NORTHERN ILLINOIS UNIVERSITY

How Student Loans Affect College Students with Regional Analysis

A Capstone Submitted to the

University Honors Program

In Partial Fulfillment of the

Requirements of the Baccalaureate Degree

With Honors

Department Of

Economics

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DeKalb, Illinois

May 2019
University Honors Program

Capstone Approval Page

Capstone Title: How Student Loans Affect College Students with Regional Analysis

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Date of Approval 12/6/2018

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HONORS CAPSTONE ABSTRACT

With the burden of student debt growing, it is important to study how this increasing debt is affecting individuals and look at the impact it has on the nation as a whole. By analyzing statewide data and comparing the different states, we can try to find what states are doing well, and begin to look at how we can improve in states that have an increased amount of student debt.

Different regions were found to have varying amounts of debt. A linear regression model was used to test if the average amount of debt per state is affected by per capita income, population size, the percentage of the population that graduated high school, the percentage with a bachelor’s degree, state public enrollment at public universities, state tuition revenue, and state appropriations towards state public higher education. The main results show that per capita income has a major influence on average debt, and education levels may be correlated with the amount of debt.
Introduction

Americans hold a total of approximately $1.5 trillion in student loan debt, according to a report by the United States Federal Reserve (2018). An article published by Forbes states that “Student loan debt is now the second highest consumer debt category - behind only mortgage debt - and higher than both credit cards and auto loans” (Friedman, 2018). With such an astronomical amount of debt, it is important to research the effects of this debt and the impacts it has on the students that must take on this burden. While the topic is attracting more and more media attention, economists are considering what potential policies could be implemented to assist students with their student debt and what the federal government should be doing about it.

One of the most recent ideas of what to do about student debt was popularized in the 2016 democratic primaries by candidate Bernie Sanders, when he introduced the idea of “making college debt free” (On The Issues, 2016) at public colleges and universities across America. Sanders supports his idea with known cases of other countries that have implemented free college and have been able to financially support the institution.

The high costs of education often act as a barrier of entry when a student wants to receive an education. This barrier of entry can lead a student to make a different decision in their life to either go into the work force without higher education or do something else with their lives. The idea of earning money right out of high school instead of going to college is appealing to some people instead of accruing potentially tens of thousands of dollars in student debt.

The purpose of this research is to find out how much of an impact student debt has on a person either choosing to not go into college or not being able to finish through college because of the financial burdens. This can include aspects that may help a student overcome these
financial burdens, such as scholarships, grants, specially designed programs, or personal wealth. By using data showing the availability of these resources to a student, we should be able to see how much of an impact these resources have on the decision to go to college instead of an alternative option such as going straight into the work force.

**Related Literature**

Because of the popularity of the problem of student debt rising so rapidly, there are economists researching the specific options for student loans and how those options are affecting the students who are taking on these loans. Susan Dynarski’s (2015) working paper titled “An Economist’s Perspective on Student Loans in the United States”, Dynarski touches on the economic rationale of the federal government providing loans to students and the different repayment options of those loans, as well as a summary of time trends in student borrowing. This document shows that student loan debt is the fastest rising debt of all non-mortgage consumer debt and surpasses credit card and auto loan debt shortly after the end of 2009.

In her findings she concludes that private lenders have a hard time loaning out money to students because students cannot offer much of a collateral on their loan much like for a mortgage, where the house is the collateral on the loan. It is found that there is a market failure going on because the investment of education will have high future payoffs, but the current risk doesn’t justify the banks giving out the loans the young people with not much liquidity to offer as collateral. Therefore, the government plays a huge role in lending money because the country will reap the future benefits of the human capital gained through education and wants to support more people going to college.
As for time trends in student borrowing, the idea is that borrowing is happening quicker over the past few years, but so is the return on education, so in the long run the investment will pay for itself eventually. The two factors that are considered are the increase of students taking loans out and an increase in the size of the loans. It was shown that the number of students that took out loans went from 34 percent in 2001 to 50 percent in 2011 (Dynarski, 2015). This increase to the amount being taken out can be explained in part from the increase of costs of college.

