Researching Pay Inequalities: A Preliminary Study on the University of Colorado Boulder's Gender Pay Gap

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Introduction

Women have consistently faced various forms of oppression, one of which has been everlasting pay inequalities in the workplace. As these discrepancies have persisted, many scholars have researched and continue to study these inequalities through various frameworks. These frameworks have led to vast differences in conclusions on discrimination and types of discrimination that women face. Throughout this analysis, I will be demonstrating the historical use of these frameworks. Utilizing two prominent frameworks, I will be performing a preliminary study on the gender pay inequalities at the University of Colorado Boulder.

Why it matters

The gender pay gap is an especially important area of study because what we pay individuals represents the value we place on them as a society. When we place lower value on individuals due to their gender, race, ethnicity, ability, etc., we are reproducing inequalities and oppressing these individuals. By studying the gender pay gap we can begin to understand where these forms of discrimination are occurring and start to understand how we can restructure our society in order to value all individuals equally. Not only does the undervaluing of certain groups in the workplace reflect their value in society's eyes, it has also been linked to decreased productivity and economic growth, and to lower labor force participation (Equitable Growth, 2017). It is important to study the frameworks of analysis scholars and researchers are using in order to 1) understand and examine the gaps in knowledge, and 2)rectify them.

Equal Pay for Equal Work

A common approach for studying the gender pay gap is looking at equal pay for equal work. Equal pay for equal work is defined as the idea that all individuals within the same workplace should be given equal pay for the same amount of work regardless of their identities. In 1963, the United States passed a federal law requiring the implementation of this idea. While studying the pay gap, many prominent scholars (Sanborn 1964; Fuchs 1989; Bolotnyy & Emanuel 2018; Filer 1983; Oaxaca 1973) focus on equal pay for equal work to eliminate any external factors that may play into pay differences. Analysis of wages and pay can be extremely complex. These scholars strive to reduce the difference between workers to gender alone. Occasionally they will factor in race. These prominent researchers use the ideology of equal pay for equal work to determine whether there are gaps in pay based on gender.

Keeping factors such as job title, industry, and time-worked consistent allows for a comparison between men's and women's salaries, revealing employer based pay discrepancies between men and women. When discussing equal work for equal pay, unless told otherwise, scholars hold industry, job title/occupation, and time worked constant. Studying the gender pay gap from this lens is very common, but can bring about other issues. One of the most common problems scholars encounter is deciding which factors to hold constant in order to isolate the impact of an employee's gender. Sanborn (1964) looked at equal pay for equal work while controlling for education, age, and race. This allowed him to control data for 262 detailed occupations. Sanborn estimates the upper limit of pay discrepancies by employers against employees based on gender is less than 10% (Sanborn 1964, 546-7). He concluded that employer-based

discrimination is unlikely to account for the significant income differences between men and women.

Following the scholar Sanborn, Fuchs examined the 1970 census to study remaining gender inequities decades after anti-discrimination legislation and significant cultural shifts (Fuchs 1989, 26). Fuchs' examination was completed decades after Sanborn's, and unlike Sanborn, he acknowledged that social structures have shifted around women in the workforce. Fundamental shifts that he noted include an increase in women receiving higher education, an increase in divorce rates, an increase in the number of single mothers, and the continuation of women doing the majority of household work (Fuchs 1989, 25). His work, like Sanborn's, includes racial data, but lacks a complete intersectional analysis that would thoroughly examine the impacts of race on gender discrimination in the workplace. Nonetheless, he not only concluded that employers remained prejudiced against women in the workplace, but that gender discrimination is twice as pronounced as racial discrimination when looking at equal pay for equal work in the labor market (26).

Fuchs explains that employer based discrimination between gendered job placements works to exploit women, by driving down women's wages in order for the employer to make above-normal profits (27). Fuchs' work looking at equal pay for equal work counters Sanborn's claim that employer-based discrimination is not as prevalent and suggests that employer-based gender discrimination may be used as a tool to drive higher profits. The pay gap is due to various factors such as sex segregation, socialization, work-family balance, discrimination, and employers specifically discriminating between men and women's job assignments. However, Fuchs also supports claims that align with Sanborn's findings. For example, he found that other

forms of discrimination such as sex segregation have a more significant effect on women's earnings.

Sanborn’s and Fuchs' results show that increasing the number of factors held constant will demonstrate a smaller pay gap when examining equal pay for equal work. This outcome aligns with Sanborn's argument that discrimination based on gender by employers is relatively low and, supported by Fuchs' work, that other factors make up a more significant portion of the pay gap. Another relevant scholar in this argument is Oaxaca, whose 1973 study, "Male-Female Wage Differentials in Urban Labor Markets", investigated the influences of culture, tradition, and discrimination as factors that limit women's pay and restrict participation in the labor force. Holding constant race, age, years of schooling completed, and potential experience, Oaxaca found the sex differential in pay to be quite large. However, unequal pay for equal work makes up a small percentage of this gap. These scholars explain that the gap is primarily caused by the high concentration of women in low 'dead-end' jobs, those with room for little or no advancement (708). Oaxaca concludes that the differences in past experiences and the short work-life expectancy of women lead to discrimination of women in higher-paying jobs which will later become known as the "glass ceiling." Although using different data sets, and separated by ten years, Oaxaca and Fuchs reached similar conclusions -- that sex-segregated jobs are more significant factorwhen looking at the gender pay gap. Oaxaca, Fuchs, and Sanborn all found the concept of unequal pay for equal work to contribute minimally to the larger issue of gender discrimination in pay.

Equal pay for equal work as a research area focuses specifically on discrimination women and minorities face from their direct employers. This framework attempts to

analyze the differences between men and women of the same status by holding many variables constant. While scholars are still discussing what factors to hold constant to pinpoint the numerical gap most accurately, variables that are always held constant when working with this framework are employer, industry, job title, occupation, and time worked. Academics utilizing this framework typically argue that one cannot compare men and women in different jobs because it will give an inaccurate representation of discrimination in the labor market. However, these scholars also argue that employer-based discrimination is relatively low and that further studies should look into sex segregation in the labor market as a more impactful source of discrimination. While the concept of equal pay for equal work has been essential in the history of analyzing the gender pay gap, its smaller impact has led many to study the seemingly larger issue of sex segregation in the labor markets, and the influence it has on gender-based discrimination in the labor market.

Sex Segregation in the Labor Market

Sex segregation within the labor market means that men or women predominantly hold jobs in certain occupations. For example, childcare workers are predominantly women, whereas most pilots are men. Examing sex segregation is essential when researching the pay gap, especially when looking at the highest- and lowest-paying occupations. The Washington Center for Equitable Growth 2017 study, *Occupational Segregation in the United States,* examined occupational segregation and provided relevant statistics for the highest and lowest-paying jobs based on data from the United States Bureau of Labor Statistics. Figure 1.0 *(shown below)* shows the gender composition of the highest- and lowest-paying occupations. The graphic clearly

demonstrates that men are predominantly concentrated in higher-paying occupations, whereas women are more highly concentrated in lower-paying occupations. The Washington Center's and Blau and Kahn's (The Gender Wage Gap, 2016) work both show that nearly half of the pay gap since 1980 has been due to women working in different occupations and industries than men, while gender discrimination itself accounts for another 38% of the gap. It is no surprise that when women are more highly concentrated in lower-earning jobs, the pay gap between men in women is more significant than it is when just examining equal work for equal pay.

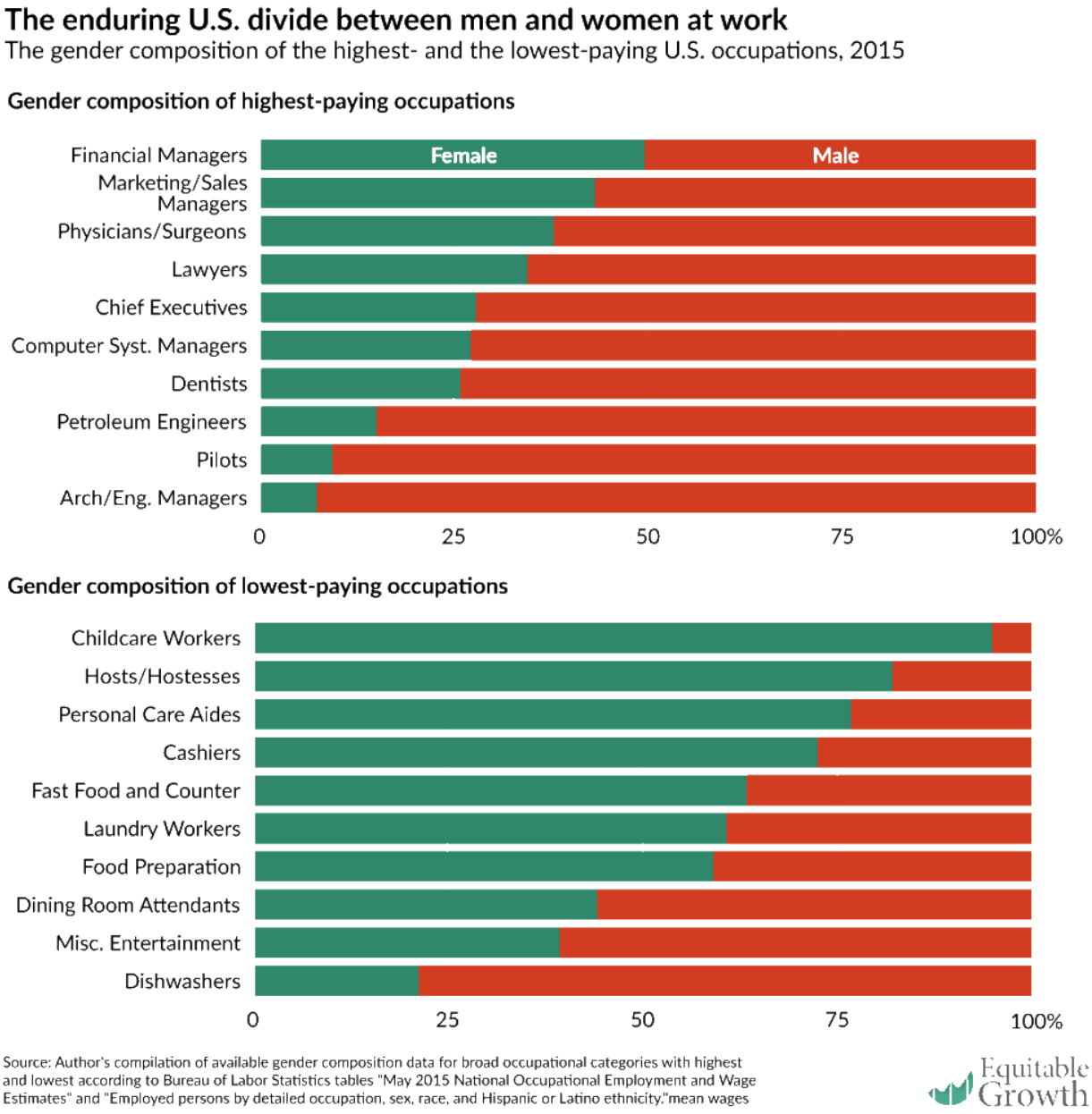

Figure 1.0, Source: Author's compilation of available gender composition data for broad occupational categories with highest and lowest according to Bureau of Labor Statistics tables "May 2015 National Occupational Employment and Wage Estimates" and "Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity" mean wages.

Schieder and Gould's 2016 work looks at how discrimination, societal norms, and other factors can affect both women's occupational choices as well as their paychecks. Focusing on how gender occupational sorting, or how gender tends to predetermine which field and industry one enters, is part of the discrimination women face in the labor market, this study examines how societal and economic factors shape that sorting. These factors contribute to the gender pay gap both when controlling for occupation and when not controlling for occupation (2). Schieder and Gould conclude that a women's decision for occupation is shaped by society, and that gender pay gap persists even after controlling for experience, hours worked, and educational attainment. Higher paying jobs that require longer hours make it difficult for women to succeed as women continue to perform the majority of household and childcare work. Furthermore, professions dominated by women are lower paying, and professions that become female dominant will be followed with lower pay (8). Although previous studies have made several of these conclusions, Schieder and Gould demonstrated that controlling for education, experience, occupation, and other factors can reveal the low end of the pay gap -revealing only the low end of discrimination. However it does not show the discrimination that women face leading up to their current career. It leaves out discrimination at every level in a women's career that she has faced.

The Washington Center for Equitable Growth concluded that "men tend to be paid better regardless of education level or skill because work that is predominantly done by women is valued less in the labor market." As the rate of women working in a given occupation increases, the pay in that occupation declines - even when controlling

for education and skills (Occupational Segregation in the United States 2015, 1)." The concept that women's labor is less valued than men's labor shows in several scholars' work. Carnevale, Smith, and Gulish (2018) also concluded that as a field or industry becomes employed by more and more women, wages will drop due to "deep-rooted societal beliefs about differences in competencies between the sexes (10)". When confronted with concepts of gender based discrimination and segregation in the work place, scholars have equipped various approaches and models to help explain not only why these issues occur but how they be addressed.

Human Capital Model

One model hoping to explain sex segregation and discrimination in the labor force is the human capital model, which is the idea that, on average, women lack the human capital factors and dedication to work high-paying jobs in high-paying industries. In regards to the labor market, human capital factors, such as education level or technical skill, can greatly contribute to determining one's pay. Human capital theory argues that it is an individual's choice not to invest in such labor-market skills (Becker 1956). Scholars Mincer and Polachek's study looks to reexamine women's earnings concerning labor force continuity, the amount of time one has continuously spent in the labor force. Intermediate labor force participation refers to the amount of time spent in and out of the labor force. Mincer and Polacheck conclude that labor force continuity can account for 19-49% of the gender pay gap (133). This bold and highly varied conclusion is drawn without recognizing the many external factors that have influenced women's decisions, the time they have to dedicate to being an active member of the work-force, and capability to obtain more human capital.

According to Grybaite, women tend to accumulate less work experience than men and have shorter and discontinuous work lives due to the traditional division of labor by gender in the family (Grybaite 2006, 86.). This leads to a lower incentive in accumulating individual human capital for women. Likewise, Angle and Wissmann's 1981 study looks at the return on investment for men and women in higher education, with their original hypothesis being that women make less because of choice in college majors. They argue that women's choices make women earn less. Grybaite and Angle & Wissmann's argument begins to fall apart when looking at Blau and Kahn's more recent 2007 work. Their work shows that the pay gap has dropped 7% because of women's great educational strides (Blau & Khan, 2007, 21). However, they argue that the gap has plateaued due to the ongoing presence of sex segregation (Blau & Khan, 2007).

Arguing against the human capital model, Browne and Misra (2005) provide an in-depth intersectional analysis of how gender, race, class, and citizenship play into the pay gap (2005, 169). Browne and Misra explain how the meanings attached to class, gender, and race work together to uphold power hierarchies that maintain inequalities (166-167). Browne and Misra find that men earn more than women within each race/ethnic group, which shows us a clear picture of the gender pay gap (171). They argue that access to human capital is dependent on factors other than just gender, such as class, ethnicity, race, and citizenship. They argue that one is less likely to gain human capital with more intersecting identities, therefore keeping one's wages low.

The human capital argument boils down to differences between men and women as productivity and skill-related differences rather than systemic issues, which is consistently disproved by economists who find that white men have a considerable wage advantage, even after adjusting for work skills, productivity, and education (Oaxaca (1973), Blinder (1973), Corcoran & Duncan (1979)). Sanborn, for example, finds that employer-based discrimination plays a role in the wage gap, but the effect is low, which leaves occupational segregation as a primary cause of the wage gap. In contrast, Fuchs (1989) argues that the most significant role is the conflict for a woman between career and family. Earlier scholars such as Oaxaca and Fuchs found that sex segregation is more admissible than unequal work for unequal pay. In Fuchs's study, he argues that the pay gap is made up inherently due to differences in socialization between men and women, rather than women's choices or unequal pay for equal work. He determined that career family balance (Fuchs 1989, 41), socialization, and gender roles (Fuchs 1989, 29) play a role in sex segregation, which plays a more prominent role in the gender pay gap. Carnevale, Smith, and Gulish conclude that discriminatory practices have yet to close due to the deep-rooted societal beliefs about differences between the sexes, which have and will continue to impact the labor market (Carnevale, Smith and Gulish, 2018, 10).

The Human Capital Model plays an important role in the understanding of how gender discrimination takes many different forms, and can be measured in many different ways. However, while the model can aid in the part of the explanation of the pay gap, it falters in its inability to compare jobs across different industries and how jobs dominated by different genders play a role in the inequality we see today.

Comparable Worth

While looking at the pay gap, most scholars have focused on the concept of equal pay for equal work, examining one type of discrimination, employer preferences. However, as we have seen, women must deal with sex segregation as a critical factor in determining the gender pay gap in the workforce (Blau & Kahn 2016; Washington Center for Equitable Growth 2017; Oaxaca 1973; Fuchs 1989). Comparable worth brings a new form of analysis. Rather than examining equal pay for equal work, it looks at equal pay for similar work, and provides a model for comparing sex-segregated jobs.

England's *Comparable Worth Theories and Evidence* examines comparable worth, focusing on the gender discrimination between pay for jobs that are predominantly male and jobs that are predominantly female, and provides insight into how one can compare the jobs. To explain this concept, England gives us an example: "In 1975, nurses in Denver sued the city claiming that their jobs paid less than male jobs such as tree trimmer and sign painter (Blum 1991, 49)." One issue that arises when looking at comparable worth is how to compare jobs in different industries. In this example, how can we compare nurses with tree trimmers? England argues we can make these comparisons if we hold constant education, job experiences, and years worked in that position. England concludes that if there were no occupational sex segregation, then there would be no problem of comparable worth (England, 1986, 43). However, even without occupational sex segregation, there may be concerns about gender and racial discrimination in pay levels. Overall, England's work has helped address how we can study the pay gap across industries and how job sex segregation plays into the

gender pay gap. England's work provides a clearer explanation regarding the importance of gender and pay comparisons across industries. However, in order to obtain a more holistic understanding of all the factors at hand, it is necessary to discern how this applies not only within different industries, but within organizations as well.

Organization Theory

In its most basic form, an organization is a group of people working together through labor division to achieve a common goal. In this sense, an organization provides a means of using individual strengths within a group to achieve more than could be achieved from individual efforts. Concerning the pay gap, organization theory looks at how organizations act as a site to enforce and reproduce structural discrimination that women face in the workplace.

