engineering departments tend to produce more scholarly publications and secure more research funding than other departments (Cantwell & Taylor, 2013). However, women who achieved tenure in SHE fields still are likely to experience pay gaps and despite many efforts of administration are still outnumbered by their male counterparts (Rollor, 2014). According to the newest report by College and University Professional Association for Human Resources (CUPA-HR) (2019) only 18% of all engineering faculty are women. Similarly, only 29% of all physical sciences faculty are women. The percentage gets even smaller when it comes to tenured or tenure track faculty; for example, only 16.9% of all tenured or tenure-track faculty in engineering fields are women (Yoder, 2017). The lack of women in Science and Technology fields (S&T) has obvious negative consequences for women's salaries, since these fields are among the best paid in the academia. According to CUPA HR (2019) the median pay ratio for female faculty in

engineering is $.89 in comparison with white men. In physical sciences the ratio is even lower at $.83.

Academia provides a unique and mostly homogenous group to study gender wage inequality, since most full-time faculty members have obtained a doctoral degree and their work includes teaching a set number of courses, publishing research, and various service duties to the department or their institutions. This relative homogeneity provides an advantage when studying gender pay gap among full-time faculty. The rest of this chapter will be divided into three subsections. First, I will go over theories that are guiding this study. Second, I will go over different factors that influence the gender pay gap. Some factors such as years of experience, productivity, and pay disparity between disciplines might be justifiable under the law, and others such as labor market discrimination, motherhood wage penalty and institutional disparity may suggest employer discrimination.

Theories

Human Capital Theory

Based on numerous studies on the gender pay gap (Blau & Kahn, 2000; Blau & Kahn, 2006; Blau & Kahn, 2017; Hart, 2013; Porter et. al, 2008; Renzulli et al, 2013; Perna, 2003, 2005; Zhang, 2008), this study is guided by the assumptions of human capital theory (HCT). HCT is based upon the work of Schultz (1971) and Psacharopoulos and Woodhall (1985), and is a neoclassical economics theory claiming that education is instrumental in creating a productive population and provides benefits such as monetary advantages for that individual (Paulsen, 2001; Perna, 2003, 2005; Olaniyan & Okemakinde, 2008).

HCT has been used by social scientists and economists to study benefits of education, training, pay disparity, and labor market segregation (Becker, 1981; Perna, 2003, 2005). First,

HCT helped calculate the individual's private and social returns on investing in education, which in turn provides strong empirical support of the benefits of education and additional training (Becker, 1981). In general, higher education almost always increases an individual's earning potential (Bobbitt-Zeher, 2007; Zhang, 2007). Investing in higher education especially benefits women; thanks to their higher educational levels women were able to reduce the pay disparities in recent decades (Bobbitt-Zeher, 2007). Second, full-time employment, seniority in a position, and years of work experience are all positively related to higher earnings (Becker, 1981; Bobbitt-Zeher, 2007; Zhang, 2008). Women are more likely to work part-time; in academia women are more likely than men to leave academic careers completely before reaching tenure. They are also more likely to switch to non-tenure or part-time positions which would naturally explain a portion of the gender pay gap. Third, the role of socialization has an important function in HCT, women face additional family related career disruptions that can lead to a potential loss of skills over time and reduced work hours that can lead to lower pay (Becker, 1981; Bobbitt-Zeher, 2007; Perna, 2001; Polachek, 1984; Zhang, 2009).

HCT is an appropriate theoretical framework to use for this study as it offers distinctive perspective on the gender pay gap in higher education. For example, HCT ascribes the gap in earnings between men and women to gender stereotypes, role socialization as well as to the selection bias in which a person may select their occupation in gender-specific patterns (Polachek, 1981). In other words, men and women develop gender-specific preferences regarding occupation and skills that are considered by society to be gender appropriate. Historically, females were and still are the primary caregivers to their family and small children, and therefore are more prone to choose occupations that give them more flexibility with their domestic and childcare obligations; at the same time, men are traditionally considered to be the

"breadwinners" of the family and tend to choose occupations that may have higher salaries to fulfill their financial obligations (Blau & Kahn, 2000, 2017; Polachek, 1984).

When applying HCT to the academic labor market, an individual's prestige and financial rewards are determined largely by his or her productivity. According to Becker (1962) productivity in academia can be determined by the personal investments that a faculty member makes in him or herself, such as quality of education, additional job trainings, motivation, and emotional and physical health. Human capital refers to any inborn or acquired characteristic, knowledge, or skill that can contribute to an individual's economic productivity (Garibaldi, 2006). Or in other words a person acquires knowledge or skill which increases his or her productivity and in turn increases salary (Marginson, 1993). In academia, the reputation of the institution from which a faculty member received his or her doctoral degree also affects salary (Claypool et al., 2017). Often, a faculty member's salary is directly related to his or her quality of education. In other words, if the faculty member attended a highly-ranked graduate program, their salary will be greater than a faculty member who attended a lower ranked university (Ehrenberg et al, 1998; Formby & Hoover, 2002). Research productivity measures are often used in studies on faculty compensation when they are available, as they can be used for estimates of human capital in producing research (Toutkoushian & Conley, 2005). Researchers suggest that HCT focuses only on the attributes of each individual and therefore it does not explain the different complexities of social structures and labor markets that can impact salaries in academia (Perna, 2003; Rosenbaum, 1986).

Structural Theory

Structural models suggest that the gender pay gap between men and women exists because men and women are segregated into different types of institutions (Smart, 1991).

Toutkoushian and Conley (2005) claim that the gender pay gap is more prominent in certain kinds of academic institutions such as Research I and II institutions in comparison to the less research-intensive institutions. Research by Monroe and Chiu (2010) showed the organizational disparity increases with the institution's prestige; as an example, on average women earn about 3% less than male faculty working in the community college, and this number increases to about 8% when working at a Research I institution. Alternatively, the Ph.D. granting departments have an advantage over departments offering only bachelor's degrees when trying to hire a highly sought-after faculty member (Melguizo & Strober, 2007). Large private institutions also may have larger endowments that allow them to pay their faculty members more than public institutions (Claypool et.al, 2017).

Gendered Organizations employ practices that distribute positions and power associated with rank unevenly between men and women (Acker, 2006). One indicator of this process is gap in salary between men and women (Umbach, 2007). In addition, rewards such as tenure, promotion, and higher compensation are primarily granted to male faculty due to their uninterrupted progression in a career and more research productivity, in comparison to women who spend more time on teaching and providing service to the institution (Ahmad, 2017).

Gender Pay Gap Factors

Disruptive Work Careers

According to the traditional view of division of labor, women tend to have shorter and more disruptive work careers due to family responsibilities such as caring for children or family members, and therefore they will have less opportunities to invest in job skill training than men (Blau & Kahn, 2017). Additionally, women are more likely to choose careers in which the human capital attributes that prospective employee may possess are less important to employers.

For example, some positions may not require certain years of experience or specialized training, and therefore will allow women to return to work after their childcaring responsibilities may be over (Polachek, 1981). Recent research by Goldin (2014) suggests that the role of family-career interruptions that lower women's wages is explained not by the human capital theory, but also by personnel economics. The author highlights that providing flexibility (that women place much higher value on than men, due to the previously mentioned primary family responsibility) may be much costlier in some sectors of the labor market than others. While higher education does have a fair amount of flexibility when it comes to schedule, in other high paying fields, such as business and law, more work flexibility may reduce a person's income (Goldin, 2014). For example, working in a firm that requires meeting tight deadlines, working face to face with clients, and doing work that someone else may not easily fill in, may have higher wage penalty for working shorter hours or workforce interruptions not because of the depreciation of their social capital but rather through the inability to transfer work to other employees and interruptions in servicing clients (Goldin, 2014). This analysis highlights another important issue: disadvantages of looking for temporary flexibility in prospective employers, it may signal to them that a person is not willing to work long hours, which can be perceived as a person who is both less committed and willing to work hard and ultimately is less marketable. Academia as a workplace is built around a model of an ideal worker who does not have many responsibilities outside of their work. This model is best represented by a male faculty member with a homemaker wife who can manage all the domestic and family responsibilities while allowing her husband to concentrate on his scholarship, service, and teaching (Williams, 2000). Research by Cress and Hart (2009) shows that female faculty members are being looked down upon and are considered less qualified and committed to the field of academia because of having families.

Females are expected spend more time physically with their children in order to be considered good mothers (Baker, 2016). At the same time being a good father for a male faculty member means spending more time on research and his work in order to receive promotions, increase in his earnings, and support his family with a higher income (Wall, 2009).

The gender pay gap declines more slowly in the high-earning occupations in comparison to the lower earning occupations (Blau & Kahn, 2017). A study conducted by Noonan, Corcoran and Courant (2005) looked at two cohorts of law graduates from Michigan Law School fifteen years after graduation. The results of the survey showed that at the start of their careers there was only a small difference between the pay of men and women, however fifteen years later men would earn over 50% more than their female counterparts (Noonan et al., 2005). The difference in earnings was attributed by Noonan, Corcoran and Courant (2005) to the greater likelihood of female lawyers working shorter hours, working part time in the past, or taking some time off after childbirth. Bertrand, Goldin and Katz (2010) looked at earnings of MBA's who graduated between the years of 1990 and 2006 from University of Chicago. Similar to the law graduates study mentioned earlier, there was a minimal difference between earnings of male and female business graduates in the beginning of their careers. However, on average males would earn 33% more than women a year to sixteen years after they graduated, and almost 82% more 10-16 years post-degree. Bertrand et al. (2010) found that a large portion of this gender pay gap can be explained by number of weekly hours spent working and post-MBA work experience. Once again, the research suggests that there are significant penalties for shorter work hours, less workplace experience, and more career interruptions in the high-earning occupations, which mostly affect female workers due to the additional family and childbearing responsibilities. It is important to note that because part-time workers have lower hourly earnings than full-time

employees and there is a larger number of women working part time than men, it may potentially increase the gender pay gap in these studies. For example, in 2016 20% of working women were working part-time for non-economic reasons such as childcare problems, health or medical limitations, school, or other family and personal obligations etc., compared to only 10% of men working part-time for non-economic reasons (Dunn, 2018).

Labor Market Experience

According to some studies based on HCT, (Blau & Kahn, 1997; Blau & Kahn 2006; Gayle & Golan, 2012; Polachek, 1993) the gender pay gap can be explained by the difference in labor market experience between men and women. For example, in 1980, 24% of the gender pay gap was explained by these differences in comparison to only 16% in 2010 (Blau & Kahn, 2017). According to this theory, the gender pay gap can be attributed to the fact that women do not receive the same amount of on-the-job training as their male counterparts due to employer discrimination. Most of the research regarding on-the-job training or lack thereof for women was conducted in the early 1990s, and it would be beneficial to see updated results which could provide new information and knowledge on the new generation of women, who are now even more educated than previous generations. A study conducted by Royalty (1996) found that female employees have higher a probability of leaving their jobs because of family-related responsibilities, which in turn can affect on-the-job training. However, even when controlling for the leave, less job experience, and less training, there is still a portion of the gender pay gap that is unexplained, which may suggest the influence of workplace discrimination (Royalty, 1996).

In regard to job quitting behavior, women historically were more likely to quit their jobs than males (Blau & Kahn, 1981; Royalty, 1998). Royalty (1998) discovered that there are no significant differences between the probability of a male or female employee staying on the job.

Nonetheless, there is a difference when it comes to reasons for quitting between men and women; women are more likely to quit their jobs and possibly exit the workforce permanently or for several years due to family responsibilities, while men are more likely to quit for job-related reasons (Royalty, 1998), which once again has a negative effect on women's wages (McWilliam et al., 1995).

Occupational Sex Segregation

Occupational sex segregation is closely related to gender role socialization. This phenomenon states that both men and women choose to work in jobs that are mostly occupied by workers of the same sex (Okamoto & England, 1999). According to several studies, female-dominated occupations have less advancement opportunities and lower pay than occupations that are mostly male dominated (Blau & Kahn 2007, 2017; Okamoto & England, 1999). The gender pay gap can be partially explained by the labor market structure, where women are concentrated mostly in jobs that pay less (Blau & Kahn 2007, Okomoto & England, 1999). Both Blau and Kahn (2017) and Goldin (2014) looked at the occupational differences and noted that the gender pay gap may be only partially explained by the differences in occupations between men and women.

Historically, the gender differences in occupations have been declining significantly since the 1970s, however women still predominantly occupied positions such as administrative support, service occupations, teaching, and nursing, while men were highly represented in managerial jobs, law, medicine, engineering, and high-skill blue collar positions (Blue & Kahn, 2017). According to U.S. Department of Labor (2017) the most common occupations for women are: registered nurses (2,092,489), secretaries and administrative assistants (2,060,289), and elementary and middle school teachers (1,933,074). Duncan and Duncan's (1955) segregation

index provides a valuable insight into the occupational distribution, showing how many women or men would have to change their jobs in order for the occupational distribution to be equal, value 0 indicates no segregation while 100 indicates complete segregation. Blau, Brummund, and Liu (2013), using occupational classification from the U.S. Census Bureau and segregation index, discovered that in 1970s the index was 64.5. In 2009 the index fell only to 51.5. It is important to note that the progress in the desegregating occupations was most rapid in the 1970s and 80s, and during later years it slowed down substantially (Blau et al., 2013). Additionally, the greatest progress was made among highly educated women who were able to break into the previously male-only managerial positions and professional occupations (Blau et al., 2013).

When it comes to higher education, women are especially underrepresented in the Science and Engineering (S&E) fields. Several factors are usually identified to explain why women are still a minority in these fields: the number of women studying in the S&E fields, the number of women entering the S&E academia environment, the number of women applying for tenure track positions, and lastly the number of women who were successfully granted tenure (Burrelli, 2008). Vallain (1999) provided a variety of reasons why women are underrepresented in these fields, such as women's lower SAT mathematics scores, women's inaccurate judgment regarding their mathematical abilities, and their lack of interest in science and math. However, most scientists argue that no empirical evidence can suggest that women are less capable than men in the STEM fields, but rather that society prompts women to consider science and math as unsuitable interests for women (Fisk, 2011).

There are many factors that explain why male and female labor supply elasticities (measure of the responsiveness of labor supply given a change in the wage rate) may be different, such as the family's decision that the male's job within the family is more important

and dominant. In this case a husband who will receive a more lucrative job offer in a different city or state, will cause the family to move, which can force the wife to leave her job in favor of a new job closer to her husband's new place of employment, which may lead the wife to less job opportunities and possibly lower pay (Webber, 2013). Additionally, women may place greater value on non-wage benefits offered by employers, such as health insurance, flexible work schedules, or family-friendly practices or policies (Webber, 2013). This can cause women to have fewer options when it comes to searching for employment, and therefore women will have lower labor supply elasticity. Card, Cardoso and Kline (2016) conducted a study in which they examined Portuguese firm-worker data and found that women are more likely to work at low-paying firms and also are less likely to bargain regarding their compensation in comparison to men in high paying companies; both of these factors play a role in explaining the gender pay gap.

Men and women not only tend to work in different occupations, but they also tend to be employed at different hierarchical levels within occupations. For example, looking at the 2018 data on Fortune 500 companies 44.7% of all employees were women, 36.9% of mid-level managers were women, 26.5% of executive or senior level officials were women, 21.2% of all board members were women, 11% of all top earners were women, and finally only 4.8% of all CEO's were women ("Catalyst Pyramid: Women in S&P 500 Companies, 2019"). In short, the more prestigious and well paid the position, the more the share of female employees drastically decreases.

It is difficult to determine precisely why there is a shortage of women in high-power positions or high-earning positions, however this can be partially explained using the pipeline argument, which states that women started working full-time in large numbers relatively recently and therefore they need time to move up in the ranks which will eventually result in equal

representation (Blau & Kahn, 2017). In academia an assistant professor has usually about 6 years in order to apply for promotion to associate professor; this time usually coincides with a time when a married female faculty member might decide to have children which can delay the promotion process or force the faculty to switch to non-tenure track (Winslow, 2010). The second argument states that there are other barriers to women advancing in their ranks, otherwise known as the glass ceiling. Some of these barriers may include discrimination, but they may also reflect the work-family conflicts that may reduce a woman's productivity or even diminish her interest in applying for a higher-level position (Blau & Kahn, 2017).

