

Exploring the Relationships Between GPA, Gender, Internship Participation, and Familial Influence in Salary and Salary Growth of Construction Management Alumni

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College students seek to make themselves desirable to employers upon graduation, and employers use subjective and objective information to determine the best applicants. This study aims to survey the factors of college GPA, gender, internship experience, and familial influence and independently explore their relationship to career success as measured by starting salary and salary growth. A convenience sample was collected from construction management graduates from California Polytechnic State University, San Luis Obispo. The data for this sample found higher starting salaries for respondents who reported having higher GPAs, being female, having completed more internships, and who had an immediate family member in the construction industry. Highest salary growth for this sample was found for respondents who reported having higher GPAs, being male, having completed fewer internships, and who did not have an immediate family member in the industry. Despite the findings for this sample, none of these results were found to be statistically significant and will not necessarily be replicated with subsequent trials. Additional data samples with a larger size and mutually dependent variables may be studied to better analyze the relationships between GPA, gender, internship experience, and familial influence on financial success.

Key Words: GPA, Salary, Gender, Internship, Success

Introduction/Purpose

Entering the workforce and securing a full-time position in their field can be a competitive exercise for college graduates. Students can work tirelessly throughout their college years to give themselves the highest chance of securing the best post-graduation financial opportunities by making themselves desirable to potential employers. While some objective factors bolster their resumes, like grade point average and work experience, others may increase their opportunities like personal relationships and networking. Other factors, like gender, are fixed and are expected to have no influence on the hiring process. It is to be recognized that these represent a small fraction of the influences that employers consider when seeking out the most qualified applicant for their company. Interview skills, compatible values, and references are examples of these types of less measurable indicators.

Most universities place a heavy emphasis on maintaining a competitive grade point average to improve a student's chances of success after graduation. The California Polytechnic State University Construction Management program additionally places an even heavier emphasis on completing valuable internship experiences prior to graduation to foster industry knowledge, build a network within the industry, and contribute to their resume.

This study examined relationships between a sample of these factors and starting salary and salary growth in the construction industry. Specifically, the factors explored in this study were graduating GPA, gender, number of internships completed before graduation, and if the respondents had an immediate family member in the construction industry before or during college. Students may find this information helpful for their college experience and employers may find this helpful for finding suitable employees.

Literary Review and Background

A variety of studies have been conducted to determine predictors of financial success. The most popular are grade point average because it is an objective measure of academic success, and gender, because many industries exhibit gender pay gaps. This is of particular interest to the construction industry where the proportion of female employees in the construction sector has remained constant at 2.6% from 1983 to 2016 (Bigelow, 2016). There have also been several studies conducted regarding the influence of internship experience on financial success. Overall, there are conflicting results for GPA, but studies on gender and internship experience have more homogenous results.

One study surveyed Construction Management graduates from five American universities. The study focused on students that competed in ASC student competitions during their college careers. The study found no statistically significant relationship between GPA of participants or of starting salary (Bigelow, 2012).

A similar 2017 study conducted on 104 Construction Management graduates specifically from California Polytechnic State University also found no statistically significant correlation between salary or salary growth and GPA (Gleason, 2017).

However, other studies found differing results. A 2012 study found a positive correlation between GPA and financial success (Low, 2012). This study showed that for every 1.0 GPA increase, the corresponding salary was 8.4% higher. This translates to a 0.84% salary increase for every 0.1 GPA point (Low, 2012). The results of this study were found to be independent of the industry of employment.

Other studies focus on relationships between gender and salary. A report published by the United States Bureau of Labor Statistics reported that female construction managers' earnings were 89.1% as a percentage of male construction managers' earnings for 2018 (Economics Daily, 2018). This corresponds with other studies on gender and starting salary.

Another study analyzed the relationships between gender and internship experience on starting salary. It looked at the difference in salary offers for men and women that had and had not first completed an internship with the employer. The results showed that there is no statistical significance between the salaries offered to men regardless of internship participation. However, female applicants were offered higher starting salaries from employers they had completed an internship with (Sterling, 2018).

Another study that found a positive correlation between internship experience and salary was conducted in 2021. This study found that internships had a 17% positive effect on short term wages, and a 14.9% positive impact on long term wages (Bolli, 2021). It is to be noted that the study was conducted on graduates who completed mandatory internships, whereas this study includes responses only from graduates who completed elective internships.

