Difference in Starting & Mid-Career Salaries According to School Type

Study of Undergraduate Degrees

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ABSTRACT

The following article will describe the correlation between what type of college/university received the highest starting and mid-career compensation. The goal is to achieve results which back up Engineering undergraduates who receive a higher starting and mid-career salary as compared to Ivy League, party, liberal arts, and state schools. There was a sample size of 261 different institution around the United States. With the results that were produced, Ivy League schools did in fact have the highest starting and mid-career salary. The correlation to actual STEM major within engineering schools, only can prove that these in fact are the highest chance to achieve the most outstanding starting and mid-career salary, as an average student. As gathered from the results, Liberal Arts students did achieve a higher starting and mid-career wage apart from state schools coming out last for both results. All of this will be discussed later in the article.

1 Introduction

STEM majors have been known to be on top of the game after graduation. With a large demand of these technical newly undergraduates, there should be no problem guessing they will be living the most successful life. [1] The actual scholarly research to back up this claim regarding the compensation that these engineering colleges receive are limited. This article will walk you through the explanation between the average data being calculated as well as the providing evidence to support my claim. As for the other types of universities, they contain an abundance of other degrees and majors, other than STEM, which will provide interesting results.

Using the data collected from a Kaggle dataset, I will combine all the different types of schools into one average early compensation value. This will not only provide a more stable result but should narrow down any outliers above or below the average curve. I will then do the same with the mid-career data as the early compensation value. This will not only show if the school type will change as years progress but will provide a logical reasoning behind the large pay difference with engineering schools. Lastly, I will use the averaged data between new graduate and 10 years in, to calculate the mean change within these two findings. This will then show the specific difference in results.

After conducting this project, Ivy League schools had in fact had the highest starting and mid-career salaries. Apart from this, engineering schools had fallen right behind these schools providing evidence to the STEM majors producing an ample about of compensation. The party schools had a higher mid-career salary as compared to the schools that were non-party. The data set does not provide much information regarding how the party schools were classified but does provide evidence that they did not provide a higher wage than non-party schools, in respect to starting careers.

This project shows how great schools and majors pay off. With Ivy League schools being extremely great schools and engineering schools having great majors, I was not surprised by what I had concluded. I was surprised that there was not a larger difference in salary for Ivy League schools, since I thought that they would have a higher mid-career salary than starting salary. This does show that connections could be a viable answer to this but cannot prove it in the gathered data set.

2 Literature Review

Here is where I will explain the research that was conducted for this project as well as some questions regarding my project prior to data execution.

2.1

The first article, “Technical Colleges, Technology Deployment, and Regional Development”, expressed how Information Technology colleges have been on the emerging and producing frugal careers since around the 1980s. It also provided great knowledge that these STEM majors are finding jobs right out of graduation since the demand is so high. This also pertains to the great amount of success and pay they will receive while attending one of these colleges/universities. [1]

2.2

The second article, “NACE Research: The Liberal Arts Graduate and the College Hiring Market”, explains how a Liberal Arts college and degree is not useless since it, “paves the path for future professions”. This article also provided evidence that around 40% of college graduates with a Liberal Arts degree will pursue either a masters or professional school at some point in their life. This should account for a lower set income as an undergraduate student. [2]

2.3

The third article, "An Empirical Investigation of the Predictors of Executive Career Success", expressed a great deal of some of the factors that ensure a student's success in each career. Some of these factors included quality of degree, region, and personal connections. Another conclusion from the reading was Ivy League graduates will end up making a larger compensation in the future of their career due to the vast amount of connections that they receive throughout their classes and organizations. [3]

2.4

The fourth article, "Can students predict starting salaries? Yes!", provides studies conducted on newly graduated students from various majors and schools regarding their forecasted income. The highest recorded realized earnings were those of engineering, technical, and medical studies. These few majors were also the few which predicted a lower wage before graduation than compared to receiving a higher compensation after securing a job. [4]

2.5

The fifth article, "Salaries of Scientists, Engineers and Technicians", provided many dated accounts averaged of specific scientific, technical, and engineering salaries. Since these findings were dated back to a few decades ago, it still provided beneficial accounts to these technical roles having a higher compensation than other studies. The engineering careers were the highest profitable over these other degrees. It was also beneficial to see this data only for a 4-year bachelor's degree since many STEM majors would not continue their work in higher education, due to the student falling into a comfortable spot with compensation. [5]

2.6

The sixth article, "From the Liberal to the Practical Arts in American Colleges and Universities", explained that 60% of students that graduate with a Liberal Arts bachelor's degree will attend a higher education in either masters or professional degrees. Occupational-professional education does ensure students to be more successful in their area of study. This pertains to a higher compensation in the future of their career path. [6]

2.7

RQ1: If 60% of liberal arts students pursue a higher education after receiving their bachelor's degree [6], will the mid-career salary at liberal art schools should be significantly higher?