Analysis of wages by Blau and Kahn (2017) showed that the largest pay gaps exist at the higher end of wage distribution. Additionally, the gaps have declined much more slowly over time in comparison to the lower levels. A Study by Bertrand and Hallock (2001) looked at the differences in pay between the highest male and female executives in S&P 1500 firms. They found that the 2.5% of women in their sample earned about 45% less than their male counterparts (Bertrand & Hallock, 2001). The majority of the difference was due to women being younger and having less seniority, however three-quarters of the wage gap was associated with the women managing smaller companies and the smaller likelihood of them ever being promoted to CEO, chair, or president of the company (Bertrand & Hallock, 2001). A number of studies that show that the gender differences in high-level positions reflect discrimination in the workforce. Blau and Devaro (2007) found that women are much less likely to be promoted in comparison to men. A study by Gayle, Golan, and Miller (2012) finds that women are also less likely to be promoted to executive managers, however they attribute it to a large number of women leaving this profession. They found that women who stay in this occupation are as likely to be promoted as men, and in some cases are more likely to be promoted (Gayle et al., 2012).

Nonetheless, it is important to note that women who stay in the executive labor market may have select attributes that the women who left the force did not. Also, the high exit rate of women may suggest possible discrimination.

Rank and Tenure

Faculty rank, such as assistant, associate or full professor is related to years of experience. Typically, it takes an assistant professor 6 years to get promoted to an associate professor rank and an additional 6 years or more to get promoted to full professor, however it is not a requirement. Both rank and the number of years a professor possessed his or her Ph.D. are among the most important determinants of the absolute salary structure (Koch & Chizmar, 1973). The academic salary models often use faculty rank as an explanatory variable (Moore, 1993). Full-time tenured or tenure track faculty job descriptions can be simplified and divided into the three categories of teaching, research, and service, which are important components for tenure and/or promotion applications. Historically, institutions of higher education granted the highest rewards, such as promotions, to faculty with doctorates from top-ranked universities, who publish in prestigious scholarly journals, work full-time, and bring prestige to their institutions through their scholarship, service, and teaching (Monroe et al., 2008).

Advancement in academic rank is an imperative goal and accomplishment for a faculty member, as this advancement is usually accompanied with additional salary and increases their influence across the department (Long et al., 1993). In the majority of universities, the most important reward comes when promoted from assistant to associate professor with tenure; tenure provides additional rewards such as job security and pay raise (Long et al., 1993). For institutions of higher education, the decision whether to promote a faculty member is very important. Failure to promote a promising faculty member can result in losing him or her to

another institution; on the other hand, granting tenure to a faculty member who may not necessarily be deserving of this honor may turn out to be a very costly mistake that the department and institution may have to deal with for decades.

The additional issue that is making tenure, reappointment, and promotion difficult for both men and women is the vague nature of the process. Few faculty members receive a contract with a specific number of publications, type of journals in which to publish, and quality of teaching evaluations expected in order to get promoted (Winkler, 2000). The vague process can make the rank and tenure procedures even more difficult to navigate by a new faculty member.

Statistically women are also less likely to be tenured than male faculty. According to the National Center for Educational Statistics (NCES) in 2017 52% of assistant professor jobs were held by women, only 45% had the rank of associate professor and finally only 33% of women were full professors ("Spring 2016 through Spring 2018 Human Resources Component", n.d.). This gap widens even more in Science and Engineering fields. In these fields women hold a larger proportion of junior faculty positions in comparison to senior ones. In 2015, women held 43% of assistant professors' positions, 40% at the rank of associate professor, and finally only 25% of women had the rank of full professor in academia ("National Science Board", 2018). The loss in rank not only prevents women from achieving additional prestige, but also inhibits them from receiving additional pay promotions. Some research suggests that the when given time, the rank and tenure gender issue will resolve itself on its own. Using the pipeline argument, the more that women enter the workforce as assistant professors they will naturally advance in ranks and end the gender discrimination (Monroe & Chiu, 2010). However, the research of academic, private sector, and federal jobs showed that a larger pipeline does not naturally lead to an

increased number of women in positions of power, which suggests that there is gender discrimination in the advancement process (Myers & Turner, 2004).

As mentioned earlier women are underrepresented in the top-paying, high-skilled occupations. Professions such as lawyers, executives, and academics share similar up-or-out environments in which there is a very specific window of time where one can advance (O'Flaherty & Siow, 1995). In academia a new tenure-track faculty member usually has 6 years to earn their tenure from their hire date, and it may be especially difficult for a female faculty member to concentrate on this research-intensive process while taking care of her family and children- many times the tenure process coincides with the most optimal childbearing years.

In order to alleviate this gap, the stop the clock (STC) policy was implemented that would grant an additional year before being evaluated for tenure for tenure-track faculty who had a child. The first STC policy was introduced in 1971 at Stanford University and was available to all female faculty members who gave birth before tenure (Flaherty Manchester et al., 2010). According to a survey by Hollenshead (2015) 43% of all institutions and 86% of all research institutions offer some variation of STC. For some institutions these policies extend only to female faculty, while other institutions extend policy benefits to both men and women. Some research suggests that the gender-neutral tenure clock stopping policies benefit mostly male faculty members who may use this additional time to concentrate on research and publications, while female faculty members will be taking care of newborns and recovering from childbirth (Antecol et al., 2018). A study by Manchester, Leslie, and Kramer (2010) found that when faculty members use the STC policy for family reasons, taking that leave has a negative effect on salary, however the specific cause behind the effect is unknown. Manchester et al., found that in their follow up study conducted at only one institution, the stop the clock policy has a negative

impact on salary for both male and female faculty members (Manchester et al., 2013). The negative impact on salary cannot be explained by a change in quality or quantity of publications produced by the faculty members who returned from their leave (Manchester et al., 2013). The authors suggest that the evaluators treat the use of this policy by a faculty member as a negative signal regarding a faculty's member commitment and dedication to academic work (Manchester et al., 2013). It should be noted that the tenure-track faculty that were sampled for this study came from one institution, and therefore the findings may not apply outside of this specific institution as it might be specific to this institution's policies and culture.

Research by Barbezat (2002) indicates that women scholars have delayed promotion schedule and each additional year added to the tenure and/or promotion clock means a delay in salary increase in addition to having less influence or prestige in their college or university. Women unfortunately tend to be overrepresented in full-time non-tenure track positions such as instructor and lecturer, which are not only one of the lowest paid full-time positions in academia, but also lack job security (Harper et al., 2001). Additionally, a lower rank can affect not only a faculty's pay but also access to institutional resources (Stewart, 2009).

There are many reasons why women are overrepresented in low paying, low status and low rank academic positions. However, research by Mason and Ekman (2009) presents that women who have children within 5 years of receiving their Ph.D. are 38% less likely than men with children to achieve tenure. This pattern stays almost identical in the social sciences, humanities, and hard sciences (Mason & Ekman, 2009). A survey of faculty in the University of California system suggests that women spend over a hundred hours a week taking care of children, doing housework, and fulfilling professional responsibilities while men spend an average of 85 hours per week (Mason & Goulden, 2004). The additional time that female faculty

spend on these responsibilities makes it even more difficult to achieve tenure. Many women and some men accept the part-time or non-tenure track position because of fear that they will not be able to handle the demands of a full-time tenure track position while taking care of young children simultaneously (Mason & Ekman, 2009). This especially hurts women who happen to have their most optimal childbearing stage at the same time as starting their career in academia. Some women may choose the career path at the cost of being childless in order to be able to compete with their male colleagues (Mason & Ekman, 2009). This gender-specific choice may be an additional reason why some women may not be able to reach tenure or switch to a non-tenure track that allows more time to spend taking care of their children or are not able to produce as much competitive research as their childless peers due to childcare responsibilities.

Additionally, research shows that there is a gender imbalance in faculty service loads. Women report spending more time on service in comparison to male faculty (Guarino & Borden, 2017). A study by Misra, Lundquist, Holmes, and Agiomavritis (2011) found that female associate professors in STEM fields spent more time on service and fewer hours on research in comparison to men. Mitchell and Hesli (2013) in a survey of 1,400 political science faculty found that women spent more time serving on committees than men and were also less likely to chair them. In research intensive institutions, the publication of research is the primary medium for advancement for the majority of faculty and in non-doctoral granting institutions, teaching is the main means for promotion (Street et al. 1993). Women tend to devote more time to teaching and service, which leaves less time to produce peer-reviewed publications, which are usually more valued in promotion and tenure review (Monroe et al, 2008; Nakhaie, 2007). Women are not only less likely to produce a large number of peer reviewed publications but according to research they are also less likely to apply for and receive external grants in comparison to men

(Waisbren et al, 2008). There are additional biases towards female faculty when evaluating their research. Studies have found that female authored papers are reviewed on average 6 months longer than male authored papers, despite the fact that female authors score higher on readability scores (Hangel, 2017). Randomized experiments showed that students show biases towards female faculty which result in lower ratings on teaching evaluations in comparison to men (MacNell et al., 2015; Boring, 2017). Researchers have also found that men and women differ when it comes to negotiating salaries (Bertrand, 2011). Women are less likely to negotiate their salaries, raises, and promotions in comparison to men, therefore it may affect their pay in comparison to men. This phenomenon may be explained by women being socialized that negotiation may be seem as pushy or overbearing and therefore make them seem unfeminine (Babcock & Laschever, 2003).

Pay Disparity Between Disciplines

The gender pay gap in academia can be partially explained by the pay disparities among disciplines. It is widely known that a full professor in a department of English may not necessarily earn the same amount as a full professor in a department of management. According to CUPA-HR 2017-18 faculty salary survey across all institutions, a full professor in Communication, Journalism, and related programs will earn about $87,541 while a full professor in engineering will earn around $123,144 ("Tenured/Tenure-Track Faculty Salaries", n.d.). A 2018 report on faculty in higher education shows that the highest-paying disciplines for tenure-track faculty are legal professions, engineering, business, health professions, and computer science (Bichsel et al., 2018). These higher paying disciplines are largely male-dominated, while the mostly lower paying disciplines have a large number of female faculty (Shulman et al., 2017). Not surprisingly, when male faculty are overrepresented in higher paying disciplines, the

gender pay gap will be larger when comparing faculty across the ranks only. However, it is important to note the discrepancies exist not only between disciplines but within disciplines as well. The American Association of University Professors (AAUP, 2017) found that a gender pay gap exists even within the ranks, or in other words female full professors will still earn less than male full professors in the same discipline. Additionally, women tend to have lower starting salaries in comparison to men; this in turn increases the pay gap during the span of her career (Shulman, et al., 2017).

Some research suggests that all faculty employed in disciplines that have a high proportion of female professors will have lower salaries because women's work is not as highly valued as men's work (Bellas, 1994). On the other hand, more recent research suggests that women are more likely to be hired in STEM fields in R1 universities now compared to 20 years ago, however they face additional issues and challenges such as decision whether or not to have a family and how to balance career and child care, that men may not necessarily have to face (Ceci & Williams, 2011). The increase in the number of women being hired in STEM fields may help alleviate some of the salary gap as these fields are well paid. Some research suggests that women are less likely than men to negotiate for higher salary when accepting a job offer, which can cause the pay gap between male and female faculty in the same department (Dey & Hill, 2007). On the other hand, if women are being sought after to enter STEM fields by institutions, they might be offered more competitive starting salaries, since they might have multiple job offers to consider.

Labor Market Discrimination

The gender differences in human capital and other models mentioned earlier do not fully explain the gender pay gap. This may suggest that the labor market discrimination theory may

offer additional clarification of the unexplained percentage of the gender pay gap. Becker (1971) created a theoretical framework for racial discrimination in which he analyzed three possible cases: (1) discrimination by employers, (2) coworkers, and finally (3) clients. Additionally, he provided discrimination examples that may create and explain the gender pay gap. When it comes to employer discrimination, the discriminatory employers will only hire women if their pay will provide enough of a discount in order to compensate them for hiring the less efficient gender (Becker, 1971). The discriminatory male workers will work with women if they will get a wage premium, and finally clients will be purchasing less goods or services from women, therefore reducing their wages (Becker, 1971).

Monopsony is another element used to explain the gender pay gap, especially when employers wield greater monopsony over women than men (Blau & Kahn, 2017). The term monopsony was first coined by Joan Robinson in her 1933 book "Economics of Imperfect Competition". She describes monopsony as similar to monopoly where employees only have an option to work for one employer, and therefore their wages can be set lower than the worth or benefit they create as they have no other options for work. Research suggests that the imperfect competition in the labor market may have significant impact on wages for different groups of workers (Dube et al., 2017). Employers usually pay higher wages to workers who are harder to recruit or retain even if their productivity is not higher than that of other employees. Women are on average less likely to leave their employers due to less information about outside labor market opportunities or placing higher priorities on non-monetary benefits such as flexible hours and benefits and therefore will earn less than men who are more likely to leave their employer for a better opportunity (Card et al., 2016).

In order to better control for qualifications and get a better picture of the unexplained portion of the gender pay gap, scientists started concentrating on using more homogenous samples such as lawyers or MBAs for their studies on the gender pay gap (Goldin & Rouse, 2000; Neumark, 1996). Goldin and Rouse (2000) investigated the effect of symphony orchestras switching to blind auditions, in which a screen was used to hide the identity of the candidate. The researchers found that this switch was able to explain one-quarter of the increase of women in the top five symphony orchestras in the United States; in 1970 women accounted for only 5% of all musicians, while by 1996 this number increased to 25% (Goldin & Rouse, 2000). Neumark and colleagues (1996) conducted a study in which they had pretend job seekers from both sexes with similar resumes, sent to apply to sixty-five Philadelphia restaurants. The researchers found that there was statistically significant discrimination against women in the high-end restaurants; female applicants on average were 40% less likely to get an interview in comparison to a male applicant. Additionally, women were 50% less likely to receive a job offer in comparison to their male counterparts (Neumark, 1996). A field experiment conducted by Moss-Racusin (2012) and colleagues looked at possible discrimination of academic faculty in biology, chemistry, and physics at six large research-intensive universities. The faculty were asked to provide insights on application materials for pretend undergraduate senior students who intended to go to graduate school and applied for a science laboratory manager position (Moss-Racusin et al., 2012). The researchers found that both the female and male faculty members rated the male applicants as much more competent and better fit for the position than the identical female applicants. On average they also suggested a starting salary for the male applicant about $4,000 higher than the female. Additionally, they offered more career mentoring to the male participant in comparison to the female participants (Moss-Racusin et al., 2012). A study by Reubern, Sapienza, and

Zingales (2014) created a laboratory experiment in which the employers were hiring applicants based on their performance on arithmetic tasks, that on average both women and men perform equally well. The Researchers found that employers who had no information on the applicants' performance, just their resume and gender were twice as likely to hire male applicants than female ones (Reuben, et al., 2014). Additionally, the bias did not change even when the performance data was revealed to the employers; they were still preferring male applicants over female (Reuben et al., 2014).

Motherhood Wage Penalty

The negative relationship between having children and women's wages is known as the motherhood wage penalty (Sigle-Rushton & Waldfogel, 2007). Baker (2006) uses this term to explain differences in pay between women with young children and women who are childfree. There are several plausible reasons why women who have children have lower wages. Some of the reasons are justifiable under employment law, such as women switching to more flexible jobs for less pay after having children, and some are not and may suggest discrimination such as paying a woman less because she has children. The justifiable factors behind motherhood penalty have been covered earlier in the chapter, the following paragraphs will explore the causes and effects of motherhood penalty due to discrimination.

First, before mandated paternal leave was enacted in 1993, and to some extent today as well, a woman after the birth of her child might decide to exit the workforce completely or switch to a more flexible or child-friendly. This in turn may reduce her income might reduce her income in comparison to the job she had before having children or with a better job match (Blau & Kahn 2017). Second, both employers and women of childbearing age may forgo any substantial investments in job-specific training in anticipation of their maternity leave or exiting

the workforce due to childcaring responsibilities (Blau & Kahn 2017). Third, becoming a mother may shift a woman's productivity, place new constraints on her schedule and travel, and even cause her reluctance to be promoted to a more time demanding job (Albanesi & Olivetti, 2009; Blau & Kahn 2017). Zhang (2009) conducted a study in which she used a labor force survey to analyze the difference in pay between young mothers and women with no children, controlling for age, educational attainment, time spent outside labor force, experience, and number of children. The author found that the pay gap between mothers and childfree women increased with age, work experience, education, and number of children; by age 30 women with no children earned on average 12% more that mothers with 2 or fewer children and 20% more than women with three children or more (Zhang, 2009).