Another article written by Celine Mistretta-Belna (2014) discusses the effects of the increased government lending on the household’s disposable income for families sending their children to college. The gross disposable income (GDI) takes into account the amount of money taken in and then what that money has to be spent on, leaving a certain amount of money to be spent on other goods. There has been a negative wealth effect on families, making them feel poorer and having to borrow more loans because families are not willing to help finance higher education. The housing market crash is used as a comparable situation. When houses started to become more expensive and buyers no longer had the extra money to afford a house, spending decreased. This is similar to taking student loans, just the type of loan is the only change. In both situations, the effects that the expenditures have are almost identical.

As the rise in tuition fees was explored, the main reasons that this happened was that the demand for higher education was increasing, the authorities in charge of providing funding to go to school were failing, and colleges needed to increase the cost to worry about saving their own operation to deal with a decline in revenues. The demand for higher education increased due to more people choosing to go to college and the increased need of a college degree to obtain a job in the job market. As for the local governments allocating a means of funding higher education,
other financial situations, such as the 2009 recession, often demanded more attention and the funding for education was not a main priority. The universities had to worry about raising enough revenue to stay in operation due to a lack of stability in funding. If the university’s revenue were to drop down, the university would have to compensate by raising the prices of tuition.

The conclusion on Mistretta-Belna’s work is that these loans are having a serious negative effect on these household’s spending and borrowing capacities in other areas such as mortgage payments, delaying the decision of the person in debt to buy and move into their own home. A high default rate is leaving these households with little other places to obtain credit when looking to purchase something else such as a car, leading to a recession and a lack of spending on other goods and services in the market.

Other articles in the field of economics touch on the effects student loans have on other aspects on the economy such as the housing market and many other markets. In an article discussing the negative effects that college debt has on the growth of new businesses (Ambrose, Cordell, Ma, 2015), a conclusion is drawn that because of a new business’s need for initial capital, those people with the education and ability to start their own company that have accumulated student debt will not have access to the initial capital needed to start their small business. This leads to a decreased amount of small businesses with 1-4 employees, which is potentially leading to a higher unemployment rate due to the fact that the potential business is not able to hire those employees.
Theoretical Framework

Student loans play a big role on a student’s future and can affect a student’s career choice, living conditions, and future purchases depending on how much debt is being taken out. The purpose of my research is to determine exactly who is taking out the most debt, what is causing these students to have to take out this amount of debt, and how this debt affects the future choices a student makes in their life.

The variables proposed were chosen from the related literature found in the field of economics. I chose to use variables that are shown to have an impact on the amount of student debt a student will accumulate through their years of college. This includes region, a variable that is shown to have a high amount of variation depending on where the student debt is from. When looking at data available, a dataset from the institute for college access and success splits the average debt per student of all schools in the nation by state. I can use the state’s average debt per student and see if that correlates with the number of students that receive a federal grant or scholarship.

My theory is that the more populated regions (the states with the most people) will have the most student debt due to inefficiencies in the distribution of scholarships in those more heavily populated states. I will test this by running a regression with both region and amount of scholarships received as the variables being tested. I might find that there is a straight-line correlation with a fixed amount of average debt that increases when less students receive government funding. For example, the numbers might come out to be that a state with an average student debt of $20,000 when the government assistance rate affects 50% of students, a state with $22,000 might have 40% government intervention, and a state with $24,000 of average student debt might have 30% government intervention. This example could lead to a conclusion
that if the government didn’t intervene, the average student loan debt would be about $30,000. The high number of states (50) will allow me to plot these on a chart to see if there is any correlation and to see if there is a straight-line relationship or if it is curved. 

For a second variable to be studied, I want to look at the amount of time it takes students to pay off their debts. The more I searched for this data, the more difficult it was to work with the numbers and find a way to manipulate the data to give me a meaningful output. Navigating this data has been the toughest because of the amount of differences in different aspects of the loans and the data provided. For student loans, there are a whole assortment of different types of loans. Many of them have a steady rate repayment plan to be completed in a certain amount of years, such as the standard 10-year repayment program. Others are set for a change in rates of repayment, which are often used for students that believe they will be earning more money in the future, so start off by repaying small amounts that become larger over time. Income driven repayment plans determine the rate you pay off the loans by the amount of money you are making after college at your current job. 