While not directly looking at the pay gap, Moss-Kanter, a scholar looked at organizational structures around labor and gender, which led to direct implications of the pay gap. In Moss-Kanter's book *Men and Women of the Corporation* (1977), she shows us that gender differences in organizations are not due to individual behaviors or characteristics, but are somewhat due to systematic structures (1977, 292). This argument disputes Filer's research that the pay gap is explained by individual characteristics rather than gender. Early on in her book, Moss-Kanter acknowledges the presence of gender in organizations and, Moss-Kanter "argues that the problem women have in large organizations is consequences of their structural placement, crowded in dead-end jobs at the bottom and exposed as tokens at the top (Acker, 143)." The

argument that [white] men will always dominate organizations, while women will structurally be placed in dead-end positions, leads to a gap in pay and a gap in advancements in the workplace, which will continue to affect the pay gap (Moss-Kanter 1977). This also applies to women and minority men in token positions and similar dead-end positions. Although claimed to be gender-neutral, Moss-Kanter argues that organizations will always benefit the masculine individuals dominating their structures (1977, 46). Moss-Kanter's primary focus is organization as gender-neutral, rather than gendered, leaving a gap in knowledge. However, in the 1980s, this gap began to close with new studies that brought organizations as gendered concepts to light (Cockburn 1985; Knights & Willmott 1985; Sorenson 1984; Game & Pringle 1984). Furthermore, Moss-Kanter's explanation of organization sets the stage for Joan Acker's work on organization theory and gender pay differences.

Joan Acker's work "Hierarchies, Jobs, Bodies --A Theory of Gendered Organizations" is one of the first in-depth explanations on how organizational structures are not gender-neutral as suggested by previous feminists (Moss-Kanter 1977; MacKinnon 1979; Ferguson 1984). Acker's work is the first of its kind, diving into how the organizational structures work to favor [white] men, which keeps women in oppressed positions- except for a few women seen as social men (Sorenson 1984). This approach helps fill the last gap in knowledge that feminist scholars had not previously examined, such as why women are concentrated at the bottom of organizations. Acker's argument allows them to work through five different sections: the gender segregation of work -including what determines unpaid and paid work; income and status inequality; organizations as inventors and reproducers of cultural ideas of gender; aspects of

individuals' gender identity as products of organizational pressures; and finally a critical feminist goal to make large organizations more democratic (140). Acker concludes that organizations work to benefit men over women in managerial positions because these positions are based around excluding women in higher positions/higher-paying positions. To fix this exclusionary practice, they claim that we must end organizations as they exist today, reworking them with new definitions of work and work relations. Changing not only organizations but changing the value placed on unpaid work (such as childcare, household work, taking care of elderly) to being valued equally with the work of a software engineer (155). By restructuring our organizations, we would destroy the harmful hierarchies of jobs and genders, which are deeply rooted in class inequality, and work to reproduce class inequalities (146) powerfully. Unlike prior studies, Acker considers "that class is constructed through gender, and that class relations are always gendered" (145; 1988). Acker argues that the labor market, workplace relations, control of the work process, and underlying wages are always affected by symbols of gender, gender identity, and material inequalities between men and women. Acker's work moves beyond past works, focusing on explaining the pay gap through preferences and opening up gender discrimination. Acker's work not only furthers to solidify organizations as a strong reproducer of class inequalities, but also makes the breakthrough in identifying organizations as a source and reproducer of gender inequalities.

Williams, Muller, and Kianski's more recent work on *Gendered Organizations and the New Economy* (2012) revisit Acker's (1990) theory of gendered organizations, and they find that organizations are still gendered but "the mechanisms for reproducing gender disparities are different from those in the traditional career path (570)." This

work is highly relevant because in the decades following Acker's theoretical breakthrough, organizations have gone through downsizing, restructuring, computerization, and globalization, which has led to a complete shift in organizations (572). Williams, Muller, and Kianski conclude that Acker's gendered organization theory still reproduces class and gender inequalities in the new economy. For instance, in the new economy, teamwork was found to affect women's rewards because it negatively relies on self-promotion, and women are given disproportionately less credit than men in group settings (557; Heilman and Haynes 2005). Although having positive responses from employees, industry-specific career paths had contributed to discrimination against women. With careers and potential earnings laid out, employees were likely to promote based on gender bias. They conclude that organizations are still gendered and work to favor [white] men even with these new factors in the new economy.

Intersectionality

Intersectionality is defined as the intersecting nature of social categories, such as gender, race, class, ability, etc. While Sanborn and other scholars included race in their adjustments, the majority of scholars do not take an intersectional approach to look at the pay gap. An intersectional approach would include race as a factor similar to gender. What most early scholars produced was comparisons such as:

White Men	White Women	People of Color

Table 1.1

An intersectional approach would be formatted more similarly to this, including gender, race and/or ethnicities that are being examined:

White Men	White Women
Black Men	Black Women
(Any Other Race) Men	(Any Other Race) Women

Table 1.2

This comparison provides the opportunity to examine all races and genders rather than lumping all people of color into one group. The latter example would allow us to look at groups with intersecting identities such as Black women, and how their pay compares to that of white men. It is vital to do an intersectional analysis to understand the pay gap's full extent because the gap is not solely a gender pay gap. It depends on other factors such as race, class, education, and ability.

Browne & Misra (2005) conclude that labor-market research enriches our understanding of economic inequalities when incorporating an intersectional perspective (2005, 180). At the same time, they note that intersectional research has its own set of issues such as conceptualizing and measuring class (Dahrendorf 1959; Wright 1978; Acker 1999), race/ethnicity, gender, and citizenship. In conclusion, they find that "employers use intersecting ideologies of class, gender, race, ethnicity, and citizenship to justify exploiting women of color (179)." Overall, Browne and Misra's work takes on a robust intersectional approach, something most early economists (Fuchs 1995, Filer

1983, Sanborn 1964) leave out of their analysis on the gender pay gap. Along with Browne & Misra (2005), the Washington Center for Equitable Growth (2018) concluded that when looking at race and gender, women of color -at all education levels- are segregated into occupations with even lower pay than their white female counterparts (1). Understanding how race, ethnicity, class, gender, and education play into the pay gap is essential to fully understand inequalities in pay.

Education

In more recent years, we see Browne & Misra (2005) and Carnevale, Smith, and Gulish (2018) looking directly at education and how it affects the pay gap. They both determine that educational attainment is a sign of class and race, which can further research on the pay gap. In Browne and Misra's (2005) work, they include educational attainment to examine inequalities, and determine that those with higher educational attainment creates greater inequality in pay based on gender. They find that education is an indicator of class and race, which explains most of the inequality across race and ethnic groups (171). This supports intersectional theorists who "interpret 'education' as an indicator of social class, education could be an indicator of human capital also - that is, ability and skill" (172).

Carnevale, Smith, and Gulish's 2018 study is a more recent analysis arguing that historical arguments -such as women are not as educated- cannot explain the discrimination women face in the workplace. They boil the pay gap down to four distinct factors: choice of field of study, choice of majors within fields of study, choice of

occupation, and finally, discrimination (4). These factors have been used in previous studies to explain the pay gap (Corcoran and Duncan 1979; Oaxaca 1973; Filer 1983; Sanborn 1964) but those studies have typically lack a further explanation of how discrimination can occur at all steps leading up to discrimination. They conclude that women earn 81 cents for every dollar paid to a man and that 41% of the pay gap is unexplained discrimination (43) even when controlling for factors such as education, race, union status, work experience, occupation, and industry. Women now outnumber men in bachelors, masters, and Ph.D. programs; however, women are still more concentrated in lower-paying majors than men, and women with graduate degrees make the same as men with only bachelor's degrees (Carnevale and Smith; 2018). An argument that has been made in previous studies is that women are less educated than men, or their choice of major is preventing them from making the same as men, but now women outnumber men in educational spaces and still receive less pay. This reinforces that even when adjusting for education there remains an unexplained portion of the pay gap.

Constant Variables

A major challenge in studying the pay gap is deciding which variables to hold constant. Holding certain variables such as job title, industry, occupation, and time worked is considered a given when looking at equal pay for equal work, but what else needs to be held equal to determine if it pay differences are due to human capital or due to discrimination? In Corcoran and Duncan's study (1979), they incorporate an intersectional approach, looking at differences for wages between sexes and race (1). Similar to other studies, they used data from the Panel Study of Income Dynamics,

adjusting for factors such as educational attainment, work history, and on-the-job training. Unlike prior studies, however, they also adjusted for attachment to the labor force, which was based on absenteeism, self-imposed restrictions on hours and location of work, and plans to quit work. They found that white men are privileged to wage advantages that cannot be explained "by superior qualifications or more attachment to the labor force (19)." Williams, Muller, and Kianski (2016) study networks (personal connection networks) as an uncontrollable variable. Specifically, networking is highly gendered and racialized (Williams, Muller Kianski 2016; Burt 1998; Loscocco 2009; McGuire 2002; Smith 2007). Networks would be a challenging factor to control for in studies. However, the effects of individual networks work to promote individuals [predominantly white men] into more job opportunities and higher-paying jobs. Corcoran and Duncan (1979), and Willaims, Muller, and Kianski (2016) all brought new variables into question, raising the question of how many variables we should be looking at, and the which most critical variables are when studying the pay gap.

In Filer's (1983) study, he looks at the effects of individual personalities and tastes on the pay gap. Filer performs an in-depth analysis on the pay gap, including factors such as marital status, number of children, a measurement of one's childhood environment, past experiences, relevant past experiences, the total number of jobs held, highest job title held, years of school, high school and college GPAs, and skill tests based upon personal relation skills, masculinity, thoughtfulness, friendliness, activity level, restraint, sociability, desire for dominance, emotional stability, and objectivity (Filer 1983, 88). He defines work experience as the number of months one has held a position; typically, more work experience produces higher wages. He defines gaps in work history

as the number of months since leaving full-time schooling (or the military) without employment, not including military service; typically, more gaps in work history led to lower wages. Filer still finds a pay gap between men and women with all of these controlled and adjusted for variables. Filer's analysis concludes that women with higher education face less of a pay gap than those who stopped formal education after high school (Filer 1983, 97). Furthermore, he finds that labor market discrimination is primarily due to experience and gaps in work history (Filer 1983, 97). Although Filer's analysis looks at many different factors, we need to consider the implications of adding more factors.

A common theme throughout these studies to control for different variables, which shows an understanding that a variation of factors plays into the wage gap: age, race, education, gender, the industry of work, on-the-job training, and tenure. Some scholars look at other more individualized and detailed factors, such as in Filer's study on individual personalities and tastes. One common historical explanation for the wage gap has been work-related skills and differences in productivity-related factors. Several scholars have argued that the gender pay gap is due to a woman's lack of human capital, lack of dedication, productivity, quality of work, and other related factors. These assumptions are due to societal beliefs of the differences between men and women. These societal beliefs stem from historical roles that were traditionally assigned to women, such as housework.

Earlier studies, such as Sanborn (1964), Blinder (1973), Oaxaca (1973), and Corcoran & Duncan (1979), have controlled their studies based on additionally

work-related factors in an attempt to prove the pay gap is still present without these factors. These adjustments were made to explain the wage gap as men and women having different sets of work and productivity-related skills therefore resulting in different pay. These productivity-related factors are theorized to be absenteeism, quality and quantity of work, and attachment and dedication to the workforce. Over time, these work and productivity factors have become more complex and detailed.

An example of this is Angle & Wissmann's 1981 study, in which they directly looked at gender, earnings, and college major. Their study tries to understand if the choice of major significantly plays into a woman's lesser earnings post-graduation than men. They found that choice in major is directly correlated with future earnings; however, these choices may be significantly influenced by external societal factors and cultural norms. When explaining the pay gap, economists have been trying to adjust for many variables that would explain the wage gap; however, one will never be able to account for all variables that could play into the gap. Other scholars such as Schieder and Gould (2016) look at how adjusting for factors such as education, job experience, and adjustments dramatically affect the pay gap results (Schieder and Gould 2016, 2). These adjustments lower the measured pay gap. They argue when adjusting for education and looking only at equal pay for equal work, you ignore the discrimination women face at every step of their careers. This idea is radically different from what has been argued by those scholars who focus on equal work for equal pay such as Fuchs (1989), Oaxaca (1973), and Sanborn (1964). Schieder and Gould (2016) bring forth the idea that scholars focusing on the pay gap should not just work to explain away the gap

with the minimal focus on discrimination. Instead, they should understand and explain the discrimination women and minorities face at each step in the workforce.

Higher Education

Higher education as an industry is complex; it works in a different way than most other sectors typically do. One important factor to consider is how promotions and advancements work for instructional faculty. These promotions are much more complex than in other sectors. For example, looking at the professor status, an individual must start as an assistant professor then move into associate and then professor, typically all at the same University. These titles tend to represent where someone is at along the path to tenure. Tenure is a way of referring to an educator's employment status. The title is a great achievement for educators and increases their job security for they cannot be terminated without justifiable cause or under extreme circumstances. Assistant professors are typically at the beginning stages of their career, with the hopes of achieving tenure. Associate professors typically are placed on a tenure track, with the process taking around five to seven years in this position to achieve tenure. Once achieving their tenure, associates are typically moved to full professor positions unless otherwise under review. Distinguished professors are professors who are considered to be at the top of their fields. The complexity in these professor advancements is that they have to take into consideration one’s teaching ability, publications, research, and student feedback. All of these factors rely on assessment in which there is great potential for human biases. Determining which of these factors has the most significant impact on the pay gap in higher education is a gap of knowledge in the research.

Before considering the University of Colorado Boulder as a preliminary case study on the different frameworks for looking at the wage gap, we should understand the general landscape of working in higher education and a pay gap across the industry as a whole. According to the National Center for Educational Statistics, in 2018, there were 1,542,613 instructional faculty in higher education in the United States. Instructional faculty is defined as professors, associate professors, assistant professors, instructors, lecturers, assisting professors, adjunct professors, and interim professors, with 54% full-time and 46% part-time. In figure 1.2, we can see that the professor and associate professor -the two highest academic ranks- hold more men than women across all races, except for Black men and Black women who remain equal. Following sex segregation, this graph shows us that men across all races are in higher positions -which typically correlates with higher pay- than their female counterparts. As we look at the lower end of the academic ladder, we see instructor and lecturer positions populated by more women than men across all races. In these lower-paid positions, we see a higher percentage of women occupying them, showing a gendered and racial pay gap in higher education. If we find discrimination at the University of Colorado Boulder, it would not be out of line with higher education as an industry.

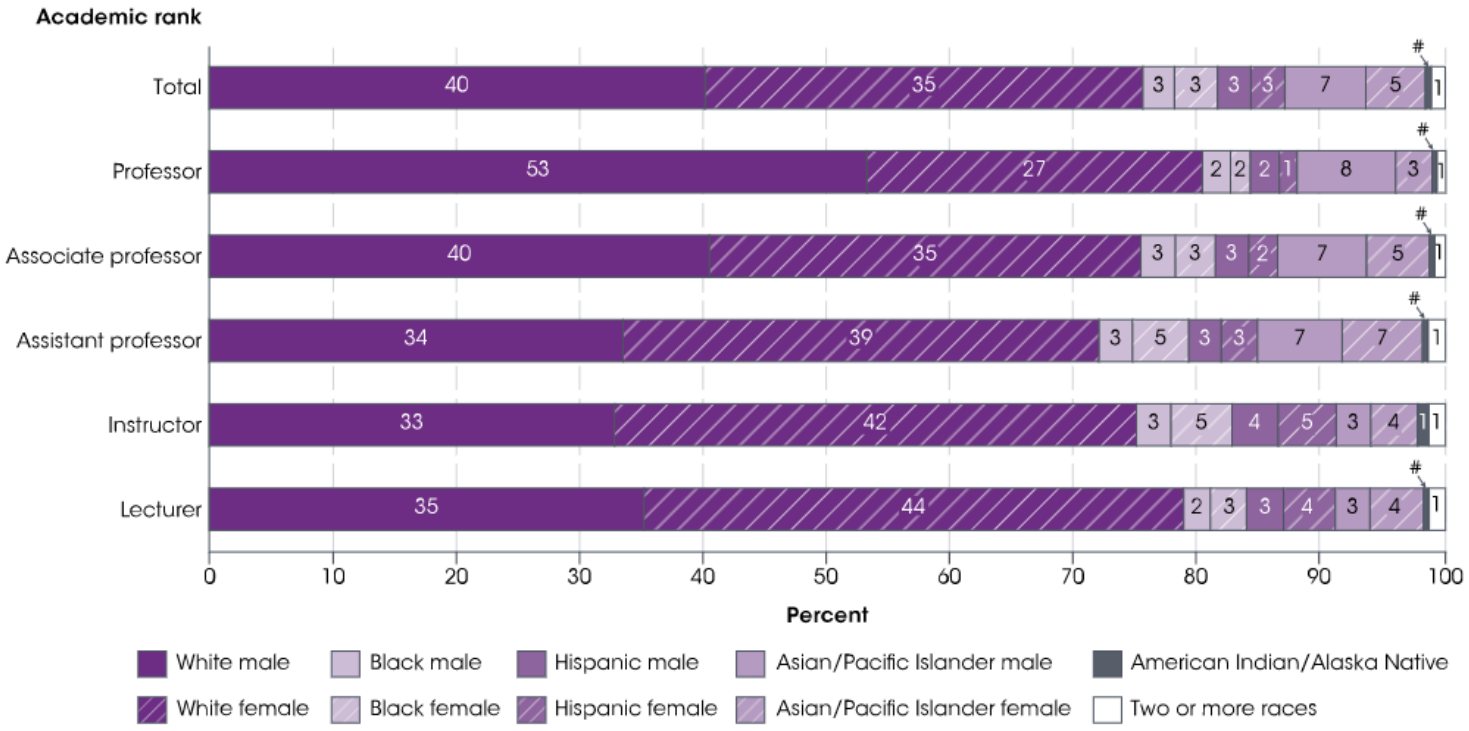

Figure 1.2: Source: U.S. Department of Education, National Center for Education Statistics (2020). *The Education 2020* (NCES 2020), Characteristics of Postsecondary Faculty. "**NOTE:** Sex breakouts excluded for faculty who were American Indian/Alaska Native and of Two or more races because the percentages were 1 percent or less. Degree-granting institutions grant associate's or higher degrees and participate in Title IV federal financial aid programs. Race categories exclude persons of Hispanic ethnicity. Percentages are based on full-time faculty whose race/ethnicity was known. Detail may not sum to 100 percent due to rounding. Although rounded numbers are displayed, the figures are based on unrounded data."