RQ2: Since engineers and technical undergraduate degrees are in high demand, should technical colleges receive the highest starting salary?

RQ3: If engineers and technical students stop at a 4-year degree, would there be a lower percentage from starting salary to mid-career compensation for engineering schools?

3 Methods

In this section, I will discuss how I had come to using my data for my research as well as some of the statistical outcomes I have received in feedback after data cleaning.

After conduction some research as to possible topics to conduct research on, I had found a data set called salaries-by-college-type from a Kaggle user[1]. After downloading this csv file, I loaded it into my Jupyter notebook[2] where I began to clean up the data itself. The first change that I had conducted was to remove the Mid-Career Salary percentiles, which I would not be using in report. It provided several different salary percentiles above and below the median of college students who are around 10 years into their started career. The next step in which I cleaned the data, was removing the 'Party' school type from the actual school type column. Having school classified as a party school did not strike me as beneficial for this report and viewed it as a biased opinion. After looking up each university apart of the party group, I had concluded that each these schools were in fact state schools. I then changed the name of all these school types to 'state' schools instead of 'party' school types. Instead of throwing out this party school data, I instead decided to create a new column which either had a yes or no entity correlating if the school was a party school or not. I will discuss about these results later but had used this information to see if the party schools received a lower salary. The final data cleaning that I had to conduct was to replace all the currency objects into float values. From the original csv file, the dollar signs and commas would not allow me to manipulate the data. I then converted each school name and school type values into Strings. Apart from data cleansing, statistical results were concluded from my report.

After cleansing the data, I had taken the mean of each individual school type regarding the starting median salary.

Starting Median Salary	
School Type	Dollars $
Engineering	59057.894737
Ivy League	60475.000000
Liberal Arts	45746.808511
State	44289.230769

Figure 1: The figure above shows the starting salary mean for each school type

In Figure 1, you can see that the mean starting salary for Ivy League schools had achieved the highest starting wage. With engineering schools in a close second, the liberal arts and state schools fell largely behind the other two school types. Following this, I had conducted the mean salary for mid-career students, shown below.

1: https://www.kaggle.com/wsj/college-salaries
2: https://github.com/zeny16/cosc3570-introdatascience-fall2018

Mid-Career Median Salary	
School Type	Dollars $
Engineering	103842.105263
Ivy League	120125.000000
Liberal Arts	89378.723404
State	79194.871795

Figure 2: The figure above shows the mid-career salary mean for each school type

As seen above, Figure 2 shows that the Ivy League school type is still the top highest mean salary in front of the other school types. This also shows that both Figure 1, and Figure 2, have the same placement of school types in the same order of highest salary. The main prominent difference that can be gathered is the fact that liberal arts schools have a higher difference than that of state school type.
As discussed from the data cleaning, I had created a separate column to account for party and non-party schools, shown below.

	Starting Median Salary
Party School	Dollars $
No	46096.787149
Yes	45715.000000

Figure 3: Describes the mean starting salary for party and non-party schools

In Figure 3, we can see that there is a very slight difference between the mean starting salary pertaining to the school type being of party or non-party. To also account for this, I have conducted another mean statistic of mid-career students attending party or non-party schools shown below.

Mid-Career Median Salary	
Party School	Dollars $
No	83871.88755
Yes	84685.00000

Figure 4: Describes the mean mid-career salary for party and non-party schools

Figure 4 shows surprising results that party schools in fact had a higher mean salary as compared to non-party schools. I will discuss these results in more detail later. A final statistic was made regarding the mean percent difference between the starting and mid-career salary, pertaining to school type.

Mean Percent Difference in Salary	
School Type	Percent $/$
Engineering	56.970520
Ivy League	50.590321
Liberal Arts	51.600849
State	56.303099

Figure 5: Describes the mean percent difference in salary

In Figure 5, we can see that engineering schools had the highest percent increase in salary from starting out of college to their mid-career. The state schools also had a higher percent difference than both the Ivy League and liberal arts schools.