According to research, there are two different cultural expectations for the perfect worker and perfect mother. The perfect or ideal worker will work long hours, is dedicated, and has few disruptions such as childcare or childbearing (Crittenden, 2010; Williams, 2001). The perfect mother will put the needs of her children first even if she is working full-time outside of home (Ridgeway & Correll, 2004). Men on the other hand have a much better balance between their expectation as a father and employee; an ideal father works hard to support his family by working long hours and being dedicated to his work first (Wallace & Young, 2008; Williams, 2002). The two vastly different expectations regarding family and work for men and women suggests that employers reward men for being fathers but penalize women for being mothers (Correll et al., 2007; Williams, 2001).

A growing number of studies suggest that women are being financially punished by employers for being mothers while men are being rewarded for becoming fathers (Correll et al., 2007; Williams, 2001). One of the justifications for these occurrences by employers is that men

are more dedicated to their work when becoming a parent while women will be less committed to their paid work and less work oriented after becoming mothers (Correl et al., 2007; Wallace, 2008). A study conducted by Kmec (2011) compared the pro-work behaviors of mothers, fathers, and non-parents. The multivariate results of her study show that the pro-work behaviors of mothers and fathers are more similar than they are different. Women with children in fact engage in more work hours than fathers and childless men; home responsibilities do not significantly reduce job effort, and there are no significant differences in motivation to work between parents and non-parents (Kmec, 2011).

For women who have no children the term childless is often used, however the feminist movement notes that this word suggests a deficiency and instead suggests using childfree (Baker, 2010). A study by Korenman and Neumark (1992) reported women with children had a lower salary by about 20% in comparison to childfree women, when controlling for education, tenure, marital status, and experience. Another study looked at the perception of motherhood by undergraduate students. In this study the students were asked to recommend salaries for equally qualified male or female candidates who only differed regarding parental status (Correll et al., 2007). The results showed that women with children were perceived to be less qualified, committed to the job, and competent in comparison to non-mothers. On average mothers were recommended 7% lower salary than non-mothers; in contrast, fathers were perceived as more committed and students recommended higher starting salaries for them (Correll et al., 2007). Correll and his colleagues continued their study by sending out fictional but equally qualified resumes to real employers. In this case, they found that mothers were called back only half the amount as childfree women, while men were not affected by parental status at all. In addition, there was no advantage for fathers as there was in the laboratory experiment.

There are many reasons why a woman may be childfree, such as financial insecurity, few opportunities to meet suitable partners, separation/divorce, infertility, or personal preference (Rowland, 2007). Women who earn their doctorates and choose academic careers such as teaching or research are less likely to have children and marry in comparison to male faculty (Bassett, 2005). Research by Fox (2005) shows that the long hours and requirement of continued research productivity in order to achieve tenure affects male and female faculty differently: women are more likely to be divorced, single, childfree or single parents, while male faculty are more likely to be married with children. Research by Carr et al. (1998) found that female faculty with children were more likely than male faculty to report greater obstacles in their academic careers, lower career satisfaction, and slower perceived career progress. Additionally, new female Ph.D faculty who have children within 5 years of graduation are 20% less likely to earn tenure than male faculty with young children (Mason, 2004). Furthermore, women in academia are more likely to be married to older professional career men; on the other hand, men faculty are more likely to be married to younger women with less demanding jobs (Bracken et al., 2006). This may suggest that women in academia choose not to have children in the beginning of their career in order to successfully dedicate themselves to years of intensive work to achieve tenure and possibly to be viewed as an expert in their field by their peers. Some research-intensive fields such as STEM are often described as having child-free department cultures in order to achieve tenure (Stromquist, 2015).

Regarding the impact of parental status on men, even today men are the primary earners in most marriages and/or families (Blau & Kahn, 2017). In 2017 in 69% of cohabiting or married couples, men earn more than women; this number is down from 87% in 1980 (“Americans see men as the financial providers, even as women’s contributions grow”, 2017). Becker (1991)

claims that in most families, men will have the flexibility to focus mainly on their paid work, while married women will be primarily responsible for housework and childcare. Married women are more likely to reduce their work hours to take on the new parenthood responsibilities while men are encouraged to extend their work hours in order to support their family financially (Beujot, 2000). Additionally, current parental laws and government policies make it difficult for parents to take extended maternity or paternity leave (Baker, 2006). The U.S. is one of the only developed countries without mandated, paid parental leave (OECD, n.d)

Becker's (1985) theoretical analysis suggests the negative effect of time spent on housework on women's wages. Hersch and Stratton (2002) show evidence that the additional time spent on housework is associated with lower wages for both male and female workers, with stronger effects for married women. The tasks that most interfere with market productivity are routine tasks such as cleaning, shopping, meal preparation, and laundry (Hersh & Stratton, 2002). In addition, women's earnings may be reduced due to the family placing higher priority on her husband's career, rather than her own. (Frank, 1978). A woman's earnings may be reduced due to her husband's job relocation, which may cause her to lose a flexible job. She may also experience unwillingness to relocate to a new job due to family responsibilities (Frank, 1978; Mincer, 1978). This is an especially difficult issue in academia when both partners are trying to find tenure track positions in the same institutions. Due to the decline in numbers of tenure track positions and growing graduate enrollment, the academic labor market has become highly competitive ("American Association of University Professors", 2015). Mason et al. (2009) suggests that individuals, most likely women, may take on lower paying, non-tenure track positions, or choose non-academic jobs in order to relocate to their partners' new job. Undeniably this phenomenon occurs not only due to the traditional gender roles, but also due to

economical rationality that suggests placing higher importance on the career of the higher earner in the family. On the bright side Cooke et al. (2009) presents evidence that shows that the migration due to job relocation still increases the family's earning even with the decline of women's earnings. Interestingly, power couples, where both husband and wife are college-educated, are concentrated in large metropolitan areas where there are more opportunities to find well-matched jobs for both (Costa & Kahn, 2000).

Research has shown that work-family conflicts are one of the most prevalent reasons why female faculty are more likely to leave their academic careers (Goulden et al., 2009), switch to part-time status, stop the tenure clock, and finally take time off from their careers due to childcare responsibilities than a male faculty member (Fox et al., 2006). Not surprisingly for a married female faculty member with young children a part-time position or non-tenure track position may be more compatible than a tenure track, research intensive full-time position. However, the part-time work or non-tenure track position most of the times equals less or no research and teaching generally large, lower level classes.

Affording childcare is another obstacle for female faculty. According to a report by Child Care Aware of America in 2018, the average cost of center-based infant care exceeded 27% of median household income for single working parents ("The US and the High Cost of Child Care", 2018). A survey of professors in heterosexual relationships with children found that women spent on average 31.6 hours per week on childcare while male professors spent only 17.4 hours on the same task (MLA, 2009). Moreover, female faculty members in natural sciences fields have been found to spend 19.3 hours per week on domestic work in comparison to 4.7 hours a week for male professors (Schiebinger & Gilmartin, 2010). Granting that many institutions have family friendly policies such as stopping the tenure clock, extended maternity

and paternity leave, many female faculty members are hesitant to use them, for concern that by doing so they will look like they are less committed to their academic career and hold back their professional growth (Etzkowitz et al., 1992; Hollenshead et al., 2005). Martinez et al. (2017) conducted a study in which they found at six sample institutions (Agnes Scott College, Rice University, Rensselaer Polytechnic Institute, Texas A&M University, University of Colorado Boulder and the University of Nebraska-Lincoln) that 1) women faculty were more likely than male faculty to leave their institution due to discrimination or harassment, 2) family and childcaring concern had greater impact on female faculty when deciding to leave the institution 3) women faculty were also less likely to have an offer in hand when leaving the institution in comparison to male faculty.

The drastically different experiences of female faculty regarding parenthood in comparison to male faculty was captured well by Leonard and Malina: "Being a mother in academic life is a predominantly silent experience. The facts of this motherhood—the personal individual struggles, compromises and solutions to daily problem of attempting to combine being a good mother and a competent, productive academic [are] largely unvoiced at work" (cited in Marchbank, 2005, p. 145).

Organizational Disparity

The organizational disparity for women in higher education means that women as a group may be treated differently and may face different expectations from administrators, department chairs and deans in comparison to male faculty. Research showed that in higher education men were being hired more frequently for a faculty position in comparison to women (Moore & Sagaria, 1993). However, there is a recent trend in STEM departments, for preference in hiring women for tenure track faculty positions (Williams & Ceci, 2015). Williams and Ceci (2015)

suggest that the efforts to fight the former sexism in science fields have succeeded; both male and female faculty are more welcoming towards female candidates in STEM disciplines. Some studies have argued that because only the very top women persist in those fields, they might be more qualified than the average male applicant and therefore, the hiring preference towards women is justifiable (Ceci et al., 2014). Additionally, women tend to be hired at less prestigious institutions and into lower ranking positions such as non-tenured track, which do not have the same job security as prestigious tenure track positions (Harper et al., 2001). Female faculty members who are working in liberal arts colleges are more likely to have lower pay and less access to resources, when compared to faculty who work in research universities (Jacobs, 1996). It is important to note that according to research by Barbezat and Hughes (2005) the pay is more equal between men and women at liberal arts colleges; however, faculty do tend to get paid less than their colleagues working at research universities in the same department and rank. Furthermore, women faculty working for research universities receive less favorable treatment than their male colleagues, in comparison to the work climate at liberal arts colleges where faculty regardless of gender are treated more similarly (Barbezat & Hughes, 2005). Women in STEM disciplines face additional challenges; they are more likely to have less access to resources such as lab equipment, graduate assistant support and financial assistance from their department and college, which once again puts them at disadvantage in comparison to their male counterparts (Park, 1996). A large number of institutional case studies shows that women-unfriendly climates in academia, especially in male dominated fields such as science and technology still exist (Dutch et al., 2012; Mason et al., 2009; Moss-Racusin et al., 2012). Some of this unfavorable conduct can be explained by the fact that women participate less in

professional networking, publish fewer peer reviewed publications and receive less mentoring than men due to family and domestic demands (Chesterman et al., 2005).

Research according to Sonnert and Holton (1996) shows that women in higher education may feel pressured into joining a large number of committees and also take on larger student advising load, compared to their male colleagues, which inadvertently leads to less time for research and therefore smaller chance for tenure. Research by Bowles et al. (2007) shows that women are less likely to say no to service requests due to fear of retaliation and discomfort of saying no, particularly when the department chair is male. Furthermore, there is some evidence that female faculty members are more teaching oriented while male faculty are more research inclined, which can explain some discrepancies between male and female research productivity (Shuster et al., 2006). Other research suggests that women believe that they are treated differently as a group and that they receive less support and less information about tenure from their department chairperson, which may hinder the tenure application process for female faculty (Park, 1996). This in turn can delay the tenure process or may force her to look for non-tenure track position with a lower salary and therefore affect the gender pay gap. Women not only have a more difficult time getting help with their rank and tenure application process they similarly have a more challenging time finding appropriate mentors and role models during their career (Stout et al., 2011). Research by Renzulli, Reynolds, Kelly and Grant (2013) concludes that women earn less than men because of factors such as segregation by institution type, division, and rank. Female faculty are not only viewed differently by their institution's administration, but also by their students; research suggests that students expect a more intensive and time-consuming teaching technique from female faculty members (Sprague & Massoni, 2005). A study by Boring (2017) shows that students expect female faculty to behave according to female

stereotypes, however they evaluate them based on male gender stereotypes, because of this fact male students usually rate male professors higher in comparison to female professors. A study by Miller & Chamberlin (2000), showed that students evaluate male professors as more educated and knowledgeable in comparison to female faculty with equal or similar education. Male faculty are being regarded by students as professors while women as teachers (Miller & Chamberlin, 2000).

While female faculty members may choose different career tracks in order to accommodate their children's schedules or childcare (Winslow, 2010), their superiors may view female faculty members differently than male faculty members. Research by Cress and Hart (2009) suggests that female faculty members are viewed as less committed to the institution and less qualified as a professor when they have children. Williams (2000) argues that higher education is built and viewed through the lenses of an ideal worker, who does not have many responsibilities outside of work, or in other words a male faculty member with a stay-at-home wife who will take care of the family and home.

Female faculty members face many additional challenges that male faculty may never experience such as lower starting salary, finding the right time in their career to have children, being looked as less committed to their work because of being a parent, and sacrificing higher salary and better job security to work in a position that may give more freedom and time to take care of family members.

Summary of the Gender Pay Gap

The gender wage gap has been and still is one of the most persistent forms of gender inequality in the United States of America (Renzulli et al., 2013). Research suggests that there is a variety of reasons why women may be paid less, such as access to jobs and occupations, work

discrimination, and occupational segregation (Blau & Kahn, 2000; 2006; 2017). Similarly, the academic labor market presents inequality whether by discipline segregation (Burrelli, 2008), pay disparity within disciplines (Shulman et al., 2017), segregation by discipline and institution where women are overrepresented in low paying discipline and lower quality institutions (Monroe et al., 2008; Jacobs, 1996), or underrepresentation of women in tenured positions (Monroe & Chiu, 2010).

Although the majority of research studies show salary differentials by gender, there is less consensus regarding the reasons for the gap. The most widely accepted reasons offered to explain the pay disparity between men and women are human capital characteristics such as work experience and educational attainment, research by faculty member, academic rank, pay disparity between disciplines and institutional segregation. However not many studies explore pay gap within the disciplines and the influence of motherhood on salary for faculty.

Chapter 3: Methods

This chapter provides a broad summary of the data and methods that were used to address the research questions in this study. First, the characteristics of the sample are described, including information on the source of data used. Second, outline of the statistical methods that will be used. Third, the variables used in this analysis is described, along with the underlying justification for their selection.

Research Questions

1. What are the salary patterns among full-time faculty in SHE fields?
2. To what extent is there a pay gap after controlling for academic and demographic factors?
3. To what extent is there a pay gap after controlling for academic, demographic, and family factors?

For the purposes of my study I decided to run eight multiple regression analyses in order to examine the differences in salaries between male and female faculty members in SHE fields while controlling for academic, demographic, and family factors. My dependent variable is annual salary. While the independent variables included gender, rank, discipline, age, hours per week worked, race/ethnicity, employer size, weeks per year worked, and children.

Data Source

In order to identify the salary patterns among full-time faculty in SHE fields, this study uses data from the 2017 Survey of Doctorate Recipients conducted by the National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF) and National Institutes of Health (NIH). This survey provides demographic, career, and educational

data on individuals who have earned an U.S. research doctoral degree in SHE fields and are less than 76 years of age. The initial survey was distributed in 1973 and is distributed biennially.

The SDR data were well suited to address research questions in this study. Advantages using this SDR data included access to a large, nationally representative sample, high response rate, and the newest available data (data was released to public in February of 2019). In addition, data was coded and checked for accuracy, as well as the SDR questionnaire items were pretested in focus groups and cognitive groups in order to reduce measurement errors.

The target population for the SDR survey includes individuals who have earned a SHE research doctorate degree from a U.S. academic institution. The sample was drawn from the Doctorate Records File (DRF), which was constructed from the annual Survey of Earned Doctorates (SED)-a census survey of all recipients of U.S. doctoral research degrees. The SDR uses a fixed panel design in which a sample of new doctoral graduates in SHE fields is added to the previous sample of the biennial survey. The reference week used for the 2017 cycle of the survey was the week of February 1, 2017. For the 2017 cycle of the SDR, all doctoral graduates who were included in the 2015 cycle and remained age eligible were retained, and a sample of new graduates who earned their doctoral degree between July 1, 2013 and June 30, 2015 were added. The new graduates' sample was selected using a stratified sample design.

The weighted response rate for the 2017 SDR cycle was 69%, the unweighted response rate was 70%. Item nonresponse for key employment items such as employment status, primary work activity, and sector of employment ranged from 0.0% to 4.0%. Nonresponse to salary was 18.9%, to earned income was 21.8%. The personal demographic data nonresponse varied: gender at 0.01%, birth year at 0.4%, marital status at 15.9%, ethnicity at 0.8% and race at 1.2%. The item nonresponse rates reflect data missing after logical imputation or editing, but before the hot-

deck imputation, for all variables except gender, respondent's location, ethnicity, race, and citizenship at birth.

