

# ***Is the Inequality of Education the Main Factor That Causes the Gender Inequality in Different Industries?***

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**Abstract:** Gender inequality remains a significant issue globally, affecting various aspects of individuals' lives. Despite improvements in educational opportunities for women, gender disparities persist, particularly in the workplace. This study aims to investigate the role of education in contributing to gender inequality in different industries. Data was collected from the United States Census Bureau, including information on education levels, occupational distribution, and gender ratios. Statistical analysis methods, such as analysis of variance (ANOVA), were employed to examine the relationship between education and gender inequality. The findings show that while educational attainment has improved for both genders, gender disparities still exist in occupational distribution. Most females remain concentrated in certain industries, such as education, while males dominate fields like management and STEM occupations. These findings highlight the need to address gender inequality beyond educational factors and consider societal and cultural influences. By understanding the complexities of gender inequality, policymakers, and stakeholders can work towards promoting gender equity and equal opportunities for all.

**Keywords:** Gender inequality, Educational attainment, Occupational distribution, STEM occupations, Societal and cultural influences

## **1. Introduction**

Gender inequality is a pervasive issue that exists on a global scale, encompassing various aspects of society and affecting individuals of all ages. Despite advancements in education opportunities for women, gender inequality continues to persist. Women are often subjected to societal expectations and limitations that are not imposed on men, leading to disparities in opportunities and treatment. This inequality is particularly evident in the workplace, where women frequently face lower pay, limited career advancement, and unequal distribution of household and childcare responsibilities.

In the past, women endured even greater forms of gender inequality, with their rights and freedoms severely restricted. They were denied fundamental rights such as the right to vote, own property, borrow money, and pursue higher education. While gender inequality has gained more attention in recent years, it still poses significant challenges for women in various aspects of their lives, both personally and professionally. The perception of gender inequality differs between males and females, with women generally perceiving greater inequality than men.

Education has often been identified as a potential solution to address gender inequality. However, studies have shown that although educational opportunities for women have improved, education alone may not be the primary cause of gender inequality. Data from Western societies, such as the United States, indicate that the gender gap in education is not significant in at all levels, and women are even exceeding men in higher education levels. Women's enrollment and achievement in science, technology, engineering, and mathematics (STEM) fields have also prominently increased. Besides these advancements, gender disparities persist in certain industries, particularly those that feature prominent engineering programs.

To better understand the factors contributing to gender inequality, it is crucial to explore beyond education and consider other elements such as company mechanisms, social stereotypes, and inappropriate expectations. By examining data from different countries, such as the United States, we can gain insights into the impact of cultural differences on gender inequality.

In this study, we are going to investigate the role of education as a factor contributing to gender inequality in different industries. We will employ statistical analysis methods, including regression analysis and analysis of variance (ANOVA), to assess the relationship between education levels and gender inequality. Regression analysis will allow us to examine the independent influence of education while controlling for other relevant variables. ANOVA will help us compare gender inequality across different industries and assess whether education plays a significant role in these disparities.

By conducting this research, we hope to shed light on the complex factors influencing gender inequality and contribute to the ongoing efforts to promote gender equity and equal opportunities for all individuals, regardless of their gender. The findings from this study, based on data collected from the United States Census Bureau, demonstrate that although educational attainment has improved for both genders, gender disparities still exist in occupational distribution. Females remain predominantly concentrated in certain industries, such as education, while males dominate fields like management and STEM occupations. These findings emphasize the need to address gender inequality beyond educational factors and consider the influence of societal and cultural factors. By understanding the complexities of gender inequality, policymakers and stakeholders can work collaboratively toward creating a more equitable society that provides equal opportunities for all individuals.

