# College Major and the Gender Pay Gap

## Honors Thesis

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**Abstract**

Using the IPUMS USA database and the American Community Survey sample for the year of 2018, this paper seeks to explain how graduating with a bachelor's degree in a female dominated major can affect post-graduation earned income. Increases in the percentage of female students within a field of study have negative effects on an individual's earned income. Even after controlling for the percentage of female students within a degree field, there is an additional penalty to one's income for working within a female dominated industry.

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## 1. Introduction

The percentage of female students within a field of study should not have any indication on the potential income a college graduate may receive. Unfortunately, this is not the case and women are often penalized for their choice of major. Previous research has directed much of its focus on the segregation of men and women into different occupations (Shauman, 2016). The purpose of this study is to take the gender pay gap one step further and examine the separation of men and women in their choice of college major.

In the 1970s, a crowding hypothesis was proposed by Barbara Bergman claiming the restriction of women to few occupations and thus suppressing their wages (Bergman, 1974). This theory has been examined over and over again in research attempts to debunk the gender pay gap. Even today, individuals are finding lower wages within strong percentage female occupations versus those that are strongly supplied with male labor (Gronlund, Magnusson, 2013). Rather than continue to add to this research, a necessary examination of degree fields and their effects on earned income can lead to further interpretation of the gender pay gap. While Bergman uses the crowding hypothesis to explain separation in the labor market, this study will apply her theory to how individuals segregate into college majors.

When entering college, men and women differ on their reasoning for choice of major. The commonality between the two is interest in the subject. Besides that, women are influenced by aptitude in the subject while men are likely to be more influenced by the career potential that comes with the major (Malgwi, Howe, Burnabay, 2005). Although it may not be one of the most influencing factors for women, hope of labor

market success is shared amongst all college students (Robst, 2007). As men and women choose their different paths, the relationship between one's major and occupation is anticipated as graduation approaches.

The discrepancy between one's choice of degree field and occupation is often unknown. Students are likely to accept the most profitable job regardless of the relationship it has to their formal education. Robst (2007) argues that majors with a greater probability of unrelated occupations come at an economic cost of lower wages. While the classification of majors comes in a variation of forms, the traditionally female majors are often categorized as lower skill than their male counterparts (Eide, 1994). The gendering of a college major has become the driving factor in the divide between male versus female students.

Within this paper, the percentage female variable is used to describe the percent of female students within a particular degree field. Cech et al. (2011) propose a theory about professional role confidence and how one's confidence in their ability to succeed within a profession can relate to degree completion. Women do not hold the same degree of confidence that their male counterparts do and therefore turns them away from fields such as engineering and computer science. In some cases, women who do select a more male dominated major are discouraged and opt for a different field of study.

Professional role confidence closely relates to the stereotyping that occurs to individuals within certain degree fields. Computer science is overwhelmed by male students and has a distinct stereotype of masculine, extremely intelligent and technology-oriented individuals (Cheryan et al., 2013). When a prospective student fails to picture themselves within a degree field, the likelihood that they will select it as a major is

almost nonexistent. Just as gendering a degree field, categorizing the students who make up a degree field are all ways in which women are being turned away from prospective careers.

The disconnect in the research between degree field and post-graduation income is the driving force of this paper. While an abundance of research has focused its efforts on occupations and income, it is necessary to gear students in the direction of career paths prior to entering the labor market. The trends that influence occupational segregation of genders, can be applied to college majors as well. The purpose of this study is to add to the existing research of the gender pay gap and provide an additional perspective of how degree fields that contain a high percentage of female students tend to be the ones that are paid the least.

This paper is organized as follows; a literature review to examine previous research on the subject, methodology, analysis of results, and a conclusion to summarize the final findings.

## 2. Literature Review

Despite battling the gender pay gap for countless years, women are still being paid less than men (Blau, 2000). Gary Becker (1957) was one of the first economists to study the issue of labor market discrimination. Following his lead, Bergmann (1974) and Daymont and Andrisani (1984), added to the research in regard to previous ideas about women in the work force. While originally seen as strictly household labor, women proved themselves in earning more degrees than men. (Gemici, Wisiwall, 2014). The Civil Rights Movement and Title VII of the Civil Rights Act of 1964 changed the way of women's work. This has allowed women to enter the labor market with more frequency,

though within the market they are still earning less. It is necessary to continue the research on wage disparity and further explain why this gap is still in existence today.

Becker (1957), sparked the economic analysis of labor market discrimination. While published during a time where discrimination against black and women workers was legal (Ashenfelter, Oaxaca, 1987), Becker proposed a theory of taste-based discrimination. This taste-based discrimination was expected to have market push back, as discriminatory employers would experience less profit for hiring and paying "preferred" workers (Lang, Kahn-Lang Spitzter, 2020). Becker focused his work on three categories of discrimination; employer, customer, and employee. He used a discrimination coefficient to measure the monetary amount each of these three groups were willing to sacrifice to maintain their distance from "members of the undesirable group" (Figart, Mutari, 2005).

Much of Becker's theory was surrounding racial wage gaps. Claudia Goldin (2004) argues Becker's theory in regard to the gender pay gap as there "doesn't appear to be a desire for distance, so how could there be a distaste for women by men?" (Clement, 2004). If men are not experiencing a distaste for women, it is unclear why employers are still hiring men over women in the workforce. In the absence of taste-based discrimination, one other possible source for the gender wage gap is selection bias among women who decide to enter the workforce.

The discrimination that Becker brings to light is one that is referred to often within wage determination research. Despite having a focus on racial discrimination, this theory is still applicable to women. Goldin argues that the overall idea of "distaste" towards women may not be valid, though the choices that women make in their journey

to the workforce may be considered distasteful. Men are considered to have a greater tendency to choose a more lucrative major (Newmark, 2018). Within these fields, the percentage of female students is lacking.