The data collected in the SDR were subjected to both editing and imputation procedures. The SDR uses both logical imputation and statistical (hot deck) imputation to compensate for item nonresponse. The logical imputation was often accomplished in the editing phase. For example, the answer to a question with missing data was sometimes determined by the answer of another question. Most SDR variables were subjected to the hot-deck imputation, with each variable having its own class and set of variables chosen by regression modeling in order to identify nearest neighbors for imputed information.

Description of Data Sample

The sample used for this study consists of individuals with a U.S. research doctoral degree in science, health or engineering (SHE) fields working at 4-year colleges or universities, as a faculty member in the following ranks: associate, assistant, or full professor.

The population size for this survey was approximately 1,103,200 individuals and the total sample size was 124,580 individuals who earned SHE research doctorate degree, were less than 76 years of age and were not institutionalized or terminally ill as of February 1st, 2017. Out of that sample, 85,739 participants completed the survey; the individuals who could not be located accounted for about two-thirds of the non-respondents.

For the purposes of my study I excluded a number of participants from my sample. First, I excluded all individuals who were not employed as teaching faculty, leaving me with 21,813 participants. Second, I excluded all faculty who were not working at 4-year institution, this excluded a total of 2,258. I decided to exclude faculty working at K-12, 2-year and technical institutes as they may focus less on research and more on teaching; while medical schools and

research institutes may primarily focus on research which can have effect on their starting and lifetime salaries as well as having different responsibilities in comparison to faculty working at 4-year institutions. Third, I removed all faculty who did not have the rank of assistant, associate, or full professor; this excluded a total of 1,960 faculty members. Next, I excluded all faculty who did not have tenure or were currently on tenure-track, this excluded a total of 3,262 faculty members. I chose to include only faculty who are on tenure-track or have tenure, because they have similar work responsibilities such as teaching, scholarship, and service, while faculty who are not on tenure-track might be primarily focused on teaching and less on research which can affect their salary. Next, I excluded all faculty members who did not teach in one of the five following disciplines: computer and math sciences, life and related sciences, physical and related sciences, social and related sciences, and finally engineering due to the fact that science faculty are among of most highly paid disciplines ("Tenured/Tenure-Track Faculty Salaries", n.d.).; this excluded a total of 2,466 faculty members. Next, I excluded all faculty members who indicated that they work 20 or less hours a week which would suggest that they might be working part-time or on reduced load, which can also affect their salary. Finally, I excluded all faculty who worked less than 25 weeks in a year. My final sample consisted of 11,814 faculty members in the following ranks: assistant (n=3,093), associate (n=3,688), or full professor (n=5,033) that satisfied my stated above criteria. In my sample 36.4% of faculty were female and 63.6% were male. According to NSF (2019) of the doctoral scientists and engineers who were employed at four-year colleges and universities in 2017, only 36% were women. When it comes to strictly engineering disciplines only 17.4% of all tenured or tenure-track faculty were female (Roy, 2019). The data clearly shows that my sample is representative to the distribution at the national level.

Statistical Methods

Each of the research questions will be explored using the statistical methods depicted below.

The exploratory nature of question one is designed to examine the different salary patterns among full-time faculty in SHE fields based on gender and discipline type and rank. Measures of central tendency, cross-tabs, frequencies, and comparing means, were used to describe how the salary is allocated between male and female faculty, by discipline and rank.

Question two was explored using multiple hierarchical regressions. Question three was also explored using multiple hierarchical regressions while controlling for academic, demographic, and family factors. My research questions are examining the gender pay gap in three ways: first looking at the overall salary patterns among faculty in SHE fields, second controlling for only academic and demographic factors, and third when controlling for both academic, demographic, and family factors, since influence of family factors have significant effect on womens' salary according to research (Blau & Kahn 2017; Mason et al., 2009; Zhang, 2009). In my models the variables were added individually, one at a time in order to determine whether the newly added variables show a significant improvement in the proportion of explained variance in dependent variable by the model. Therefore, my second research question will have 7 multiple regression models and question three will have only one (final) model. The results were compared in order to investigate whether the relationship between academic and demographic factors and salary differs, when family factors are also included in the model.

As demonstrated in the literature review section, there does not exist a one universally accepted model for explaining faculty salaries. Some models are criticized by either overestimating the degree of pay gap and inequity due to absence of potentially important variables in the model. For example, many studies of the gender pay gap use economy-wide

measures, where they include a variety of different occupations and try to compare them (Barbezat & Hughes, 2005; Toutkoushian & Conley, 2005). While these measures may be useful to examine the overall gender gap, examining the wage gap within same or similar fields provides more precise and informative look on the gender pay gap. On the other hand, some models are found faulty by underestimating the influence of discrimination by not looking at the differences in socialization between men and women, differences in opportunities for advancement, and motherhood penalty (Umbach, 2007). In order to alleviate these gaps, I will be comparing faculty in the same field and rank and controlling for additional academic factors (years of experience, educational attainment) in order to explore their salary patterns and to what extent there is a gender pay gap if any. Additionally, I want to explore if the gender pay gap increases after controlling for having children under 18 years of age, as previous research states that female faculty members with children earn significantly less in comparison to childfree female faculty members and male faculty members with our without children (Bracken et al, 2006; Carr et al, 1998; Fox, 2005; Fox et al., 2006; Mason, 2004).

Variables

My dependent variable is annual salary. While the independent variables included gender, rank, discipline, age, hours per week worked, race/ethnicity, employer size, weeks per year worked, children. In the sections below I will go over each variable in more detail.

Dependent Variable

For the purpose of this study I am focusing on salaries of faculty members who work more than 21 hours a week and have the following ranks: assistant, associate, and full professor ranks. The SDR provides a median annual salary that is reported for the principal job and rounded to the nearest $1,000; for individuals who were employed by educational institutions, no

accommodations were made in order to convert the academic year salaries to calendar year salaries. The faculty salary is reflected as an annual salary of earned income on his or her principal job, before any deductions and not including any additional compensation such as summertime teaching or research. The sample distribution in my study was skewed, therefore I performed log transformation in order to make the distribution look more normal.

Independent Variables

Socio-Demographic Characteristics.

The socio-demographic characteristics such as race/ethnicity was coded as series of dummy variables(1=Asian, 0=other; 1= Black, 0=other; 1=Hispanic, 0=other; 1= other race, 0=other) The reference group for race/ethnicity variable is White. The two primary variables of interest: children living in the household (1-children, 0- no children) and gender were coded as dummy variables (1= female, 0=male). The reference group for children living in the household is not having children, while for gender variable is male.

Human Capital Characteristics.

Variables in the human capital theory reflect skills or different attributes that a faculty member possesses that increases his or her productivity and value to their employer such as quality of education, productivity the amount of on the job training, or experience.

Years of work experience is one of the most basic variables in human capital-based models, as work experience is used to substitute for the on-the-job training (Perna, 2001). Accurately representing faculty work experience has been proven to be somewhat difficult as some faculty members may have acquired additional teaching experience while pursuing their Ph.D. Especially when it comes to women, their work experience may not be accurate due to

possibility of more disruptive work careers due to having children or taking care of family members (Blau & Kahn, 2017).

Work experience has been represented differently across a variety of studies such as age, years in current position, years at current rank, years of academic experience, years of total experience, or years since highest degree. For the purpose of my study, I used the date of their doctoral degree (recorded in 5-year intervals and coded as follow: 1965=50 years of experience; 1970= 45 years of experience; 1975=40 years of experience; 1980=35 years of experience; 1985=30 years of experience; 1990=25 years of experience; 1995=20 years of experience; 2000=15 years of experience; 2005=10 years of experience; 2010=5 years of experience; 2015=1 year of experience) as a measure of years of experience. The limitation of using the date of receiving doctoral degree as a measure of experience, is the fact that it may overestimate or underestimate the actual length of experience for some individuals. For example a faculty member may have not started working as a faculty member right away, it also does not take into account leaving the labor market for some time and coming back; this may be especially relevant for female faculty members who have children and took maternity leave.

I also included the variable for the size of the employer where the faculty member is working as a series of dummy variables (1=EMSIZE= 99 or fewer employees, 0=other; 1=EMSIZE= 100-499 employees, 0=other; 1=EMSIZE5=500-999 employees, 0=other; 1=EMSIZE= 1000-4999 employees, 0=other; 1=EMSIZE=5000-24999 employees, 0=other). The reference group for this variable is employer size of 25,000+ employees. Some research suggests that the size of the company can have a positive relationship with salary, larger firms may have more resources to pay larger salaries (Lallamand & Rycx, 2007).

Full-time tenured or tenure track faculty might have different faculty contracts based upon different institutions or departments. Traditionally, full-time tenured or tenure track faculty will have 9-month contracts, which means that their salary will reflect working 9 months out of 12, however it is not unusual that some faculty might have 10-month or even 12-month contracts which could reflect in higher salary in comparison to a 9-month faculty contract. Unfortunately, SDR does not acknowledge the difference between the various contracts when it comes to the faculty, which may overestimate some faculty salaries and understate others. However, the SDR provides number of weeks worked per year which I will be using to control for the possible different length in contracts for faculty members. This variable is coded as a continuous variable ranging from 1 week to 52 weeks.

In order to alleviate the issue of different workloads, I used the hours per week typically worked in order to group faculty into three different productivity groups in order to control for productivity (1=hours worked per week:21-35, 0=other; 1=hours worked per week:36-40, 0=other). The reference group for this variable was hours worked per week: greater than 40. Faculty who worked 20 hours or less were excluded from my sample.

Rank and Tenure.

Faculty Rank (1=Associate Professor, 0=other; 1=Assistant Professor, 0=other) was used in the models in order to more accurately explore the gender pay gap. The reference group for this variable is full professor rank. As full professors get paid higher salaries than assistant professors, it is only fitting to control for the influence of rank. Additionally, this helped to control for the over inflation of the salary gap when comparing salaries of male professors, who are overrepresented in the highest rank, while female faculty are overrepresented in the junior faculty ranks (Barbezat, 2002; Harper et al., 2001; Myers & Turner, 2004; Mason and Ekman,

2009; Stewart, 2009). In my study, women represent 45% of all assistant professors, 41% of associate professors and only 27% of all full professors. Faculty with different ranks or individuals who logically skipped this question were not analyzed in this study.

Disciplinary Characteristics.

Disciplinary characteristics variables control for salary differences between faculty in different disciplines. The 2017 Survey of Doctorate Recipients categorizes postsecondary faculty in five disciplinary categories for easier analysis and for greater numbers of participants in each discipline group coded as dummy variables (1=computer and math sciences, 0=other; 1=life and related sciences, 0=other; 1=physical and related sciences, 0=other; 1=engineering, 0=other). The reference group for this variable is social and related sciences. The computer and math sciences category includes faculty teaching in computer sciences and mathematics and statistics; life and related sciences includes agriculture, biological sciences, and other natural sciences; physical and related sciences includes chemistry, Earth, environmental, marine sciences, and physics; social and related sciences includes economics, political science, psychology, sociology, and other social sciences; and finally engineering as the last stand alone category.

As discussed earlier in chapter 2 regarding the pay disparity between disciplines, female faculty tend to be overrepresented in less competitive and lower paid disciplines (Bellas, 1994; Shulman et al., 2017). In my sample, women represent 28% of faculty in computer and math sciences; 39% in life and related sciences; 31% in physical and relates sciences; 51% in social and related sciences, and finally only 19% in engineering (Table 1). Social and related sciences is the lowest paid discipline from the five that I included in my sample. It is important to note that sciences and engineering is one of the highest paying disciplines (Bichsel et al., 2018), however pay disparity between the disciplines still exists. For example, in the 2017-18 academic

year, a full professor in social sciences across all institutions (research, doctoral, master's and baccalaureate) got paid on average $92,677 while an engineering full professor was paid $123,144 ("Tenured/Tenure-Track Faculty Salaries", n.d.). In order to better understand the different salary patterns among faculty in my sample, I decided to control for the different disciplines in order to alleviate the issue of pay disparity in academia.

Table 1.

Gender Ratio in SHE Disciplines

Discipline	Female	Male
Computer and Math Sciences	28%	72%
Life and Related Sciences	39%	61%
Physical and Related Sciences	31%	69%
Social and Related Sciences	51%	49%
Engineering	19%	81%

Family Status.

According to research, work-family conflicts are one of the most prevalent reasons why female faculty members are more likely to leave their academic careers (Goulden et al, 2009), switch to part-time status, stop the tenure clock, and finally take time off from their careers due to childcaring responsibilities than a male faculty member (Fox et al., 2006). Additionally, new female Ph.D. faculty members who have children within 5 years of graduation are 20% less likely to earn tenure than male faculty members with young children (Mason, 2004). Research by Carr et al. (1998) shows that female faculty with children are much more likely than men with children to report having greater obstacles in their career, lower professional satisfaction, and slower career progress; which in turn can be translated into lower wages and missed promotion opportunities. In order to explore these additional adversities, I created a dummy variable for having any children living in the household as a part of the family, under 18 years of age. The

reference group for this variable is no children. This variable may prove to be problematic as some faculty members may have children who are over 18 years old still living with them or living on their own, however they will not be reflected in my study. Having that specific variable could have included additional insight on salary patterns for faculty who at some point in their career had children.

Study Limitations

The 2017 Survey of Doctorate Recipients included a very comprehensive questionnaire that provides information on demographic, education, and career history about individuals with a U.S. research degree in SHE fields. However, several limitations of this survey exist as well. The survey asks sensitive questions such as salary and income and participants may not necessarily feel comfortable enough to answer them truthfully or even answer them at all. Nonresponse to salary question was 18.9%, and to earned income question was 21.8%.

The sample distribution in my study was skewed, therefore I performed log transformation in order to make the distribution look more normal. It is important to note, that there is a key limitation when looking at a salary as a raw number and not including additional forms of gender-based inequity in academia that are not easily measured such as lack of mentorship, longer time to achieve promotion and/or tenure, expectations from administrators and students for female faculty to spend more time on teaching, mentoring and service are some of the examples that are mentioned earlier in chapter 2.

The data were not collected specifically for this study; therefore, some variables of interests were not available, such as faculty productivity, which would provide an important insight about gender pay gap as productivity (especially research productivity) impacts faculty pay. Faculty productivity is one of the key variables associated with gender pay gap. Some

research suggests that female faculty members are less productive, which, in the current pay structure in academia, has a positive influence on salary. The more research productive a faculty member is, the higher salary he or she will receive (Monroe et al., 2008; Moore, 1993). However, it is important to note that research suggests that female faculty members spend more time on service and teaching, which takes away from time that could be spent on research (Guarino & Borden, 2017; Misra et al., 2011). Female faculty members also have additional responsibilities such as childcare and house chores that male faculty members might not have, and therefore from the start of their career are in more disadvantaged positions (Baker, 2006; Correl et al., 2007; Goulden et al., 2009; Wallace, 2008). Also, the variable used to measure experience is the number of years since a faculty member earned their doctorate, which does not account for time taken away from work for childcaring responsibilities. This can overestimate a female faculty's experience. However, this was the only variable that is available in this study to measure the years of experience.

Many pay studies are based on salaries reported by the institution instead of self-reported data; as in the case of the SDR this can cause additional study limitation as women systematically understate their earnings in order to inflate their male partner's earning power; which can understate the gap. At the same time men tend to overstate them in order to conform with the role of the provider (Murray-Close & Heggeness, 2018). It is important to note that there might be additional gender-based inequity issues such as promotion and other non-financial benefits that will not be reflected in the annual salary.

For the purposes of this study I decided to use the public use file data, which is openly accessible to the public on the NSF website, instead of the restricted use file which includes personally identifiable statistical data. The restricted data file was not accessible to me at the

time of writing my dissertation due to licensing requirements, therefore I chose to use the public use data. The restricted file data provides more detailed information such as the exact date of birth, doctoral institution Carnegie Class, the exact discipline that a faculty member is teaching, which is not available in the public file. Additional limitation of my study is the fact that faculty in my data set are divided into five disciplines only, and it is not accounting for pay gaps within the disciplines as well, for example full professors in engineering fields in 2011 earned on average $114,365, while faculty in the engineering technologies field earned on average $87,583("Average Faculty Salaries by Field and Rank at 4-Year Colleges and Universities 2010-2011", 2011). However, if each of the disciplines would be broken down in very detailed sub-disciplines there might not be enough statistical power because of the small sample sizes in each subfield. In future research I will consider repeating this study using the restricted file in order to mitigate some of the limitations, as well as to investigate if these added variables can give additional insight onto the gender pay gap in SHE fields. Another limitation of my study is the fact that I was not able control for the institution type for example: public, private, Research I, Research II, etc. However, using the institutional size as a control controls for the prestige to some extent, as larger institutions usually have larger endowments and more resources and larger salaries for their employees.