## 2. Literature Review

Gender inequality is a worldwide phenomenon that involves discrimination based on sex or gender, resulting in one sex or gender being routinely privileged or prioritized over another. It is not only prevalent globally but also observed across different age groups and aspects of life. For instance, regardless of geographical location, females have traditionally been expected to adhere to standards of elegance in terms of dress and behavior. They are often expected to walk gently, speak politely, and prioritize appearance regardless of the weather. On the other hand, males face fewer limitations and restrictions. Moreover, gender inequality persists throughout different stages of a woman's life. In their youth, girls may be told that STEM subjects are for boys and that boys are more intelligent. As they grow up, they may be influenced by societal and cultural concepts that prioritize skinny, thin, and white as the standards of beauty. Additionally, they may face continuous pressure to conform to the idea that women should get married and have children by a certain age. The workplace is also a setting where gender inequality is particularly prominent. Women often receive lower pay for the same or comparable work and face frequent barriers to advancement, especially to higher-level positions. There is often an imbalance in the division of housework and childcare responsibilities, with wives shouldering a disproportionate burden even when both partners spend equal time in paid work outside the home [1].

Looking back at the nineteenth and early twentieth centuries, the circumstances for women were truly miserable. It is astonishing to think that women did not have the right to vote, own property and capital, borrow money, inherit, retain their earnings, initiate a divorce, retain custody of their children, go to college, become professionally certified physicians, argue cases in court, or serve on juries [1]. Gender inequality received relatively limited attention in discussions during that time. For example, in Aronowitz & Giroux's work from 1993, less than 2 out of 256 pages were devoted to gender issues [2]. However, as we entered the twenty-first century, the overall situation for women has improved compared to before. People nowadays respect women's thoughts and behaviors. More and more women have access to opportunities and resources, allowing them to pursue their aspirations. Today, from kindergarten through high school and even in college, girls get better grades in all major subjects, including math and science [3]. Society as a whole is gradually realizing the power of women and the importance of their autonomy. However, many women still face gender inequalities in various contexts, especially in the workplace. Based on research by Hang-yue Ngo et al., it was found that females perceive greater gender inequality than males. However, it did not support the notion that employees in lower job positions experience higher inequality compared to those in higher job positions [4]. Gender inequality not only leads to unequal distribution of income, authority, and prestige between men and women, even at the same occupational level, but also violates the principle of equal treatment for all employees, often resulting in problems with retention, morale, and performance [4].

When considering the reasons behind the prevalence of gender inequality, past papers and common beliefs often point to the unequal distribution of education resources and opportunities. However, Judith Lorber argues that about two-thirds of the world's illiterates are women. In contrast, in Western societies, the education gap is adjacent at all levels of schooling, and in some cases, women are doing better than men in higher education degrees [1]. Additionally, in recent years, women's advantage in college enrollment has been similar to that observed for earned degrees, suggesting that women and men complete their degrees at similar rates [2]. In Jacob's research, 54.2% of bachelor's degree recipients were women. Women also earned 58.9% of two-year degrees, 51.5% of master's and professional degrees, and 37.3% of Ph.D. degrees [2]. Throughout the twentieth century in the United States, women comprised a significant portion of students in primary and secondary schools. The rate of enrollment among 5-19-year-old women has exceeded 90% of men's rate since as early as 1850 and reached 98% since 1890. Women have been the majority of high school graduates since at least 1870, with over 60% of high school graduates being women in 1920.

Based on the data presented above, it appears that education alone may not be the primary reason for gender inequality. Also, the research shows that women can't get into STEM workplaces not because they are unable to do the work but because managers, coworkers, and the broader society send the message that women are not supposed or are not suited for the work (in addition to workplace norms that may be incompatible with competing gendered demands on women's time, as we discuss later [5]). To address this question, we aim to determine whether education is the main factor contributing to gender inequality in different industries, or if there are other factors, such as company mechanisms, social stereotypes, and inappropriate expectations at play. We have chosen to collect data from the United States, for two main reasons. First, these countries represent major global economies, and their employment and education levels are indicative of broader trends. Second, there is a wide range of diversity of races in United States, black, African American, Asian and so on. We can find out the characteristics and nuances of gender inequality within different cultural contexts.

To sum up, past research has shown that the universal education level for women may not be the reason for gender inequality. The lack of education resources and opportunities for women in certain areas is the key. Also, people should also pay attention to the mechanism of these certain areas'

education. Besides, the institution and the whole society should focus more on the industry mechanism.

