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In this project, we aimed to address the question of whether or not college is “worth it.” This is a very highly debated topic, especially with colleges' exponentially rising costs and the emergence of non-traditional ways to obtain a degree. Using a large dataset from The National Longitudinal Survey of Youth (NLSY), we came to the conclusion that graduating college is predictive of higher annual earnings on average.

To come to our conclusion, we analyzed the data of 3851 college graduates and non-graduates. We considered many different variables in our study, including IQ scores, annual earnings, participants' mother's graduate status, age, marital status, geographical region, the hours they work per week, gender, and in what region they live.

We began by looking at basic descriptive statistics of annual earnings by college-graduate status.

### I. Descriptive Statistics of Annual Earnings for College Graduates and Non-Graduates

**Annual Earnings Centrality and Spread**

	College Graduates	Non-Graduates
<b>Mean</b>	\$ 79,580	\$ 32,006
<b>Median</b>	\$ 59,000	\$ 25,850
<b>Standard Deviation</b>	\$ 81,407	\$ 36,470
<b>25th Percentile</b>	\$ 31,000	\$ 4,000
<b>75th Percentile</b>	\$ 96,000	\$ 45,000

For both the mean and median statistics, the annual earnings of graduates far exceeds those of the non-graduates. These values indicate centrality, or where the “middle” of the data lies for each category.

The spread of the data is indicated by the standard deviation for the graduates and non-graduates. Both college graduates and non-graduates have a standard deviation that exceeds their respective means, indicating that there is a high level of variation in the data.

The middle fifty percent of annual earnings, as indicated by the distance between the 25th and 75th percentiles, shows that college graduates have a larger range of earnings (\$66,000 compared to \$41,000). The middle fifty percent of college graduate annual earnings is also higher than those of the non-graduates.

## II. Difference in Average of Annual Earnings for College Graduates and Non-Graduates

College graduates earn more on average than non-graduates, meaning that there is a positive correlation between graduating college and having higher annual earnings.

Our dataset consists of 3,851 total observations. Of these, 1,067 are college graduates and 2,784 are non-graduates. Each had reported their annual earnings for 2010. The histogram below shows the frequency of graduates and non-graduates that fall into each earnings range, or “bin.” For instance, the first bin depicts the number of respondents that reported earnings of \$20,000 or less. The last bin corresponds to those that earned \$300,000 or more. There were no earnings reported between \$160,000 and \$300,000 which is why these values are not depicted in the graph.

Notice that the highest numbers of non-graduates (in beige) correspond to earnings of \$20,000, \$40,000, and \$60,000: 2,405 out of the total 2,784 non-graduates in the survey earned on average \$60,000 or less in 2010 - roughly 86% of them. Meanwhile, the percentage of college graduates whose earnings fall in the same \$60,000-or-less range of the histogram is only 52% (less than the percent of non-graduates in the same range). We graphed the distribution, which allows us to make a common-size analysis between the two:

Evidently, as the average earnings increase, the frequency of non-graduates decreases. The difference in earnings between graduates and non-graduates becomes especially visible as the earnings get higher. For instance, 4.6% of college graduates earn between \$140,000 and \$160,000. The percent for non-graduates pales in comparison: only 0.35% reported earnings within this range in our 2010 data.

We also want to note that in our data, 696 respondents reported earnings of \$0. Some of these reported earnings of \$0 and this might be because they worked 0 hours or are not employed. However, we noticed that some earned \$0 in 2010 and still worked 40 hours per week, which we thought was weird. We think this might be because they might be doing community service and counting those hours, or they made a mistake in reporting. Whatever the reason, we ran our data without the 596 non-graduates that earned \$0 and the 99 graduates that also earned nothing that year. Without these data points, our initial conclusion still stands.

### III. Difference in IQ Scores Among College Graduates and Non-Graduates

The average IQ scores of college graduates tends to be higher than the sample average and the average among non-graduates. At first glance, it is evident that the frequency of non-graduates decreases as the IQ scores increase, indicating that there is a negative correlation. For college graduates, the opposite holds true: as the IQ scores increase, so does the frequency of college graduates in these higher IQ ranges. Additionally, we know that the average IQ score of the entire dataset sample is 100 with a standard deviation of 15. If we calculate the average IQ among non-graduates, it is roughly 95, which is lower than the population average. Conversely, the average among those 1,067 respondents that did graduate college comes to about 113, 13 points above the population average and almost a full standard deviation away from the mean. While the number of respondents in each category is not equal, the sample sizes of each are large enough that our findings are reliable.