Another hard thing with the amount of time it takes to pay off student debt is that some of that debt is still outstanding, so there is no real definitive answer. For example, if there was a dataset with loans taken out in 2008, some of that debt (and a relatively good amount of it) would still be outstanding, so we still don’t know how long it took for that debt to be paid off. When working with these numbers, I might have to use averages already found by other studies instead of working with the raw data myself because of the uncertainty of the data. 

Using the averages, I can see what sort of correlation the amount of debt has with the amount of time it takes to pay it off. My hypothesis is that the more debt taken out, the harder it is to get the debt paid off. Therefore, I see a student with $10,000 worth of loans able to pay their
debt off in a manageable 5 years, where a student with $20,000 worth of loans has a much harder time getting the debt paid off and will have to worry more about keeping up with the interest payments, so it might take them closer to 12 years. This rate of repayment will get slower and slower the more debt that is accrued, ending up in a convex, upward sloping graph. A government program that can come into play for the upper limits for this variable include the loan forgiveness program, which forgives any qualifying outstanding student loans after 25 years, or 10 years if you work in public service.

Gender is another variable that I would like to explore. While I’m predicting that gender shouldn’t have too much of a role in the amount of debt a student has, I think that women will end up accumulating more debt than men and will take long to pay off their debt relative to the speed that men pay off their debt. This difference may be caused by the wage gap and would be good data to show that the wage gap between men and women are negatively affecting the ability of women to get ahead in life and eliminate their student loans.

Most of the data I find pertaining to student debt differences between men and women are sorted out by race as well. Looking at how different demographics affect the amount of student debt with regards to race will help me gain a better understanding of just how impactful race and gender are. I can also look at how race and gender affect how quickly the student debt is paid off.

Something that I must take into mind when looking at the gender results is if it really is gender that is causing the debt to be paid off faster or slower, or if it is just because the initial amount of debt is higher, it takes longer to pay off that debt. I will have to look at my results from the amount of time it takes to pay off debt and see if there is any difference when
comparing those generalized results with the specific gender results and the amount of time it takes to pay off those loans.

By finding how much debt students have after graduation and how long the debt hinders these students, I can begin to analyze how this affects other aspects of the economy. An area that student debt effects greatly is the housing market. When young students coming out of school are ready to begin their independent lives and start their careers, they will want to put down a mortgage for a house. They will be unable to do so because of all the debt they incurred, and the housing market will go stagnant. If a student manages to increase borrowing to put down on a house, they will most likely be doing so by taking out a loan with an increased interest rate and will be putting themselves in an even tougher situation which can be more dangerous as a person’s liabilities increase.

Another area that increased debt will affect is the student’s ability to purchase their own car. Much like buying a house after graduation, a student might also need or want to buy a new car. Often, car loans are made with a relatively lower interest rate and the car loans have set prices to be paid for monthly. If a recently graduated person is trying to pay for their car every month, then paying off their student loans will take even longer to pay off, potentially increasing the amount needed to pay due to having to pay more interest. This increased amount needed to pay reduces the student’s ability to buy more things due to a loss in the consumer’s surplus.

**Empirical Analysis**

My plans to analyze what effects student loans have on college students can be very broad. The effects can stretch from anything between psychological effects that weigh on the students and the added pressure of needing to find a way to pay the debts off, to the material
effects of future expenditures such as buying a car or a house. When considering these effects as to how to implement them for analysis in my linear regression, a lot of these datasets are hard to find. Financial aid offices are not going to know how many students that take out loans buy cars, and car dealerships are not going to know what buyers are dealing with paying off their debt while buying a car. To draw conclusions, I am going to have to do a broad analysis on any aspect that might have to do with a student’s financial situation.

When searching for data, I was fortunate to find that much of the data came by state. This allows me to view how debt affects college students on a national level with a strong sample size of 50 for each state. My independent variable would represent the amount of debt each state had. This variable I used average debt of graduates per state because this would take the per capita amount into account so the numbers for the amount of debt are not determined by the size of the state, but the average amount per graduate.