With all the studies shown above, our research seeks to investigate whether education is the primary cause of gender inequality in different industries and to explore other potential factors contributing to this inequality. We will employ regression analysis to assess the independent impact of education and ANOVA to examine differences in gender inequality across industries. By selecting data United States, we aim to capture the pure relationship of inequality between education and employment.

### 3. Methodology

People used to think that education is the main factor causing gender inequality; however, this phenomenon still exists despite improved educational opportunities for women. This study aims to examine whether education is a contributing factor to gender inequality in different industries. We utilized the method of analysis of variance (ANOVA) to explore the relationship between education levels and employment situations among males and females. ANOVA is a statistical technique used to determine if the means of two or more groups significantly differ from each other. By comparing the means of different samples, ANOVA assesses the impact of one or more factors. In our study, we treated education level as an independent variable and inequality level as the dependent variable. We gathered data from the United, specifically focusing on education extent (e.g., primary school, high school, undergraduate, graduate degrees), schooling years, and educational backgrounds (e.g., nursing, medicine, STEM). In terms of measuring inequality level, we examined the discrepancy in numbers between males and females in the same occupation and the number of highly qualified females who were unable to secure jobs despite having comparable resumes to males. Age, working experience, race, and country were considered as control variables. Returning to ANOVA, we collected an extensive amount of data and categorized it into different groups. Subsequently, we calculated the mean square between (MSB), which represents the mean square deviation between each group. Additionally, we calculated the mean square within (MSW), which represents the mean square deviation within each group.

Back to the ANOVA, or analysis of variance, we select an enormous amount of data and divide them into different groups. Then, we calculate the mean square between, or MSB. It is the mean square between each different group. Also, the mean square within, or MSW should also be calculated. It is the mean square within a group of data.

$X_m$  is mean of data in  $X$  group,  $X_{m1}$  is one group,  $X_{m2}$  is the other group

$X_G$  is the grand mean of  $X$ , which is the mean value of all data

$$SS_{\text{between}} = n_1(X_{m1} - X_G)^2 + n_2(X_{m2} - X_G)^2 + \dots + n_k(X_{mk} - X_G)^2$$

$$MSB = SS_{\text{between}} / (k - 1) = n_1(X_{m1} - X_G)^2 + n_2(X_{m2} - X_G)^2 + \dots + n_k(X_{mk} - X_G)^2 / (k - 1)$$

We calculate the square deviation by each sample size, the  $SS_{\text{between}}$ . Then, the divide  $SS_{\text{between}}$  by the degrees of freedom, which is the number of values of the sample mean minus one,  $k - 1$ . Therefore, the MSB, or mean square between can be calculated.

$$Df_{\text{within}} = (n_1 - 1) + (n_2 - 1) + \dots + (n_k - 1) = N - k$$

$$SS_{\text{within}} = \sum (X_k - X_{mk})^2$$

$$MSW = \sum (X_k - X_{mk})^2 / (N - k)$$

$Df_{\text{within}}$  is the degrees of freedom, it is the number of amounts of data minus the number of groups. The  $SS_{\text{within}}$  is the squared deviation of each value from its respective sample mean and add them up, so the MSW can be calculated by the  $SS_{\text{within}}$  divided  $Df_{\text{within}}$ .

After calculating  $SS$  between and  $SS_{within}$ , we obtain  $MSB$  and  $MSW$ , respectively. Next, we calculate the factor  $f$ -ratio, which is the ratio of  $MSB$  to  $MSW$ . This ratio represents the difference between the data in each group and the data within each group. Finally, we compare the  $f$ -ratio to a specific  $f$ -critical value. A smaller  $f$ -ratio suggests that the independent variable has little or no significant influence on the dependent variable.

#### 4. Data

We collected data from the United States Census Bureau. For the sources, all of the data ranged from 2010 to 2021, as the table is shown below. Based on that, we gathered information on the number of individuals aged 25 and older with a high school diploma or higher education, as well as those with a bachelor's degree or higher. Additionally, we obtained the percentage of males and females in various occupational fields, including management, business, and financial occupations, computer, engineering, and science occupations, and education, legal, community service, arts, and media occupations. Furthermore, we identified the percentage of males and females with majors in science and engineering-related fields, business, and education. Our objective is to examine the extent to which inequality in education resources influences occupational inequality, as well as consider other factors such as the likelihood of choosing a STEM major and social inequality in job choices.