Conclusion to the Literature Review

The gender pay gap has been studied for almost seven decades. Throughout, scholars have looked at the pay gap in many different ways. In the beginning, we see most scholars (Sanborn 1964; Oaxaca 1973, Fields & Wolff, Groshen, Weichselbaumer & Winter-Ebmer; Filer 1989; Oaxaca 1973; Blinder 1973) focusing on equal pay for equal work, discussing the various factors that they must hold constant in order to find the exact number to attach to the pay gap. Each scholar held different factors constant and made adjustments that they saw fit. However, they ran into challenges in determining which factors played into the pay gap and what data they needed to collect. A criticism against these scholars is that they did not hold enough factors constant to compare men and women working in the same industry with the same occupational title. However, even as economists, sociologists, feminists, employers, and employees began to control for vast range of characteristics, each data set showed women on average are paid less than men (Sanborn 1964; Blinder 1973; Oaxaca 1973; Corcoran & Duncan 1979; Filer 1989). We see several scholars encounter this in work, such as Filer's 1989 attempt to consider personalities, tastes, and 21 other personal characteristics. Scholars studying equal pay for equal work reached the same conclusion: that it is not discrimination against women for the same work; it is sex segregation of jobs that creates a more significant gap.

Sex segregation in the labor market has been determined as the most significant gender pay gap (Washington Center for Equitable Growth 2017; The Gender Wage Gap 2016; Schieder & Gould 2016). Sex segregation leads to women being concentrated in dead-end, low-paying jobs, while it concentrates men in high-paying jobs. This

drastically changes the pay gap. In studies of equal pay for equal work, an individual would be looking at men and women in the same occupation in the same industry. In looking at sex segregation, an individual would examine which industries and occupations are predominantly female and compare those to those that are predominantly male. Carnevale, Smith, and Gulish (2018) take this a step further and conclude that as a field or industry becomes more highly occupied by women, pay will decrease.

However, there is a significant gap in knowledge for a more detailed explanation of these inequalities and a lack in understanding how race and class play into upholding these inequalities. A problem with this approach of studying the pay gap is that they are just looking at the data and trying to find the quantifiable number for the gap -when in reality, that is not as important of an aspect as others. When studying the gap, we should focus on why discrimination is occurring, the social and cultural reasons women are discouraged from entering higher-paying industries, and how and why predominantly female industries are paid less.

Throughout recent years, there has been a shift in explanations behind the gender pay gap. Economists once believed that the pay gap was primarily due to a lack of women's human capital -a lack of education, training, and other skills. In recent decades, women's strategy has been to increase their human capital to combat low pay. We now see women outnumbering men in bachelors, masters, and Ph.D. programs (Carnevale and Smith; 2014). With these spectacular strides in higher education, the gender pay gap was closing. However, the rate at which it was closing has begun to slow down (England 2010; Williams, Muller & Kianski 2015). Thus, we can see how important the factor of human capital -specifically education- is in determining one's

pay. However, the plateauing of the rate that the gap has been closing reveals that discrimination still exists, and women are, on average are making less than men (Blau & Kahn 2018; Misra & Browne 2007).

Transition to Analysis

I will be performing a preliminary look at the University of Colorado Boulder gender pay gap. Following the strategies in practice by previous scholars, my analysis will focus on two main frameworks: equal pay for equal work and sex segregation with an emphasis on gendered organizations, the human capital model, and comparable worth. In my analysis, I used data visualization to allow for an accessible way of understanding the data while following data visualization best practices and allowing for a more unbiased analysis of the numeric results. However, these two frameworks each have their own set of biases and standards. Because I am analyzing data compiled by the University of Colorado rather than data I collected myself, my research will be lacking those factors to which I did not have access, such as race, ethnicity, disability, national origin, gender identity, sexuality, and age. Due to the limits of the data, my study cannot take an intersectional approach and thus does not cover the intersectional dynamics, which may contribute to the pay gap. The data provides only salary, job title, full-time status, department, school, gender, and a unique identifying number for each employee for the years 2005 to 2019. I will conclude my analysis with specific areas of future research in higher education and the gender pay gap. I predict that we will see varying rates of discrimination throughout each framework. I predict that a combination of the

two frameworks will be best suited when attempting to explain the gender pay gap in higher education.

A Note on Data Collection

There are many problems with data collection, especially when looking at gender and racial data collection. One problem that is always bound to happen is the act of collecting any data. What do you collect? What exactly do you need to know? Are you collecting the data or obtaining it through other sources? What data is available? With that in mind, there is always the challenge that more data could help study the pay gap. However, it is impossible to collect every data point one would need to do a complete analysis of the pay gap in higher education. To truly understand a gap in pay, we would ideally gather such data as: age, race (which we will discuss in-depth later), past education, number of publications, number of time working at the university, previous work experience, family life (children, partner), mobility (ability to move to different job opportunities), amount of outside funding (funding they bring into the university from outside sources), gender performance, sexuality, ability, FCQ reviews, English as a first language. These factors would help give us a better understanding of the pay gap here at CU, however, we are not able to access this data.

Some of these factors, such as past education, age, number of publications, number of time at the university, previous employment, and outside funding, could provide the school with a justification for paying individuals more or less than others. As we discussed in section 1, some of these factors, such as education and outside funding, have more barriers for women -and even more so for women of color. By paying an individual less because of the university they could afford to attend, it furthers the pay

gap and continues to place value on upper-middle-class white men over other individuals- specifically women of color.

In addition, a significant problem with racial data collection is that historically when individuals are asked to disclose their race, they are given a set of options and told to select one. Options are typical: White or caucasian, African American, Native American or Alaskan Native, Asian, Pacific Islander, or I chose not to disclose. This framework does not allow individuals to identify with more than one race or with a race that has not been listed - they have to pick the next best one. According to the 2010 census, 9 million Americans identify as multiracial. However, in a study conducted by the Harvard Business Journal in which they reviewed 300 journal articles on top management from 1996-2015 - they found that 95% of these articles categorized race, ethnicity, and gender in traditional normative ways, which means that they are leaving out multiracial identities, non-traditional genders, and overlapping ethnicities.

Similar challenges hold for gender identity. While at the federal level -specifically the census- data collection has shifted to allow individuals to self-identify with race, it has not evolved for gender identity. In the 2000 census individuals could select more than one race and write in their race if it was not listed. However, gender at a federal level has not seen this change. In the 2020 census, the question on gender, rather the one question on sex, was "What is this person's sex? Male or Female". This question gathers individual's sex at birth but is phrased to be harmful to gender non-conforming individuals, trans, non-binary, and other non-traditional gender identities. This erasure of an individual's identity leaves them feeling counted out of the national census. Which is vitally important. This erasure of racial or gender identity is not only frustrating and hurtful to these individuals, but it causes the data to lack pertinent information. For

example, looking at the 2020 Census, they didn't count the estimated 2 million people who identified themselves as transgender. This miscount skews the data and also doesn't allow new federal funding to serve this population. This demonstrates a lack of knowledge and understanding on how one can best collect intersectional and inclusive data.

We see these national trends of data collection trickle down throughout corporate and public settings. At the University of Colorado Boulder, they collect a certain amount of data on their employees, as is standard for large institutions. One specific challenge with their collection is that they ask when hiring one's 'gender' for which they only have two options -- 'Male' or 'Female.' This is asking for 'sex' rather than gender. In the data sets I obtained there was not one employee who chose something other than M or F, thereby excluding gender non-conforming individuals from the conversation. Another issue is that one is not allowed to change their marking with CU's data system. Once they have said 'F', they are not allowed to change to 'M' even if they are living and presenting as a man. This exclusion from the data restricts us from including any other gender besides the normative M or F in our completes. A full intersectional analysis of the pay gap would show other gender identities and could then study pay differences among all gender identities.

Another issue with my specific data sets is related to race. For a complete intersectional analysis, racial data would be exceptionally important in determining the pay gap between men and women and between white men and women of color. However, because of differential privacy, I was unable to study this factor for a complete intersectional analysis. Differential privacy is essentially a system for publicly sharing datasets without exposing individuals in the datasets – it's a way to still release

data to see patterns and trends without putting the individual's privacy at risk. In the two data sets that I received from the school, they made clear the information they were willing, and more importantly not willing, to give me because they wanted to keep the privacy of their employees. The first step in differential privacy is removing one's name from the data set. For my data set on gender, they removed employees' names, roster ID, and employee ID number to not pinpoint exactly which employee makes what salary. This, however, has some flaws. When looking at the data for smaller departments, you can easily see which professors make how much, but for larger departments such as Chemistry, it gets more complicated.

For my data set involving race, CU's system for protecting individuals got much more complex. In my dataset, I was given the following rows: Campus, Year, Department Name, ODA Department, ODA Department Description, ODA Constructed School / College/ Program, ODA Constructed School/ College/ Program Description, URM Status, Sum Annual Pay (Salary), and finally Sum Apt Time. URM is defined as American Indian, Native American, Native Alaskan, Black, African American, Hispanic, or Native Hawaiian/ Other Pacific Islander. No URM is defined as Asian, White, International ("nonresident alien"), or Unknown. International is based on the visa status, and Unknown means that the employee upon hire did not wish to disclose race. This dataset gets tricky because they did not provide rows based on employees, which is how the Gender data set is set up. They provided me with two rows for each department, one representing URM the other representing not URM. For each department (every two rows), we see that aggregated salary and appointment time may be suppressed data based on whether the URM status (URM, Not URM) was based on less than five employees. The system they put in place restricts me from matching URM status to

gender, pay annual (salary), and job title. However, looking into departments where appointment time and pay annual (salary) are not suppressed, I can find specific individuals' URM status. This restriction on racial data has led to a gap in knowledge in my final analysis.

Obtaining the Data

I obtained two data sets from the University of Colorado Boulder through the United States Freedom of Information Act (FOIA) which "provid[es] the public the right to request access to records from any federal agency." This act aims to give power to the people by allowing them to stay informed about their government and the federal agencies under the government. One of the checks and balances in our country is free speech and free press, and FOIA works to allow the media -typically investigative journalists- to look at all federal documents unless it falls under one of the nine exceptions. All nine exemptions relate to the protection of private interest or would be harmful to governmental interest. This act has laid the groundwork for all states to enact similar measures -also known as the sunshine laws. Although state by state, there is much variation in the details of such acts, the general purpose is to protect the press' freedom and to allow citizens to inform themselves on what their governments are doing.

Through Colorado's Open Record Act (CORA), people in Colorado can request information from any publicly-funded institution. Colorado's act gives more power to its citizens than most states. It did not always used to be like this, but Jeff Roberts, the

executive editor for the Colorado Freedom of Information Coalition and a voice for open government in Colorado, has been fighting for more open government. Jeff Roberts is one of the most experienced in FOIA and CORA requests, and on his website, you can find guides and resources to Colorado and Federal laws, and learn how to format a request. I was fortunate enough to have him as a guest lecturer and was able to have his help when writing my request to CU.

The University of Colorado has a different approach for CORA requests than most places. Because of its size, its requests are in a form style with a typical letter attached. I submitted my first CORA request to the University on February 20th, 2020, but it took five months and $604.04 to receive the information requested. By CORA standards, the University is allowed to charge (at max) a $33.58 per hour fee to find and collect the information that is being requested. Although I requested this fee exception since I am a full-time student, they denied the request. However, I was able to secure funding through the University Undergraduate Research Opportunity Program.
I should note that I also requested that anyone else who has ever made a similar CORA request be notified of my CORA petition. If someone had, it would either allow me to access the data directly from them or cut the costs down charged from CU by already having the data set I was looking for assembled. To this, they informed me that no one had made a request in the past 15 years. Therefore it would take them 16 hours to pull and arrange the data. They broke their estimated 16 hours down into five smaller categories:

1. Data extracts using existing records - 5 hours
2. Document data differences over the years - 4 hours

3. Data clarification and resolution - 3 hours
4. University Counsel Review - 4 hours

CORA's primary reason for allowing institutions to charge a fee for collecting data is to cover some of the institution's cost burdens; if they have to pay an employee to find, digitize and distribute records, the whole financial burden is on the institution. However, in the estimate CU provided, they said that the University Counsel Review would take an unknown amount of time, which could change the cost significantly . This university review can be as long or as short as they want, depending on how much they want to drive up the requester's costs.

Once the CORA request was made, I worked directly with the records custodian to determine the exact fields of data I would be requesting, and if they were legally allowed to release that information. The data I initially requested was for "Employee data from the University of Colorado at Boulder campus including but not limited to their School, College, Function, Department, Job Title, Job Time Percentage, Total Funding, Gender, Race and Employee ID or Rooster ID Number for the past 15 years". I was quickly told that I would not be permitted to ask for an Employee ID or Rooster ID because it is a recognizable number for each employee; you could use these numbers to determine who the employee is, which would be a breach of employee privacy. This brings up an interesting point on subjectivity, and how the person who is responsible for the CORA and FOIA requests has a bias in what is allowed to be requested and what is not. I have also managed to get access from a journalist at the Denver Business Journal to a different database with the employee name directly attached to salary, which is a prime example of the bias that the individual record keeper has. Having to pay hundreds

of dollars for two data sets also raises another conversation about accessibility and the privilege one must have to access and pay for these data sets. With their paywall, CU restricts a more profound understanding of biases and discrimination on their campus because they are not allowing an individual or the press to have a check on their institution. Withholding such data from students wanting to understand their University better creates a barrier to learning, and to student engagement with some of the deeper issues on campus.

Data

For my analysis, I will be using employee data collected by the University of Colorado Boulder for the period 2005 to 2019, which was collected at the start date of each individual's employment at any University of Colorado location. From my CORA request, I received two datasets, one focusing on gender and annual pay for individuals, and the other focusing on race and annual pay for different departments. The first spreadsheet contains the year, department name, unique employee ID number, job title, gender, pay annual, and appointment time. This dataset will show the gender pay gap at CU Boulder for full-time teaching faculty over 2005-2019. The second dataset shows department racial demographics with a yearly salary, department, appointment time, and race status of each department. This second set of data will not be used in my analysis because I could not connect individuals from each data set to one another without an immense amount of coding and an immense amount of assumptions. To further this research, one could include racial data while looking at the different approaches to the pay gap in higher education.

Methods

In order to understand this data quickly and efficiently, I will be utilizing a software called Tableau. This software will allow for accessible data visualizations and calculations based on my data set. Before creating specific visualizations, I needed to structure them to best support the software Tableau. To accomplish this, I used a software called Tableau Prep to help me clean, sort, and connect my excel sheets. While preparing the data to be connected to Tableau, no data was altered; only the columns were rearranged to have them structured alphabetically to create ease when creating visualizations. Directly following this, I connected the Tableau Prep workbook to Tableau to start the visualizations.

Once in Tableau, before I created any specific visualizations, I needed to create different groups within the data, such as Professors, which grouped all instructional faculty into one group. These groups, when applied, allowed me to quickly filter down the data to instructional job titles with ease. The first calculation I created was 'Full-Time Only'; this ensured that I could easily filter down to only full-time employees. When applied, this filter allowed me to view only employees whose job time status was equal to 100%—leaving out anyone who works less than full-time. The next calculation I created was 'Number of Employees'. This calculation counts the number of unique employee IDs for the given time.

Next, I worked through our two lenses of researching the gender pay gap; Equal Pay for Equal Work and Sex Segregation. Following different practices for each lens, I created visualizations utilizing the University of Colorado Boulder's data in order to see how these different approaches compare and contrast in the context of higher

education. By researching this data through several different lenses, I hope to determine which framework is better for studying the gender pay gap in higher education.

Data Visualizations

My analysis was composed of data visualizations in order to represent the data. When working with the data, I followed best practices to not skew or misrepresent the data to the best of my ability. I primarily used bar graphs throughout my analysis to easily display the differences between men and women, different departments, different schools, etc. I decided to use data visualizations because they can help us quickly understand large amounts of data. They also allow us to detect patterns, trends, and outliers in groups. Throughout the entire analysis, I used orange to represent women and purple to represent men. In the data visualization community, there has been a recent push to stop using pink and blue to represent women and men. This color representation follows newsrooms and other scholars working on rebranding pink and blue as colors that do not represent gender.

Equal Pay for Equal Work

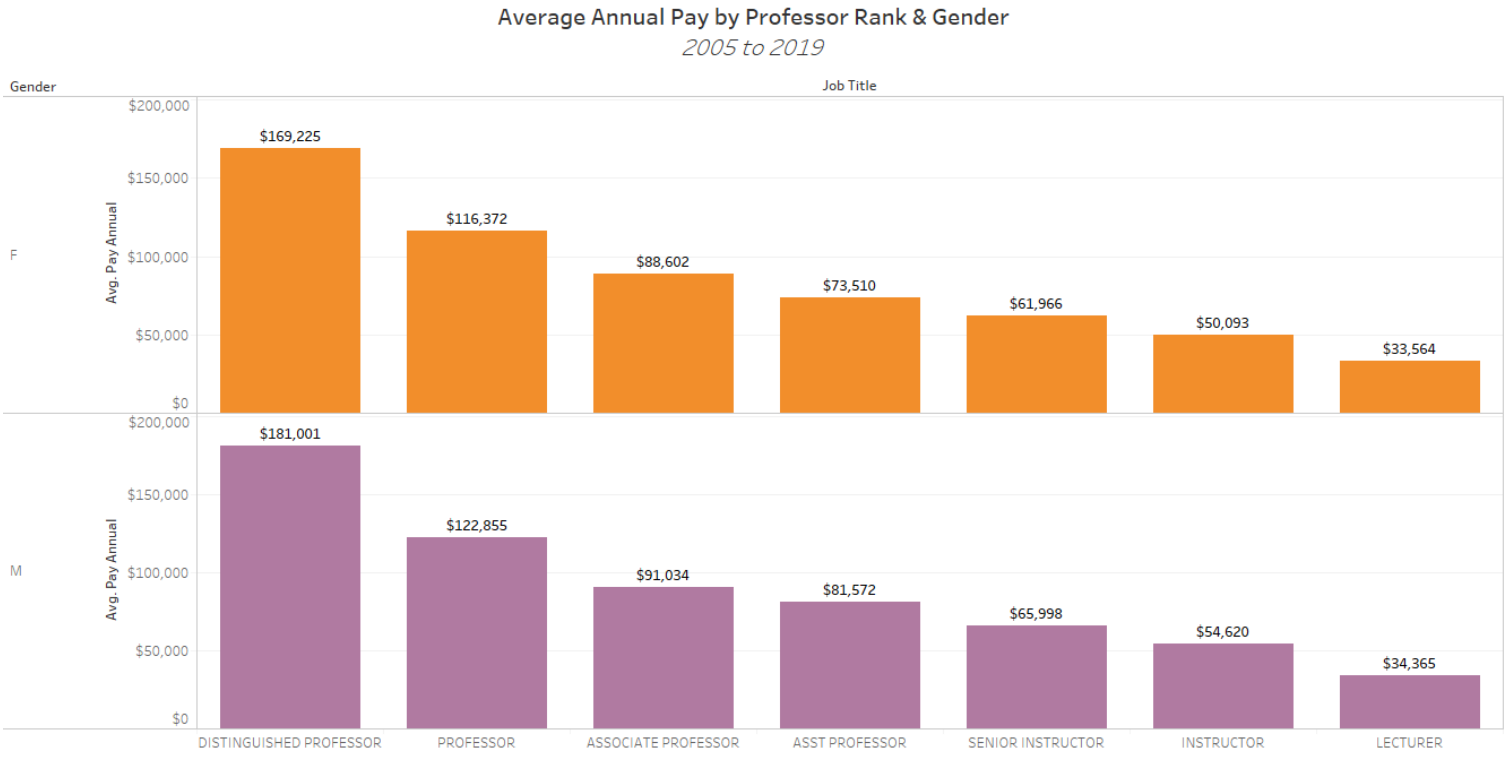

Figure 2.0: Source: CU Employee Data 2005-2019. Average of Pay Annual for each Job Title broken down by Gender. Color shows details about Gender. The marks are labeled by average of Pay Annual. The data is filtered on Full-Time Only, Professors and Year. The Full-Time Only filter keeps True. The Professors filter has multiple members selected. The Year filter ranges from 2005 to 2019.