4 Results

This section will account for visual results that were gathered from the data.

4.1

Ivy League schools had produced the largest mean salary out of the other school types. As stated in the section prior, Ivy League schools had both the highest starting and mid-career salary with engineering schools in second, followed by liberal arts and state schools.

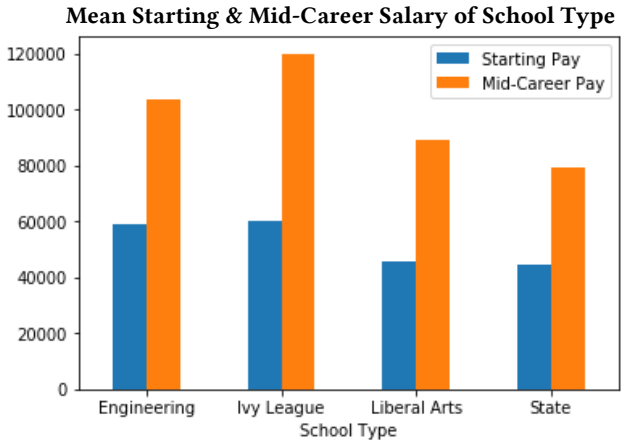

Figure 6: Represents the mean starting and mid-career salaries pertaining to school type

In Figure 6, we can see how each mean school type is displayed. With the starting pay in blue and the mid-career salary in orange, each of these lines truly shows how Ivy League schools had the highest salary in both starting and mid-career.

4.2

There was a slight difference seen after calculating the mean salary in party and non-party schools.

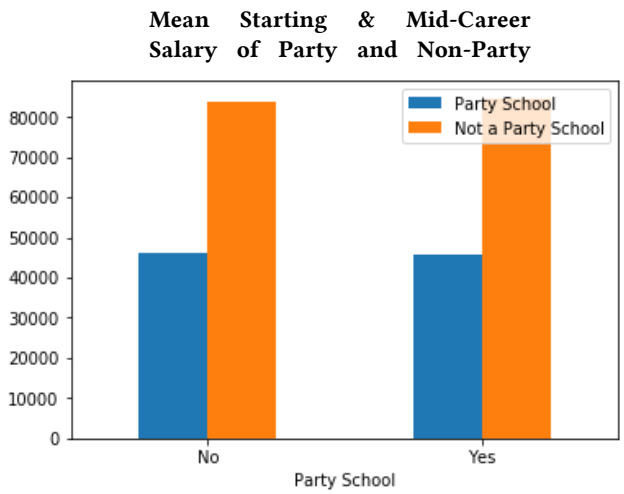

Figure 7: Represents the mean starting and mid-career salaries pertaining to party and non-party schools

From Figure 7, we can see that being a graduate from a non-party school does not provide a large difference in starting salary. Having a larger impact, party schools have a very similar result with non-party schools with a student's mid-career salary.

4.3

Having seen average results from the data, there were interesting findings pertaining to the top 10 schools.

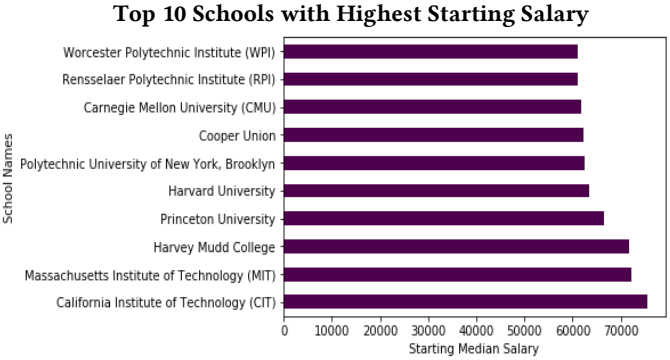

Figure 8: Shows the top 10 schools with the highest starting salary

In Figure 8, the first, second, and third schools, on the bottom of the graph, are engineering schools. They are then followed by two Ivy League schools and then mixed from there on out. This can account for some engineer school averages which account for highest starting salary, but as a mean value, most of the Ivy League schools are around the top 10 highest starting salaries.