Chapter 4: Findings

The findings chapter presents the results from multiple regression analyses, that were used to examine the differences in salaries between male and female faculty members in SHE fields while controlling for academic, demographic, and family factors. As discussed in the methods chapter, eight multiple regression analyses were conducted in this study in order to examine and to compare the pay gap in salaries between female and male faculty. Using the 2017 Survey of Doctorate Recipients conducted by the National Science Foundation as a data source, while looking at influence of rank, discipline, hours per week typically worked, race and ethnicity, employer size, year of receiving the highest terminal degree, number of weeks worked per year, and family status. This chapter presents the findings from all eight multiple regression models in order to address the research questions.

Research Questions

1. What are the salary patterns among full-time faculty in SHE fields?
2. To what extent is there a pay gap after controlling for academic and demographic factors?
3. To what extent is there a pay gap after controlling for academic, demographic, and family factors?

What are the Salary Patterns Among Full-Time Faculty in SHE Fields?

Interaction Effects between Gender and Rank

When it comes to rank, female faculty members earned less than male faculty members in all three ranks (assistant professor, associate professor, and full professor). The median salary for female assistant professors was $69,000 (Table 2), whereas for male faculty was $74,000 (difference of $5,000.). Regarding faculty members in the associate professor rank, female

faculty earned a median of $80,000 in contrast to male faculty who earned $83,000 (difference of $3,000). In the full professor rank female faculty earned a median of $101,000 while male faculty earned $108,000 (difference of $7,000). Faculty members in the associate professor rank had the smallest pay gap when looking at their median salary, the mean salary pay gap was equal to $2,756.79; where female faculty members earned on average $81,422.67 and male faculty earned $84,179.46.

Table 2

Median Annual Salary*Gender*Rank			
Rank	Female	Male	Difference (F-M)
Professor	$ 101,000	$ 108,000	$ (7,000)
Associate Professor	$ 80,000	$ 83,000	$ (3,000)
Assistant Professor	$ 69,000	$ 74,000	$ (5,000)

Interaction Effects between Gender and Disciplines

When it comes to the gender ratio within the SHE disciplines (table 2.2) male faculty members are overrepresented in all disciplines except social and related sciences, where 50.86% of faculty are female. Not surprisingly, the smallest percentage of female faculty members are in engineering disciplines, where only 18.95% of faculty members are female. Female faculty represent 28.05% of all faculty in computer and math sciences; 38.88% in life and related sciences and 30.54% in physical and related sciences. These findings go hand in hand with previous research stating that female faculty are still underrepresented in the hard sciences and overrepresented in the social sciences and low paying disciplines (AAUP, 2017; Shulman et al., 2017).

In my sample, female faculty earned less than male faculty in all of the disciplines except engineering. Both female and male faculty members earned a median of $96,000 (Table 3). This may suggest that the pay gap in this field is slowly disappearing, or that female faculty members

who work in this field receive higher salaries, since there is a push for women to enter STEM fields and therefore might receive more competitive salary in this specific field (Hill et al., 2010).

The largest pay disparity occurred in life and related sciences, where female faculty earned a median of $77,000 while male faculty earned $89,000 (difference of $12,000). Female faculty in social and related sciences earned a median of $80,000, while male faculty earned $90,000 (difference of $10,000). Interestingly, there was a relatively high ratio of women in both of these fields; 38.88% women in life and related sciences and 50.86% in social and related sciences. The pay disparity in computer and math sciences was slightly smaller; female faculty earned a median of $83,500, while male faculty earned $91,500 (difference of $8,000). Lastly, female faculty members in physical and related sciences earned a median of $80,000, while their male counterparts earned $87,000 (difference of $7,000). Intriguingly, the ratio of female faculty in both these fields was smaller; 28.05% of faculty in computer science and math and 30.54% faculty in physical and related sciences were female. Only 18.95% of all engineering faculty were female. These findings may suggest that female faculty members may be paid more competitive salaries when women are underrepresented in particular disciplines. However, it also may have to do with the specific group of female faculty, who broke the barriers in these fields and were able to become successful, despite the different barriers that they had to face.

Table 3

Median Annual Salary*Gender*Disciplines			
Disciplines	Female	Male	Difference (F-M)
Computer and Math Sciences	$ 83,500	$ 91,500	$ (8,000)
Life and Related Sciences	$ 77,000	$ 89,000	$ (12,000)
Physical and Related Sciences	$ 80,000	$ 87,000	$ (7,000)
Social and Related Sciences	$ 80,000	$ 90,000	$ (10,000)
Engineering	$ 96,000	$ 96,000	$ -

Interaction Effects between Gender and Hours per week Typically Worked

When it comes to number of hours typically worked, female faculty members earned less than male faculty in all three categories: 21-35 hours, 36-40 hours, and greater than 40 hours (Table 4). The largest pay disparity existed among faculty who worked 40 hours or more; in this group female faculty members earned a median of $84,000, while male faculty members earned $95,000 (difference of $11,000). Female faculty members working between 36-40 hours earned a median of $75,000, while male faculty members earned $80,000 (difference of $5,000). Lastly, female faculty members who worked between 21-35 hours a week earned a median of $73,000 and male faculty earned $78,000 (difference of $5,000).

Table 4

Median Annual Salary*Gender*Hours per week typically worked			
Hours per week	Female	Male	Difference (F-M)
21-35	$ 73,000	$ 78,000	$ (5,000)
36-40	$ 75,000	$ 80,000	$ (5,000)
Greater than 40	$ 84,000	$ 95,000	$ (11,000)

Interaction Effects between Gender and Race/Ethnicity

Female faculty members earned less in every race/ethnic group (Table 5). The largest pay disparity existed among white faculty members; where female faculty in this group earned a median of $83,000 while male faculty earned $95,000 (difference of $12,000). The second largest pay disparity existed among Black faculty members, where female faculty earned a median of $77,000, whereas male faculty earned $85,000 (difference of $8,000). The third largest pay disparity existed among Asian faculty members, where female faculty earned a median of $78,500 while male faculty members earned $85,000 (difference of $6,500). The fourth largest pay disparity occurred among other races including multiracial individuals, where female faculty members earned a median of $85,000, while male faculty members earned

$90,000 (difference of $5,000). The smallest pay disparity occurred among Hispanic faculty members, where female faculty earned a median of $75,000 and male faculty members earned $76,000 (difference of $1,000).

Table 5

Median Annual Salary*Gender*Race/Ethnicity			
Race/Ethnicity	Female	Male	Difference (F-M)
Asian	$ 78,500	$ 85,000	$ (6,500)
Black	$ 77,000	$ 85,000	$ (8,000)
Hispanic	$ 75,000	$ 76,000	$ (1,000)
White	$ 83,000	$ 95,000	$ (12,000)
Other races	$ 85,000	$ 90,000	$ (5,000)

Interaction Effects between Gender and Employer Size

In respect to the size of the educational institution, female faculty members earned less than male faculty members in all employer size categories (100-499, 500-999, 1000-4,999, 5000-4999 and 25,000 and more employees). I will not be including median salaries for faculty members working at institutions with 99 and less employees as the sample size was too small to have an accurate median calculation. The largest pay disparity existed for female faculty members working at institutions with more than 25,000 employees (Table 6); at these institutions female faculty members earned a median of $84,000 while male faculty earned $95,000 (difference of $11,000). The second largest pay disparity existed for faculty members working at institutions with 5,000-24,999 employees; female faculty members earned a median $89,500, while male faculty earned $100,000 (difference of $10,500). The third largest pay disparity existed at institutions that employed 100-499 employees; at these institutions female faculty earned a median of $66,000, while male faculty members earned $72,000 (difference of $6,000). The fourth largest pay disparity existed among faculty members working at institutions with 1,000-4,999 employees; female faculty members earned a median of $82,000 and male faculty

earned $85,000 (difference of 3,000). And lastly female faculty members working at institutions with 500-999 employees earned $79,000 and male faculty earned $80,000 (difference of $1,000).

Table 6

Median Annual Salary*Gender*Employer Size			
Employer Size	Female	Male	Difference (F-M)
100-499 employees	$ 66,000	$ 72,000	$ (6,000)
500-999 employees	$ 79,000	$ 80,000	$ (1,000)
1,000-4,999 emoloyees	$ 82,000	$ 85,000	$ (3,000)
5,000-24,999 employees	$ 89,500	$ 100,000	$ (10,500)
25,000+ employees	$ 84,000	$ 95,000	$ (11,000)

Interaction Effects between Gender and Year of Award of the Highest Degree

When looking at the year of award of the highest degree, female faculty earned less than male faculty in all categories (Table 7), except for faculty who earned their degree between 1975-1979; female faculty members in this group earned a median of $135,000, while male faculty members earned 125,000 (a difference of $10,000). Interestingly, there were 77 (18.16%) female faculty in that group and 347 (81.84%) male faculty members. The largest pay disparity existed for faculty members who earned their highest degree between 1960 and 1969; in this group female faculty members earned a median of $100,000 while male faculty members earned $144,000 (difference of $44,000). It is important to note that there were only 3 (6.25%) female faculty members in this category and 45 (93.75%) male faculty members. Unfortunately, even faculty members who earned their degrees more recently earned less than their male counterparts. For example, female faculty members who graduated with their Ph.D. in 2015 or earlier, earned a median of $65,000 while male faculty earned $68,500 (difference of $3,500). This disparity is even more concerning since in this group female faculty account for 51.9% of all faculty. Female faculty members who graduated with their Ph.D. between 2005 and 2014

earned $6,000 less than their male counterpart; female faculty members in this group earned a median of $74,000 while male faculty members earned $80,000.

Table 7

Median Annual Salary*Gender*Year of Ph.D.			
Year	Female	Male	Difference (F-M)
1960-1969	$ 100,000	$ 144,000	$ (44,000)
1970-1974	$ 123,500	$ 125,000	$ (1,500)
1975-1979	$ 135,000	$ 125,000	$ 10,000
1980-1984	$ 112,000	$ 120,000	$ (8,000)
1985-1989	$ 101,000	$ 102,000	$ (1,000)
1990-1994	$ 95,000	$ 100,000	$ (5,000)
1995-1999	$ 89,000	$ 95,000	$ (6,000)
2000-2004	$ 82,000	$ 86,000	$ (4,000)
2005-2009	$ 74,000	$ 80,000	$ (6,000)
2010-2014	$ 67,000	$ 72,000	$ (5,000)
2015 or later	$ 65,000	$ 68,500	$ (3,500)

Interaction Effects between Gender and Family Status

In respect to the family status, female faculty members earned less than male faculty members who had children or were childfree (Table 8). Female faculty members with children under the age of 18 earned a median of $80,000, while male faculty members with the same family status earned $89,000 (a difference of $9,000). At the same time, female faculty members who were childfree earned a median of $80,000; while male faculty members who were childfree earned $92,000 (a difference of $12,000). Curiously, female faculty members with or without children in my sample earned the same amount, while male faculty members without children earned more than male faculty members who were childfree.

Table 8

Median Annual Salary*Gender*Children living in household			
Children	Female	Male	Difference (F-M)
Yes	$ 80,000	$ 89,000	$ (9,000)
No	$ 80,000	$ 92,000	$ (12,000)

To what extent is there a pay gap after controlling for academic and demographic factors?

In order to investigate the extent of a pay gap after controlling for academic and demographic characteristics I used hierarchical linear regression for my study. Regression models 1-7 look at the gender pay gap for academic and demographic factors, each variable is added one by one, in order to determine whether each newly added variable shows a significant improvement of the proportion of explained variance in dependent variable by the model. Model 7 is the final model that includes all academic and demographic factors: rank, discipline, hours per week worked, race/ethnicity, employer size, year of award of the highest degree, and number of weeks worked per year.

Model 1) Gender + Rank

The dependent variable in this model is the natural log of salary, the two set of predictors in this model include gender-female, a demographic predictor, and academic predictor for rank: associate professor and assistant professor rank. The omitted categories in this model were male and full professor.

This model significantly predicted salary for a faculty member, $F(3,11810)=424.051$, $p<.001$, adjusted $R^2=.097$. However, as indicated by the R^2 only 9.6% (Table 1.1) of the variance in salary can be explained by knowing faculty's gender and rank. When looking at gender in this model female faculty had a statistically significant ($p=.008$) lower salary by 2.9% in comparison to male faculty when controlling for rank.

Coefficients for assistant and associate professor had both statistically significant influence on salary (p=.000). Assistant professors had a 52.8% lower salary in comparison to full professors, while associate professors had 34% lower salaries.

In regards to the gender/rank composition of faculty in my sample, percent of female faculty members decreases as the rank increases (Table 1.2). Female faculty represent 45.91% of all assistant professors, however this ratio decreases in the higher ranks. Women represent only 41.38% of all associate professors. This ratio of women drastically decreases in the full professor rank to only 26.92%.

These results are consistent with what previous research has found, that rank has influence on faculty members salary (Long et al., 1993; Moore, 1993,). Faculty members who achieved full professor rank received higher salary in comparison to assistant professors (Stewart, 2009). When it comes to the gender representation in the different ranks, my findings are consistent with previous research which found that women are fairly equally represented in the assistant professor rank, however they are underrepresented in the highly prestigious and well-paid full professor ranks ("National Science Board", 2018; "Spring 2016 through Spring 2018 Human Resources Component", n.d.).

Table 1.1

Variable		B	SEB	R^2	Delta R^2
Model 1				0.097	0.097**
	Female	-0.029*	0.011		
	Assistant Professor	-0.424**	0.013		
	Associate Professor	-0.293**	0.012		
	Constant	11.534	0.008		

*p<.05; **p<.001.

Table 1.2

Faculty Rank*Gender					
Faculty Rank	Female	% Female	Male	% Male	Total
Professor	1355	26.92%	3678	73.08%	5033
Associate Professor	1526	41.38%	2162	58.62%	3688
Assistant Professor	1420	45.91%	1673	54.09%	3093
Total	**4301**	36.41%	**7513**	63.59%	11814

Model 2) Gender + Rank + Discipline

Model 2 adds onto model 1 with a new set of academic predictors for SHE disciplines which included: engineering, physical and related sciences, computer and math sciences, and life and related sciences. The omitted categories in this model were male, full professor, and social and related sciences.

When additional variables for disciplines were added to this model, they significantly improved the prediction, R^2change=.003 $F(4,11806)=9.377$, $p<.001$. As indicated by the R^2 only 10% (Table 2.1) of the variance in salary can be explained by knowing faculty's gender, rank, and discipline in which they teach. The change in explained variance between model 1 and 2 is equal to 0.3%.

Female faculty continue to have lower salaries, in this model the gender pay gap equals to 2.9% (Table 2.1) in comparison to male faculty while controlling for both rank and discipline. These results go hand in hand with research that shows that even when controlling for rank, discipline, and human capital characteristics female faculty still earn less than male faculty (Barbezat, 2002; Perna, 2001; Toutkoushian & Conley, 2005). The pay gap for female faculty members increased by 0.1% in comparison to model 1, which can suggest that the addition of discipline does not have a large influence on the pay gap for female faculty members for this specific sample. When looking at gender in this model, female faculty will still have a

statistically significant (p=.008) lower salary in comparison to male faculty when controlling for rank and discipline. Interestingly, engineering and computer and math sciences disciplines were not statistically significant predictors in this model. However, faculty in physical science fields had a significantly (p=.001) lower salary by 4.9% in comparison to social and related sciences. Faculty members working in life and related sciences disciplines also had significantly (p=0.00) lower salaries by 7.8% in comparison to social and related sciences. This study confirms that there is a substantial effect of different disciplines within the SHE fields on faculty salary. In other words, disciplines in engineering, life and related sciences, physical and related sciences had either a positive or negative effect on faculty salary in relation to the reference group of social and related sciences. Computer and math sciences discipline had negative effect on faculty's salary, however it was not statistically significant in any of the models.

When it comes to the gender ratio within the SHE disciplines (table 2.2) male faculty are overrepresented in all disciplines except social and related sciences where 50.86% of faculty were female. Not surprisingly the smallest percentage of female faculty was in engineering discipline, only 18.95% of faculty members. Female faculty represent 28.05% of faculty in computer and math sciences; 38.88% in life and related sciences, and 30.54% in physical and related sciences. These findings go hand in hand with previous research, stating that female faculty are still underrepresented in the hard sciences and overrepresented in the social sciences and other low paying disciplines (AAUP, 2017; Shulman et al., 2017).

