

An Investigation of Construction Workforce Inequalities and Biases in the Architecture, Engineering, and Construction (AEC) Industry

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Abstract

The construction industry, one of the largest job providers in the U.S., is suffering from critical problems pertaining to labor shortage in the workforce. The researchers have recognized as a critical issue an insufficient interest and poorly sustained participation in the architecture, engineering, and construction (AEC) industry by underrepresented demographic groups. To address the issue of workforce income inequality and bias, the industry must be able to understand the current situation regarding inequality and pinpoint some of the basic problems. To address this need, this study analyzes current inequality within the construction workforce by race/ethnicity and gender. The preliminary results of the study show that White construction workers are, in average, 16.2 times more than African Americans and 3.6 times more than Hispanics in average, African Americans being the least in number in the construction workforce. Also, the study shows that men in construction workforce, on average, earn 4.2% more than women in the years sampled. Our trend analysis shows that these gaps relating to the number of employed personnel and median weekly earnings did not change.

Keywords: Construction workforce; Ethnicity; Gender; Inequalities; Bias.

INTRODUCTION

The construction industry is one of the largest job providers in the U.S., and plays a major role in producing well-paying, middle-class, high-quality jobs. According to the U.S. Bureau of Labor Statistics (BLS 2015), 6.5-million workers are employed in Construction and Extraction Occupations in 2015, and is expected to grow to 7.2 million by 2024. Additionally, 1.4-million workers work in Architectural,

Engineering & Related Services in 2015, and this number expected to grow to 1.5 million by 2024 (BLS 2015). In 2013, the *Construction Chart Book* (The Center for Construction Research and Training 2013), based on analysis of the BLS data, expects construction employment to grow by 33% between 2010 and 2020, more than double the growth rate for all industries (14.3%). On average, full-time employees in the Construction Sector work 44 hours per week and have an average yearly salary of \$45,528; in contrast, full-time employees in the Architectural, Engineering & Related Services Group work 44.1 hours per week and have an average yearly salary of \$80,229 (U.S. Census Bureau 2014). In addition, construction industry workers are more satisfied in general than workers from all other industries (Taylor and Goodrum 2016).

However, problems among the construction workforce are many, and the solutions are complex. Among the challenges, the authors believe that insufficient interest and poorly sustained participation in construction, civil, and architectural engineering from underrepresented demographic groups is a critical issue. However, literature that examines a shortage of construction workers has not paid sufficient attention to the problem of insufficient interest and poorly sustained participation in these three engineering fields across underrepresented demographic groups nor the insignificant preparation and limited opportunities for members of underrepresented demographic groups. The researchers of this current study believe that until the current situation of inequality within the construction workforce is properly understood and a root problem pinpointed, the construction industry will not address this structural problem. To fill this gap, this study analyzed the current situation of inequality within the construction industry and examined whether inequalities and biases within the system were due to insufficient interest and poorly sustained participation in construction, civil, and architectural engineering.

LITERATURE REVIEW

The authors conducted a literature review from peer-reviewed publications of major journals, which including but was not limited to the American Society of Civil Engineers (ASCE) *Journal of Construction Engineering and Management*, the *Journal of Management in Engineering*, *Project Management Journal*, and the *International Journal of Project Management*. The related literature was organized into five groups: 1) segregation and inequality issues in general, 2) the labor shortage problem in the construction industry, 3) inequality and discrimination problems in the construction industry, and 4) factors causing wage gaps.

Segregation and Inequality Issues in General

Inequality are not only issues of the construction industry, but also are pertinent issues for the U.S. workforce as a whole. In 1996-1997, according to a multi-city study by the Russell Sage Foundation on urban inequality in the labor market, a significant wage gap existed between the relative earnings of blacks and whites, with blacks earning 65% of the income for whites (Annie E. Casey Foundation, Baltimore 2001). In general, participation of women in the workforce was lower than for their counterparts, although, interestingly, the divide between males and females was the least in the black community. However, a wage discrepancy for minority women

(Latinas and blacks) still exists, as women, in general, working full time in the U.S. earn 70% of what men earn; moreover, they earn less than what non-Hispanic white women earn. Moreover, it was found that black women earned between 70% to 87% of black men; Latinas fared similarly, earning 70% to 84% of Hispanic men's earnings. Compared to the highest earners in the construction industry (white men), Latinas and black women earned somewhere between 47% to 61% (Cocchiara et al. 2006). African American women especially have fallen victim to the unfortunate collaboration of race and sex, as aforementioned data suggests (Lewis et al. 2013).