5 Discussion

As seen from my results, the data explains that explicitly states that Ivy League schools will provide you with the highest mean starting and mid-career salary. Based on my results on 4.1, Figure 6, shows the massive difference between all the other types of schools. Correlating to my prior research before the data execution, the article, "An Empirical Investigation of the Predictors of Executive Career Success", [3] explains that with the vast amount of network that these Ivy League students achieve from their school, can correlate to the highest mean salary in their mid-career. Speaking at a standpoint between engineering schools and Ivy League schools, these both had an extremely similar mean starting salary. Referencing Figure 1, these two school types show how similar in salary they resulted in. Backing up this result, goes back to the article, "Technical Colleges, Technology Deployment, and Regional Development", [1] where it stated the importance of these majors in the vast technological advances that we have today. With such a large demand for technical STEM majors, there was no surprise to see Engineering schools having the second largest starting and mid-career salary. Although this does not prove my RQ2 question, the engineering schools did provide a close second correlating to the second highest starting and mid-career salary.

Apart from Ivy League and engineering schools, I was quite surprised with the results from Liberal Arts schools having a higher mid-career salary than state schools, as seen in Figure 6. Similar as stated about the Ivy League schools, I believe that these students have created a vast amount of connections throughout their career and are able to seek ways to forming new careers or possible employment. Another possibility for this comes with the fact that Liberal Arts students, "pave the path for future professions." [2] With this being said, these students will most likely continue their career in either master's or professional school. This proves my RQ1 questions to be correct as well.

With this data not being clear as to where the salary averages per school, it is safe to assume that each starting salary average is from an undergraduate degree. As for the mid-career result, there are many possibilities as to what could have happened before these measurements have been taken. In respects to taking averages for each school, many of the colleges, if not all, provide several different majors which creates a separate alternative for results. The engineering and Liberal Arts schools do offer other undergraduate degrees besides what their school is based from. The way to dismiss this as an argument, would be the fact that the average student would in fact be pursuing an engineering course or Liberal Arts degree. This would account for the several students who are studying the other subjects.

After conducting the results of the party and non-party schools, we see in my 4.2 results that Figure 7 is inconclusive. Even turning to the statistics in Figure 3, there is almost an even result established. The reason to account for these results is that the vast majority of the schools tested were in fact state schools. With only 8 Ivy League schools being on the top with 23 engineering schools, the rest of the schools were state and liberal art schools. With this considered, as stated before, the party schools were all state schools as well, so with the average of the schools testing being state schools and the party schools being state schools, there should be a close mean of either party and

non-party schools. What did surprise me was that the party schools in fact did have a higher mean mid-career salary seen in Figure 4. I can attest to this result that these party schools are in fact top schools rated on non-scholarly websites. Having this unknown fact will not conclude any results since this is not proven.

As a result, seen in 4.3, the top 10 schools with the highest starting salary concludes with mainly Ivy League and engineering schools. As discussed prior, with there only being 8 Ivy League schools recorded in this data set, it does make sense that they would be on top, looking back at the results from Figure 6. With the remaining top 10 schools displayed in Figure 8, this can only prove that these schools are pristine and extremely successful in all its undergraduate majors. This can be supported since this graph is of starting salaries and would be undergraduate students.

As stated in my literary questions, RQ3 can be proven, since Figure 5 shows that the percent difference in starting and mid-career salary for engineering students is the highest out of all four entities. This, however, does not prove too much since engineering schools did not have the highest mean average, but can prove that they had the highest change in salary from starting career to mid-career.

CONCLUTIONS

In conclusion, Ivy League schools were found to have the highest starting and mid-career salary. This does prove my theory incorrect, since I stated engineering schools will have a higher mean average but was a close second. This research project expressed the correlation and factors proving that schools with majors or school type regarding having connections proves to have higher wages. As much can be unstated about the data set that was used, the average salary of each school shows that technical degrees are a proven factor for achieving the highest pay that an average student can not attend an Ivy League school. Liberal Arts schools had in fact topped state schools, concluding that they continued to graduate school or had created a vast network from a social based major. Both engineering and Liberal Arts schools had achieved the highest percent change in salary from starting to mid-career compensation with 56.97% and 56.3%. The top 10 schools resulted in providing a large quantity of Ivy League schools with engineering schools as well. This provided ample findings, since it correlated to all resulted claims in accordance to these two school types. Party schools were taken out as one of the types of schools that would be researched on but concluded that they do in fact have a higher mid-career salary as opposed to non-party schools. The major factors that contributed to the actual results from this data set are unknown and had to create assumptions that were discussed within discussion section of this article. In respect to future research, a more in depth understanding of the data provided would be beneficial as to conclude on a larger scale. This brings specific majors and salary as a key aspect to the findings within this article.

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