Rather than focusing on the labor market alone, examining the college major that students select is something that few researchers focus on. Limitations on access to college major data accounts for the usage of the same few surveys within past research. The three most popular data sets are the 1993 National Survey of College Graduates (Morgan, 2008), The National Longitudinal Study of the High School Class of 1972 (Shauman, 2016; Daymont, Adrisani, 1984), and the Baccalaureate and Beyond Longitudinal Study (Shauman, 2016; Joy, 2003). The issue with these data sets is that they are outdated. In the 1970s, women were just beginning to expand into gender non-traditional majors. While the data does expand into the 1990s, a more recent data set is necessary to talk about the current pay gap.

Women experience devaluation for much of their career. Much of this devaluation comes from the idea that women "prioritize motherhood" and as a result let this affect their careers (England, Allison, Wu, 2007). This subconsciously lives within the mind of much of the population as it is considered the norm for women. Previous ideals that women provided expendable labor came from their primary job of household work (Milkman, 1982). Women have since been considered the primary caretaker and less likely to advance in the labor market. Even the model that is used in the measurement of the pay gap is based on men's pattern of working (Lips, 2003). There has always been a negative connotation towards becoming a mother and raising a family.

This takes women away from their work and thus makes them less valuable to the labor market.

The worth of women compared to men is highlighted within the fact that predominantly female occupations pay less than predominately male (England, 1999). This correlates to the crowding hypothesis that was first presented by Bergmann. Bergmann claimed that because women migrate towards a restricted number of occupations, they are supplying too much labor and thus experiencing overcrowding. Predominately female occupations that experience this over supply of labor are penalized with lower wages. The tendency of women to work in the same low paying jobs has been a negative factor of their labor market status (Blau, Lawrence, Kahn, 2000).

For many years it was a common understanding that the earning of a post-secondary degree was an equalizer. An equalizer in the sense that all those who earned this degree would be at an equal level within the labor market (Torche, 2011). The democratization of education attempts to create universal access to effective teachers and lectures. However, education is still realized differently between income brackets, race, gender, and income. This contributes to the inequalities that exist within higher education and that women continue to experience (Acemoglu, Liabson, List, 2014). While it was thought to only take a degree to become high achieving, this has not been the case for women. Women have reached a period in time now where they are more likely to graduate from college than men (Gemici, Wiswall 2014). Even while obtaining more degrees than men, women are experiencing a lesser pay. One may question the role that a specific degree can have on income. Regardless of degree, experiences in the labor market differ by gender.

Women migrate to a limited number of occupations as they do to degree fields. Grolund and Magnusson (2013) conduct a study using Bergmann's overcrowding theory and discover that there is in fact a relationship between wages and the percentage of females in an occupation. This paper looks to examine the percentage of females within a degree field and how this can affect the pay gap. Rather than allowing the gap to continue, women should be given the opportunity to enter all of the same fields as men. Changing one's career path post college is more difficult than explaining the benefits of certain degree fields prior to entering college. The examination of what major women choose before entering the labor market can add to existing research about the wage disparity. In order to complete this research, a detailed methodology is listed below.

## 3. Methods

The data in this study originated from the IPUMS USA dataset which contains United States census data for social, economic, and health research (Ruggles et al., 2020). The integrated public use microdata contains samples of the American population from several different census' and surveys. For the purposes of this study, the sample being used is the American Community Survey (ACS) of 2018. At the start of this data analysis, 2018 was the most current year available for use, however 2019 data has since been released. The primary dependent variable, earned income, reports income earned from the previous year, 2017.

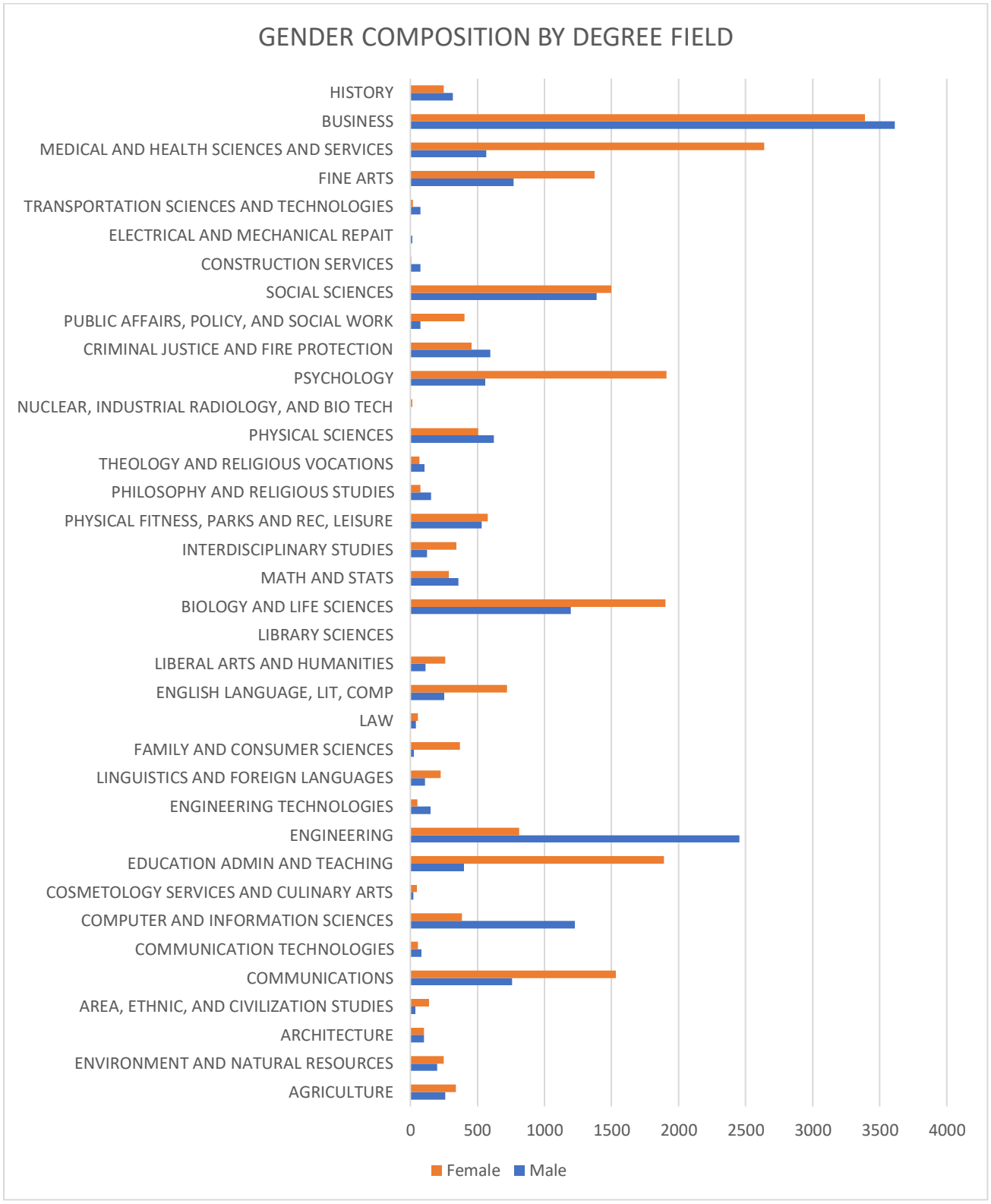
In the initial download of the data, the sample was controlled to contain only 20-25-year old's who are not currently in school, have obtained a bachelor's degree, and are either employed or unemployed. The purpose of these restrictions is to fully capture the