Many sincere efforts have been made to remove or, at the very least, assuage the barriers that hinder employment opportunities for women, and several endeavors exist to properly train individuals, especially women and minorities, who are marginalized. Isolation of colored communities throughout history has rendered them devoid of certain technical and job readiness skills. According to the study by the Annie E. Casey Foundation (2001), soft skills also has not been part of training for people of color in the workforce.

Labor Shortage Problem in the Construction Industry

Despite an exception that existed during the 2008 Great Recession in the U.S., the construction industry has experienced a shortage of skilled labor for the past three decades (Karimi et al. 2016; The Business Roundtable 1983; Sawyer and Rubin 2007; Construction Labor Research Council (CLRC) 2005; and Whyte and Greene 2012). It is estimated this shortage problem will worsen. During the past decade, the average age of the construction workforce increased four times faster than all other U.S. industries (Taylor and Goodrum 2016), and this trend is expected to continue. From 2010 to 2015, the average-aged worker (48 years old) will start retiring; moreover, the birth rate between from 1990 to 1995 has not been high enough to replace this retiring workforce.

One of the most relevant and critical studies in the area of the construction labor workforce is one recently conducted by Taylor et al. (2016). This study examined the effects on labor, productivity, safety, and project cost of major shifts in the demographics of craft labor availability. Their primary findings were:

- 1) A demographic craft labor 'cliff' exists in the construction industry that affects project performance;
- 2) The severity of this 'cliff' varies by trade and region;
- 3) The average age of the U.S. construction labor workforce is increasing four times faster than all other U.S. industries during the last decade;
- 4) The lack of educational attainment among the Hispanic workforce is one barrier to Hispanics moving into higher-skilled trades; and
- 5) A decline exists in career and technical education among high schools, along with an emphasis on four-year degrees in the U.S.

Inequality and Discrimination Issues in the Construction Industry

Even though the workforce makeup is changing little by little, non-Hispanic white males have dominated the construction labor force for many years (Fiori 2003). However, according to an article by May and Chubin, the U.S. Census Bureau projects that non-Hispanic white males of working age (18 to 64) will decline from

the year 1995 by 11% and reach 26% in 2050 (May and Chubin 2003). During this same period, the African American workforce will increase only by 2%, and Hispanics will reach 24% from the current percentage of 10%. Asians, on the other hand, will increase from 4% to 9% (May and Chubin 2003).

Given that the predicament of a skilled labor shortage in the construction industry will continue, the construction industry needs a greater labor force to meet demand, immediately. The researchers of this study expect that the construction industry will dip into the pool of untapped human resources to fulfill market needs, and will encourage participation from a more diverse workforce.

Factors for Wage Gaps

A wage gap exists in almost all professional fields, and a commonplace rationale for allowing wage gaps includes education, age, or experience. However, several theories attempt to explain the reasons for wage gaps. The American Association of University Women asserted that for women, this gap is a result of sorting women into jobs, by occupation and industry, that pay differently throughout the economy (Hill. C. 2015). Jacobs and Steinberg (1990) claimed that men seemed more associated with jobs that have an unattractive, and sometimes perilous, work environment; this perception is used to justify the wage premiums paid to men in order to legitimize the wage gap. In essence, Jacobs and Steinberg say that wage differentials are not due to discrimination, but rather due to the social structure that pushes men and women into different occupations. These occupations induce somewhat hazardous working environments that demand compensation.

Moreover, from her experience in working in different occupations, Glynn (2014) suggested that women put in fewer hours in the workplace than men, which could explain the wage gap. To be more precise, she says women employed full-time worked 35 minutes less than full-time working men. Glynn went on to say that women tended to invest this time at home with their children and family. This disadvantage perhaps widens the already existing pay gap.