Methodology

The data for this study was a convenience sample. A convenience sample was used because sensitive information regarding salary is difficult to collect, and a convenience sample allows for respondent anonymity. This anonymity can also help reduce the chance of artificially inflated responses. The sample consisted exclusively of California Polytechnic State University, San Luis Obispo Construction Management graduates working in the construction field. Respondents surveyed work in the state of California, and the results can be generalized to that location. Results should not be generalized for all universities or any other industry other than construction.

The convenience sample was an electronic survey distributed through Microsoft Forms. The short survey had an average completion time of approximately three minutes and 44 responses were recorded. The survey questions were as follows:

1. What year did you begin full time employment in the construction field?
2. In what city and state did you begin full time employment?
3. How many years after graduation have you worked in the construction industry?
4. What is your gender?
5. What was your graduating college GPA?

6. Did you have an immediate family member working in the construction industry before or during college?
7. How many internships did you complete prior to graduation?
8. What was your starting salary?
9. What is your current salary?

The independent variables were gender, GPA, number of internships, and if the respondent had an immediate family member in the construction industry. The dependent variables were starting salary and current salary. After the responses were submitted, they were exported and analyzed using Microsoft Excel. Starting salaries were adjusted for inflation using the US Inflation Calculator. Each factor was analyzed independently for its relationship to starting salary and salary growth. Mean starting salary, mean salary growth, and mean salary growth per year were analyzed for each factor. Growth per year was utilized to account for the natural increase in salary for respondents who have been in the industry longer. Finally, median starting salary, median salary growth, and median salary growth per year were determined to mitigate the influence of outliers.

Results

GPA and Salary

Table 1 shows a summary of the data relating GPA to salary and salary growth. No respondents reported a GPA lower than 2.5 for this sample. The average and median starting salaries show no practical differences between GPAs. Salary growth overall as well as salary growth per year increase as GPA increases for this sample. Respondents show that for every 0.5 GPA increase, there is an average of 5% more salary increase per year. The unnaturally low growth for the 2.5 – 3.0 category may be attributed to the low sample size and high proportion of respondents who had not been in the industry long enough to see a salary increase exceed inflation.

Table 1. Salary and Salary Growth for GPA – Adjusted for Inflation

GPA	Sample Size, n	Adjusted Mean Starting Salary	Mean Salary Growth	Mean Salary Growth per Year	Adjusted Median Starting Salary	Median Salary Growth	Median Salary Growth per Year
2.5 - 3.0	6	\$74,995	42%	7%	\$76,095	-1%	-1%
3.0 - 3.5	15	\$73,240	121%	9%	\$71,140	35%	5%
3.5 – 4.0	19	\$75,470	141%	11%	\$74,000	90%	9%

Figure 1 shows the total data for GPA summarized graphically. The box and whisker plot shows the relative consistency of starting salary across all GPAs. To determine if there was any statistically significant relationship between GPA and starting salary, a Pearson's Correlation was calculated, $r(38) = .05$, $p = .759$. The findings are consistent with the visual data and concluded that there is no statistically significant relationship between GPA and inflation adjusted starting salary for this sample. Another Pearson's Correlation was calculated for salary increase, as both Table 1 and Figure 1 suggest a possible relationship, $r(38) = .111$, $p = .497$. This determined a slight positive correlation, but not a statistically significant one, meaning while there are visible trends, they statistically could have happened by chance. This lack of correlation is consistent with Gleason's similar 2017 study on the same population.