labor force after graduation from a four-year bachelor's degree program. This demonstrates how an individual's earned degree can affect their post-graduation earnings.

The question being examined is whether or not graduating with a bachelor's degree in a female dominated major has an effect on earned income. In order to define the term female dominated, it was necessary to create a percent female variable (%Female DF). As sex and major of each individual is given, the percentage of female students within each major can be calculated. The total number of female students within a degree field is taken and divided by the total number of individuals in the entire degree field. This is the main independent variable of the study and is expected to have a negative relationship with income because men with bachelor's degrees earn, on average, more than women do (Joy, 2000).

The gender segregation of college majors diverts women to lower paid career paths (Shaumann, 2016). The overall composition of each major by sex is highlighted in Figure 1 below. Some of the key majors to point out are medical and health sciences and services, psychology, education administration and teaching and communications. These are all dominated by female students and can later on be seen as some of degree fields with the lowest average income. Engineering and computer and information sciences are dominated by male students. These degree fields are two with some of the highest earning average income.

*Figure 1: Gender Composition by Degree Field*



An additional seven variables were added to the data download on top of school attendance, educational attainment, employment status, and wage and salary income. The following are a list of control variables used within the study; metropolitan status (Metro), number of own children in the household (# of Children), sex, age, race, field of degree, and occupation.

The dependent variable extracted from the database is wage and salary income. This variable reports pre-tax wage and salary income which is money received as an employee from the previous year (2017). Income is measured in contemporary dollars. This is important to note because in determining the relationship between degree field and income, the only income that we are interested in, is one that is earned through employment. Sources that constitute this earned income includes wages, salaries, commissions, cash bonuses, tips, and any other income from an employer (Ruggles et al., 2020). This is the dependent variable for the question at hand and will determine whether the gender separation amongst degree fields affects one's financial success post-graduation.

The metropolitan status variable reports whether the household in which the individual lives is located within a metropolitan area or not. One can expect that the more metropolitan an area may be, the greater the likelihood that jobs are available and obtained. New firms are likely to locate themselves where there are high agglomeration benefits (Anderson, Bogart, 2001). This variable is transformed into a binary variable by converting metro status indeterminable (0) and not in a metro area (1) as zero, and all those who are located within metro areas regardless of central or principle city location (2,3,4) as a one.

Number of own children is included as a variable because it could be considered a discriminatory statistic against women. The children are reported regardless of whether they are stepchildren, adopted, or biological. Any such evidence of being a mother is likely to additionally disadvantage women in the workplace (Ridgeway, Correll, 2004). Sex in this sample is also used as a binary variable between male and female individuals. Females are coded as one and males as zero. As a whole, women are less likely to have long and continuous work lives and thus accumulate less experience in the labor market than men (Blau, Khan, 2007).

Age as a variable is limited only to contain 20-25-year old's in an attempt to better capture the labor market post-graduation. Workers experience a greater salary later on in their careers (Lazear, 1974). The relationship between age and income is expected to be linear because the negative effects of age are not realized in such a young cohort of people. Age is likely to have a positive correlation with income because workers obtain more experience over time.

Race is included in the sample as well in order to account for any racial differences amongst income. The general version of the race variable is used for simplicity. In order to account for multiple races, multiple binary variables are created. The three included binary race variables are black, Asian, and "Other", where in each case those who embody the specified race are counted as a one and anyone of a different race is counted as a zero. The Asian race variable accounts for Chinese, Japanese, and all other Asian or Pacific Islanders. The "Other" race variable included other race (7), those who are a combination of two major races (8), American Indian or Alaska Native (3), and three or more major races (9). Though the sample is primarily white, a negative

relationship between black or “Others” and income is likely to occur because of discriminatory factors within the labor force. Both black men and women are known to earn less than their white counterparts (Lang, Kahn-Lang Spitzter, 2020). Previous research shows Asians, however, are likely to have a positive relationship with income as they are more likely to major in science, engineering, and math (Staniec, Farley, 2004).