Coefficients for assistant and associate professor had both statistically significant influence on salary (p=.000). In this model assistant professors had 53% lower salary in comparison to full professors. The pay gap increased by 0.2% in comparison to model 1.

Associate professors had 34.3% lower salary in comparison to full professors. The pay gap for associate professors also increased slightly by .03% in comparison to model 1.

Table 2.1

Variable	B	SEB	R^2	Delta R^2
Model 2			0.1	0.003**
Female	-0.029*	0.011		
Assistant Professor	-0.425**	0.013		
Associate Professor	-0.295**	0.012		
Engineering	0.010	0.017		
Physical and Related Sciences	-0.048**	0.015		
Computer and Math Sciences	-0.024	0.017		
Life and Related Sciences	-0.075**	0.015		
Constant	11.562	0.012		

*p<.05; **p<.001.

Table 2.2

Discipline*Gender					
Discipline	Female	% Female	Male	%Male	Total
Computer and Math Sciences	446	28.05%	1144	71.90%	1590
Life and Related Sciences	939	38.88%	1476	61.10%	2415
Physical and Related Sciences	715	30.54%	1626	69.50%	2341
Social and Related Sciences	1859	50.86%	1796	49.00%	3655
Engineering	344	18.95%	1471	81.1.1%	1815
Total	**4301**	**36.40%**	**7513**	**63.60%**	**11814**

Model 3) Gender + Rank + Discipline + Hours per Week Worked

Model 3 adds onto model 2 with a new academic predictor for average hours worked per week. The omitted categories in this model were male, full professor, social and related sciences and hours worked per week: greater than 40.

When hours per week typically worked variables was added to the model, it significantly improved the prediction R^2change=.043 $F(2,11804)=398.719$, $p<.001$. As indicated by the R^2,14.3% (Table 3.1) of the variance in salary between male and female faculty can be explained

by knowing faculty's gender, rank, discipline that they teach in, and typical number of hours that they work per week. The change in explained variance between model 2 and 3 is equal to 4.3%; the largest increase in variance between all the models.

It is important to note that in this model (Table 3.1) female faculty members had 4% lower salary in comparison to male faculty and the predictor was statistically significant (p=.000) in this model. Controlling for hours worked in a week increased the gender pay gap by 1.1% in comparison to model 2. Additional variables that are contributing to this model include assistant professor (p=.000), associate professor (p=.000), physical and related sciences (p=.000), life and related sciences (p=.000), hours per week worked:21-35 (p=.000), and hours per week worked:36-40 (p=.000). Once again engineering and computer and math sciences were not statistically significant in this model.

In this model the excluded variable was hours per week worked: greater than 40 hours. Faculty members who worked 21-35 hours per week, earned 43.6% less than faculty who worked more than 40 hours. Faculty members who worked on average 36-40 hours per week, earned 28.8% less than faculty who worked more than 40 hours. In other words, faculty members who worked longer hours and presumably spent more time on research, had higher salaries in comparison to faculty who worked less and, in all probability, spent more time on teaching or service. Studies show a significant linkage between research productivity and salary (Fox, 2005; Renzulli et al., 2005). While few studies show that female faculty members in STEM fields have lower research productivity, including lower number of patents (Whittington & Laurel, 2005; Xie & Shauman, 1998). When it comes to the gender composition (Table 3.2) based on numbers of hours per week typically worked, 37.86% of faculty members working 21-35 hours per week were women; from faculty working between 36-40 hours 33.20% were women; from faculty

working more than 40 hours a week 37.43% were women. In my sample, 73% of all women described themselves as working more than 40 hours, 23% working between 36-40 hours, and only 4% working between 21-35 hours, which can suggest either high work ethic among female faculty in my sample, or there is an expectation for faculty to work long hours in their position. When it comes to male faculty 70% of all men worked more than 40 hours, 26% worked between 36-40 hours, and 4% worked between 21-35 hours.

Assistant professors had 52.7% lower salary in comparison to full professors. The pay gap for assistant professors decreased marginally by 0.3% in comparison to model 2. Associate professors had 33% lower salary in comparison to full professors; the pay gap for associate professors decreased by 1.3% in comparison to model 2. When it comes to disciplines, faculty in physical and related sciences fields had 8% lower salary in comparison to social and related sciences; an increase of 3.1% from model 2. Faculty members in life and related sciences disciplines had 10.7% lower salary in comparison to social and related sciences; an increase of 2.9% in comparison to model 2.

Table 3.1

Variable	B	SEB	R^2	Delta R^2
Model 3			143	0.043**
Female	-0.039*	0.011		
Assistant Professor	-0.423**	0.013		
Associate Professor	-0.285**	0.012		
Engineering	-.001	0.016		
Physical and Related Sciences	-0.077**	0.015		
Computer and Math Sciences	-0.008	0.017		
Life and Related Sciences	-0.102**	0.014		
Hours Per Week Typically Worked: 21-35	-0.362**	0.025		
Hours Per Week Typically Worked: 36-40	-0.253**	0.012		
Constant	11.650	0.012		

*p<.05; **p<.001.

Table 3.2

Hours per week typically worked*Gender					
Hours per week	Female	%Female	Male	%Male	Total
21-35	198	37.86%	325	62.14%	523
36-40	966	33.20%	1944	66.80%	2910
Greater than 40	3137	37.43%	5244	62.57%	8381
Total	**4301**	36.41%	**7513**	63.59%	11814

Model 4) Gender + Rank + Discipline + Hours per Week Worked + Race/Ethnicity

Model 4 adds onto model 3 with new a demographic predictor for race/ethnicity. The omitted categories in this model were male, full professor, social and related sciences, hours per week worked: greater than 40, and White non-Hispanic race.

When the race/ethnicity variable was added to the model it significantly improved the prediction R^2change=.030 $F(4,11800)=105.937$, $p<.001$. As indicated by the R^2, 17.3% (Table 4.1.) of the variance in salary between male and female faculty can be explained by knowing faculty's gender, rank, discipline that they teach in, typical number of hours that they work per week, and race/ethnicity. The change in explained variance between model 3 and 4 is equal to 3%.

In this model female faculty salary was 5.1% lower (Table 4.1) in comparison to male faculty, and the predictor was statistically significant (p=.000). The pay gap in this model increased by 1.1% in comparison to model 3, which suggests that controlling for race/ethnicity has increased the gender pay gap. Research by Toutkoushian (1998) showed, that Hispanic men earned 4-6% less in comparison to white male faculty members while controlling for discipline and human capital characteristics. When it comes to women, white female faculty earned less than black female faculty after controlling for human capital characteristics Additional variables that are contributing to this model included assistant professor (p=.000), associate professor (p=.000), engineering (p=.008), physical and related sciences (p=.000), life and related sciences

(p=.000), hours per week worked:21-35 (p=.000), hours per week worked:36-40 (p=.000), Asian only (p=.000), Black only (p=.000), and Hispanic any race (p=.000). Computer and math sciences as well as other races including multiracial individuals' variables were not statistically significant in this model.

In this model, the excluded variable for the race/ethnicity dummy variable was White, non-Hispanic. Faculty members who identified themselves as Asian had a pay gap of 24.9% less; Black faculty earned 10.5% less; and Hispanic faculty earned 28.8% less in comparison to White faculty members. In a study conducted by Li and Koedel (2017) at selective public universities; they documented the pay gap for faculty by race. Asian faculty earned 5.5% less than White faculty members; Black faculty members earned 8% less, and Hispanic Faculty earned 12% less than the White faculty members. In addition, the representation of faculty by race/ethnicity in my sample can be seen in table 4.2. In my sample 19% of all faculty members are Asian, 4.8% are Black, 9.5% are Hispanic, 2.1% are other races and multiracial, and 64.6% are White. The percentage of female faculty varies by race/ethnicity, with 28% of Asian and 41.2% of Black faculty being women.

Assistant professors had 51.1% lower salary in comparison to full professors: a decrease (1.6%) from the previous model. At the same time associate professors had 32.6% lower salary in comparison to full professors: a slight decrease (0.4%) in the pay gap from the previous model. For the first time, the faculty teaching in engineering field had a statistically significant pay gap difference; they earned 4.3% more than faculty in social and related sciences. Faculty in physical and related sciences had 8% lower salary in comparison to social and related sciences; equal to the gap in model 3. Faculty members working in life and related sciences disciplines had 10.5% lower salary in comparison to social and related sciences; a slight decrease (0.2%) in

comparison to model 3. Faculty members who worked 21-35 hours per week, earned 40.5% less than faculty who worked more than 40 hours, a decrease by 3.1%. Faculty members who worked on average 36-40 hours per week, earned 23.6% less than faculty who worked more than 40 hours, a decrease by 5.2%.

Table 4.1.

Variable	B	SEB	R^2	Delta R^2
Model 4				
Female	-0.050**	0.011	0.143	0.030**
Assistant Professor	-0.413**	0.012		
Associate Professor	-0.282**	0.012		
Engineering	0.042*	0.016		
Physical and Related Sciences	-0.0778**	0.014		
Computer and Math Sciences	0.003	0.016		
Life and Related Sciences	-0.100**	0.014		
Hours Per Week Typically Worked: 21-35	-0.340**	0.024		
Hours Per Week Typically Worked: 36-40	-0.212**	0.012		
Asian Only, non-Hispanic	-0.222**	0.013		
Black Only, non-Hispanic	-0.100**	0.024		
Hispanic, any race	-0.253**	0.017		
Other races including multiracial individuals, non-Hispanic	0.030	0.034		
Constant	11.702	0.013		

*p<.05; **p<.001.

Table 4.2

Race/Ethnicity*Gender					
Race and Ethnicity	Female	% Female	Male	%Male	Total
Asian Only, non-Hispanic	630	27.90%	1618	71.66%	2258
Black Only, non-Hispanic	235	41.01%	335	58.46%	573
Hispanic, any race	389	34.61%	730	64.95%	1124
White Only, non-Hispanic	2934	38.21%	4691	61.10%	7678
Other races including multiracial individuals, non-Hispanic	113	44.49%	139	54.72%	254
Total	**4301**	36.18%	**7513**	63.20%	**11887**

Model 5) Gender + Rank + Discipline + Age + Hours per Week Worked + Race/Ethnicity + Employer Size

Model 5 adds onto model 4 with a new academic predictor for employer size coded as a dummy variable. The omitted categories in this model were male, full professor, social and related sciences, hours per week worked: greater than 40, White non-Hispanic race, and employer size +25,000 employees.

When employer size variable was added to the model it significantly improved the prediction R^2change=.037 $F(5,11795)=111.744$, $p<.001$. As indicated by the R^2, 21.1% (Table 5.1) of the variance in salary between male and female faculty can be explained by knowing faculty's gender, rank, discipline that they teach in, typical number of hours that they work per week, their race/ethnicity, and the size of their employer institution. The change in explained variance between model 4 and 5 is equal to 3.7%.

In this model female faculty salary was 5.2% lower in comparison to male faculty, and the predictor was statistically significant (p=.000). The pay gap in this model increased by 0.1% in comparison to model 4, after adding the employer size variable. Additional variables that were contributing to this model included assistant professor (p=.000), associate professor (p=.000), engineering (p=.020), physical and related sciences (p=.000), life and related sciences (p=.000), hours per week worked:21-35 (p=.000), hours per week worked:36-40 (p=.000), Asian only (p=.000), Black only (p=.000) and Hispanic any race (p=.000), employer size 99 or fewer employees (p=.000), employer size 100-499 employees (p=.000), employer size 500-999 employees (p=.000), employer size 1,000-4,999 employees (p=.000), employer size 5,000-24,999 employees (p=.000). Computer and math sciences and other races including multiracial individuals were once again not statistically significant in this model.

In this model, the excluded comparison variable was employer size of +25,000 employees. Faculty members working at institutions with 99 or fewer employees earned 43.5% less; faculty members working at institutions with 100-499 employees earned 31.7% less; faculty members working at institutions with 500-999 employees earned 23.1% less; faculty members working at institutions with 1000-4999 employees earned 29.4% less; faculty members working at institutions with 5000-24999 employees earned 8.8% less in comparison to the faculty members working at institutions with +25,000 employees. When it comes to the gender ratio in different sized institutions (Table 5.2) male faculty members are overrepresented in all categories except the 99 or fewer employees group, where 50% of all faculty in my sample were female. The smallest percent of female faculty in my sample was found in the institutions with 1,000-4,999 employees- only 28.02%. Once again, these findings are consistent with previous research which states that female faculty are overrepresented in smaller and less prestigious institutions (Barbezat & Hughes, 2005; Jacobs, 1996). For the purpose of my research I am assuming that the largest institutions in my sample have more resources and pay their faculty more than the smaller institutions who have smaller enrollments. However, it is important to note that many smaller institutions are also in the top rankings according to the US. News and World Report (2019), such as Princeton, Harvard, Northwestern, and Duke which have an undergraduate enrollment of under 10,000 students.

Assistant professors had 50.8% lower salary in comparison to full professors; a slight decrease (0.3%) from previous models. At the same time associate professors had 32.2% lower salary in comparison to full professors; a small decrease (0.4%) from model 4. When it comes to disciplines, faculty in physical and related sciences had 7.6% lower salary in comparison to social and related sciences; a slight decrease (0.4%) in pay gap from previous models. Faculty

teaching in engineering fields earned 3.8% more than faculty in social and related sciences, a slight decrease (0.5%) in pay gap from previous model. Faculty members working in life and related sciences disciplines had 10.6% lower salary in comparison to social and related sciences; a slight increase (0.1%) in comparison to model 4. Faculty members who worked 21-35 hours per week, earned 33.6% less than faculty who worked more than 40 hours, a decrease by 6.9%. Faculty members who worked on average 36-40 hours per week, earned 21% less than faculty who worked more than 40 hours, a decrease by 2.6%. Faculty members who identified themselves as Asian descent earned 20.2% less than White faculty members; a 4.7% decrease from previous model. Black faculty members earned 11.7% less; a slight increase (1.2%) in pay gap from previous model. Hispanic faculty earned 27.5% less in comparison to White faculty members; a 1.3% decrease from model 4.

Table 5.1

Variable	B	SEB	R^2	Delta R^2
Model 5			0.211	0.037
Female	-0.051**	0.011		
Assistant Professor	-0.411**	0.012		
Associate Professor	-0.279**	0.012		
Engineering	0.037*	0.016		
Physical and Related Sciences	-0.073**	0.014		
Computer and Math Sciences	0.007	0.016		
Life and Related Sciences	-0.101**	0.014		
Hours Per Week Typically Worked: 21-35	-0.290**	0.024		
Hours Per Week Typically Worked: 36-40	-0.191**	0.012		
Asian Only, non-Hispanic	-0.184**	0.013		
Black Only, non-Hispanic	-0.111**	0.023		
Hispanic, any race	-0.243**	0.017		
Other races including multiracial individuals, non-Hispanic	0.011	0.034		
Employer size: 99 or fewer employees	-0.361**	0.072		
Employer size: 100-499 employees	-0.275**	0.017		
Employer size: 500-999 employees	-0.208**	0.018		
Employer size: 1,000-4,999 employees	-0.258**	0.015		
Employer size: 5,000-24,999 employees	-0.084**	0.017		
Constant	11.778	0.013		

*p<.05; **p<.001.

Table 5.2

Employer Size*Gender					
Employer Size	Female	% Female	Male	%Male	Total
99 or fewer employees	27	50.00%	27	50.00%	54
100-499 employees	496	44.36%	622	55.64%	1118
500-999 employees	391	37.10%	663	62.90%	1054
1000-4999 employees	485	28.02%	1246	71.98%	1731
5000-24999 employees	382	33.13%	771	66.87%	1153
25000+ employees	2520	37.59%	4184	62.41%	6704
Total	**4301**	**36.41%**	**7513**	**63.59%**	**11814**

Model 6) Gender + Rank + Discipline + Hours per Week Worked + Race/Ethnicity + Employer Size + Year of Award of the Highest Degree

Model 6 adds onto model 5 with a new academic predictor for year of award of the highest degree coded in 5-year intervals. The omitted categories in this model were male, full professor, social and related sciences, hours per week worked: greater than 40, White non-Hispanic race, and employer size +25,000 employees.