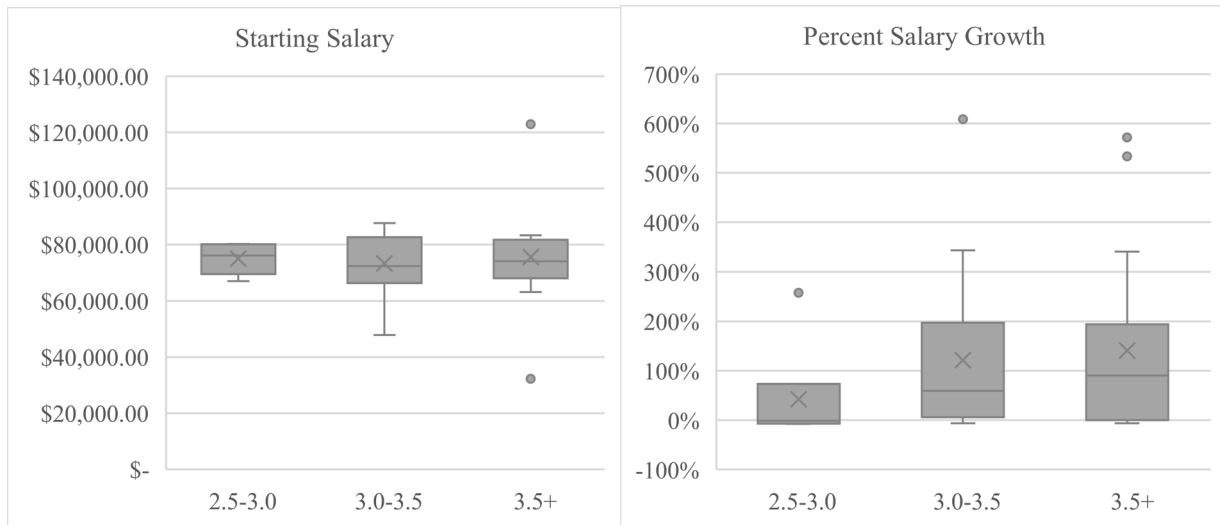


Figure 1. Salary and Salary Growth for GPA - Adjusted for Inflation

Gender and Salary

Table 2 shows a summary of gender and its relationship to salary and salary growth. The data shows that the mean starting salary for men is approximately \$5,000 higher than that of women, but that the median starting salary for women is approximately \$3,000 higher than men. The mean salary growth for men appears significantly higher, but on a per year basis it is equal to that of women. The low median salary growth for women in both the overall and per year statistics is limited by the small sample size and is heavily influenced by the fact that the female sample both for this study and industry wide has significantly less experience than the male population. The median number of years spent working in the industry in this sample for men was 13 compared to 3 for women. To find a potential correlation between salary and gender, both paired and unpaired t tests were calculated for both starting salary and salary growth between genders. None of these tests yielded any statistically significant correlation.

Table 2. Salary and Salary Growth for Gender - Adjusted for Inflation

Gender	Sample Size, n	Adjusted Mean Starting Salary	Mean Salary Growth	Mean Salary Growth per Year	Adjusted Median Starting Salary	Median Salary Growth	Median Salary Growth per Year
Male	36	\$75,448	133%	10%	\$74,000	77%	8%
Female	7	\$70,562	27%	10%	\$76,945	0%	0%

Figure 2 shows the total data for gender summarized graphically. This box plot shows the reasoning behind the difference in mean and median starting salaries by gender. A single low outlier for the female demographic lowers the mean starting salary below that of men, but when its influence is mitigated by the use of a median calculation, the overall median is higher for women. Because the male and female populations both exhibit influential outliers, the median is a more reliable measure of starting salary for this sample. For salary growth, there is a clear difference graphically between men and women in favor of men, even when the three visible outliers are ignored for the male responses.