For the first analysis, I will be utilizing the framework equal pay for equal work. Following the precedent from past scholars, I will be holding constant employer/organization, industry (higher education), job title, and time worked. In figure 2.0, we see that women, on average, make less than men at all levels of professor rank across all departments. Below is a table in which I calculated the average pay gap

between men and women of the same job title. This was done for each professor rank, using the equation: Men's Average Pay Annual - Women's Average Pay Annual = Difference in Pay. Looking at table 2, we see that the wage gap at every level, which grows from $800 at the lecturer level to $11,775 at the Distinguished Professor level, except for associate professors. At the level of Distinguished Professor, we see a difference of $11,775.91 between the average man's salary vs. the average woman's salary in the highest-ranking position. However, following an equal pay for equal work lens, we need to hold more factors constant to see if these gaps are due to employer-based discrimination or factors such as human capital, job sector, research, etc.

Rank	Men	Women	Difference
Distinguished Professor	$181,000.59	$169,224.68	$11,775.91
Professor	$122,855.20	$116,372.18	$6,483.02
Associate Professor	$91,034.05	$88,601.67	$2,432.38
Assistant Professor	$81,571.79	$73,509.88	$8,061.91
Instructor	$54,619.69	$50,093.08	$4,526.61
Lecturer	$34,365.21	$33,564.32	$800.89

Table 2: Source: CU Employee Data 2005-2019. Average of Pay Annual for each Job Title broken down by Gender. The data is filtered on Full-Time Only, Professors and

Year. The Year filter ranges from 2005 to 2019. To calculate how much less on average women make than men, I went row by row doing: Men - Women = Difference.

This analysis is in the industry of higher education, which becomes complicated when comparing different departments. The university pays different salaries in different disciplines. With value being placed on specific areas of study over others, we see wide variance of pay between different departments. In the mindset of this framework, we would not be allowed to compare an English professor to a computer science professor because they are not in the same job sector. The analysis done above therefore cannot fall under an equal pay for equal work framework. As a result, in what follows, I will narrow my focus to a single department, in effect holding department constant, in order to examine other factors. As the data is structured for appointment time (full-time vs. part-time), it is difficult to compare part-time employees; therefore, I will be analyzing full-time employees only. In total, I held constant employer/organization, industry, job title, full-time status, department 1 and education. For the first department I examine, I am able to hold constant education because the department requires a PhD to teach at this level. Factors that Filer (1983), Sanborn (1964) and Oaxaca (1973) held equal that I am unable to due to data restrictions. These include race, ethnicity, class, ability, citizenship, language, GPA, personality, absenteeism, previous work experience, highest job title held, age, etc.

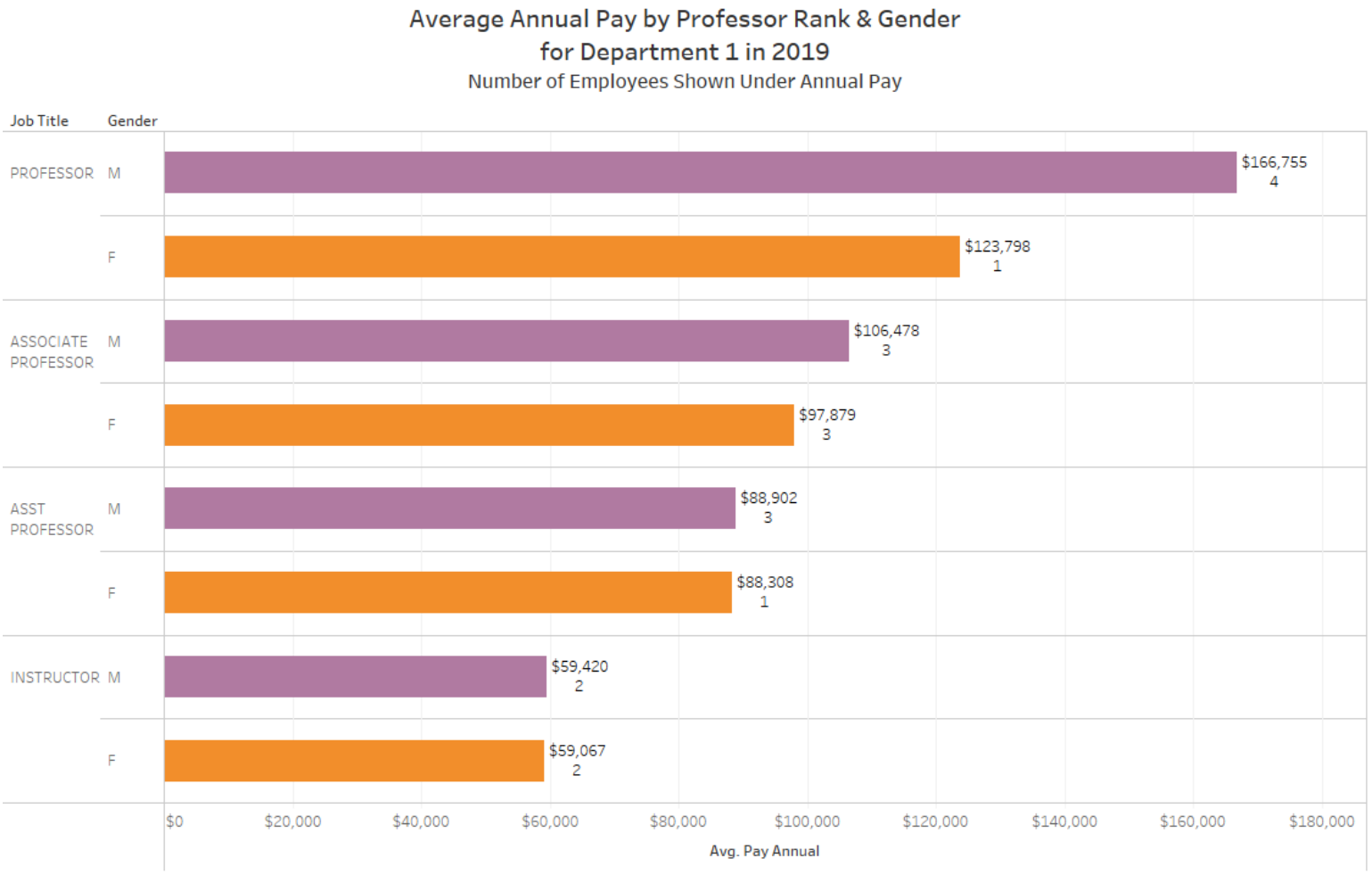

Figure 2.1: Source: CU Employee Data 2005-2019. Average of Pay Annual for each Gender broken down by Job Title. Color shows details about Gender. The marks are labeled by average of Pay Annual and sum of Number of Employees. The data is filtered on Dept Name, Professors, Full-Time Only and Year. The Dept Name filter keeps only Department 1. The Professors filter keeps ASSOCIATE PROFESSOR, ASST PROFESSOR, INSTRUCTOR, LECTURER and PROFESSOR. The Full-Time Only filter keeps True. The Year filter ranges from 2019 to 2019.

In figure 2.1, to be consistent, men are represented by purple and women are represented by orange (as they identified themselves at date of hire). On the vertical hand axis are job titles sorted alphabetically, sorted by gender, and on the horizontal axis are the average annual pay.The numbers next to the bars represent the number of employees who fall into that category. This graph gives us an overview into a chosen social science department 1, but it does not represent our current framework of looking at equal pay for equal work. I have chosen to keep the specific department that I am looking at anonymous. Some bias could lie in which department I chose; however, the same techniques for this framework can be done with any department- which I will demonstrate later in the analysis. I am showing this graph in order to give more information on the department that we will be diving into with this framework.

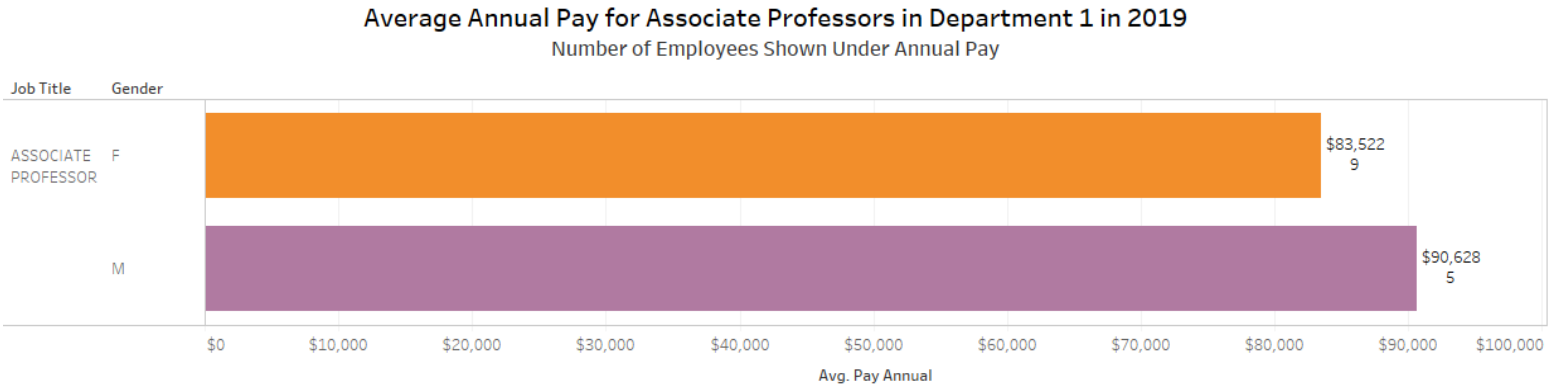

Figure 2.2: Source: CU Employee Data 2005-2019. Average of Pay Annual for each Gender broken down by Job Title. Color shows details about Gender. The marks are labeled by average of Pay Annual and Number of Employees. The data is filtered on Full-Time Only, Dept Name and Professors. The Full-Time Only filter keeps True. The

Dept Name filter keeps only Department 1. The Professors filter keeps ASSOCIATE PROFESSOR.

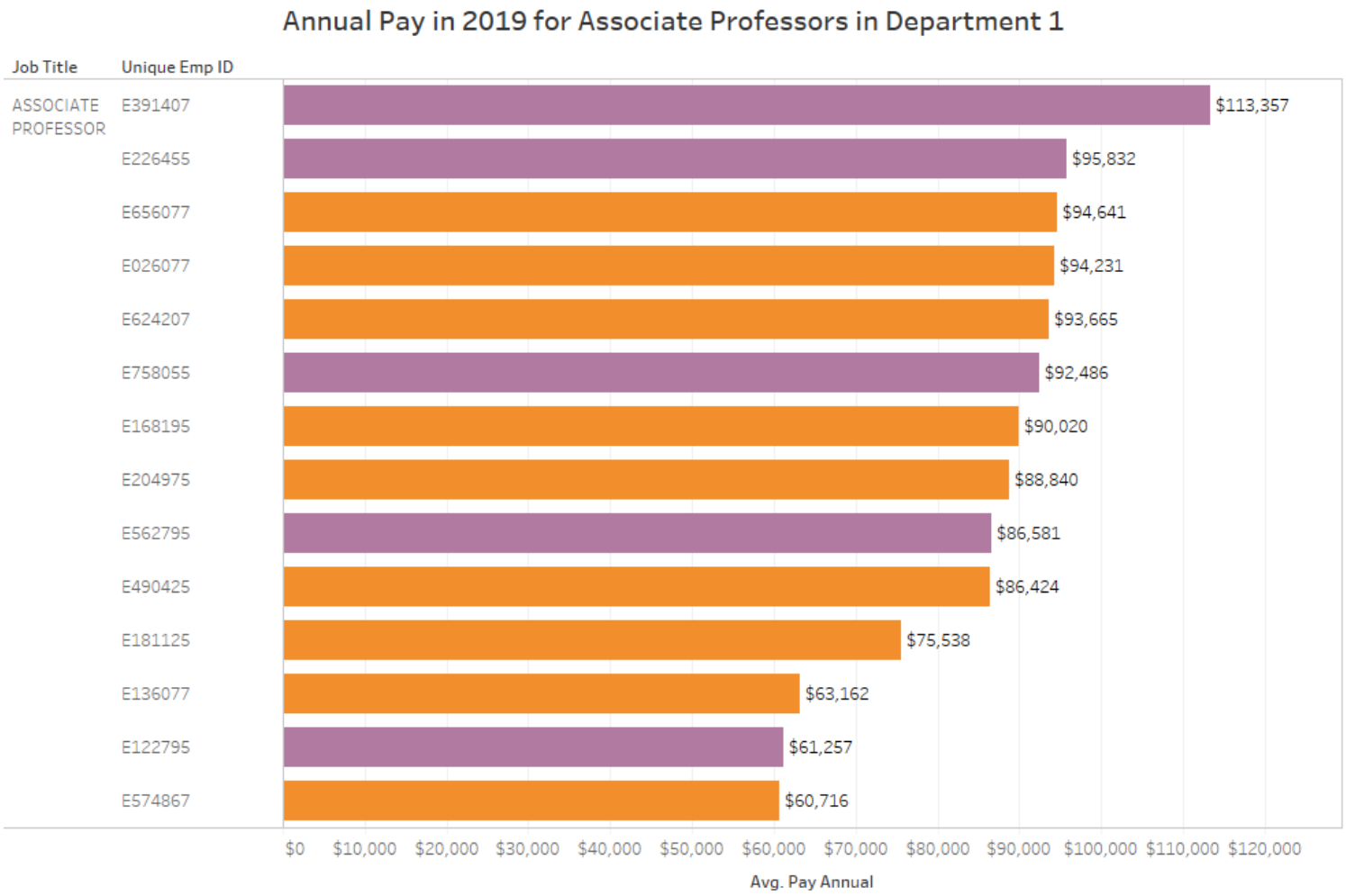

Figure 2.3: Source: CU Employee Data 2005-2019. Average of Pay Annual for each Unique Emp ID broken down by Job Title. Each unique employee ID represents one employee. Color shows details about Gender. The marks are labeled by average of Pay Annual. The data is filtered on Full-Time Only, Dept Name and Professors. The Full-Time Only filter keeps True. The Dept Name filter keeps Department 1. The Professors filter keeps ASSOCIATE PROFESSOR.

Figure 2.3 shows associate professors in the social science department broken down by gender, unique employee ID number and pay. This allows us to look at each individual employee over the time period 2005-2019 holding constant regular hours worked (only looking at full-time employees), in the same department, with the same job title - Associate Professors, and at the employer/organization (University of Colorado Boulder). We are also able to hold education constant because all teaching faculty in this department are required to have a PhD, which is the highest degree for this field, meaning that all associate professors have a PhD. What we don't know is if they hold degrees in other fields. Following Filer's (1983) and Oaxaca's lead (1973), this would be irrelevant human capital. This would hold true in other industries, and potentially have a negative impact on one's pay. In other industries, women need an average of one degree more than their male counterparts in order to achieve the same position and equal pay (Carnevlea Smith and Gulish 2018). However, degrees and educational attainment work differently in academia. Pay is more greatly affected based on how many years they have held their PhDs. In the data I am using they do not track how many years a professor has held their PhD. Typically, the longer you have held your PhD, the more time you have spent in the industry or teaching in higher education -typically meaning you would start with a higher salary than someone who just attained their PhD. A smaller factor with educational attainment is that many teaching faculty teach across two or more departments, and may not even have a PhD in the field in which they are teaching. At this time there is not enough research to draw conclusions on how this may affect one's pay; this is an area of future research. Other relevant

factors that we are unable to hold constant are: race, ethnicity, class, ability, number of years of experience, number of publications, age, number of degrees, mobility, etc.

Figure 2.2 demonstrates that, on average, men with a PhD in this department working full-time at the associate professor level are making $7,106 more annually than their female counterparts. However, several questions arise concerning this claim, such as the balance of male and female employees in this department, and how long have each of these associate professors been working in this department? Figure 2.3 works to add a dimension of seeing all employees at this level; rather than lumping them together based on gender. This figure (2.3) allows us to see fewer men in the associate level position across this department, and men occupying the top two highest-paying positions. These two insights affect our average and our findings in figure 2.2. With male associate professors making up only 35% of the department, and occupying the two highest-paying positions, they will have a higher average salary than their female counterparts. One factor that we can control in certain situations is examining when employees were hired. To truly understand an equal pay for equal work framework, we must examine the time worked at this institution.