Based on the data from the U.S. Census Bureau (Table 1.), the percentage of males aged 25 and older with a high school diploma or higher, and a bachelor's degree or higher increased from 84.8% and 28.5% to 88.6% and 33.9% between 2010 and 2021. In comparison, for females, the corresponding percentages increased from 86.3% and 27.9% to 90.1% and 36.1%. Statistically, the education resources for males and females appear to be similar, with women even showing better performance over the past decade. More women attained a high school diploma or higher and a bachelor's degree or higher.

Furthermore, an interesting observation is that the percentage of males in management, business, and financial occupations, as well as computer, engineering, and science occupations, decreased from 55.7% and 74.1% to 53.7% and 73.3% between 2011 and 2021. Although the percentage of females in these occupations increased from 44.3% and 25.9% to 46.3% and 26.7% over the same period, the majority of females, around 66%, were still employed in other fields such as education. These gender inequalities persist between males and females in occupational distribution.

Table 1: Education level for male and female

Year	High school graduate or higher (Male%)	High school graduate or higher (Female%)	Bachelor's degree or higher (male%)	Bachelor's degree or higher (female%)
2010	84.80	86.30	28.50	27.90
2011	85.20	86.50	28.70	28.30
2012	85.70	87.00	29.10	29.10
2013	85.90	87.20	29.60	29.70
2014	86.20	87.50	29.90	30.20
2015	86.40	87.80	30.30	30.90
2016	86.70	88.10	30.80	31.70
2017	87.30	88.60	31.30	32.60
2018	87.70	88.90	31.90	33.30
2019	88.00	89.20	32.30	33.90
2020	87.80	89.20	32.20	33.60
2021	88.60	90.10	33.90	36.10

## 5. Results

Based on the methodology above, we have calculated the  $X_G$ ,  $SS_{\text{between}}$ ,  $MSB$ ,  $Df_{\text{within}}$ ,  $MSW$ , and the number  $k$ , which is equal to  $MSB$  divided  $MSW$ . After the calculation, the outcome can be seen in the below table (Table 2.). The mean data of all the data, or  $X_G$  is 53.4130. The mean value for each group is 58.7, 59.738, 54.421, 45.579. After the calculation, we found out that the  $F$  value is 1.18, which is very close to 1. This means the likelihood that the education factor has no significant influence on gender inequality in occupation. In contrast, the trend of selection of majors such as STEM, education, and nursing is more related to the trend of occupation among different gender.

Table 2: The calculated data for the methodology

Mean data		Calculated data	
$X_G$	53.4130	$SS_{\text{between}}$	356.5
$X_1$	58.7000	$k - 1$	113
$X_2$	59.7380	$MS_{\text{between}}$	3.15
$X_3$	54.4210	$SS_{\text{within}}$	295.21
$X_4$	45.5790	$N - k$	110
		$MS_{\text{within}}$	2.68
		$F$	1.18

## 6. Conclusion

In conclusion, this study aimed to investigate the role of education in contributing to gender inequality in different industries. The findings based on data from the United States Census Bureau reveal that while educational attainment has improved for both genders, gender disparities still exist in occupational distribution. Females continue to be concentrated in certain industries, such as education, while males dominate fields like management and STEM occupations.

The analysis of variance (ANOVA) results indicate that education alone may not be the primary cause of gender inequality. Other factors, such as societal expectations, organizational practices, and cultural norms, likely contribute to the disparities observed in occupational distribution. The likelihood of selecting certain majors, such as STEM, education, or nursing, appears to be associated with the trend of occupation among different genders.

These findings highlight the need to address gender inequality beyond educational factors and consider the broader societal context. Policymakers and organizations should focus on implementing measures that promote gender diversity, equal opportunities for career advancement, and fair compensation. By creating more inclusive and equitable environments, we can work towards reducing gender disparities and fostering gender equity in various industries.

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