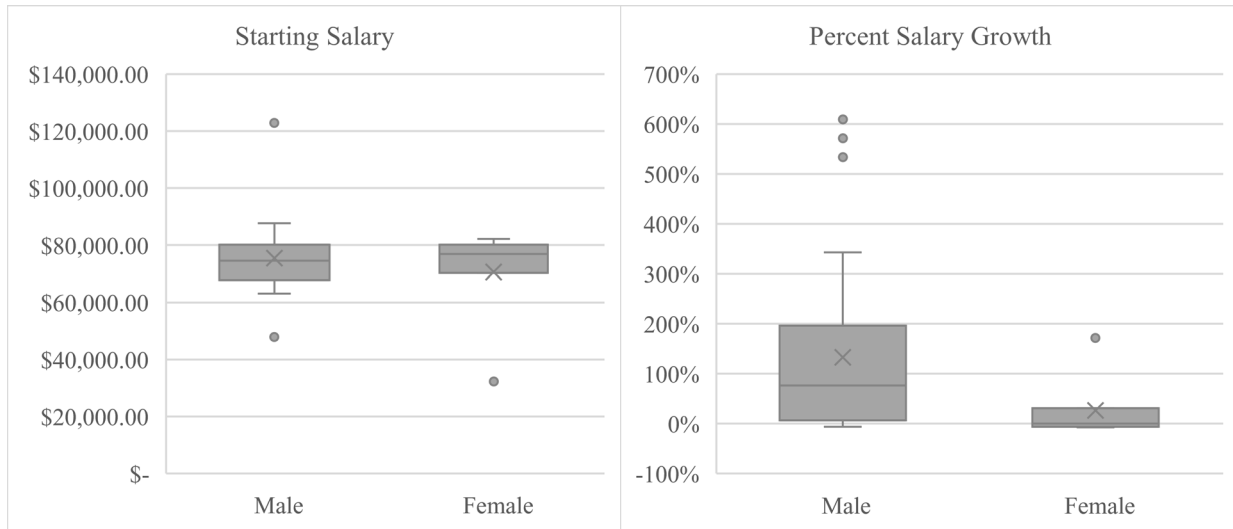


Figure 2. Salary and Salary Growth for Gender - Adjusted for Inflation

Internship Participation and Salary

Table 3 shows a summary of internship experience and its relationship to salary and salary growth. The sample shows an apparent positive relationship between number of internships and starting salary, and an apparent negative relationship between salary growth and number of internships with salary growth and salary growth per year decreasing with each internship aside from respondents who reported having 4 or more internships, which may be influenced by the very small sample size for that category. The high salary growth statistics for respondents who reported fewer internships may be influenced by the fact that industry members with more experience were much more likely to have completed fewer internships compared to more recent graduates. The median number of years of industry experience was 27 and 26 for 0 internships and 1 internship, respectively. This contrasts with the median number of years of industry experience of respondents who had completed 2, 3, and 4+ internships, at 3, 1, and 2 years, respectively.

Table 3. Salary and Salary Growth for Number of Internships - Adjusted for Inflation

Number of Internships	Sample Size, n	Adjusted Mean Starting Salary	Mean Salary Growth	Mean Salary Growth per Year	Adjusted Median Starting Salary	Median Salary Growth	Median Salary Growth per Year
0	8	\$61,685	266%	11%	\$66,560	232%	9%
1	9	\$72,640	156%	9%	\$71,388	140%	6%
2	17	\$77,623	67%	22%	\$77,249	10%	3%
3	6	\$77,745	35%	8%	\$80,151	0%	0%
4+	3	\$92,261	27%	6%	\$78,695	12%	6%

Figure 3 shows the total data for internship participation graphically. From Figure 3, the inverse relationship between starting salary and salary growth can be seen more clearly. The trend in starting salary for this sample shows the distribution of salary increase with each internship completed prior to graduation. This is consistent with the means and medians, with no outliers. In contrast, the salary growth box plot shows an inverse trend, with salary growth decreasing with each internship completed.

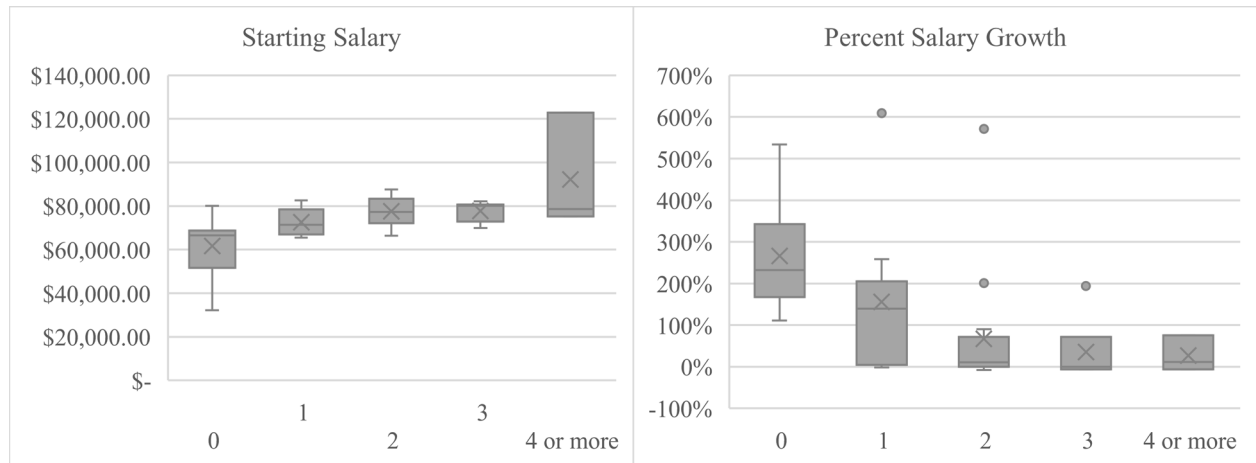


Figure 3. Salary and Salary Growth for Number of Internships - Adjusted for Inflation

Familial Influence and Salary

Table 4 shows a summary of familial influence on starting salary and salary growth. The data shows that for this sample, respondents who reported having an immediate family member working in the construction industry before or during the respondent's college experience reported approximately a \$9,000 greater starting salary than those who did not. The average salary growth per year is similar between both groups, but the median shows higher growth for individuals who did not have an immediate family member in the industry. This difference is possibly attributed to the higher proportion of respondents who answered "Yes" having less industry experience than those who answered "No". The median number of years in the industry for "No" responders was 10 compared to those who answered "Yes" at 2 years. To find a potential correlation between salary and familial influence, a paired and unpaired t test was calculated for both starting salary and salary growth between responses. None of these tests yielded any statistically significant correlation.