Associate Professors in Department 1 by Year & Salary

Job Title	G..	Unique E..	Year														
			2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
ASSOCIATE PROFESSOR	M	E122795										74,693	90,196				
		E226455					84,210	85,710	84,262	88,981	92,462	74,693	90,196	66,721	68,137	106,434	106,478
		E391407															106,478
		E562795							84,262	88,981	92,462	74,693	90,196	66,721	68,137		106,478
		E758055				90,121	84,210	85,710	84,262	88,981	92,462						
	F	E026077											62,080	46,521	43,815		
		E136077											62,080	46,521			
		E168195									71,743	59,768	62,080	46,521	43,815	97,852	97,879
		E181125			79,030		83,475	83,475	85,504	87,208							
		E204975	73,758	76,380	79,030	91,683	83,475	83,475	85,504	87,208	71,743						
		E490425									71,743						
		E574867													43,815	97,852	97,879
		E624207															97,879
		E656077									71,743	59,768	62,080				

Figure 2.4: Source: CU Employee Data 2005-2019. Annual Salary for Dept, Job Title & Gender broken down by Year vs. Job Title, Gender and Unique Employee ID. Unique Employee ID represents an individual employee. The data is filtered on Full-Time Only, Dept Name and Professors. The Full-Time Only filter keeps True. The Dept Name filter keeps Department 1. The Professors filter keeps ASSOCIATE PROFESSOR.

Utilizing our framework, we need to be holding constant the highest number variables between the men and women we are studying; the more variability we can hold constant, the more accurately we can assess for employer-based gender discrimination. Typically, in higher education, you will receive a raise for each year worked at the institution and for various other factors such as publications, research, and going "on

the market" to get other offers. While we cannot control most of these factors due to restrictions in our data, we can compare individuals who started during the same year, which will help mitigate some differences between pay between individuals who have worked at this institution for varying lengths of time. In other words, in our analysis, we should -as best as possible- hold the year started constant. Looking at figure 2.4, the data is broken down into the next level of detail possible - year. This table shows us when (if in our time range of 2005 to 2019) an individual started working at the university. This table allows us to examine whose pay is lower or higher for a male and female associate professor in this department who started in the same year. Tracing a male associate professor starting in 2009 with the unique number E226455, we can see that he started with a salary of $84,210 whereas his female counterpart, E181125, was earning $83,475, representing a $735 difference between the two. According to Filer (1983), Oaxaca (1973), and Sanborn(1964) this could be due to employer-based discrimination- finding that it is relatively low. However, we cannot determine a pay gap between two employees. This would assume that these two employees have identical factors. For instance, one issue with this specific comparison is that she started in 2007 but worked in a different department or under a different job title or was on leave for 2008 before returning in 2009. This plays a factor in understanding why her starting salary (when she returned) was lower than his—understanding other factors such as past work experience, publications, research topic, mobility, class, race and ethnicity.

To attempt to mitigate personal bias, I will be utilizing this framework to examine another department and another professor's ranks within a different department. This new department falls under the social sciences department; however, this department does not require a PhD in order to be teaching faculty at this rank. Meaning we are

unable to hold education constant. The professor rank we will be looking at for this department is Assistant Professor because this job title has the highest number of individuals. Having more employees to look at in this setting gives us a broader range of data to analyze.

			Year													
Job Title	G..	Unique E..	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
ASST PROFESSOR	M	E019195			38,877	51,366	57,453	64,000	65,971	67,299	70,443	73,734	76,934				
		E041085			38,877												
		E096977				51,366	57,453	64,000									
		E169085			38,877	51,366											
		E178307											76,934	80,235	50,132	85,927	88,045
		E210378													50,132	85,927	88,045
		E396465	47,116														
		E411635	47,116	29,420	38,877	51,366											
		E427147						64,000									
		E433917					57,453	64,000	65,971	67,299	70,443	73,734					
		E799887												80,235	50,132	85,927	88,045
		E812805	47,116	29,420													
		E824465	47,116														
		E904527									70,443	73,734	76,934				
		E935157									70,443	73,734	76,934	80,235	50,132	85,927	88,045
	F	E102917							61,662	68,998	70,888	76,410	81,604	85,376	82,447	86,883	
		E193917					66,977	66,996	61,662	68,998	70,888						
		E211635	60,192	48,598	50,038	61,090	66,977	66,996									
		E245837										76,410	81,604	85,376			
		E256085			50,038	61,090	66,977	66,996	61,662	68,998	70,888	76,410					
		E340065	60,192	48,598													
		E373368															86,380
		E387718														86,883	86,380
		E692805	60,192	48,598	50,038	61,090	66,977	66,996	61,662	68,998							
		E804195		48,598	50,038	61,090	66,977	66,996	61,662	68,998							
		E806255	60,192	48,598				66,996		68,998							

Figure 2.5: Source: CU Employee Data 2005-2019. Annual Salary, Job Title & Gender broken down by Year vs. Job Title, Gender and Unique Employee ID. Unique Employee ID represents the individual employee. The data is filtered on Full-Time Only, Dept Name and Professors. The Full-Time Only filter keeps True. The Dept Name filter keeps Department 2. The Professors filter keeps ASST PROFESSOR.

Figure 2.5 shows that, on average, male assistant professors in this department make $69,790.39 whereas on average, female assistant professors make $68,998.91. In total, the average pay difference between men and women is $791.48 yearly, similar to the difference found for department 1. This new analysis takes out the year of hire as a

factor, preventing us from seeing what year they were hired and how long they have been at the university or in that position. In figure 2.6, we can see that, unlike department 1, department 2 has more women concentrated at the top of the pay scale for assistant professors as compared to men. However, the department has fewer women than men which could be an additional factor of consideration. Finally, looking at Figure 2.7, we see that the number of women in the department is relatively low compared to men. However, we do see a high concentration of women in lower-paying positions.

Following scholars such as Sanborn, Filer, and Oaxaca, my analysis on department 1 and department 2 demonstrates that employer-based discrimination is relatively low. However, we should not overlook the potential of employer-based discrimination. The main issue of data restriction plays a prominent role in my analysis of equal pay for equal work at the University of Colorado Boulder. This analysis would be more complete if data containing factors such as race, class, citizenship, ethnicity, education, years worked, highest job title held, etc., were accessible. An area of further research within the equal pay for equal work framework in higher education would be how much effect publications and research topics have on pay? Like Filer and Oaxaca, I believe that looking at sex segregation in the workplace will also provide a more in-depth analysis of the workplace at the University of Colorado Boulder.

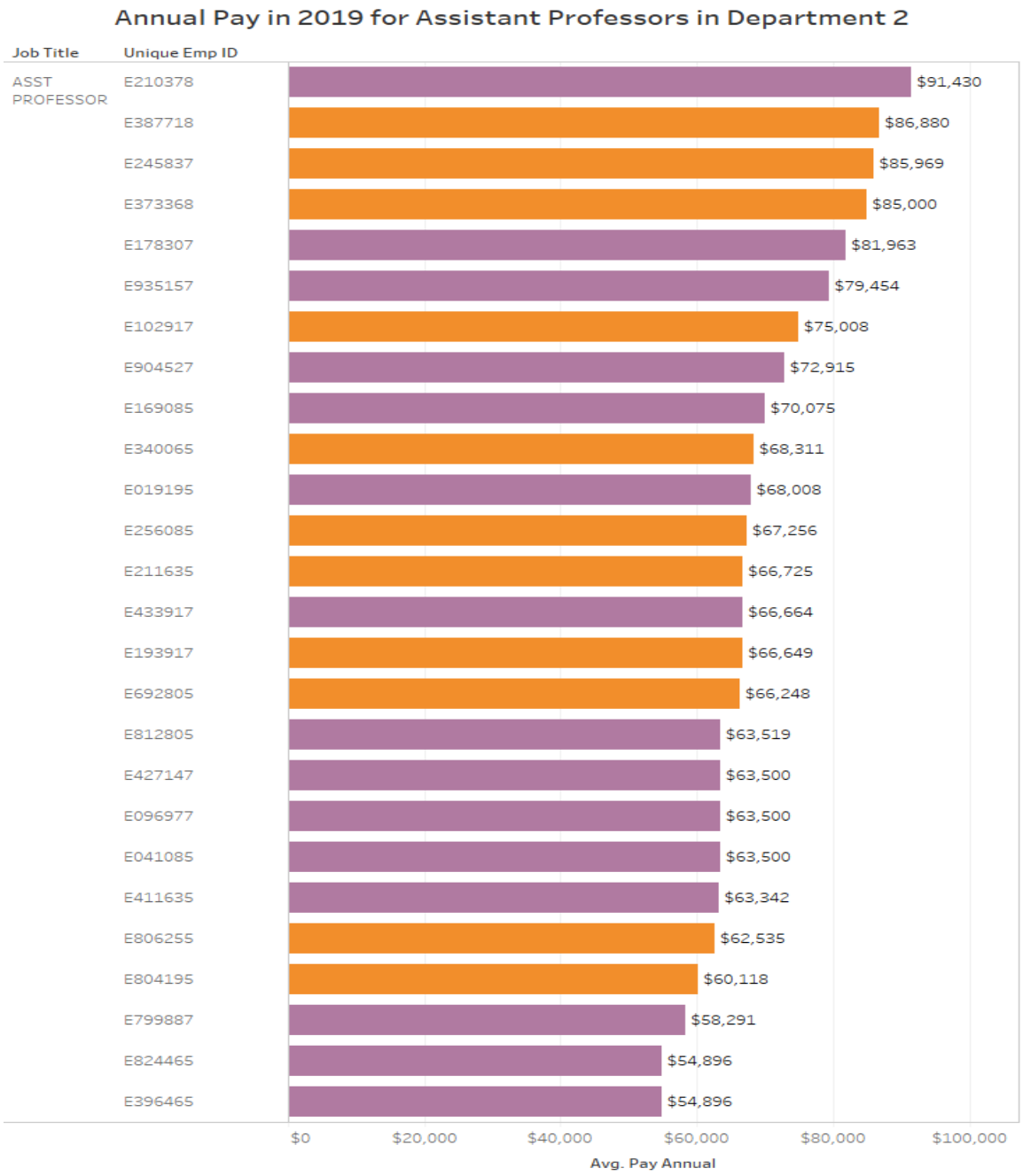

Figure 2.6: Data Source: CU Employee Data 2005-2019. Average of Pay Annual for each Unique Emp ID broken down by Job Title. Color shows details about Gender. The marks are labeled by average of Pay Annual. The data is filtered on Full-Time Only, Dept

Name and Professors. The Full-Time Only filter keeps True. The Dept Name filter keeps Department 2. The Professors filter keeps ASST PROFESSOR.

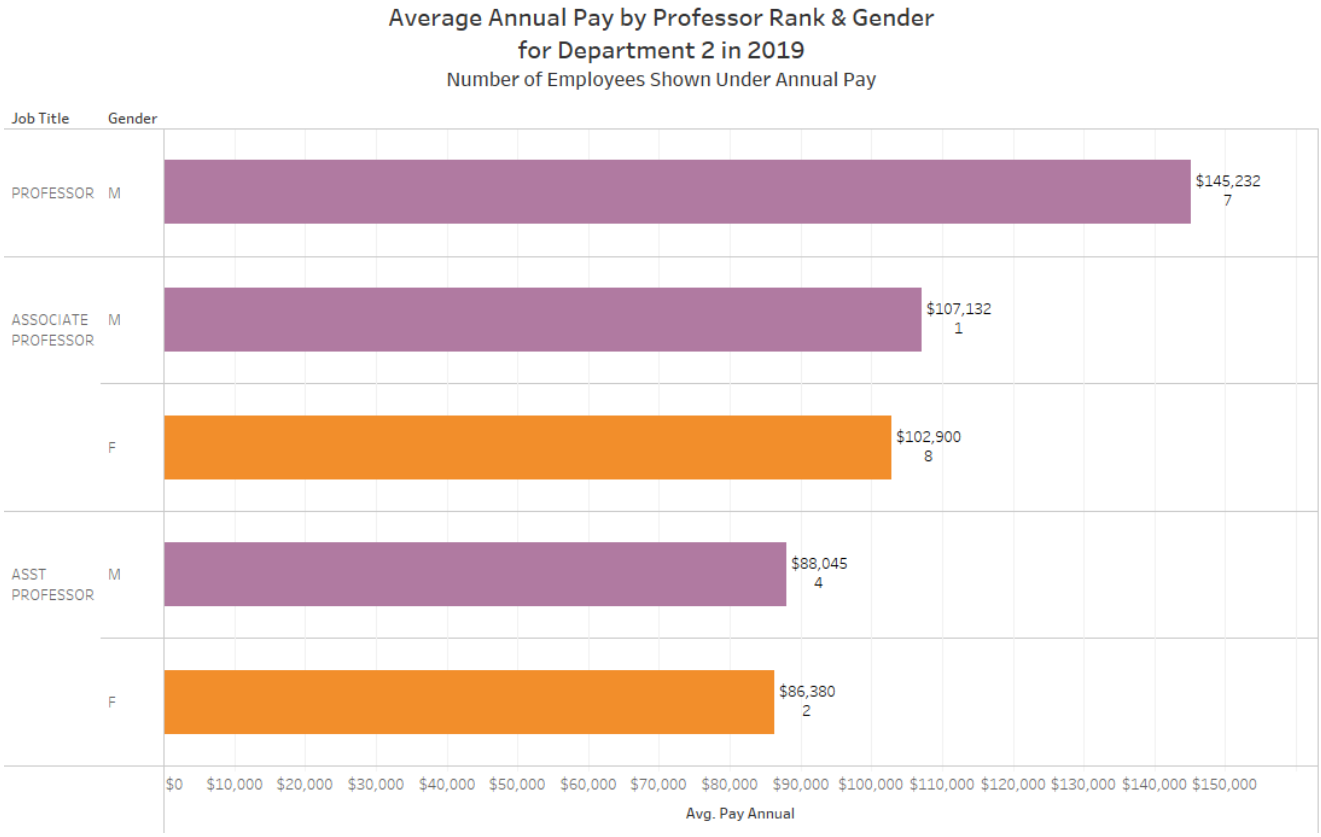

Figure 2.7: Data Source: CU Employee Data 2005-2019. Average of Pay Annual for each Gender broken down by Job Title. Color shows details about Gender. The marks are labeled by average of Pay Annual and sum of Number of Records. The data is filtered on Dept Name, Professors, Full-Time Only and Year. The Dept Name filter keeps Department 2. The Professors filter keeps ASSOCIATE PROFESSOR, ASST PROFESSOR, INSTRUCTOR, LECTURER and PROFESSOR. The Full-Time Only filter keeps True. The Year filter ranges from 2019 to 2019.

Figure 2.5 shows that, on average, male assistant professors in this department make $69,790.39. Whereas on average, female assistant professors make $68,998.91. In total, the average pay difference between men and women is $791.48 yearly. Similar to our analysis of department 1. This new analysis takes out the year as a factor, preventing us from seeing what year they were hired and how long they have been at the university or in that position. In figure 2.6, we can see that unlike department 1, department 2 has more women concentrated at the top of the pay scale for assistant professors as compared to men. However, the department has fewer women than men -which could be an additional factor of consideration. Finally, looking at Figure 2.7, we see that the number of women in the department is relatively low compared to men. However, we do see a high concentration of women in lower-paying positions.

Following scholars such as Sanborn, Filer, and Oaxaca, my analysis on department 1 and department 2 demonstrates that employer-based discrimination is relatively low. However, we should not overlook the potential of employer-based discrimination. The main issue of data restriction plays a more prominent role in my analysis of equal pay for equal work at the University of Colorado Boulder. This analysis would be more complete if data containing factors such as race, class, citizenship, ethnicity, education, years worked, highest job title held, etc., were accessible to work with. An area of further research within the equal pay for equal work framework in higher education would be how much effect publications and research topics have on pay? Like Filer and Oaxaca, I believe that looking at sex segregation in the workplace will hold a more in-depth analysis of the workplace at the University of Colorado Boulder.

Sex Segregation

Filer and Oaxaca both recommended utilizing a sex segregation framework to further research and understand the gender pay gap. Sex segregation concerning the gender pay gap is the idea that women and men occupy different job titles and occupations due to differences in socialization of girls and boys (Filer, 1989). According to scholars such as Blau & Khan (2016), Schieder & Gould (2016), Washington Center for Equitable Growth, and Carnevale, Smith, and Gulish (2018), sex segregation is the most significant factor of the gender pay gap. Sex segregation as a framework of analysis for the pay gap looks at where men and women are highly concentrated and how that, in turn, affects pay and pay differences. Unlike the equal pay for equal work framework that we examined previously, sex segregation has more minor factors that need to be held equal.

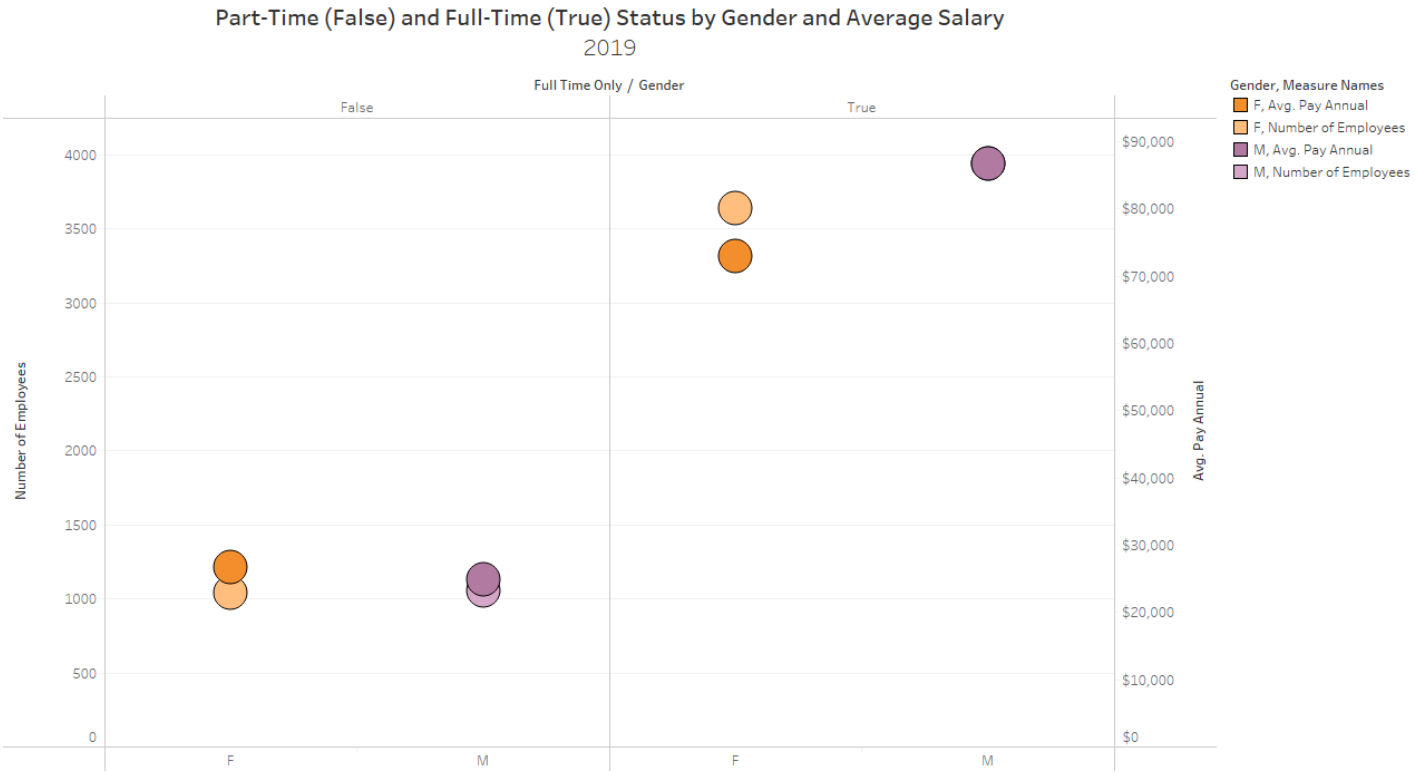

Figure 3.1 (Above): Data Source: CU Employee Data 2005-2019. Number of Employees and Avg. Pay Annual for each Gender broken down by Full-Time Only. Color shows details about Gender, Number of Employees and Avg. Pay Annual. The data is filtered on Year, which ranges from 2019 to 2019.