The school attendance variable is restricted in the initial download, so the sample only includes those individuals that have responded with a one, not in school. This is similar to the educational attainment variable that has been limited to strictly include individuals who have responded with a ten, bachelor’s degree. The variable degree field provides the field in which the bachelor’s degree is in. For the purposes of this study, the general version of the degree fields is used (Appendix A). Military Technologies (38) and Precision Production and Industrial Arts (58) are not included in the sample as none of the individuals responded with the obtainment of a degree in these fields.

The employment status variable is also limited from the start as the initial download only includes those who are employed or unemployed and excluded those who are not in the labor force. Those individuals are not necessary for the purposes of this study. For the occupation variable, the occupations classified by 2018 Standard Occupational Classification (SOC) are downloaded and the general categories are used for simplicity (Appendix B). No one has reported N/A (0) so this is not included in the study.

The employment rate (Emp. Rate) is calculated using both degree field and employment status. Since those who are not in the labor force are not included in the initial download, those who are employed divided by the total number of individuals

within the degree field provides a calculation for the degree field's employment rate. This rate demonstrates the availability of surplus labor. If there are many unemployed individuals within a degree field, it is easy to replace workers. This reduces workers bargaining power within a field.

Similar to that of the percent female by degree field, a percent female by occupation (%Female Occ) variable is created in order to control for occupation. While the study's main focus is on the relationship between degree field and income, it is necessary to include a control for occupation. This control variable has a strong relationship in determining one's income. In order to create this variable, 25 occupational classifications are used to categorize the various occupations. From there, the percentage of females within each occupation is calculated. The number of females within each occupation is taken and then divided by the number of total individuals within each occupation.

The final manipulation of the data is to create several average income variables. The purpose of these variables is for graphical purposes only and they are not included in the regression. The first set of average incomes created are per degree field by male and female. Within each degree field, the average income is calculated by summing each income and dividing by the total number of individuals. This is done for all employed individuals and separately for both males and females. The results of this calculation can be seen in the graph below where there is a relatively strong negative relationship between the percent female and average income for all those employed. This pattern is duplicated for occupation as well. Within each separate occupation, the average income is also calculated for both male and female individuals. The correlation between percent

female within occupations and their average income is seen in Graph 3. This graph does not have as strong of a negative trendline and this is consistent with the hypothesis that the gender pay gap should be targeted sooner and within degree fields.