Table 4. Salary and Salary Growth for Familial Relationship - Adjusted for Inflation

Family Member working in Construction Y/N	Sample Size, n	Adjusted Mean Starting Salary	Mean Salary Growth	Mean Salary Growth per Year	Adjusted Median Starting Salary	Median Salary Growth	Median Salary Growth per Year
No	28	\$71,327	145%	10%	\$71,834	92%	9%
Yes	14	\$80,913	66%	11%	\$80,048	4%	2%

Figure 4 shows the total data for familial relationship graphically. The box and whisker plot for starting salary shows consistent medians and means for both "Yes" and "No" responses, despite outliers being present for both. The starting salaries for the "Yes" responses are visually higher than the "No's" for this sample. The wider distribution and skewed data for salary growth is also seen for the "No" responses.

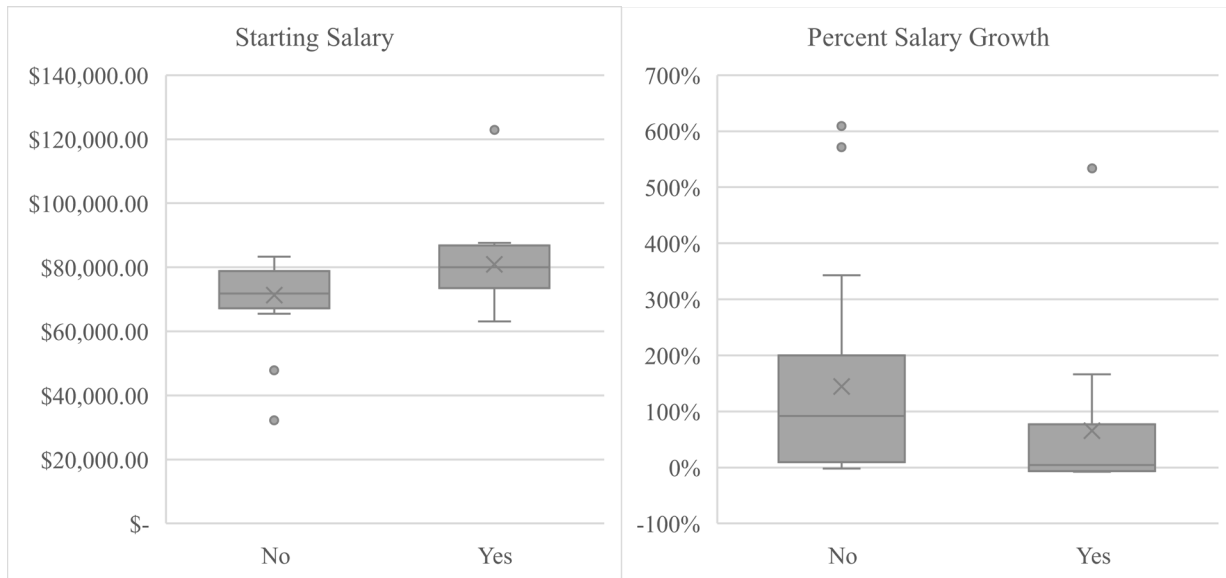


Figure 4. Salary and Salary Growth for Familial Relationship - Adjusted for Inflation

Years of Experience and Salary

The factor that was not initially intended to be a variable for the researcher, but influenced the results of this study most significantly was years of experience in the construction industry and its relationship to salary growth. While it is an expectation that more experience naturally translates to a higher salary over time, the results show a clear, statistically significant relationship. Respondents who reported less than 10 years of industry experience showed an average salary growth of 13% compared to those who reported having more than 10 years of experience at 245%. A Pearson's Correlation was calculated to examine the statistical significance between experience and salary growth, $r(41) = .793$, $p < .001$. A p-value that low shows a significant, large positive correlation between the two. A Pearson's correlation was also calculated to examine a relationship between years of experience and starting salary, $r(41) = .152$, $p = .329$. This resulted in a small positive relationship, but not a statistically significant one, which strengthens the results that only experience is influential. Figure 5 is a bar graph depicting percent salary growth as a factor of years of experience, showing the clear increase in salary growth over time. What is significant about this data is that there is no plateau in the salary growth as years of experience increase, which shows that the construction industry offers steadily increasing salaries without a salary cap.