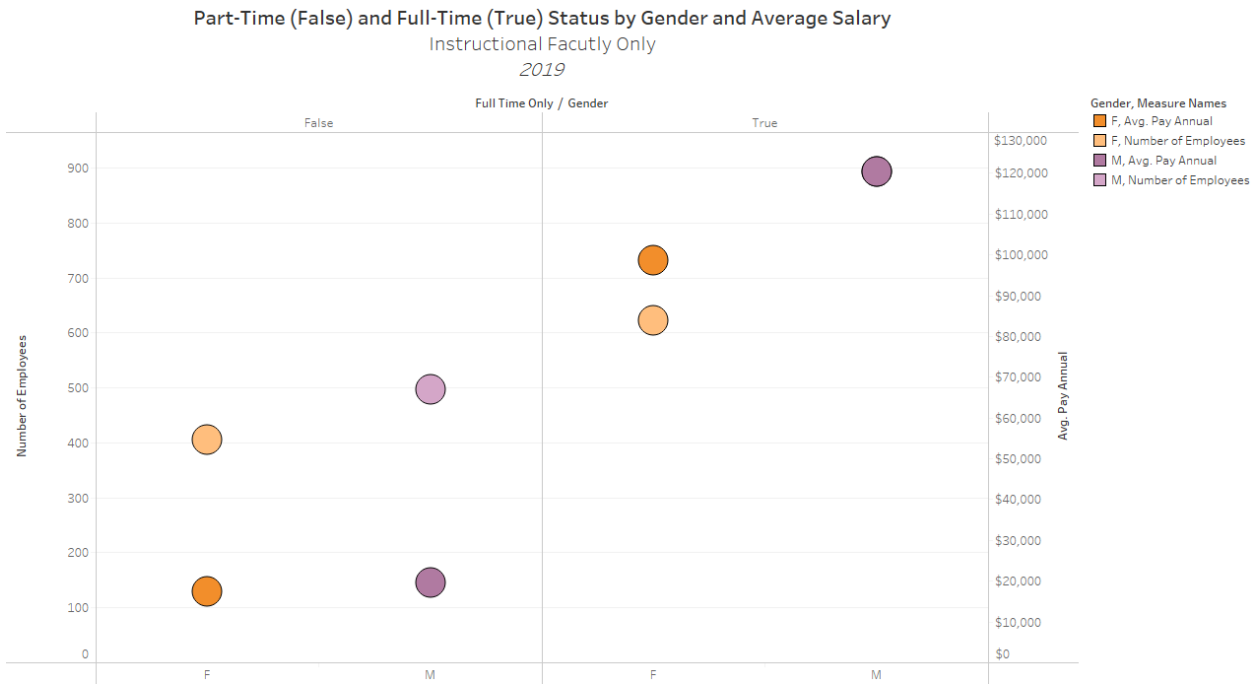

Figure 3.2: Data Source: CU Employee Data 2005-2019. Number of Employees and Avg. Pay Annual for each Gender broken down by Full-Time Only. Color shows details about Gender, Number of Employees and Avg. Pay Annual. The data is filtered on Year and Professors. The Year filter ranges from 2019 to 2019. The Professors filter keeps 24 members. False = Part Time, True = Full-Time. Note that full-time men's average salary and number of employees overlap.

Figure 3.1 demonstrates the number of employees by gender and full-time or part-time status with an average salary. Part-time status is anything less than 100% and is located under the column 'False.' This graph looks explicitly at 2019 data. Utilizing

our sex segregation framework, we will look just at the number of employees in each category. For part-time employees, we see that men outnumber women by 84 employees. When looking at the national pay gap, we see that women are twice as likely to work part-time than their male counterparts (Source: U.S. Bureau of Labor Statistics, Current Population Survey). When looking at the University of Colorado Boulder, we do not see this sex segregation in part-time and full-time work across all staff and faculty. Even when we look at just professors (figure 3.2), we see that men are more highly employed part-time than full-time. However, this shows us that the University of Colorado employs more men across part-time and full-time positions than it does women. When specifically looking at the number of employees at each professorial level, we can see a similar pattern.

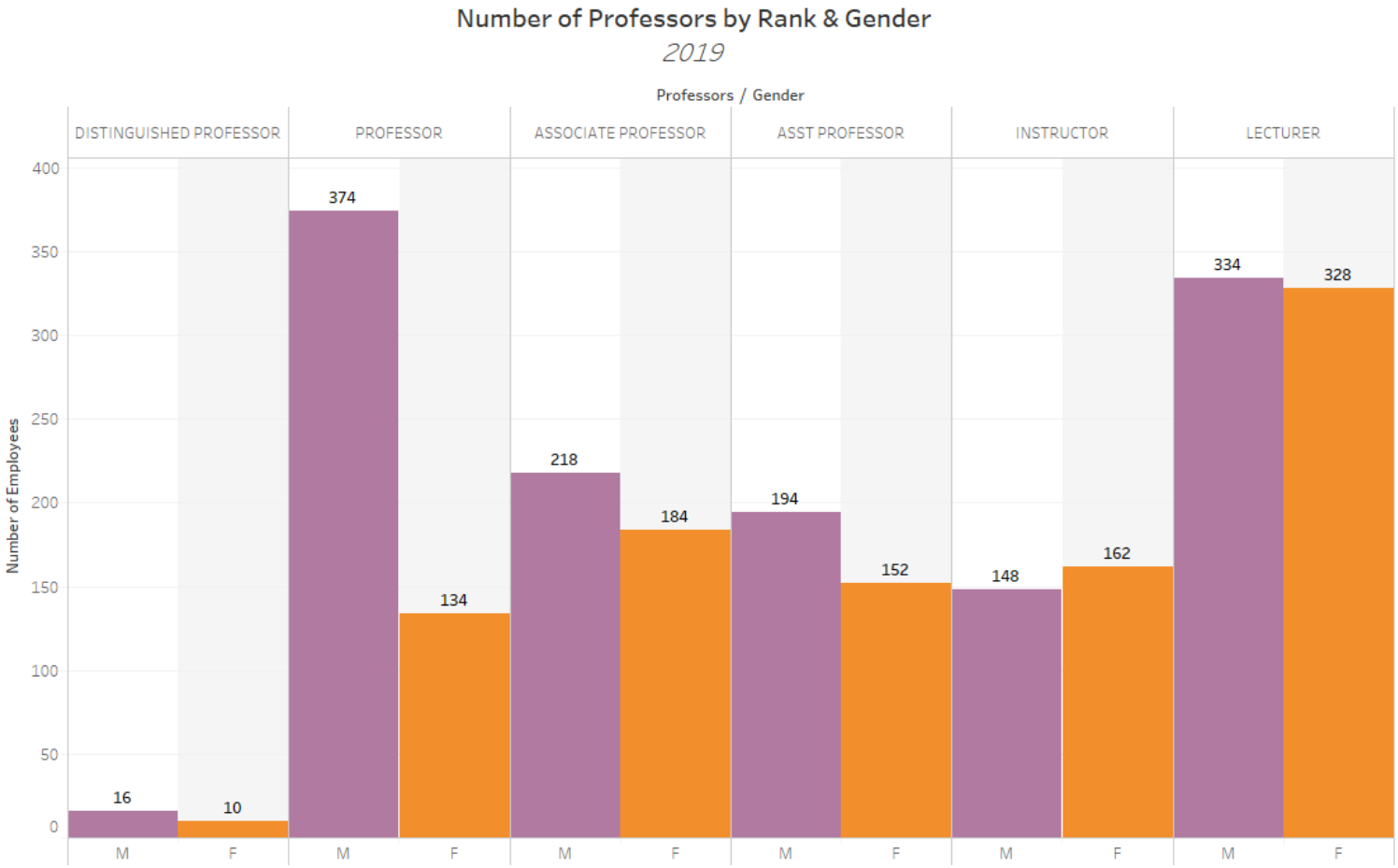

Figure 3.3: Data Source: CU Employee Data 2005-2019. Number of Employees for each Gender broken down by Professors Rank. Color shows details about Gender. The marks are labeled by Number of Employees. The data is filtered on Year, which ranges from 2019 to 2019. The view is filtered on Professors, which keeps 6 job titles in view.

In figure 3.3, we can see the number of employees for each rank. This graph is looking at 2019, and it shows us that for every rank except instructor, we see more men employed than women. A pattern to notice with this graph is how the differences between the number of male and female lecturers and instructors are less than 20, and

then as we move up to assistant and associate professor, the differences jump up to less than 40. Once we reach the professor status, we see 240 more men than women professors. While looking at the industry as a whole, in 2018, we see that there are 1,542,613 instructional faculty in the US. With a breakup of 771,594 men and 771,019 women, which is 50% women. In figure 3.3, we see that we have a total of 2,538 instructional employees, with women making up 42%. Figure 3.3 helps us understand the gender makeup of the institution as a whole. It is unlikely that the University of Colorado is discriminating against women when hiring, however there may be more discrimination when looking at who is getting promoted. Figure 3.3 raises questions on who is getting promoted and why far more men are full-rank professors than women.

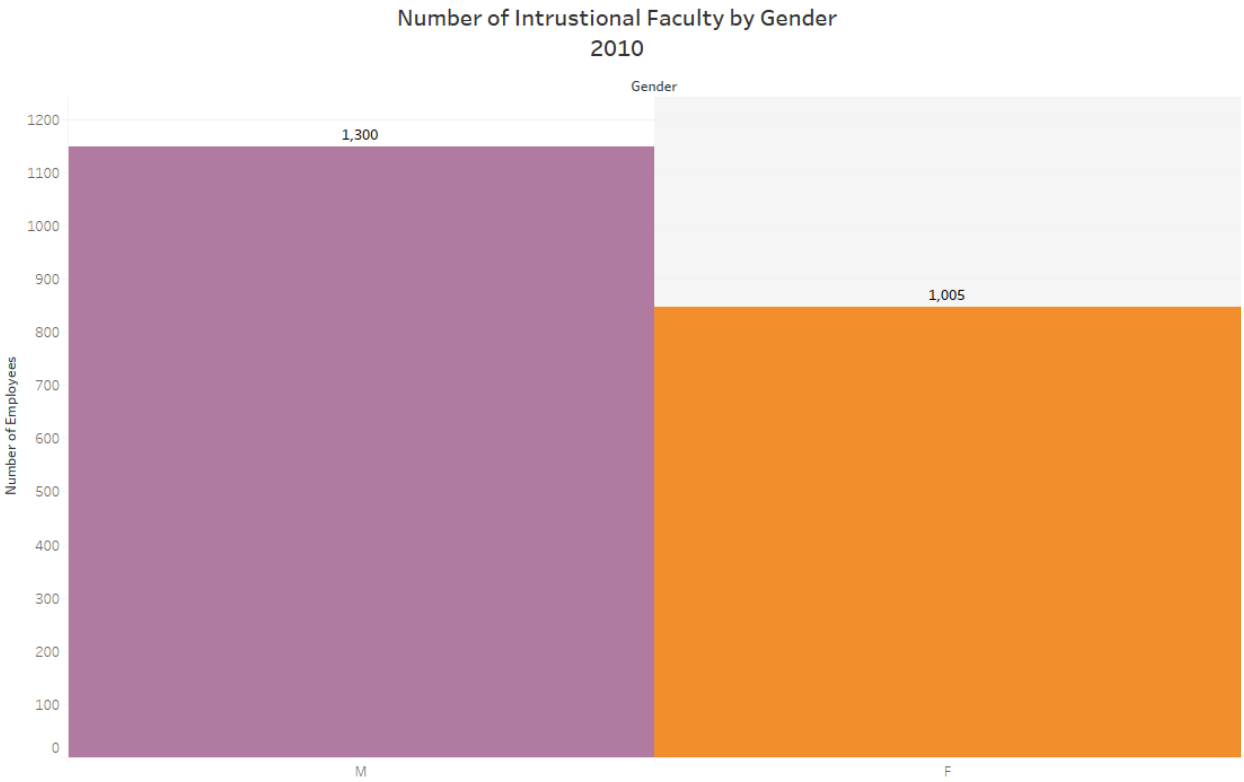

Figure 3.4: Data Source: CU Employee Data 2005-2019. Number of Employees for each Gender. Color shows details about Gender. The marks are labeled by the sum of Number of Employees. The data is filtered on Professors and Year. The Professors filter excludes 23 members. The Year filter ranges from 2010 to 2010.

The human capital model would explain this vast difference between men and women serving at higher levels as a lack of women's education or participation in higher education. One could argue that because it takes around 15 years to become a full ranked professor, and there were less women in higher education 15 years ago, that there would be fewer women in higher education than men. Furthermore, these women would tend to be in lower pay jobs due to their recent entrance into the field, whereas men who have dominated the field longer would be in higher paying positions. Looking at data from 1995, we see 562,893 men and 368,813 women in instructional positions in

higher education. Because there are far fewer women in higher education as instructional faculty than men, we could expect to see a lower number of women as complete ranked professors 15 years after 1995. Looking at figure 3.4, which looks solely at 2010 (15 years after 1995), we can see that there are far more male professors than female professors. Referring back to our 2019 graph above (figure 3.3), we see that women are beginning to occupy this space over time. This is most likely due to the vast increase in women's education.

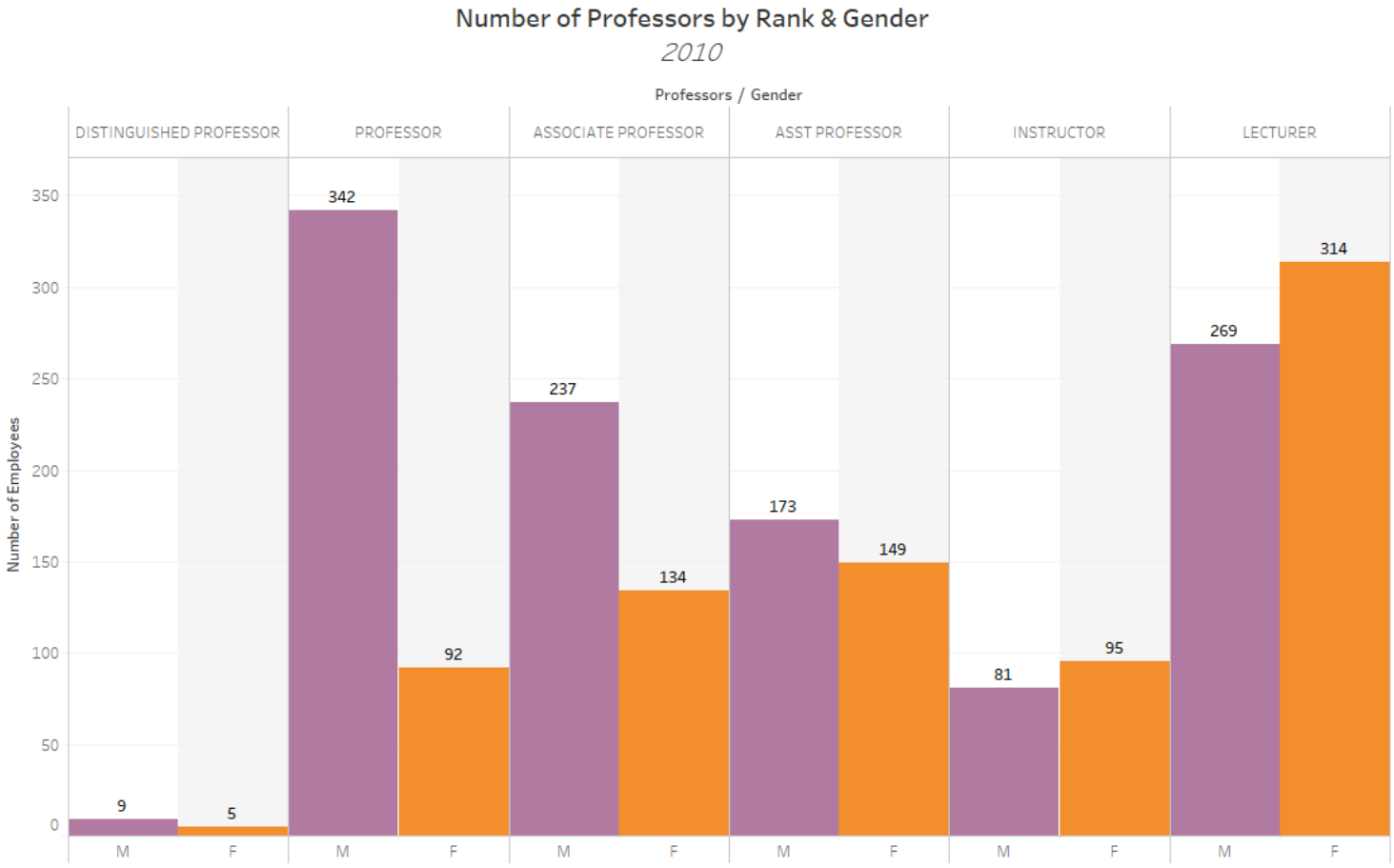

Figure 3.45: Data Source: CU Employee Data 2005-2019. Number of Employees for each Gender broken down by Professors Rank. Color shows details about Gender. The marks are labeled by Number of Employees. The data is filtered on Year, which ranges from 2010 to 2010. The view is filtered on Professors, which keeps 6 job titles in view.