Because this current study focuses within the same industry (i.e., the construction industry) and within the same occupation, some factors mentioned above will not be a critical issue. However, the authors are aware that other factors causing wage gaps do exist other than discrimination. In this study, other factors are investigated further that may affect the wage gap within the construction industry.

The existing literature has laid out the problems of segregation and inequality in general, labor shortage in the construction industry, diversity and discrimination in the construction industry, and factors for wage gaps. In particular, numerous articles were identified regarding the labor shortage problem from diverse sources (Karimi et al. 2016; The Business Roundtable 1983; Sawyer and Rubin 2007; Construction Labor Research Council (CLRC) 2005; and Whyte and Greene 2012) because this has been an outstanding issue in the construction industry for several decades. However, previous studies have not paid sufficient attention to the problem of insufficient interest and poorly sustained participation by underrepresented demographic groups in construction, civil, architectural engineering nor the insignificant amount of

preparation and limited opportunities for members of these groups to gain job in these fields.

METHODOLOGY

The overall objective of this research was to identify, analyze, and understand the problem of inequalities and biases within the construction workforce. In particular, this study focused on African Americans, Hispanics, and women in the architecture, engineering, and construction (AEC) industry. The aim of the research is to analyze the current situation, including the trends of inequalities within the construction workforce in the United States by race/ethnicity and gender, measured by wage gaps by race/ethnicity and gender.

The authors collected the total workforce data from *Labor Force Characteristics by Race and Ethnicity* published by Bureau of Labor Statistics (BLS) for all the sample years. Similarly, the authors collected data for wage from *Highlights of Women's Earnings* published by Bureau of Labor Statistics (BLS) for all the sample years. The authors also collected relevant data from *Women in the Labor Force* published by U.S. Department of Labor and *Characteristics of minimum wage* from Bureau of Labor Statistics (BLS) for all the sample years. The sample years for Working Population is between 2007 to 2015 and for working population is between 2006 to 2014.

PRELIMINARY RESULTS

Preliminary results are present regarding 1) the working population by ethnicity in the construction industry; 2) earnings by gender in the construction industry; 3) a comparison between race and gender in terms of wage and number of employees between the construction and manufacturing industry.

Working Population by Ethnicity in the Construction Industry

Based on data collected from Bureau of Labor Statistics (BLS 2017), trend analysis of the data collected showed a significant difference among the number of whites, African Americans, and Hispanics in the working population of the construction industry. Figure 1 shows the trend of the total numbers of White, African Americans, and Hispanics groups in the construction industry between 2007 and 2015.

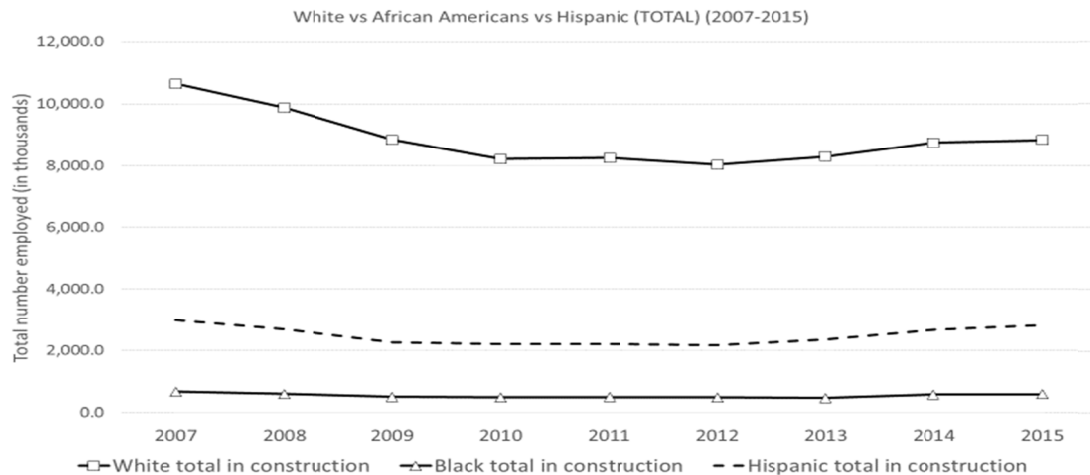


Figure 1. Total number of whites vs. African Americans and Hispanics in the U.S. construction industry from 2007 to 2015.