*Figure 2: Average Income by Degree Field and Gender Composition*

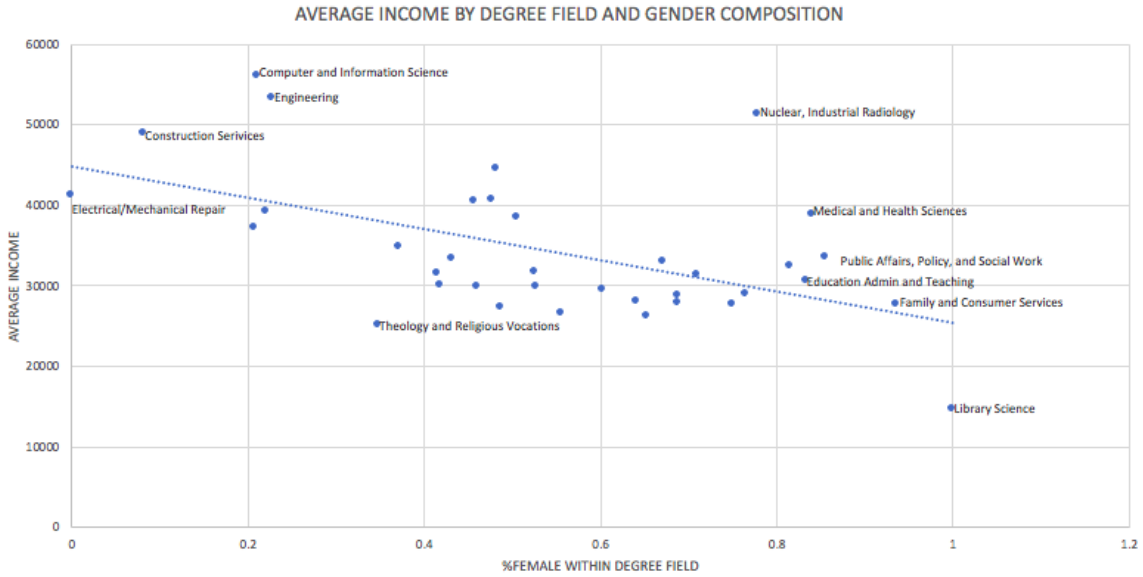



*Figure 3: Average Income by Occupation and Gender Composition*

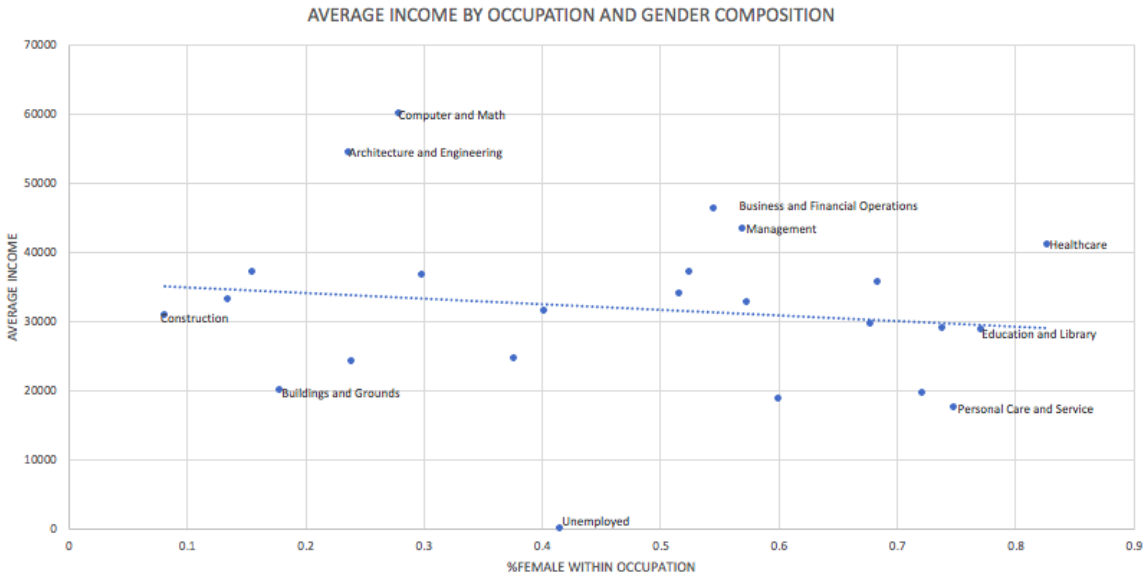


*Table 1: Descriptive Statistics*

| | %Female DF | Sex | Emp. Rate | Metro | # of Children | %Female Occ |
|---|---|---|---|---|---|---|
| Mean | 55.683 | 0.557 | 95.539 | 0.876 | 0.050 | 55.683 |
| Median | 50.503 | 1.000 | 96.084 | 1.000 | 0.000 | 56.947 |
| Standard Deviation | 19.232 | 0.497 | 1.496 | 0.330 | 0.275 | 18.584 |

| | Black | Asian | Other |
|---|---|---|---|
| Mean | 0.058 | 0.090 | 0.065 |
| Median | 0.000 | 0.000 | 0.000 |
| Standard Deviation | 0.234 | 0.286 | 0.246 |

Table 1 shows descriptive statistics of the main variables in this study. Some of the key findings to point out are the demographics of the majority of the individuals in the sample. 55.7% of the sample is female. Figure 4 shows the comparison between men and women individuals included in the study. Race was categorized separately to highlight the predominately white sample and how few of black, Asian, and other races are represented. Figure 5 demonstrates the limited racial diversity within the sample.

*Figure 4: Sex of Sample*

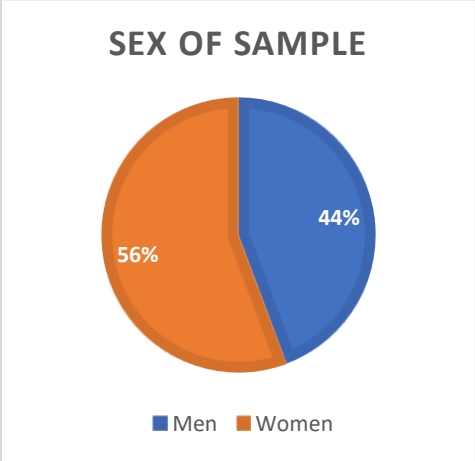
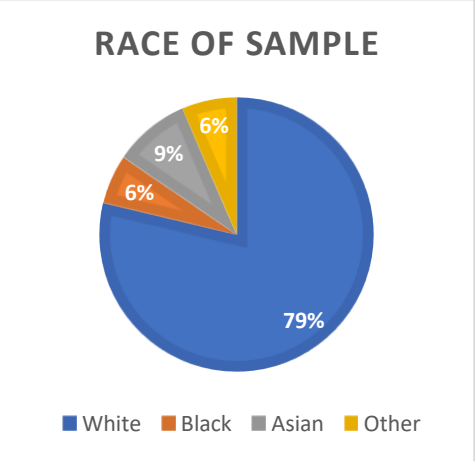


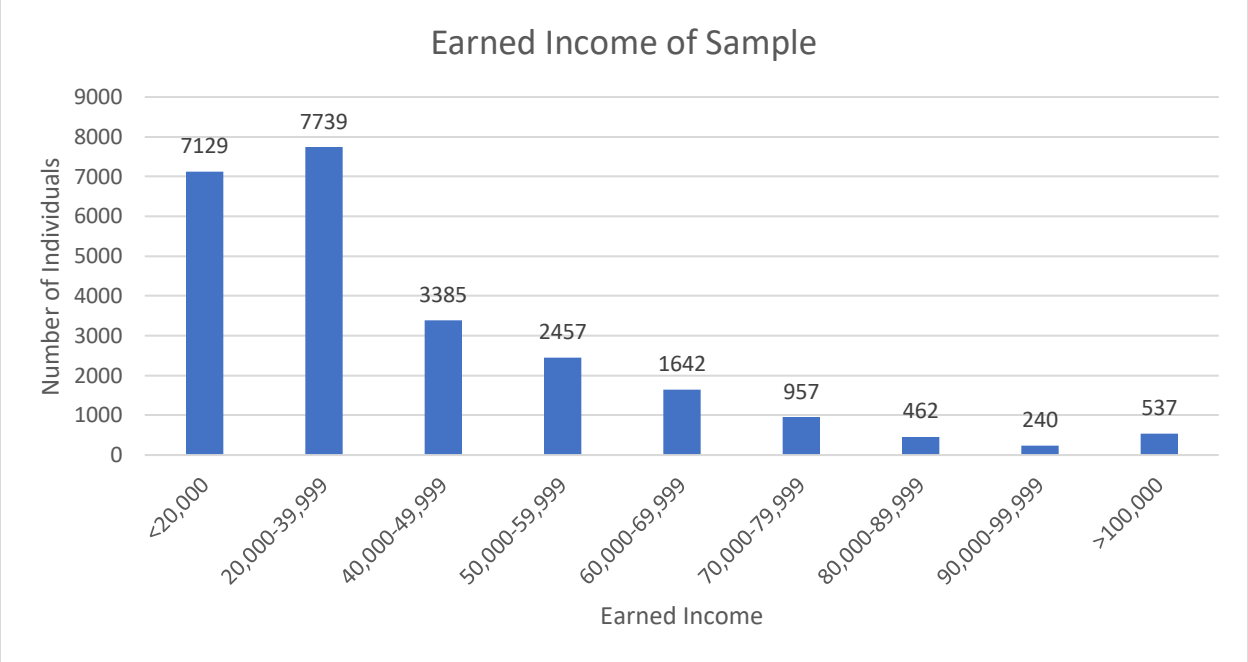

*Figure 5: Race of Sample*




The average income is $35,555 with a standard deviation of $29,569. It is important to note the importance of outliers within this sample. While this standard

deviation is considerably large, it makes sense when considering the wide range of incomes at hand. There are many individuals who earn less than 20,000 and there are many who earn more than 40,000. Graph 6 helps to visualize the spread of incomes within this sample. Individuals with an income of zero are included in the sample and this decreases the average as well. Within this sample, 70 percent of individuals who earn more than $100,000, are males.