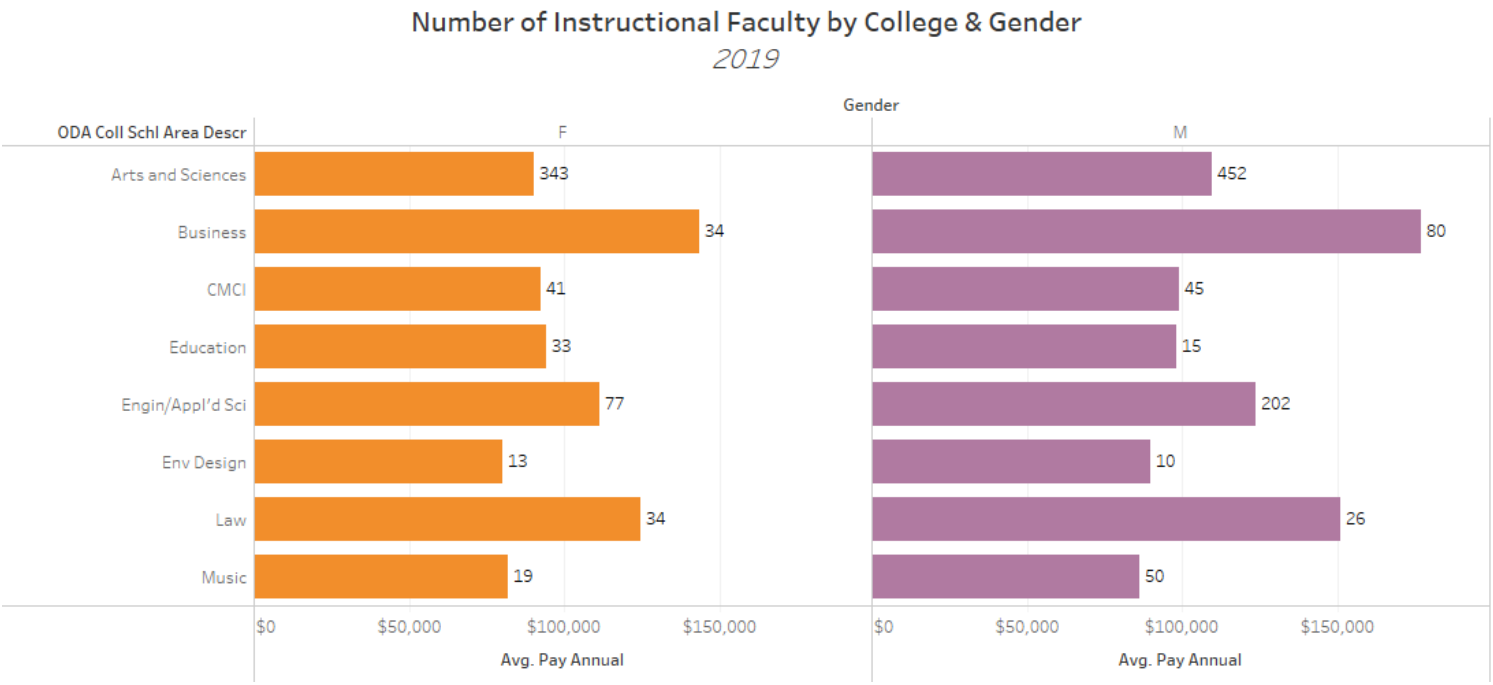

Figure 3.5: Data Source: CU Employee Data 2005-2019. Average of Pay Annual for each ODA Coll Schl Area Descr (College) broken down by Gender. Color shows details about Gender. The marks are labeled by Number of Employees. The data is filtered on Full-Time Only, Year and Professors. The Full-Time Only filter keeps True. The Year filter ranges from 2019 to 2019. The Professors filter excludes Non-Professor Titles. The view is filtered on ODA Coll Schl Area Descr, which keeps 12 of 17 members, excluding colleges/departments such as continuing education, and administration.

Going back to our sex segregation framework, another area to look at the schools and departments in which women teach. This is essential because they represent the industries in which these women individuals would be working if they were not teaching

in higher education. When specific industries are sex-segregated, there is a strong likelihood that the segregation will translate over to higher education. In figure 3.5, we see the number of full-time professors by gender for 2019 in the schools located within the University of Colorado Boulder. The five most prominent schools are Arts and Science, College of Communications and Information, School of Business, School of Music, and the School of Engineering. Looking at figure 3.5, we can see that in the College of Arts & Sciences, College of Music, College of Engineering, and Leeds Business School men outnumber women. Simultaneously, schools such as Education, Environmental Design, and Law school all have women outnumbering men. The School of Communications and Information and the School of Environmental Design show the smallest gap of only four or fewer women than men or vice versa. This is particularly interesting because, in recent decades, communications has been seen as a women's job. According to scholars (Filer 1983, Angle & Wissmann 1981)), when men take up work in a predominantly female field, they will make more on average than their female counterparts. This view of sex segregation is discrimination rooted in the upbringing of boys and girls (Fuchs, 1989), rather than discrimination on women from the employer or directly from the labor market.

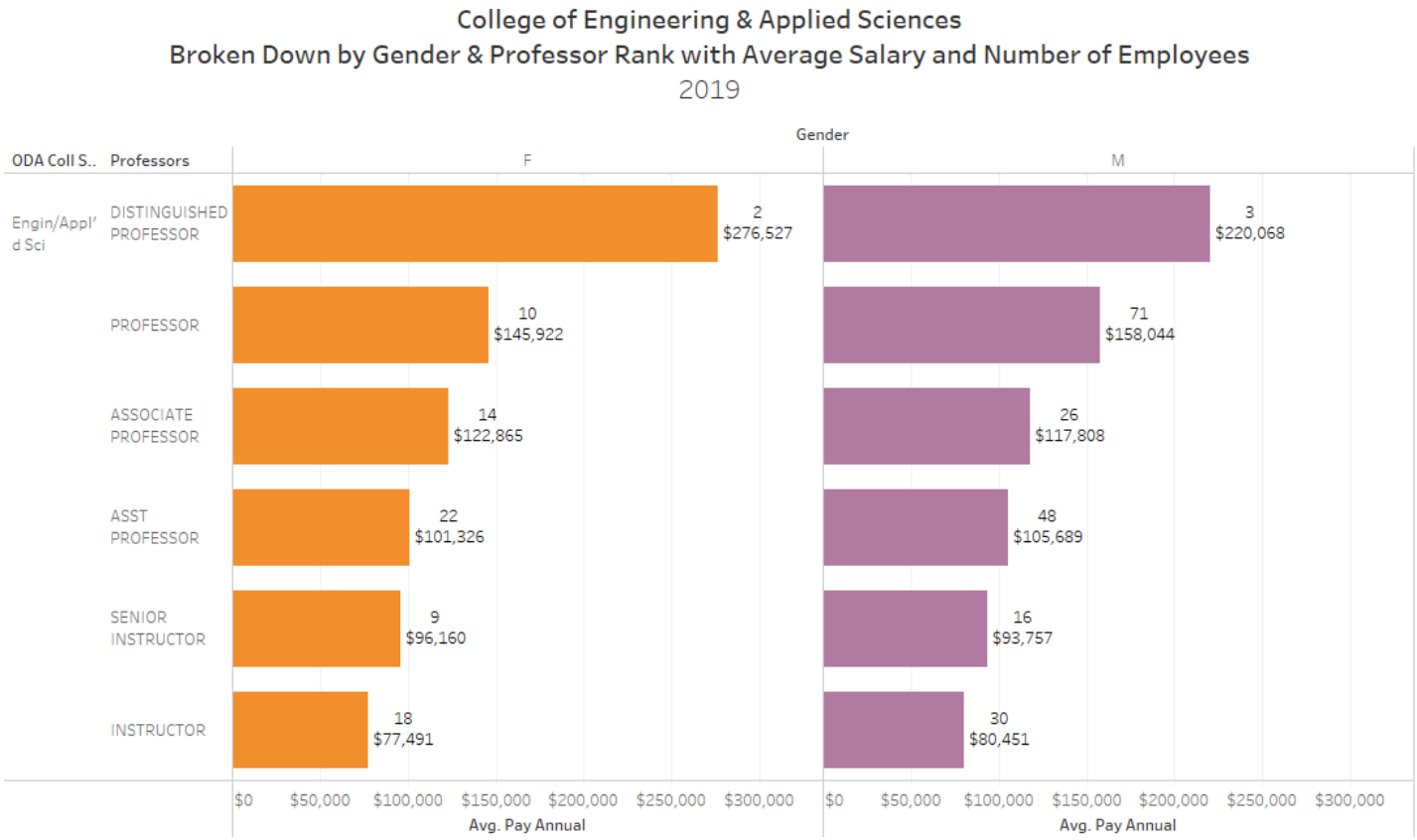

Figure 3.6: Data Source: CU Employee Data 2005-2019. Average of Pay Annual for each Professors broken down by Gender vs. ODA Coll Schl Area Descr (College). Color shows details about Gender. The marks are labeled by Number of Employees and average of Pay Annual. The data is filtered on Full-Time Only and Year. The Full-Time Only filter keeps True. The Year filter ranges from 2019 to 2019. The view is filtered on ODA Coll Schl Area Descr (College) and Professors. The ODA Coll Schl Area Descr (College) filter keeps Engineering and Applied Sci. The Professors filter excludes Non-Professor Titles.

One societal push has brought more women into STEM. Historically, past scholars showed us that women were less likely to enter STEM-related fields and more likely to enter fields such as education and communications. Here at the University of

Colorado Boulder, the most significant difference in women and men employed in instructional roles is in the School of Engineering with 125 more male professors than female professors. In comparison to other fields such as arts and sciences, communications, environmental design, and education, we see that engineering, business, and law school are, on average, the best-paid schools. In both engineering and business, we see that there are far fewer female instructional faculty than males. Looking at engineering in figure 3.6, we see women on average are out-earning men in these positions: distinguished professor, associate professor, and senior instructor. However, on average, men are out-earning women in these positions: professor, assistant professor, and instructor. A potential explanation for this is that due to the spike in women in STEM that has occurred over the past decade, we see more women entering higher education as STEM professors. However, there are still far fewer female instructional faculty in higher education, and on average, across all professor rankings, they are still making around $10,000 less than their male counterparts.

When utilizing sex segregation, a common question arises: how can we compare predominantly female and predominantly male jobs when they are not the same? Comparable worth studies equal pay for similar work and how we can compare sex-segregated jobs. The concept of comparable worth would not exist without sex segregation and predominantly female or male jobs. England's work *Comparable Worth Theories and Evidence (*1986) argues for comparing sex-segregated jobs as long as you hold constant education, job experiences, and years worked in that position. In the context of the data obtained from the University of Colorado Boulder, we cannot perform a complete comparable worth analysis. Similar to equal pay for equal work, we would need to hold constant factors that we do not have within the data.

When utilizing a sex segregation framework, we can see the University of Colorado Boulder employes more men than women, and women on average are more highly concentrated in lower-paying positions than men; this directly supports the hypothesis from Oaxaca (1973) and Fuchs(1989). Carnevale, Smith, and Gulish (2018) and Schider and Gould (2016) conclude that sex segregation is not the organization discriminating against women; it is the due to "deep-rooted societal beliefs about differences in competencies between the sexes (Carnevale, Smith & Gulish, 2018, 10)." When utilizing this framework of sex segregation, we are unable to use data to trace these deep-rooted societal beliefs about sex differences. This makes our sex segregation analysis of the gender pay gap only show the discrimination happening at our individual, organizational level. This discrimination may not be known to the organization because it has stemmed from these deep-rooted societal beliefs. Acker would argue that while the individual organization and employers within that organization may not be directly discriminating against women, organizations as a whole are sites where these gender-based societal beliefs are reproduced and reinforced. Through the lens of organizational theory, Acker would argue that the University of Colorado Boulder sees sex segregation as a form of discrimination because the organization favors men over women and works to reproduce structures of inequality that keep women and minorities at the bottom.

Intersectionality

This preliminary look at the University of Colorado Boulder's gender pay gap is in no way complete. For a complete understanding of the pay gap at the University of

Colorado Boulder, we would need to include other factors that may significantly impact pay such as race, ethnicity, ability, nationality, sexuality, educational attainment, class, etc. An intersectional analysis would evaluate how these intersecting identities play into the pay gap. Browne & Misra (2005) discussed that data-based studies that take an intersectional approach have their own set of issues such as representing all of these factors through data and collecting all of this data. Browne and Misra specifically discuss the challenge of trying to collect data on class; how would one determine what class they are in? Taking this intersectional approach for studying the pay gap is vital to understanding how intersecting identities affect the pay gap. An area of further research would be in understanding how much different identities affect pay.

When looking specifically at higher education, we see the same issue. Because instructional faculty have many more additional factors that could affect pay, more research is needed to understand how those different factors affect pay. Furthermore, research on how to collect data on these different factors is needed. Factors that can affect one's pay or advancement in higher education are mobility, publications, research topics, outside funding, FCQs (student feedback), years since PhD attainment, industry experience, and more.

Key Findings

Equal pay for equal work:

- Due to data restrictions, we could not attain and test factors that may significantly impact the pay gap such as race, ethnicity, class, ability, sexual identity? , etc. Specifically, we lacked data on factors that may play into higher

education such as mobility, research topic, number of publications, years in the industry, years since graduation, educational attainment,

- On average, men make more than women across all professor ranks. The smallest gap is at the lecturer level, and the most significant gap is at the distinguished professor level.
- Looking solely at Associate Professors in Department 1, we see that men only make up 35% employed but occupy the top paid positions, and a higher average salary than their female counterparts.
- Although employer-based discrimination may exist at the University of Colorado Boulder, we cannot confidently conclude that. In order to confidently draw this conclusion utilizing the framework of equal pay for equal work, we would need more data, including different factors that may or may not have an impact on the gender pay gap.
- However, we can conclude that there is a gap between men's average pay and women's average pay with our data. This could be due to a lack of consideration of external factors or employer-based discrimination. Similar to Filer and Oaxaca, I predict that sex segregation will play a more prominent role in the pay gap at the University of Colorado Boulder.

Sex Segregation:

- The University of Colorado Boulder employs more men than women across all faculty and staff.
- On average, men are more highly concentrated in higher-paying positions.

- It is unlikely that the University of Colorado Boulder is discriminating against women. However, it may be possible that there is discrimination for advancements and promotions. I cannot confidently conclude that there is or is not discrimination against advancements for women. However, I predict that it would show discrimination against women's advancement from the Assistant to Associate level and Associate to Professor level when looking at a more extended period.
- A potential explanation for the lack of women in higher ranking instructional positions in Universities may be the rapid increase in women's attainment in higher education; due to the lagging effect of advancements in higher education. However, to prove this, we would need to study similar universities to compare whether the University of Colorado Boulder's discrepancies are more or less than others. This seems unlikely to account for the sex segregation that occurs at Universities.
- Sex segregation is rooted in historical beliefs about the differences in competencies between men and women. Acker would conclude that because the University of Colorado Boulder has not actively worked to tear down the beliefs and structures that keep minorities oppressed, the organization is upholding inequalities.

Personal Perceptions and Analysis

While studying the gender pay gap through Equal Pay for Equal Work and Sex Segregation, we were able to come to different conclusions. These different conclusions help demonstrate how important framework is when studying the pay gap. Common

themes that we saw for both analyses is that in order to truly provide an intersectional and complete analysis we need access to more data on individuals employed. According to prior studies, factors that have the most significant impact on the pay gap are: race, previous work experience, and educational attainment. However an area of study for future research is studying factors that are directly related to higher education. In addition to those factors, I predict that the most impactful factors for higher education will be years since PhD attainment, publications, research, and how they are regarded in their field and by their colleagues and students. These areas all require further research, and further investigation into different datasets.

In relation to the University of Colorado Boulder, there is still a gap in knowledge when studying the University's employment data through just these two lenses. By continuing from conclusions made by both frameworks' conclusions, I believe that we would see a more comprehensive understanding of the gap at the University of Colorado Boulder if we were to look at the pay gap at the University over the entirety of our dataset in combination with what prior frameworks have concluded. This will allow us to see at a macro level the trends in pay based on gender. In agreement with both prior frameworks, this analysis would focus on areas that have been underrepresented by our prior frameworks. This new framework will be following standards used in both prior frameworks, however to not be repetitive we will not be restating prior points made in either framework.