The trend line shows that for the years sampled, the population of whites in the construction industry 16.2 times more than that of African Americans and 3.6 times more than Hispanics. Furthermore, African Americans had the least amount of representation in construction industry workforce, with the Hispanic workforce outnumbering them. The key finding from this trend line is that the total number of employed African Americans and Hispanics in construction industry has not changed significantly over the sampled years.

Percentage of Total workforce based on Gender

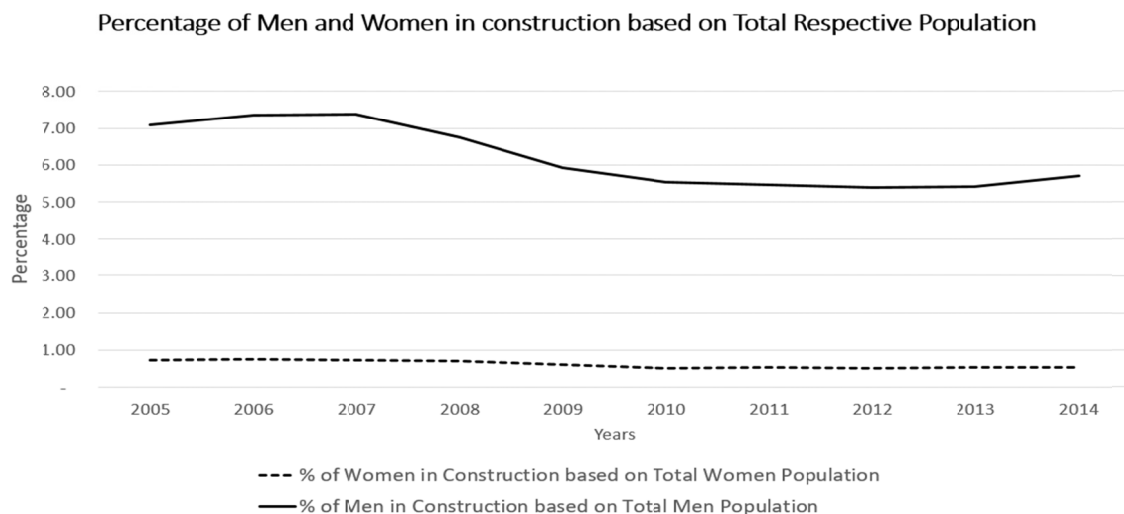


Figure 2. Percentage of Men and Women in the Construction Industry vs Total Respective Population

The trend line (Figure 2) shows that an average of 6.2% of the total population of men in the U.S. are employed in the construction industry. Based on the trend line, it can be observed that the percentage of men in the industry who are being employed with respect to the total population of men is decreasing. From 2005 to 2014, the said decrease is 1.39% point. On the other hand, an average of only 0.61%

of the total population of women in the U.S. are being employed in the construction industry, according to the trend line. The percentage of women with respect to the total number of women in the U.S. who are employed in the industry is also decreasing. From 2005 to 2014, the said decreased is observed to be 0.19% point. Therefore, it can be observed that the men in construction are decreasing more than women in construction, by 1.2% point.

Earnings by Gender

A preliminary analysis was conducted regarding the wages of men and women in the construction industry by Total Median Weekly Earnings, as shown in Figure 3. The data collected represents the median usual weekly earnings of full time wage and salary workers, by industry and gender. This particular data source reflects the overall medial weekly earnings, including several occupation (the types of which has not been disclosed in this particular table). However, the authors would like to make the data clearer by mentioning that BLS generally considers 39 construction and extraction occupations in their analysis. These occupations range from site based works like Hazardous materials removal workers and construction laborers to less site based works such as carpenters. However, BLS does not seem to consider management occupations. The source of the data was the Bureau of Labor Statistics (BLS 2017), and the sample years were from 2006 to 2014.