Figure 5. Salary Growth for Years of Experience - Adjusted for Inflation

Discussion and Conclusions

There were many limitations to this study that potentially influenced results. A foreseen limitation was a relatively small sample size. Due to the sensitive nature of salary and salary growth and this being a convenience sample, potential respondents may have been hesitant to participate and therefore contributed to a small sample size. Another contributor to the small sample size was that many respondents chose to omit their salary data from their survey, rendering their responses to other variables unusable for this study. Additionally, sample size for women was particularly scarce, which is a reflection of the relatively low number of women in the industry as a whole. Finally, an unforeseen limitation of this study was the educational trends that change over time and interferes with the independent variables. Respondents who had worked in the industry longest and therefore had higher salary growth were concentrated at lower GPAs, less internships, and in the male population. Respondents who were more recent graduates and have not had the same opportunity to see salary growth were concentrated at higher GPAs, more internships, and the female population. Researchers designed this study under the assumption that industry experience in years would be approximately normally distributed around these independent variables, but this is not the case. A final limitation of this study is the specific sample population. This study sampled exclusively Cal Poly construction management graduates. There is a possibility that the general homogenous results between individual factors like GPA, gender, etc. were a result of a much more influential factor inhibiting their influence, which is the institution all the respondents graduated from. With the Cal Poly construction management program's strong reputation in the industry, it is possible that potential employers weigh less in individual factors of applicants, and weigh more in the education they received. This could be a possible explanation for the lack of influence on GPA, gender, internship experience, and familial influence for this population specifically.

With these limitations in mind, the results for this population can be discussed. There was no relationship found between starting salary and GPA. While a possible trend was visible between salary growth and GPA, and a Pearson's correlation found a small positive correlation, it was found to be statistically insignificant. Starting salaries appeared to favor women when calculated using medians. This could indicate a possible trend in the current construction industry, but a study with a larger sample size and data stratified by years of experience would have to be conducted for more evidence. Salary growth showed a clear favorability for males, but this was likely confounded due to more industry experience from males and the very small female sample size for this study. The paired and unpaired t tests conducted concluded no statistically significant correlation for either starting salary or salary growth. Number of internships completed prior to graduation indicated a possible positive correlation to starting salary while the data suggested a negative correlation for salary growth. Like gender, the salary growth results were likely influenced by the tendency for respondents with the most experience to have completed the fewest internships. Finally, starting salaries were higher for respondents who reported having an immediate family member in the construction industry, while salary growth was higher for those who did not. Despite these slight positive and negative correlations, neither were deemed statistically significant by the paired and unpaired t tests.

Overall, due to the statistical insignificance of most of the tests, practical relationships cannot be applied to the greater population outside of this sample for GPA, gender, internship experience, and familial influence and their relationship with starting salary and salary growth. What can be statistically applied to the greater population of all Cal Poly construction management graduates based on this study is the strong likelihood of significant salary growth as they gain experience in the industry. Additionally, unlike other industries, this data suggests that there is no widespread salary cap. This means that graduates can expect to see salary growth for the entirety of their careers until retirement, which concludes that the best thing graduates can do to increase their financial success is gain experience in the industry.

Future Research

This study presents many opportunities for future research. Perhaps the most relevant to this study would be the addition of years of experience as a variable. A study with a larger sample size and a multiple regression correlation approach with years of experience would likely best measure relationships between these variables and salary success. This study aimed to isolate variables to analyze their relationship with salary, but a study where the variables are not analyzed independently could be much more meaningful because of how complex the influences

on salary are. A deeper analysis of gender trends in the construction industry could also be conducted. While very little data was surveyed for this sample from women who had many years of construction experience, the recent graduates indicated higher starting salaries than those of their male counterparts. Stratifying salary data by years of experience could help identify historical salary trends and predict future trends. Similar variables could also be studied and stratified by state, university, or type of construction such as residential, commercial, and civil. Because influences on salary are so complex, the opportunity for further research is broad.

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