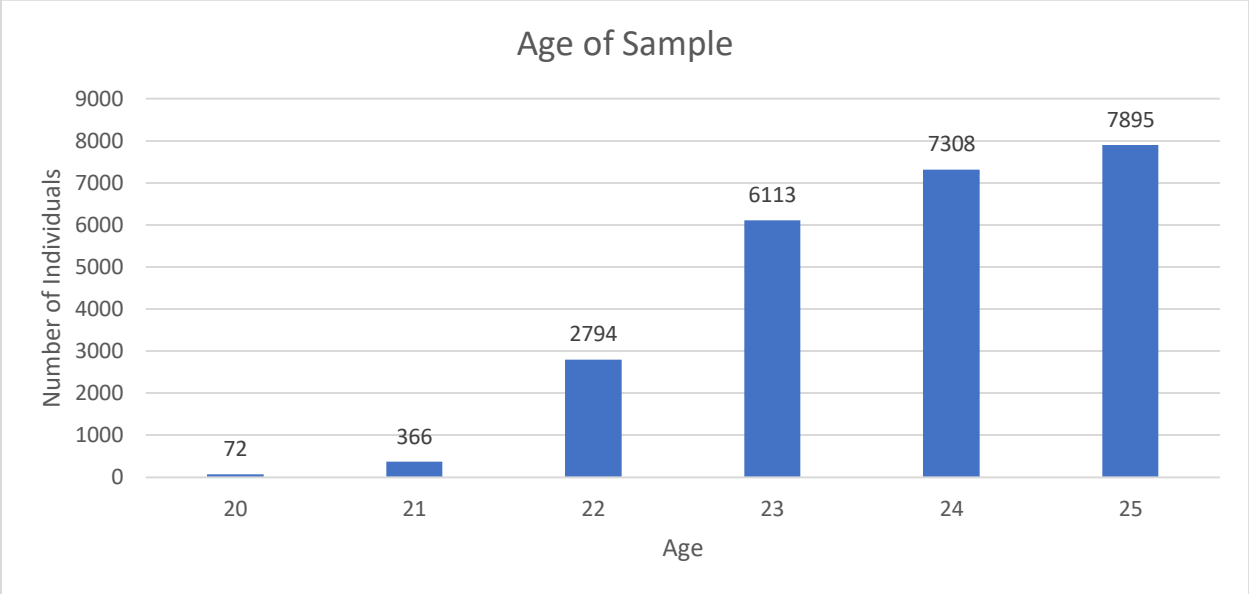
*Figure 6: Earned Income of Sample*




The percent female average is above fifty percent for both degree field and occupation. This demonstrates many degree fields and occupations have more women than men. The employment rate of the sample is very high and there are very few individuals who are unemployed. Most of the individuals within the sample are located within a metropolitan area as well. The average age of the individuals is 23, though the median is slightly higher at 24. Graph 7 shows the age distribution of the sample. The

graph is strongly skewed to the right showing an older number of individuals. I imagine this is right skewed because many 20–22-year-olds are still in school.

*Figure 7: Age of Sample*




## 4. Empirical Approach

In order to empirically analyze the data, a multiple regression analysis is completed. As stated previously, the dependent variable is earned wage and salary income and the main independent variable is percentage of female students within each degree field. The additional variables that will be included in the analysis are metropolitan area, sex, age, number of own children, employment rate, race which includes black, Asian, and "Other" and percentage of females within an occupation. Within this list of variables, the several binary variables will be considered dummy variables for the purposes of the regression. These are metropolitan area, sex, black, Asian, and "Other".

The assumptions about the model are that the error term is normally distributed with a mean of zero, constant variance, and the regressors are not correlated with the

error term. The constant variance checks for homoscedasticity and errors that are independent of one another satisfies any autocorrelation issues. The model assumes no unnecessary outliers and no serious multicollinearity issues. With this being said the final cross-sectional regression equation will mimic that of the equation listed below.

$$wage\ and\ salary\ income = \beta_0 + \beta_1 \%femaleDF + \delta_1 sex + \beta_2 age + \beta_3 emp.rate + \delta_2 Black + \delta_3 Asian + \delta_4 Other + \delta_5 metro + \beta_4 \#\ of\ children + \beta_5 \%female\ Occ + \varepsilon_i$$

## 5. Analysis

The results of the ordinary least squares, cross-sectional regressions in Table 2 show how each explanatory variable influence pre-tax earned wage and salary income for the year 2017. The model used follows a similar pattern of the empirical approach used in Morgan (2008) and Shauman (2016)'s research. Both authors use education in their regression analyses of income. Shauman (2016) specifically uses a similar percentage of female students per degree field. Regression number four is the regression of choice as each variable is statistically significant and adds to the explanation of the dependent variable. The $R^2$ value of the preferred regression is 0.102 suggesting that it explains roughly 10% of the variation. This is a considerable amount given the large sample size of the study.