**IV. Average Annual Earnings by IQ Range Among College Graduates and Non-Graduates**

This table shows that graduates in every IQ range tend to have higher average earnings than their non-graduate counterparts. College graduates in our sample earn close to double what non-graduates earn at every IQ range, with average earnings of \$79,580 compared to the \$32,006 that non-graduates earn. The graph below displays this data in a way that further supports this conclusion.

**V. Average Annual Earnings by IQ Range Among College Graduates and Non-Graduates**

(Part V Continued) As mentioned above, graduates tend to display higher average earnings than non-graduates across all IQ groups. This is evident if you look at the 120-129 IQ range of non-graduates compared to the 100-109 IQ range of graduates. The non-graduates with a higher IQ make about \$45,996, while college graduates with an IQ about twenty points lower make about \$61,268. In conclusion, college graduates tend to earn more than non-graduates, regardless of their IQ.

## **VI. Average Hours Worked per Week for College Graduates and Non-Graduates**

When attempting to find a trend of average hours worked per week by IQ-group for both graduates and non-graduates, it was hard to conclude much about the value of college and its relationship to work. Overall, 68% of the population are about one standard deviation away from the mean of 100; an interval of roughly 85 to 115 in IQ scores. Looking at this interval, we can see that most people work on average between 35 and 45 hours per week. This is pretty average: the average work-week of all our respondents is 38 hours. Overall, the majority of graduates and non-graduates in our study worked close to that, so we were not able to see much of a difference.

**VII. Percentage of College Graduates and Non-Graduates who are Non-Employed**

	College Graduates	Non-Graduates
<b>Total Non-employed</b>	161	727
<b>Total</b>	1160	2991
<b>Percentage Non-employed</b>	14%	24%

College graduates are less likely to be non-employed compared to non-graduates, as 14% of college graduates are non-employed while 24% of non-graduates are non-employed. TWWe think that the reason for this difference might be that those who were not intent on finishing college might struggle more to find work than graduates do. It is also telling that a far greater portion of this sample are non-graduates, as this is also representative of the United States population. In conclusion, this data tells a story of a higher percentage of non-graduates struggling to find work than the graduates. However, non-graduates also refers to those that may be retired or uninterested in working, which can also explain the high percentage of non-employed individuals.

**VIII: Comparing Graduate and Non-Graduate Earnings Based on Geographical Region**

To fully address if college is worth the investment it represents, we compared earnings by college graduate status in four distinct geographical regions in the United States: North Central, Northeast, South, and West. Using “College Graduate Status” as a dummy variable and earnings as the dependent variable, we conducted a regression for each region to find the average difference in earnings between college graduates and non-graduates and tested for statistical significance.



(Part VIII Continued) After running the regressions, we discovered that the “College Graduate Status” coefficient is statistically significant for every region. The t-stat for every region is well above the absolute value of 3, so we are over 99.7% confident that there is a real difference in college graduates’ and non-graduates’ earnings. The largest discrepancy in earnings is \$62,555 in the Northeast region. This difference is much greater than the earnings differences in the three other regions, which combined for an average of only \$44,794.

The Northeast is a much smaller region than the others in the dataset, having only 395 out of 3,851 total observations. A smaller sample size leads to more variance in the data, however a sample of 395 observations should be large enough to represent the population. Additionally, we hypothesize that the Northeast showed the largest discrepancy in earnings by college graduate status because of the large concentration of prestigious universities in the region. According to a study in Forbes, nearly half of the top 50 universities in the United States are located in the Northeast. Graduating from an Ivy League university, a premier liberal arts college, or one of the other top-tier schools located in the region warrants a large economic advantage for graduates over their non-graduate peers.

### **Final Analysis**

In conclusion, we believe that college is worth the investment based on the variables we studied. Employing statistical techniques and data analysis tools allowed us to conclude that having a college degree is linked to better outcomes across most variables we tested, including higher annual earnings on average, a lower rate of unemployment and higher IQ scores. We were also able to find a link between the value of a college degree as compared to geographical region, which might also be a point to consider for those weighing the costs and benefits of a college degree.

With the exception of average hours worked per week, all other variables we studied support our conclusion that college is worth the investment. However, we’d like to note that students’ investment of time and money for college education is not specified in this study. Depending on how an individual may value their time and money, they may find that college is not worth the investment.

Overall, we have found that college graduates tend to report higher annual earnings on average and lower rates of unemployment than their non-graduate counterparts. Factoring in the negligent effect of hours worked per week and the significant links between a college degree, IQ scores, and geographical region, readers have enough information to rely on our analysis that college is worth the investment it represents.