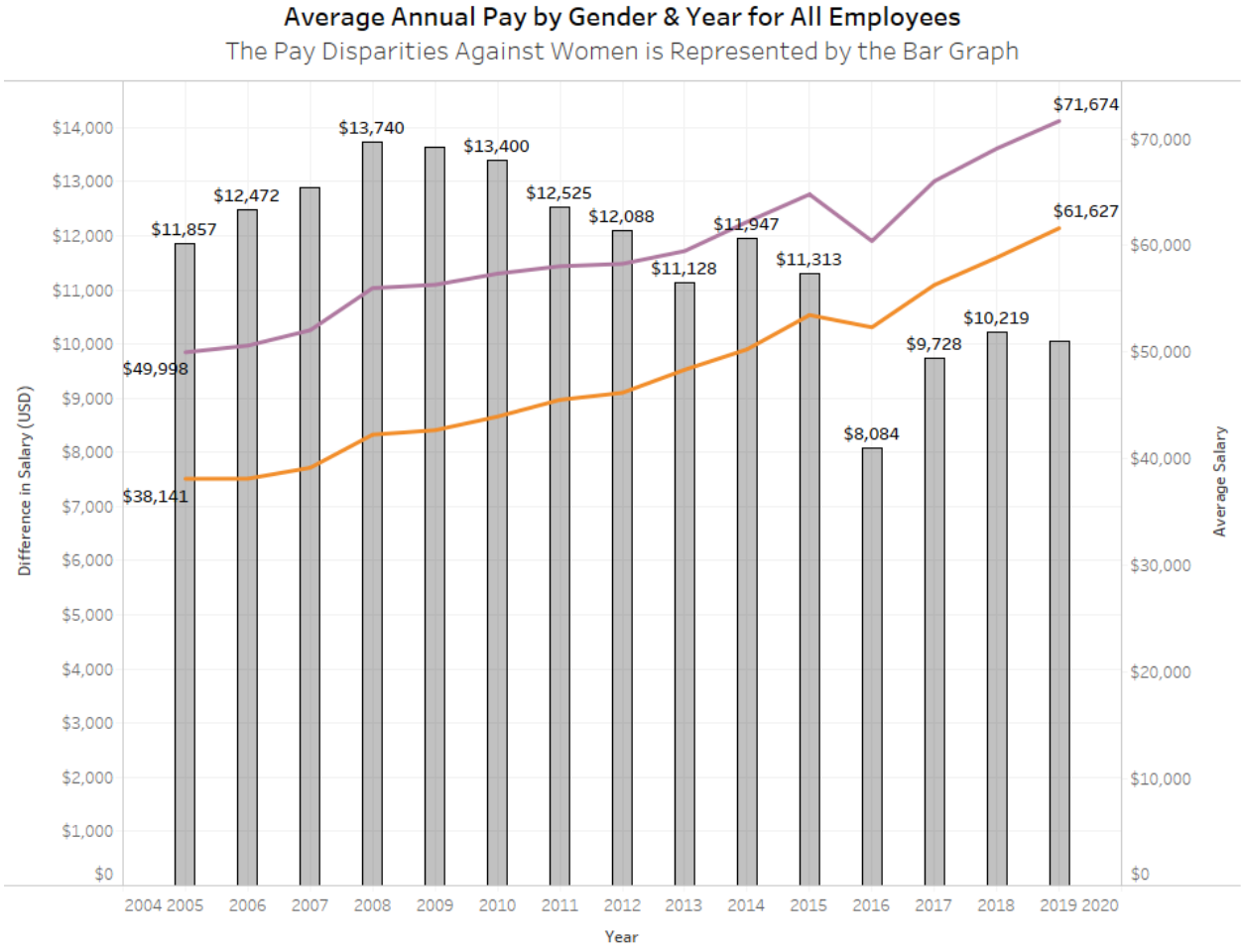

Figure 4.1: Data Source: CU Employee Data 2005-2019. The trends of Difference, Difference, Avg. Female Salary and Avg. Male Salary for Year. Details are shown for Difference, Avg. Female Salary and Avg. Male Salary. For pane Measure Values: Color shows details about Difference, Avg. Female Salary and Avg. Male Salary.

First in figure 4.1, we see the average annual salary by gender and year on the line graph. This is followed by a bar graph representing the discrepancies in pay between men and women. Looking at 2005, we can see that women, on average, made $11,857 less than men yearly. The explanations for these differences lie in our previous

frameworks of sex segregation, and the potential for employer-based discrimination that we saw while utilizing the framework of equal pay for equal work. From 2005 to 2009 the pay gap was growing, then we saw it decline, reaching its lowest in 2016. However, when studying the data, we saw a decrease in employees in 2015 and a hiring spike at the assistant professor level (typically the lowest paying professor rank) in 2016. This could be one factor that decreased the gender pay gap, as the typical gender pay gap between assistant professors is, on average, lower than at higher professor rankings. After 2016 we see the gap begin to grow again up until 2019. If we had data for the next several years, we could see if this gap is beginning to plateau, grow or decline, however with this graph we cannot conclude any trends that are currently happening. One issue with this graph is that it dose not take into account any considerations from our other frameworks, which is why I believe this graph as a representation of discrimination should be taken lightly.

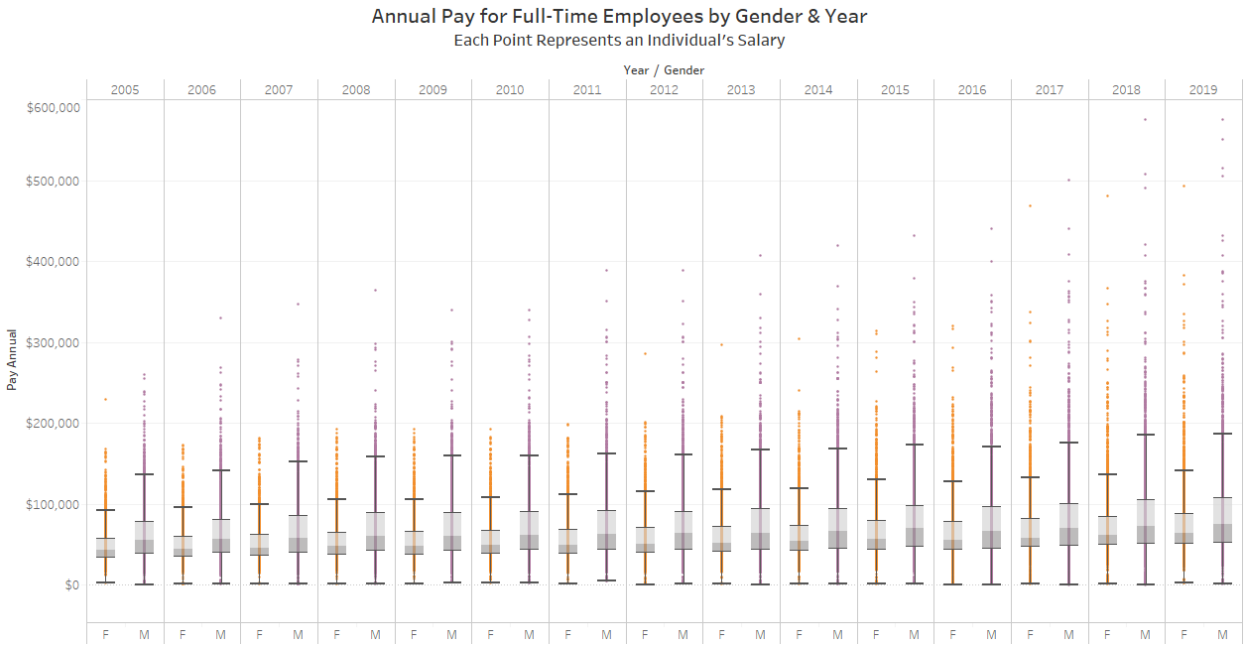

Figure 4.2: Data Source: CU Employee Data 2005-2019. Pay Annual for each Gender broken down by Year. Color shows details about Gender. Details are shown for Job Title. The data is filtered on Full-Time Only, which keeps True. The view is filtered on Year, which keeps 15 of 15 members.

Figure 4.2 represents full-time employee pay by year and gender by box and whisker plot. The ends of the lines (with the tick mark) represent the lower and upper extremes, the ends of the box represent the quartile, and where the gradient meets is the median. This type of graph is ideal for comparing distributions; in our case distribution of where women and men are more highly concentrated. When first examining figure 4.2, it is easy to follow the outliers past the upper extreme- specifically for men in later years. This brings us to a further analysis of sex segregation. When looking at figure 4.2, we see that every year there are more men in higher paying positions than there are women. Utilizing this figure we can see that over time everyone's salaries are increasing. However, when looking at the median for individuals' salaries women, on average, are

paid less than men in every year. This can most likely be explained by the sex segregation we saw earlier. According to (Carnevale, Smith, and Gulish 2018) sex segregation is repsonsible for the majority of the pay gap. Unlike our view while looking at sex segregation (figure 2.1-2.5) , this graph allows for us to see individuals and their yearly pay which allows us to see whether individuals pulling the average up or down. For instance, when looking at the last three years' data, the head athletics coach is the highest paid for men. This outlier pulls men's average up, however we can control for this by just examining professors through the same lens.

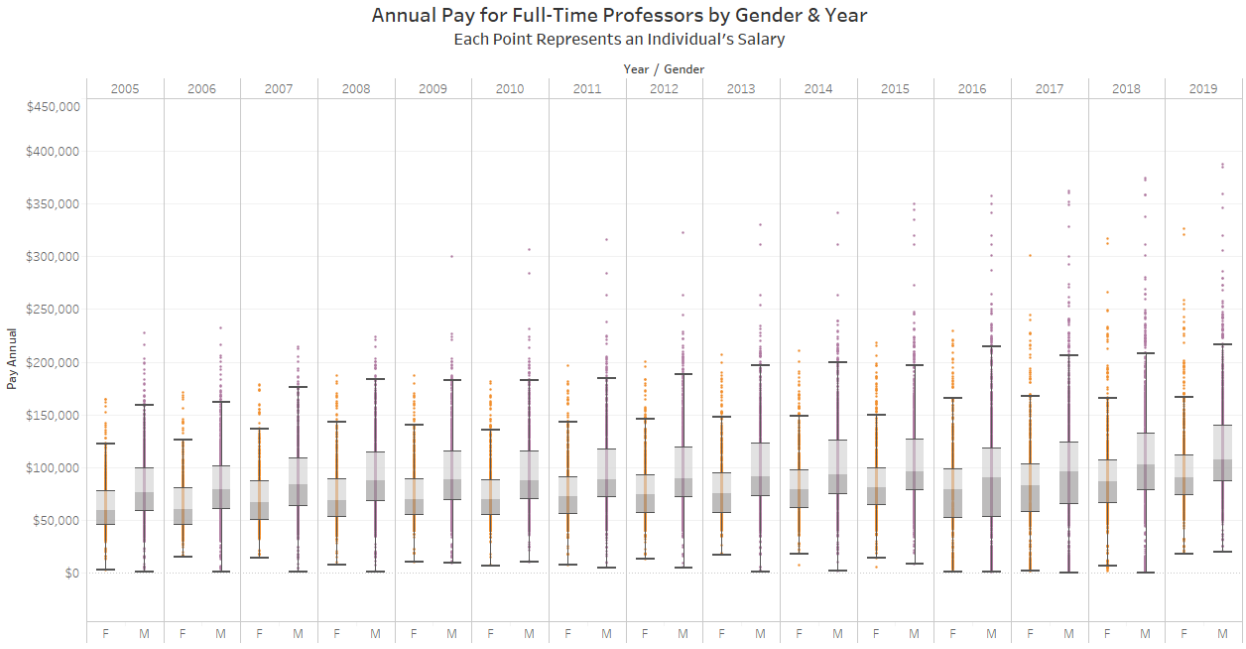

Figure 4.3: Data Source: CU Employee Data 2005-2019. Pay Annual for each Gender broken down by Year. Color shows details about Gender. Details are shown for Job Title. The data is filtered on Full-Time Only and Professors. The Full-Time Only filter keeps True. The Professors filter keeps 23 members. The view is filtered on Year, which keeps 15 of 15 members.

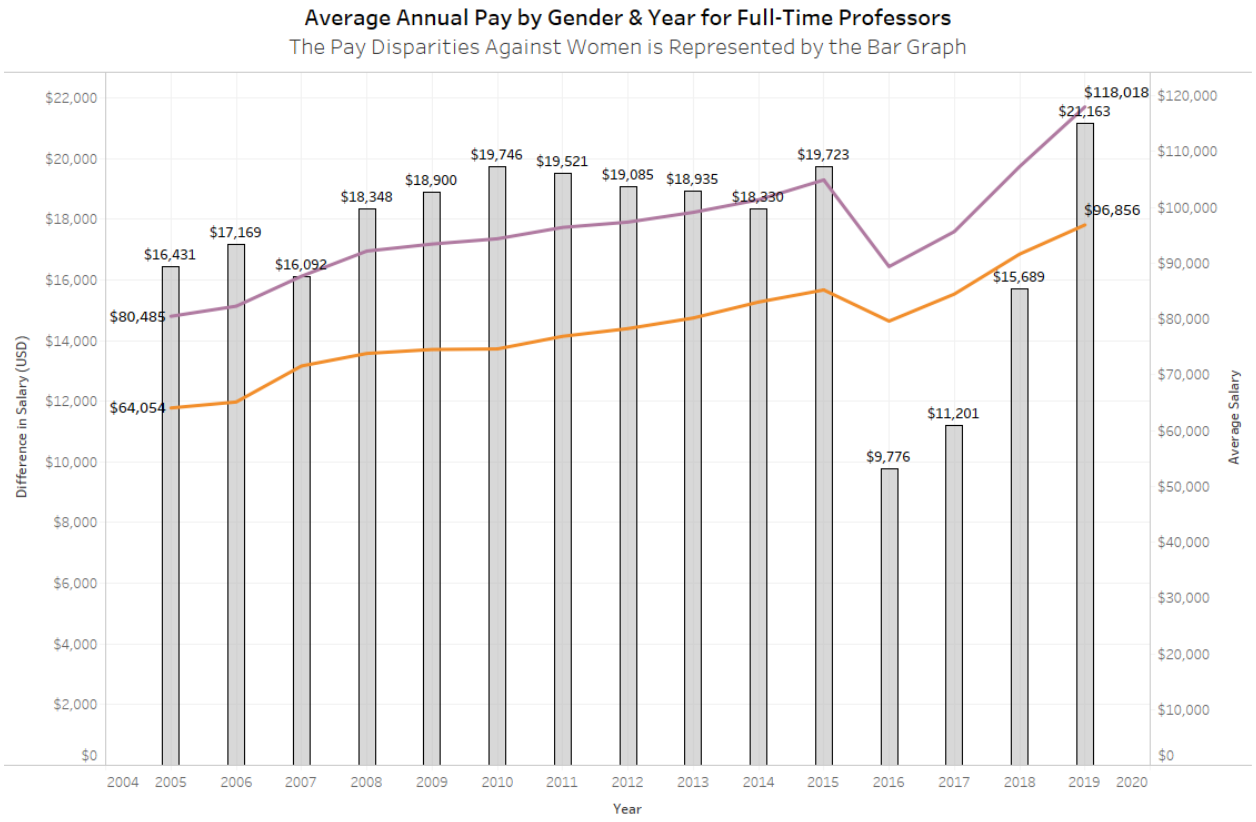

Figure 4.4: Data Source: CU Employee Data 2005-2019. The trends of Difference, Difference, Avg. Female Salary and Avg. Male Salary for Year. Details are shown for Difference, Avg. Female Sal and Avg. Male Salary. For pane Measure Values: Color shows details about Difference, Avg. Female Salary and Avg. Male Salary . For pane Difference: Details are shown for Difference, Avg. Female Salary , Avg. Male Salary , Difference, Avg. Female Salary and Avg. Male Salary. The data is filtered on Full-Time Only and Professors. The Full-Time Only filter keeps True. The Professors filter has multiple members selected.

In figures 4.3 and 4.4, we see only full-time professors by gender and year. This overview allows us to look directly at the patterns and trends for pay by gender throughout the last 15 years at the University. When looking at figure 4.4, we see an overall upward trend in the gender pay gap. Whether this is due to employer discrimination or sex segregation cannot be determined from this view or from our data only. However, we can see that unlike figure 4.1 the differences in pay are increasing rather than decreasing. Due to our previous examination of equal pay for equal work and sex segregation, we can connclude that this gap is primarily due to sex segregation and the societial belief that there are differences in competencies between the sexes. An interesting point is the gap for all employees (professors and others) seems to be on a downward or plateauing trend with 2019's difference in pay being $10,046 on average, whereas for professors the gap looks to be growing, with 2019's average gap being $21,163. These differences show that while the pay gap overall at the University of Colorado Boulder may be closing, the gap for professors is still prevalent and growing.

The human capital model would argue that this is due to women just recently outnumbering men in degrees, and the fact that it can take 10 to 15 years to become a full professor, bringing with it higher pay. Arguing that because women are only recently outnumbering men in degrees earned, we would need to re-evaluate the gender pay gap in higher education in another 10 to 15 years due to the lagging effect of how long advancements in higher education can take. While this argument may hold some truth to it, we should also consider the external context of the pay gap in the U.S. as a whole. According to Blau and Kahn (2018), since the 1980s, the gender pay gap has closed due to an increase in women's education. However, in more recent years the gap has begun to plateau. Although we need more data, we see that the overall pay gap at the

University of Colorado began to close in 2008, but in more recent years it has climbed and potentially plateaued at around $10,000. I predict that in higher education the pay gap follows the same structure as the broader pay gap, though is 10-15 years behind due to the nature of promotions. Note, however, that this applies only across the University as a whole. Looking just at professors we still see that the gender pay gap is increasing.

Conclusions

Utilizing Equal Pay for Equal Work and the Sex Segregation frameworks allowed a preliminary study on the gender pay gap at the University of Colorado Boulder. The two frameworks demonstrated different tactics and came to different conclusions. Equal Pay for Equal Work tried to hold constant as many factors as possible in order to find employer based discrimination. One major challenge with this framework is being able to hold constant the many factors on individuals. In this case, it was difficult to hold constant important factors for individuals working in higher education. Due to the complexity of advancements and promotions, you would need to consider factors such as publications, researcher, educational attainment and years since graduation. It is hard to collect usable data in a timely and cost effective manner. Another issue with this framework is that you are only looking at one small area of discrimnation. When this framework is used properly, with the correct amount of data, it is proficient at showing discrimination by a certain employer towards women or other oppressed groups.

Sex segregation as a framework has the ability to reveal discrimination that is rooted in societal beliefs rather than discrimination from one organization. The framework allows us to look where women and men are more highly concentrated, and work through why they are concentrated there. This framework predicts that women

will be more highly concentrated in lower paying jobs and men will be more highly concentrated in higher paying jobs. As we saw with our preliminary study on the University of Colorado Boulder this holds true. When researching with this framework, one issue is that the researcher must decide what is most important to hold constant. With the overall pay gap in the U.S. this task is easier because (Carnevale, Smith, and Gulish 2018) have studied and determined which factors play the biggest role in the gender pay gap. However, when looking specifically at professors more research is needed to see how factors such as publications, researcher, educational attainment and years since graduation play into the pay gap. Similarly to when men enter predominately female fields they will make more money on average, I predict this translates to higher education and furthermore that the reverse occurs; women entering male dominated fields make more on average.

Both frameworks provide unique insights into the gender pay gap, however more research is needed on how these frameworks translate to higher education. In my personal analysis I demonstrate the importance of looking at organizational trends and patterns and their comparisons to the broader gender pay gap. I conclude that at the University of Colorado Boulder, the pay gap for all employees follows the structure of the broader U.S. gender pay gap. However there is a need for more research into the gender pay gap for instructional faculty.

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