Table 2: Cross-Sectional Regressions for %Female and Other Control Variables on Earned Income

| Dependent variable: pre-tax wage and salary income for 2017 | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| %Female DF | -265.735*** | -271.256*** | -267.572*** | -262.461*** | -200.904*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Sex | -2119.734*** | -1331.699*** | -1309.450*** | -1243.14*** | -26.792 |
| | (0.000) | (0.000) | (0.000) | (0.002) | (0.947) |
| Age | | 6294.484*** | 6311.295*** | 6325.867*** | 6330.638*** |
| | | (0.000) | (0.000) | (0.000) | (0.000) |
| Emp. Rate | | | 974.804*** | 1154.925*** | 1257.755*** |
| | | | (0.000) | (0.000) | (0.000) |
| Black | | | -6629.556*** | -7032.082*** | -7021.024*** |
| | | | (0.000) | (0.000) | (0.000) |
| Asian | | | 3589.065*** | 2807.279*** | 2805.129*** |
| | | | (0.000) | (0.000) | (0.000) |
| Other | | | -3383.946*** | -3674.658*** | -3621.504*** |
| | | | (0.000) | (0.000) | (0.000) |
| Metro | | | | 6634.646*** | 6671.852*** |
| | | | | (0.000) | (0.000) |
| # of Children | | | | -2083.598*** | -1958.147*** |
| | | | | (0.002) | (0.003) |
| %Female Occ | | | | | -153.473*** |
| | | | | | (0.000) |
| Constant | 51532.737*** | -98335.041*** | -191804.798*** | -215276.543*** | -220816.254*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Obs | 24,548 | 24,548 | 24,548 | 24,548 | 24,548 |
| $R^2$ | 0.036 | 0.088 | 0.096 | 0.102 | 0.108 |

P-values are reported in parenthesis. ***p<0.01 **p<0.05 *p<0.10

The main independent variable in this study is percentage of female students within a degree field. A one percentage point increase in the percentage of female students within a degree field results in $262.46 decrease in one's earned income. This remains consistent with the overcrowding hypothesis that women experience in the labor market (Bergmann, 1974). Although the estimate may not seem large, this is on top of the additional penalties that women experience such as having children and entering a primarily female occupation. Shauman (2016) uses a similar percent female variable to

represent majors in which she classifies on a scale from male-dominated to female-dominated.

In regression five, the percentage of females within an occupation is included. Occupation is necessary to control for in this study as one's income is dependent on their occupation. Both Shauman (2016) and Morgan (2008) control for occupation as well in their research. A one percentage point increase in the percentage of female individuals within an occupation results in a $153.47 decrease in earned income. This remains consistent with the idea that predominately female occupations are often the ones that pay the least (Blau, 2000). While it is important to include a variable to control for occupation, the addition of such variable caused sex to become insignificant.

The binary variable for sex codes women as a one so that the effect of being a woman can be clearly explained through the regression. In my preferred regression, being a woman decreases one's earned income by $1,243.14. This remains consistent with existing research on gender discrimination in the workforce. One possible reason is that employers may believe that they are likely to leave their job for maternal or family reasons (Daymont, Andrisani, 1984, Neumark, 2018). In regression five, sex is no longer statistically significant. One possible explanation for why sex becomes insignificant is the fact that the inclusion of another percent female variable, provides an additional penalty to a female income. Both percent female variables have similar negative impacts and it is likely that one is taking some of the significance away from the other. Similar to that of Morgan (2008), Shauman (2016), Joy (2003), Mandel, Semyonov (2014), Robst (2007), and many others, sex is included as a control variable in wage determination research.

Due to econometric concerns and because these variables appear to capture the same penalties, I chose regression four as the preferred model.

Age also plays an important role in explaining one's earned income. Typically, as one's years of experience increase, so does their income (Lazear, 1974). Within this regression, a one-year increase in age results in a $6,325.87 increase in earned income. Since the sample has been limited to 20-25-year old's, the magnitude of this increase follows the trend that many promotions occur early on in an individual's career (Rosenbaum, 1979). Both Shauman (2016) and Joy (2003) include an age variable in their analyses and obtain a similar positive relationship between age and income.

Employment rate for each degree field is also calculated and utilized within this study. The results show that an increase in one percentage point of a degree field's employment rate results in a $1,154.93 increase in earned income. This is an expected positive relationship as employment rate generally relates to employment and income. It is likely that the higher the employment rate of the field in which an individual obtains a degree in, the more likely they are to achieve labor market success.

Race is also included in this study to account for other forms of labor market discrimination. The three categories of binary race variables included are black, Asian, and "Other". If an individual is black, their earned income is expected to decrease by $7,032.08. This large negative relationship is not unexpected as black individuals experience some of the most serious forms of labor market discrimination (Carneiro, Heckman, Masterov, 2005). Being Asian on the other hand results in an increase of $2,807.28 in earned income. Again, this is not a surprising positive relationship as Asian's tend to major in Science, Technology, Engineering, and Mathematics (STEM)

fields which allows them to earn higher wages (Beede et al., 2011). Lastly, the "Other" category which constitutes of other minorities, results in a decrease of $3,674.66 in earned income. Similar to black individuals, those of any other racial minorities are likely to experience a form of labor market discrimination (Braddock, McPartland, 1987). Morgan (2008), Joy (2004), Mandel, Semyonov (2014), and Robst (2007) include several variables that account for race as well. This is standard in most wage determination research.

In order to account for a form of location, a binary metropolitan area variable is used for individuals located within a metropolitan area. Those who are located within a metropolitan area experience an increase of $6,634.65 in earned income. The magnitude of this result is likely due to booming labor markets within metropolitan areas (Tolbert, 1987) and the cost of living.

Another variable included in the regression is number of own children. This is used as a discriminatory statistic as well. Women who have their own children are often penalized within the labor force (Benard, Correll, 2010). A one child increase in the number of own children results in a $2,083.60 decrease in earned income. This is expected as much of the previous research on wage determination includes motherhood as a negative factor for women in the labor market (Anderson, Binder, Krause, 2002). Mandel, Semoyonov (2014) find a similar negative relationship between number of own children and salary.