When year of award of the highest degree variable was added to the model it significantly improved the prediction R^2change=.016 $F(1,11794)=245.664$, $p<.001$. As indicated by the R^2, 22.7% (Table 6.1) of the variance in salary between male and female faculty can be explained by knowing faculty's gender, rank, discipline that they teach in, typical number of hours that they work per week, their race/ethnicity, the size of their employer institution, and year of award of the highest degree. The increase in explained variance between model 5 and 6 is equal to 1.6%.

In this model female faculty salary was 3.4% lower in comparison to male faculty, and the predictor was statistically significant (p=.002). The pay gap in this model decreased by 1.8%

in comparison to model 5, after controlling for the year that a faculty member received his or her highest degree. In my sample, the number of female faculty members increased with the year of award of the highest degree. As more and more women are entering the previously male dominated fields the pay gap is decreasing since these fields are more highly paid. Additional variables that were contributing to this model include assistant professor (p=.000), associate professor (p=.000), engineering (p=.016), physical and related sciences (p=.000), life and related sciences (p=.000), hours per week worked:21-35 (p=.000), hours per week worked:36-40 (p=.000), Asian only (p=.000), Black only (p=.000), and Hispanic any race (p=.000), employer size 99 or fewer employees (p=.000), employer size 100-499 employees (p=.000), employer size 500-999 employees (p=.000), employer size 1000-4999 employees (p=.000), employer size 5000-14999 employees (p=.000), year of award of the highest degree (p=.000). Computer and math sciences and other races including multiracial individuals were not statistically significant in this model.

In this model, the year of award of the highest degree variable was coded at 5-year intervals; with every interval increase the salary for faculty member decreased by 1% after controlling for rank, discipline, hours per week worked, race/ethnicity, employer size and year of award of the highest degree. When looking at gender composition and the year of award of the highest degree, there was a steady increase in percent of women with time. Between 1960-1969 only 6.25% (Table 6.2) of all faculty receiving their Ph.D. in my sample were female. Faculty members receiving their Ph.D. in 2015 or later were mostly female- 51.92%. This finding is once again on par with previous research that showed an increase of women holding doctoral degrees in sciences (Okahana & Zhou, 2018).

Assistant professors had 24.9% lower salary in comparison to full professors; a decrease by 25.9% from model 5. At the same time associate professors had 19.6% lower salary in comparison to full professors; a decrease by 12.6% from previous model. When it comes to disciplines faculty members in engineering had 3.8% higher salary in comparison to faculty in social and related sciences; on par with model 5. Faculty in physical and related sciences had 8.1% lower salary in comparison to social and related sciences; an increase in pay gap by 0.5% from previous model. Faculty members working in life and related sciences disciplines had 11.9% lower salary in comparison to social and related sciences; an increase by 1.3% in comparison to model five. Faculty members who worked 21-35 hours per week, earned 36.2% less than faculty who worked more than 40 hours, an increase by 2.6%. Faculty members who worked on average 36-40 hours per week, earned 20.4% less than faculty who worked more than 40 hours, a decrease by 0.6%. Faculty members who identified themselves as Asian descent earned 17 % less than White faculty members; a 3.2% decrease from previous model. Black faculty members earned 11.2% less; a decrease by 0.5% from model five. Hispanic faculty earned 24 % less in comparison to White faculty members; a 3.5% decrease from model five. When it comes to employer size, the excluded comparison variable was employer size of +25,000 employees. Faculty members working at institutions with 99 or fewer employees earned 43% less, a decrease by 0.5% from the previous model; faculty members working at institutions with 100-499 employees earned 30.3% less, a decrease by 1.4% from previous model; faculty members working at institutions with 500-999 employees earned 22.5% less, a slight decrease by 0.6% from previous model; faculty members working at institutions with 1000-4999 employees earned 29% less, a 0.4% decrease from model five; faculty members working at institutions with

5000-14999 employees earned 8.5% less in comparison to the faculty members working at institutions with +25,000 employees, a slight 0.3% decrease from previous model.

Table 6.1

Variable	B	SEB	R^2	Delta R^2
Model 6				
Female	-0.033*	0.010	0.227	.016**
Assistant Professor	-0.222**	0.017		
Associate Professor	-0.179**	0.013		
Engineering	0.037*	0.016		
Physical and Related Sciences	-0.078**	0.014		
Computer and Math Sciences	-0.002	0.016		
Life and Related Sciences	-0.112**	0.014		
Hours Per Week Typically Worked: 21-35	-0.309**	0.024		
Hours Per Week Typically Worked: 36-40	-0.186**	0.011		
Asian Only, non-Hispanic	-0.157**	0.013		
Black Only, non-Hispanic	-0.106**	0.023		
Hispanic, any race	-0.215**	0.017		
Other races including multiracial individuals, non-Hispanic	0.036	0.033		
Employer size: 99 or fewer employees	-0.358**	0.071		
Employer size: 100-499 employees	-0.265**	0.017		
Employer size: 500-999 employees	-0.203**	0.017		
Employer size: 1,000-4,999 employees	-0.255**	0.014		
Employer size: 5,000-24,999 employees	-0.082**	0.017		
Year of award of the highest degree	-0.010**	0.001		
Constant	31.844	1.280		

*p<.05; **p<.001.

Table 6.2

Year of award of the highest degree*Gender					
Year	Female	% Female	Male	% Male	Total
1960-1969	3	6.25%	45	93.75%	48
1970-1974	34	16.04%	178	83.96%	212
1975-1979	77	18.16%	347	81.84%	424
1980-1984	169	21.89%	603	78.11%	772
1985-1989	293	25.13%	873	74.87%	1166
1990-1994	446	30.84%	1000	69.16%	1446
1995-1999	574	36.17%	1013	63.83%	1587
2000-2004	750	41.25%	1068	58.75%	1818
2005-2009	948	43.51%	1231	56.49%	2179

2010-2014	953	46.31%	1105	53.69%	2058
2015 or later	54	51.92%	50	48.08%	104
Total	**4301**	36.41%	**7513**	63.59%	11814

Model 7) Gender + Rank + Discipline + Hours per Week Worked + Race/Ethnicity + Employer Size + Year of Award of the Highest Degree + Number of Weeks Worked per Year

Model 7 adds onto model 6 with a new demographic predictor for number of weeks worked per year. The omitted categories in this model were male, full professor, social and related sciences, hours per week worked: greater than 40, White non-Hispanic race and employer size +25,000 employees.

When number of weeks worked per year variable was added to the model it significantly improved the prediction R^2change=.003 $F(1,11793)=48.216$, $p<.001$. As indicated by the R^2, 23% (Table 7.1) of the variance in salary between male and female faculty can be explained by knowing faculty's gender, rank, discipline that they teach in, typical number of hours that they work per week, their race/ethnicity, the size of their employer institution, the year that they received their highest degree, and number of weeks worked per year. The change in explained variance between model 6 and 7 is equal to 0.3%.

In model 7, the female faculty salary is 3.7% lower in comparison to male faculty, and the predictor is statistically significant (p=.001). The pay gap in this model increased by 0.3% in comparison to model 6, after controlling for the number of weeks that faculty member is working per year. Additional variables that were contributing to this model include assistant professor (p=.000), associate professor (p=.000), engineering (p=.020), physical and related sciences (p=.000), life and related sciences (p=.000), hours per week worked:21-35 (p=.000), hours per week worked:36-40 (p=.000), Asian only (p=.000), Black only (p=.000), Hispanic any race

(p=.000), employer size 99 or fewer employees (p=.000), employer size 100-499 employees (p=.000), employer size 500-999 employees (p=.000), employer size 1000-4999 employees (p=.000), employer size 5000-14999 employees (p=.000), and number of weeks worked per year (p=.000). Computer and math sciences and other races including multiracial individuals were not statistically significant in this model.

In this model, the number of weeks worked per year was coded as a number, where one unit equals to one week; with one unit increase in number of weeks worked the salary decreased by 0.1%. Female faculty members are underrepresented in all categories except for working between 26-30 weeks a year, where female faculty members account for 47.3% (Table 7.2). The two largest groupings of faculty were in 36-40 weeks and 52 weeks. 5,417 faculty members worked between 36-40 weeks per year and 39.2% of that faculty were women and 60.8% were men. 5,217 faculty members working the full 12 months and 32.6% were women while 67.4% were men.

Assistant professors had 25.2% lower salary in comparison to full professors; an increase by 0.3% from model 6. At the same time associate professors had 19.8% lower salary in comparison to full professors: an increase by 0.2% from the previous model. When it comes to disciplines faculty members in engineering fields had 3.7% higher salary in comparison to faculty to social and related sciences; a decrease by 0.1% from model 6. Faculty in physical and related sciences had 8.4% lower salary in comparison to social and related sciences; an increase in pay gap by 0.3% from previous model. Faculty members working in life and related sciences disciplines had 11% lower salary in comparison to social and related sciences; a decrease by 0.9% in comparison to model 6. Faculty members who worked 21-35 hours per week, earned 35.1% less than faculty who worked more than 40 hours, a decrease by 1.1%. Faculty members

who worked on average 36-40 hours per week, earned 19.8% less than faculty who worked more than 40 hours, a decrease by 0.6%. Faculty members who identified themselves as Asian descent earned 15.5% less than White faculty members; a 1.5% decrease from previous model. Black faculty members earned 10.4% less; a decrease by 0.8% from model 6. Hispanic faculty earned 22.6% less in comparison to White faculty members; a 1.4% decrease from model 6. When it comes to employer size, the excluded comparison variable was employer size of +25,000 employees. Faculty members working at institutions with 99 or fewer employees earned 39.1% less, a decrease by 3.9 % from the previous model; faculty members working at institutions with 100-499 employees earned 29.6% less, a decrease by 0.7% from previous model; faculty members working at institutions with 500-999 employees earned 20.8% less, a decrease by 1.7% from previous model; faculty members working at institutions with 1,000-4,999 employees earned 25.9% less, a 3.1% decrease from model 6; faculty members working at institutions with 5,000-14,999 employees earned 6.3% less in comparison to the faculty members working at institutions with +25,000 employees, a 2.2% decrease from the previous model. The year of award of the highest degree variable was coded as 5-year intervals; with every interval increase the salary for faculty member decreases by 1%, which stayed constant from the previous model.

Table 7.1

Variable	B	SEB	R^2	Delta R^2
Model 7				
Female	-0.036*	0.010	0.23	.003**
Assistant Professor	-0.225**	0.017		
Associate Professor	-0.181**	0.013		
Engineering	0.036*	0.016		
Physical and Related Sciences	-0.081**	0.014		
Computer and Math Sciences	-0.000	0.016		
Life and Related Sciences	-0.104**	0.014		
Hours Per Week Typically Worked: 21-35	-0.301**	0.024		
Hours Per Week Typically Worked: 36-40	-0.181**	0.011		
Asian Only, non-Hispanic	-0.144**	0.013		

Black Only, non-Hispanic	-0.099**	0.023
Hispanic, any race	-0.204**	0.017
Other races including multiracial individuals, non-Hispanic	0.037	0.033
Employer size: 99 or fewer employees	-0.330**	0.071
Employer size: 100-499 employees	-0.259**	0.017
Employer size: 500-999 employees	-0.189**	0.017
Employer size: 1,000-4,999 employees	-0.230**	0.015
Employer size: 5,000-24,999 employees	-0.061**	0.017
Year of award of the highest degree	-0.010**	0.001
Number of weeks worked per year	-0.001	0.000
Constant	31.977	1.278

*p<.05; **p<.001.

Table 7.2

Number of weeks worked per year*Gender					
# of weeks	Female	% Female	Male	%Male	Total
26-30	43	47.3%	48	52.7%	91
31-35	89	42.2%	122	57.8%	211
36-40	2126	39.2%	3291	60.8%	5417
41-45	295	42.3%	402	57.7%	697
46-50	68	34.0%	132	66.0%	200
52	1699	32.6%	3518	67.4%	5217
Total	4320	36.5%	7513	63.5%	11833

To what extent is there a pay gap after controlling for academic, demographic and family factors?

Model 8) Gender + Rank + Discipline + Hours per week worked + Race/Ethnicity + Employer size + Year of award of the highest degree + Number of weeks worked per year + Children

Model 8 adds onto model 7 with new family predictor for having children under 18-years of age that was coded as dummy variable. The omitted categories in this model were male, full

professor, social and related sciences, hours per week worked: greater than 40, White non-Hispanic race, employer size +25,000 employees, and not having children.

When having children living in the household under 18-years of age variable was added to the model it significantly improved the prediction R^2change=.004 $F(1,11792)=65.677$, $p<.001$. As indicated by the R^2, 23.4%(Table 8.1) of the variance in salary between male and female faculty can be explained by knowing faculty's gender, rank, discipline that they teach in, typical number of hours that they work per week, their race/ethnicity, the size of their employer institution, the year that they received their highest degree, number of weeks worked per year, and whether they have children or not. The change in explained variance between model 7 and 8 was equal to 0.4%.

In the final model female faculty salary is 3% lower in comparison to male faculty, and the predictor was statistically significant (p=.004). The pay gap in this model decreased by 0.3% in comparison to model 7, after controlling for children living in the household under 18-years of age, which suggests that having children had significant influence on the gender pay gap for women. Additional variables contributing to this model included assistant professor (p=.000), associate professor (p=.000), engineering (p=.044), physical and related sciences (p=.000), life and related sciences (p=.000), hours per week worked:21-35 (p=.000), hours per week worked:36-40 (p=.000), Asian only (p=.000), Black only (p=.000), Hispanic any race (p=.000), employer size 99 or fewer employees (p=.000), employer size 100-499 employees (p=.000), employer size 500-999 employees (p=.000), employer size 1000-4999 employees (p=.000), employer size 5000-14999 employees (p=.000), and number of weeks worked per year (p=.000) and having children living in the household under 18-years of age (p=.000). Computer and math

sciences and other races including multiracial individuals were not statistically significant in this model.

Faculty members who had children under 18 years of age earned 8.4% more than faculty who did not have children. Research suggests that female faculty members who have children will earn less in comparison to female and male faculty members without children and even male faculty members with children; they are also less likely to achieve tenure and receive promotion (Carr et al., 1998; Fox et al., 2006; Gouldern et al., 2009; Mason et al., 2009; Martinez et al., 2017). In my sample 5,228 faculty members (44.25%) (Table 8.2.) identified themselves as having children under the age of 18. When it comes to female faculty members, 40.99% had children under the age of 18 living with them, while 59.01% of female faculty did not. For male faculty members 46.12% of all men had children, while 53.88% did not. It is important to note that from all faculty who had children 66.28% were men and 33.72% were women. This gender disparity can explain why faculty members who have children will earn 8.4% more, as majority are men who already earn more in comparison to women.

Assistant professors had 23.1% lower salary in comparison to full professors: a decrease by 2.1% from model seven. At the same time associate professors had 19.6% lower salary in comparison to full professors: a decrease by 0.2% from the previous model. When it comes to disciplines faculty members in engineering fields had 3.1% higher salary in comparison to faculty to social and related sciences; a decrease by 0.6% from model 7. Faculty in physical and related sciences had 8.9% lower salary in comparison to social and related sciences; an increase in pay gap by 0.5% from previous model. Faculty members working in life and related sciences disciplines had 11.5% lower salary in comparison to social and related sciences; an increase by 0.5% in comparison to model seven. Faculty members who worked 21-35 hours per week,

earned 35.5% less than faculty who worked more than 40 hours, an increase by 0.4%. Faculty members who worked on average 36-40 hours per week, earned 20.4% less than faculty who worked more than 40 hours, an increase by 0.6%. Faculty members who identified themselves as Asian descent earned 15.4% less than White faculty members; a slight decrease from previous model (0.1%). Black faculty members earned 10.2% less; a decrease by 0.2% from model seven. Hispanic faculty earned 22.5% less in comparison to White faculty members; a 0.1% decrease from model 7. When it comes to employer size, the excluded comparison variable was employer size of +25,000 employees. Faculty members working at institutions with 99 or fewer employees earned 38.1% less, a decrease by 1% from the previous model; faculty members working at institutions with 100-499 employees earned 30.1% less, an increase by 0.5% from previous model; faculty members working at institutions with 500-999 employees earned 21.3% less, an increase by 0.5% from previous model; faculty members working at institutions with 1,000-4,999 employees earned 26.2% less, a 0.3 increase from model seven; faculty members working at institutions with 5,000-14,999 employees 6.6% less in comparison to the faculty members working at institutions with +25,000 employees, a 0.3% increase from previous model. The year of award of the highest degree variable was coded at 5-year intervals; with every interval increase the salary for faculty member decreased by 1.1%, which stayed constant from the previous model, which increased by 0.1% from previous model. Finally, the number of weeks worked per year was coded as a number, where one unit equals to one week; with one unit increase in number of weeks worked the salary decreased by 0.1%, which stayed constant from previous model.