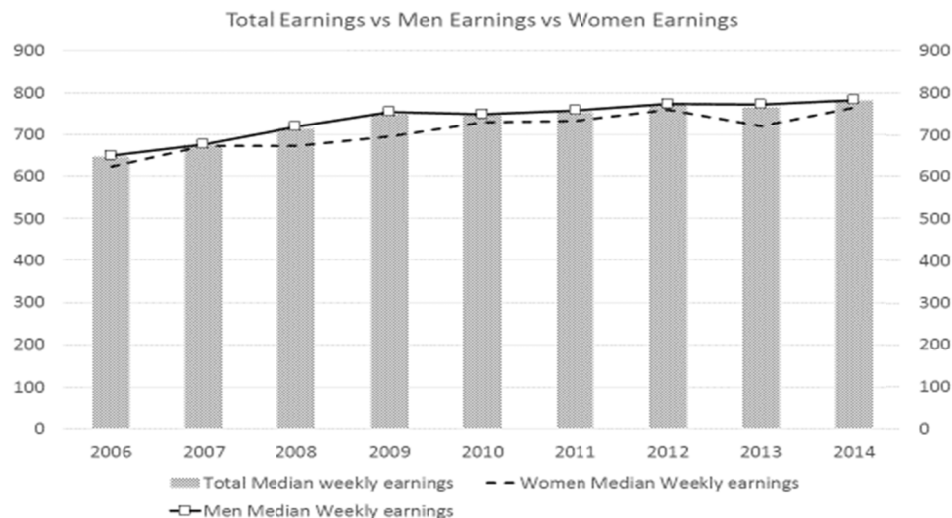


Figure 3. Total earnings vs. earnings by men and women (for all construction jobs listed in BLS).

For all the years considered, the Median Weekly Earnings of men was greater than the Total Median Weekly Earnings. During the same interval, the Median Weekly Earnings of women was less than the Total Median Weekly Earnings.

The Construction Industry vs. the Manufacturing Industry

Given that the manufacturing industry is closely similar to the construction industry, this study analyzed 1) the trend of total population (i.e., the number of men and women) in both the construction and manufacturing industries (Fig. 4) and 2) the

trend of total earnings of men and women in the construction and manufacturing industries (Fig. 5).

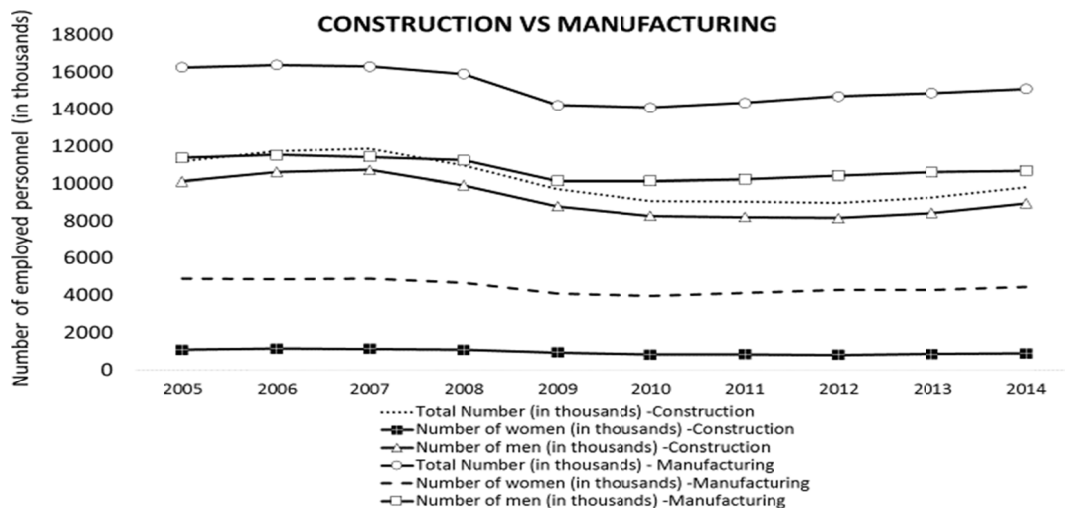


Figure 4. Construction vs. Manufacturing industries (Total Population).