Due to the fact that the sample contains only 20–25-year-olds, the penalty for children is likely higher. Career growth is just beginning and having children requires time out of the labor market. This missed time has profound effects on the future for

women. Adda, Dustmann, Stevens (2017) argue the lost time leads to lost skills and lower accumulation of experience. With the lost earnings and opportunities, women must weigh the costs that having children early on in their career has on their future.

The main take away from this analyzation is that the percentage of female students within a degree field does in fact have an impact on earned income. While there are many additional factors involved, the focus of this analysis was on the penalty women experience from their choice of college major. Other findings demonstrate additional negative impacts from just being a woman and also for having children. One surprising finding was the insignificance of the sex variable in regression five. The precious literature suggests this variable should be negative and significant. It may be that controlling for occupations differently could resolve this discrepancy with the existing literature.

## 6. Conclusion

It is of no surprise that the results of this study demonstrate a negative impact of a female dominated degree field on earned income. Although wage determination is impacted by a number of different factors, college major is one of them. Due to the inequity in the labor market, the gender pay gap is likely to persist for many more years. In this sample alone, of the individuals that make more than $100,000 a year, 70% of them are men. Future research should continue to examine this divide and provide further economic explanations and policy recommendations to close the gap once and for all.

In regards to the future of the gender pay gap, it is necessary to focus on students from an early age. Morgan (2013) explains the few women in STEM due to a negative

experience with a teacher, their male peers or to their lack of confidence. Cech et al. (2011) also proposes a similar confidence theory. Women lack the confidence that men do, especially when it comes to education or work. Starting in elementary schools, curriculum that emphasizes confidence in student work is essential. Professional development should be implemented for teachers across the nation, educating them on the importance that classroom confidence has on future career paths. Educating teachers on the profound effects that confidence has on a young girl's future abilities, can change the classroom environment. This can foster the self-assurance that so many women seem to be missing.

Women are also more likely to consider motherhood when choosing a career path (Weisgram, Diekman, 2015). Due to the demands that a career in STEM may entail, women are likely to choose an occupation that will allow them to raise or spend time with their family. The ancient gender roles are still maintained today as women are often the primary caregiver, regardless of occupational roles. Employers should focus their efforts on maternity and paternity benefits. Lack of paternity leave prevents men from leaving the labor market and forces women out. Cost and accessibility of childcare keeps women away from work for even longer periods of time. The Equal Employment Opportunity Commission (EEOC) should require companies to offer childcare programs for employees. The prevention of motherhood discrimination needs to be openly discussed amongst work place professionals.

The *Know Your Value* campaign and Liz Bentley (2021) propose government tax incentives in order to increase the representation of women in positions of power. It shouldn't take a tax break to hire women into positions where they belong. The National

Women's Law Center (2020) reiterates the pay gap with their shocking statistic that the average women will lose $407,760 over the course of a 40-year career. With all the progressive changes in this world, it is a shame that women still experience this large of a loss.

The purpose of this study is to provide a reason for change. A portion of the gender pay gap can be explained by college major. This fact alone gives substantial reason to focus future efforts on younger students. For a single percentage point increase in the percentage of female students within a degree field, there is a $200 decrease in earned income. Now imagine if the field that you earn a degree in is primarily female. As society continues to grow, women continue to suffer the consequences of their educational career paths. It is time to change the narrative and diminish the labor market inequality that women have experienced for far too long.

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*Appendix A: CIP Codes for Bachelor's Degree Field*

| Code | Label |
|---|---|
| 11 | Agriculture |
| 13 | Environment and Natural Resources |
| 14 | Architecture |
| 15 | Area, Ethnic, and Civilization Studies |
| 19 | Communications |
| 20 | Communication Technologies |
| 21 | Computer and Information Sciences |
| 22 | Cosmetology Services and Culinary Art |
| 23 | Education Administration and Teaching |
| 24 | Engineering |
| 25 | Engineering Technologies |
| 26 | Linguistics and Foreign Languages |
| 29 | Family and Consumer Sciences |
| 32 | Law |
| 33 | English Language, Literature, and Composition |
| 34 | Liberal Arts and Humanities |
| 35 | Library Science |
| 36 | Biology and Life Sciences |
| 37 | Mathematics and Statistics |
| 40 | Interdisciplinary and Multi-Disciplinary Studies |
| 41 | Physical Fitness, Parks, Recreation, and Leisure |
| 48 | Philosophy and Religious Studies |
| 49 | Theology and Religious Vocations |
| 50 | Physical Sciences |
| 51 | Nuclear, Industrial Radiology and Biological Technologies |
| 52 | Psychology |
| 53 | Criminal Justice and Fire Protection |
| 54 | Public Affairs, Policy, and Social Work |
| 55 | Social Sciences |
| 56 | Construction Services |
| 57 | Electrical and Mechanic Repairs and Technologies |
| 59 | Transportation Sciences and Technologies |
| 60 | Fine Arts |
| 61 | Medical and Health Sciences and Services |
| 62 | Business |
| 64 | History |

*Appendix B: SOC Codes for Field of Occupation*

| Code | Label |
|---|---|
| 11 | Management Occupation |
| 13 | Business and Financial Operations |
| 15 | Computer and Math |
| 17 | Architecture and Engineering |
| 19 | Life, Physical and Social Science |
| 21 | Community and Social Service |
| 23 | Legal |
| 25 | Education and Library |
| 27 | Art, Design, Entertainment, Sports, Media |
| 29 | Healthcare and Technical |
| 31 | Healthcare Support |
| 33 | Protective Service |
| 35 | Food Preparation and Serving |
| 37 | Buildings and Grounds |
| 39 | Personal Care and Service |
| 41 | Sales |
| 43 | Office and Administration |
| 45 | Farming, Fishing, and Forestry |
| 47 | Construction |
| 49 | Installation, Maintenance, Repair |
| 51 | Production |
| 53 | Transportation |
| 55 | Military |
| 99 | Unemployed |