Table 8.1

Variable	B	SEB	R^2	Delta R^2
Model 8				
Female	-0.030*	0.010	0.234	.004**
Assistant Professor	-0.208**	0.017		
Associate Professor	-0.179**	0.013		
Engineering	0.031*	0.015		
Physical and Related Sciences	-0.085**	0.014		
Computer and Math Sciences	-0.004	0.016		
Life and Related Sciences	-0.109**	0.014		
Hours Per Week Typically Worked: 21-35	-0.304**	0.024		
Hours Per Week Typically Worked: 36-40	-0.186**	0.011		
Asian Only, non-Hispanic	-0.143**	0.013		
Black Only, non-Hispanic	-0.097**	0.023		
Hispanic, any race	-0.203**	0.017		
Other races including multiracial individuals, non-Hispanic	0.038	0.033		
Employer size: 99 or fewer employees	-0.323**	0.071		
Employer size: 100-499 employees	-0.263**	0.017		
Employer size: 500-999 employees	-0.193**	0.017		
Employer size: 1,000-4,999 employees	-0.233**	0.015		
Employer size: 5,000-24,999 employees	-0.064**	0.017		
Year of award of the highest degree	-0.011**	0.001		
Number of weeks worked per year	-.001	0.000		
Children-Yes	0.81	0.010		
Constant	34.272	1.305		

*p<.05; **p<.001.

Table 8.2

Faculty with children under 18 years of age*Gender					
Gender	Yes	% Yes	No	% No	Total
Female	1763	40.99%	2538	59.01%	4301
Male	3465	46.12%	4048	53.88%	7513
Total	**5228**	44.25%	**6586**	55.75%	11814

Chapter 5: Conclusions Discussion and Future Considerations

"When we pay women less than men, we're telling women their work isn't as valuable. We're all equally valuable. And we should be paid equally" Maria Shiver (Shiver, n.d. para. 6). Maria Shiver is an American journalist, author, founder of nonprofit organizations, and the former First Lady of California ("Mariashiver.com", n.d.).

The goal of this dissertation research was to examine the differences in salaries between male and female faculty members in SHE fields while controlling for academic, demographic, and family factors. More specifically, the goal was to examine the following research questions.

1. What are the salary patterns among full-time faculty in SHE fields?
2. To what extent is there a pay gap after controlling for academic and demographic factors?
3. To what extent is there a pay gap after controlling for academic, demographic, and family factors?

The purpose of this chapter is to take the results from each of the multiple regression analyses and place the results in the perspective of previous research and to conclude how this study has improved the existing body of research on gender pay gap in higher education setting. This chapter is organized as follows: key finding with discussions will be presented first, followed by the conclusion and future considerations for policies and research.

The pay gap between male and female faculty members in academia varied based on academic factors that were included in my analyses. When controlling for rank only, female faculty members earned 2.9% less than male faculty members. However, when taking into consideration all academic, demographic, and family variables such as: rank, discipline, hours per week worked, race/ethnicity, employer size, year of award of the highest degree, and number

of weeks worked per year the pay gap increased to 3.7%. It is important to note that there was a consistent and statistically significant pay gap for female faculty members across all eight models. This pay gap showed that there is a statistically significant difference between salaries for men and women in academia in SHE fields when controlling for demographic, academic and family variables, however this percent is smaller than the average of 15% more that male full professors earned in 2014 (Hatch, 2017). It is important to note that this gap is across all colleges (more than 4,500 institutions were included and disciplines, controlling for rank only). This smaller gap may be attributed to several factors: the gender pay gap in SHE fields is slowly decreasing, because faculty in my sample were working in higher paying disciplines the gender pay gap is smaller due to the elimination of discipline pay disparity issue, or female faculty in my sample may be already highly competitive and successful since they were able to enter the predominately male field.

The pay gap for female faculty members in SHE fields still exists today, most of the gap can be explained by looking at the academic, demographic, and family factors. However, there still remains portion of the gap that cannot be explained by the differenced in, academic, demographic, or family factors. These findings are consistent with other studies which show that gender pay gap still exists in academia (Barbezat and Hughes, 2005; Feder, 2017; Hill, 2015; Luna, 2006; Nadler et al, 2016; Perna, 2003; Renzulli et al, 2013; Umbach, 2007). Its important to note that women may have additional barriers preventing them from obtaining the same levels of human capital as men since USA is still a patriarchal society. The childcaring, family, and domestic responsibilities may block women from attaining job experience, producing more research, receiving large research funds, or securing sought after positions and promotion.

Subsequently, many times women must choose whether they will be a great parent or a great researcher; a choice that male faculty seldom have to choose between.

The pay gap between male and female faculty members in my sample after controlling for academic, demographic, and family factors was still statistically significant after controlling for family characteristics. Interestingly the pay gap for female faculty members after controlling for all the factors increased slightly by 0.1%. When controlling for all demographic and academic variables female faculty members earned 3.7% less than their male counterparts, however after adding the family variable into the regression model the pay gap decreased to 3%, which suggests that having children does have a significant influence on the pay gap for women.

The unexplained portion of the pay gap may be used as an evidence of gender discrimination, as faculty who are somewhat equivalent are receiving different compensation for reasons that cannot be explained by human capital attributes. It is important to note that the extent to which this unexplained gap can be contributed to discrimination, relies on the differences on productivity on which I did not possess detailed data. Additionally, scientists might never be able to identify the precise mechanism or formula on how to measure the individual characteristics that may be unobservable or are inaccurately measured and therefore are not showing the true pay gap.

Practical Considerations and Implications

It is not enough to acknowledge that the gender pay gap exists, it is important to take action in order to reduce it and in the end to eliminate it. In 1963, John F. Kennedy signed the Equal Pay Act stating that there shall be no pay discrimination based on gender ("Equal Pay Act of 1963", n.d.). 56 years after the signing of the Equal Pay Act, the gender pay gap still exists; the good news is that it is smaller than it was, as female faculty salaries are starting to increase.

According to Chronicle of Higher Education in 2015 faculty salaries increased 2.8% from the previous year, and specifically female salaries increased by a slightly higher rate of 3% (Hatch, 2017). However, since male faculty members already have higher salaries than female faculty the pay gap either increased or stayed the same (Hatch, 2017). It is important to note that the pay gap is slowly decreasing, the results of my study show that female faulty members in SHE fields earn on average 2.8% less when controlling for the academic, demographic, and family variables.

The first step to reduce the gender pay gap in academia and other workplaces in America is to conduct a salary study and give women who were paid less because of their gender-a pay rise. Some of the institutions that conduced a quantitative study of faculty salary include the University of Virginia, University of Minnesota, University of Maine, Texas A&M University, University of Wisconsin at Madison, and the University of California system (Turner et al., 2014). University of California Irvine is one of the institutions that created a large number of programs in order to combat the gender pay gap, starting with an annual pay equity analysis of faculty salaries (1996-present), a career equity review policy that addresses the issues of rank and academic achievement, and lastly the ADVANCE initiative which provides funding for tenure track female faculty in the STEM fields ("University of California Irvine Website", n.d.). These programs successfully increased the number of female faculty members in STEM fields from 20% in the 1990's to 34% in 2014, as well as indicating that there is no evidence of pay disparity based on gender and/or race when controlling for experience, discipline, and rank ("University of California Irvine Website", n.d.). Notably the University of Michigan conducted regular studies of faculty pay equity every 5 years since 1999. University of Virginia conducted a first study in 1992 then 1999 and the following in 2012 (Turner et al., 2014). The latest study

found that there was a statistically significant pay gap for female faculty in the associate and full professors rank, and the recommendation of the task force committee was to conduct a careful qualitative assessment of individual faculty salary by deans and department chairs in order to ensure a fair compensation; as well as continue to schedule periodic reviews of faculty salaries and review different institutional practices that may affect faculty success (Turner et al., 2014). However, in the 2018-19 academic year female faculty members still earned on average $33,939 less than male faculty (Wilson, 2019). The University of Wisconsin-Madison conducted its first salary study in 1990 and provided a plan for salary adjustment for female faculty in 1993 ("Guidelines for Implementing Faculty Salary Equity Review", n.d). The Faculty Senate also established a periodic pay equity review. In 2002-2003 the policy was modified to include the review of any faculty member who experienced salary inequity, the review happens in the third year of the probationary period, during promotion to the associate or full professor rank and at each of the five year post-tenure reviews, as well as at a written request from a faculty member ("Guidelines for Implementing Faculty Salary Equity Review", n.d).

It is imperative to find out why a female faculty member with the same amount of experience and same rank is being compensated less than a male faculty member in the same department. It is essential, when hiring employees to give men and women equal salaries for the same or similar type of work. Women should be provided with similar or equal working conditions at their workplaces. For example, in 1999 Massachusetts University of Technology (MIT) came out with a work study after prompting from female faculty comparing working conditions of women and men and what to do to make it fairer (Feder, 2017).

Another solution to aid closing the gender pay gap, is to reexamine the differences in the starting salaries of female and male professors. Interestingly, among new faculty in my study

there was still a pay gap between male and female faculty. Female faculty members who earned their doctoral degree in 2015 and later earned a median of $65,000, while male faculty earned $68,500 (difference of $3,500). Female faculty members had lower salary in all the disciplines, except physical and related sciences and engineering, where they earned more than male faculty members. This finding may suggest that there may still be inequality when it comes to hiring female faculty members and overrepresentation of female faculty in lower paying disciplines within the SHE fields.

Institutions should conduct salary studies in order to reevaluate the pay differences between men and women working in the same departments with similar experiences and credentials in order to provide appropriate, one-time raises to make the pay equal and continue scheduled salary studies to check the pay equities. Finally, the starting salary for new hires, for both men and women should be somewhat equal for similar responsibilities, and not influenced by gender. The different hiring procedures and pay should be reassessed by the department, Dean, and the Human Resources Department in order to ensure that there is no unintentional discrimination based on gender. It is important to also educate the hiring committees on the gender pay gap and discuss with them what can be done to prevent it.

Results from my study show that faculty members with children earned 8.4 % more than faculty members who did not have children under 18 years of age living with them. It is important to note that from all faculty in my sample that had children majority (66.3%) were men who already have higher salaries in comparison to women, and therefore can skew the data by inflating female faculty member salaries, as well I am looking at a very specific sample in only 5 disciplines. Even with these hopeful results it is prudent to remember that female faculty earned 3% less after controlling for all the demographic, academic, and family characteristics. It

is important for the United States to put its efforts into providing a better parental leave as well better family support; as the national data shows that female employees with children get paid 71 cents for every dollar that male employee with children gets paid ("NWLC", 2017).

In order to help mothers, succeed in their career, institutions of higher education should become more family friendly workplaces by expanding policies that can integrate work and family responsibilities (Blau & Kahn, 2017). Institutions could provide day care centers, babysitting services, or provide a list of lower cost childcare facilities for their faculty, which would be especially beneficial for mothers with children under the age of three, who many times are forced to stay home with their children, because traditional day care may be too expensive or do not provide flexible enough hours. Faculty members can have non-traditional work hours ranging from 8 AM to 9 PM or later at night and their schedules change each semester. Not many daycares provide such long hours or allow for schedule flexibility. The convenience of having a daycare at their workplace would not only allow women to return to work sooner after having children (if they choose to), but also provide a happier workplace and lessen the burden of worrying about childcare from female faculty members. The female faculty member would no longer have to worry about running late to pick up her child from private childcare and instead, she would be able to visit her child between classes. For some institutions, it may be difficult to find the necessary extra funding in their budget, in this case the state, or even the town could provide additional incentives or funding to help subsidize the high cost of childcare by providing discounts for faculty members. As institutions of higher education provide many benefits not only to the state but to the municipality that it is located in, by providing jobs, help creating a better-prepared workforce, help build civic infrastructure, attract new businesses to their neighborhood and raise academic performance, as well as pursuit of knowledge and help solve a

variety of public issues ("What Should Universities do for their Cities?", 2012). It is important to note that for a large number of institutions, especially top research universities who have large endowments and plenty of resources that could be used to provide free or reduced cost childcare services to their employees. On-site childcare services could also provide employment or internship experiences for qualified undergraduate and graduate students majoring in children education or counseling, this could reduce the cost for smaller institutions that may have smaller budgets.

The next step to reduce the maternal discrimination of women by employers is to provide a longer parental leave available to both women and men. If men can take parental leave as well, it will allow women to return to work earlier without worrying about childcare issues. For example, in Sweden parents are entitled to 480 days of paid parental leave in which each partner is able to use 240 days (Akinmade-Åkerström, n.d.). In order to promote gender equality the Swedish government enforced that each parent has 90 days exclusively reserved for him or her and cannot be transferred to the other partner; this in turn promotes more fathers taking parental leave and spending time with his child or children (Akinmade-Åkerström, n.d.).

Women in academia are also known to do more service than male professors who usually dedicate more time to teaching and research. A study conducted by Guarino and Borden (2017) finds that women performed about 30 more minutes of service per week; however, the service many times is overlooked when a faculty member is applying for tenure and/or promotion. If women are spending more of their limited time on service to the institution, they will not be able to spend that time teaching or doing research and therefore they are decreasing their chances for promotion. In order to prevent women from taking on the larger chunk of service, the department chairs, dean,s and administrators should reevaluate how the service assignments are being

distributed and more importantly look at the gender distribution of the work. Another possibility is to increase the value of service when it comes to promotion. If women are being expected to put in more service hours for their institution whether mentoring students, attending committee meeting, administrative work etc. then the service should be more valued and appreciated. The fact that the service for the university is not being valued enough in the rank and tenure promotion system should be reevaluated. There should be a larger significance placed on the service and teaching responsibilities when it comes to the decision of whether to promote the faculty member. This in turn would help more women receive their promotion and raise in ranks which in turn would reduce the pay gap. Nonetheless, institutions of higher education should also create mentoring and other support programs in order to encourage and promote women and their scholarship and also encourage men to spend more time on service, and therefore fairly divide the different assignments between faculty.

Institutions of higher education can also provide additional support to female faculty members in order to help them succeed in the workplace. For example, they can promote women's conferences that not only help to develop solutions to the gender pay gap issue, but also provide women with support and education on how to succeed in academia. Academia can also enforce the existing laws that govern fair pay and set example to others by paying men and women equally. Additionally, they should develop additional policies of equal work equal pay. They can also hire more women for the top paying leadership positions in the institution as well as help as support female mentorship programs and foster a culture of equality within the institution where women are seen as equals and not inferior to men. Research by Flabbi et al., (2019) shows that female executives decrease the wage-gap for women in the top 25% positions, by better assessing the qualities of female employees and assigning them more demanding tasks

that go in par with their abilities, and in the end boosting the company's performance as well. Organizations should strive to a future where people are treated equally no matter their race, culture, ethnicity, nationality, and gender!

In order to truly eliminate or narrow the gender pay gap, women faculty themselves can take several initiatives to empower themselves and their female colleagues by educating themselves through different seminars, workshops, and female support groups regarding their rights and privileges. Female faculty should also try to apply for positions in power such as dean, department chair, etc. as well as for the more selective and coveted tenure track positions. According to research by Finkelstein, Conley and Schuster (2016) that percent of female faculty increased significantly between 1993 and 2013, from 38.6% to 49%, however the proportion of all women faculty who are tenured declined from 20% in 1993 to 16% in 2013; and female faculty who are on tenure track declined from 13% to 8% respectively. At the same time the percent of female faculty in part-time position increased from 48% in 1993 to 56% in 2013. Female faculty who are already in positions of power and have resources should strive to hire more women, but also to mentor women to become future leaders and help them with the tenure and promotion process.

All these proposed solutions will require time and resources from universities, however these changes will provide a happier and more equal workplace and it would be important for learning institutions to be the first group to make the gender pay gap disappear, as they are the home of the mind and where future generations are learning. Gender pay gap is a very difficult topic, and many institutions don't know how to tackle it, however it is important to remember that even small change can make a large difference and it is important to continue to study the gender pay gap in changing times where female voices are being heard.

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