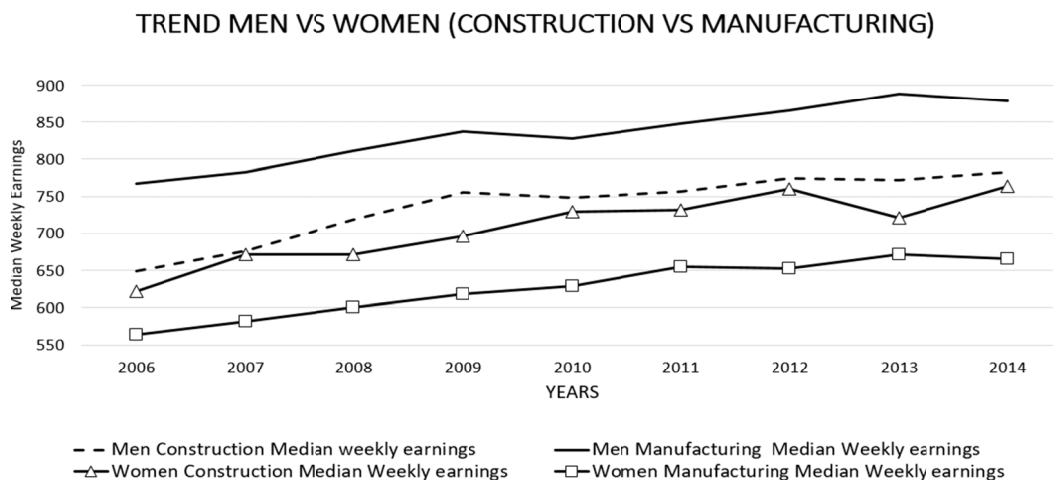


Figure 5. Construction vs. Manufacturing industries (Median Weekly Earnings)

Figure 4 shows that in both the construction and manufacturing industries, the total population of men was greater in the workforce than women. However, the proportion of women employed in the manufacturing industry (29.11% of the total) is more than the proportion of women employed in the construction industry (9.29% of the total). It is observed that women in manufacturing exceed women in construction by about 20% point.

Furthermore, according to Figure 5, irrespective of the industry in general, men earned more than women. The good thing is the wage gap between men and women in construction industry is better than its counterparts in manufacturing

industry. Furthermore, as per the sample years data, men earned more than women whereas women earn even less than the total median weekly earnings. This suggests that for some time, the status of women earnings has not seen significant improvement. However, when construction and manufacturing industries are considered, even though manufacturing industry is faring better in every regard, women in construction earn more than women in manufacturing, which is good news.

CONCLUSION AND DISCUSSION

In conclusion, the preliminary results indicate that the employed population of African Americans and Women in the construction industry is the least. The number of African Americans employed in the industry over the years has remained stagnant, which would suggest that something needs to be done in order to improve this area.

This research highlights the current situation of inequalities and biases in construction workforce by ethnics/races, and genders. This study will assist the industry in understanding the current situation of the construction industry with regards to employment and wages of minorities in the construction industry. An increasing trend would mean that a particular sector is doing well, whereas a decreasing trend would mean that the industry requires urgent improvement in that sector. Furthermore, the authors expect the findings from this research will encourage leaders, educators, and workers in the construction who make decisions to recognize the problem and take serious action to resolve. To fill this gap and address the problem, future research could involve analyzing the current situation of inequalities within the construction workforce in order to 1) resolve issues in inequality and bias in the construction industry and 2) increase interest and sustain participation in the AEC industry by underrepresented demographic groups.

The authors will further conduct advanced statistical analysis on the research hypothesis, which is that there are inequalities within the construction workforce. Future data analysis will include a comparison of earnings with regards to ethnicity, observation of trends for various different jobs in the construction industry over the years, and an analysis of total population in the construction industry based on gender.

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