When looking for data pertaining to the variables I believe will be impactful on student debt, there were good sources for national data for the size of the debts incurred nationally as well as broken down by state (Federal Student Loan Portfolio, 2018). Looking at the differences in the size of the debts by state allowed me to better understand the regional trends on what areas had lower or higher debt totals per person. Fortunately, I was able to obtain regional data for the state’s average debt incurred amount. This allowed me to see what areas had high and low amounts of average debt.
By using the data to map out the average debts incurred in all 50 states in a color-coded picture, you can easily see a trend in what regions have the most debt. By taking the average debts incurred instead of the total debts, you avoid having to deal with inflated numbers due to certain states having a higher population. The North-East coast and the Midwest are two regions that have high amounts of average student debt, with averages ranging from $27,457 to $33,808. Out west, there is a lot less debt, with these states ranging from a mere $18,921 in Utah to $25,064 in Colorado. This data shows that region does influence the average debt per college student, with a few specific trends occurring.

When constructing our linear regression, it is the goal to try to include variables that might answer our question about why region seems to be a large indicator of if a state has high debt or not. Is it the states population? Maybe it is the state’s general welfare. The consideration of other variables can be looked at on a state basis, searching for a consistent data set for a
specific variable across all states. For some of the variables, this is hard to do as the data varies from state to state. For example, when looking at financial aid provided by each state, there are many different factors that vary from state to state. One of these include looking at how much money is given to financial aid from the state vs. the federal government vs. independent scholarship opportunities. When looking for data for this information, it is often hard to find this data because of the differences of the financial aid processes that vary by state, especially from an independent scholarship and other independent financial aid level.

I believe an interesting variable would be to see how population affects whether a state has a higher or lower average debt of graduates. There are many states out west with low population levels that have some of the lowest averages of debt, where the more compact, heavily populated east cost has some of the worst levels of average debt. My guess is that if there are less people in the state, it is a possibility that finding financial help in the form of scholarships and other funds that do not need to be paid back might be easier and more efficient because of the smaller amount of people.

A variable that can go along with the population of the states can be the enrollment. Due to required state school data collections, I was able to obtain the amount of people enrolled across the state in public universities. My prediction here for this variable is that the more enrollment a state has, the higher the amount of average debt a state will have. I can guess that this could be due to the chance of a high school student’s decision to go to college will be greater, even if they are going to need to carry added debt.

When looking at a population’s average debt gained from the expenditure on education, it would be a helpful piece of information to know exactly how educated that population already is. Two variables I can use to help gauge this is the percent of the population with a high school
degree and the percent of the population with a bachelor’s degree. My guess is that if both percentages are higher and more people graduate high school, then that is going to lead to more people going on the get a bachelor’s degree, therefore incurring more debt.

As I mentioned before, another factor to investigate is the welfare of the state and how the people in that state can afford college. An obvious variable that I would be able to use is the income per capita in that state. My hypothesis is that the higher the per capita income a state has, the less amount of debt there will be for graduates in that state. If the people in that state are generally richer, then they should have less of a problem paying for college without financial aid than other countries where the per capita income is a lot lower. I think in general, this should be one of the highest determining factors, because if the wealth is there in the state, then the people likely to go to college are more likely to have enough money to pay for their college degree.

When students borrow to go to school, no matter what the future holds for them, the school will always make that money as revenue. Adding a variable for the tuition revenue gained will be able to look past financial differences that vary in each state, such as the cost of tuition, because the revenue gained is the bottom line amount of money used towards tuition. This takes a look at the actual cost of tuition, as the State Higher Education Executive Officers Association (SHEEF) defines the data I used as the net tuition revenue being “the gross amount of tuition and fees, less state and institutional financial aid, tuition waivers or discounts” and goes on to mention that “Net tuition revenue used for capital debt service is included” (State Higher Education Finance, 2018). This would mean that this variable would represent the price actually paid for college tuition, as it takes out any discounts or “state and institutional financial aid”.

One of the final variables I chose to include in my linear regression was the educational appropriations in each state, or in other words the amount of money each state put aside for the
operating expenses by the state for public universities. This variable can be an interesting tool that may be able to help look at how much each state’s importance emphasized on higher education plays a roll with the average debt of graduates. My hypothesis for this variable would be that if this variable have a statistical impact on average debt of graduates, then it is because the states that allocate more money to the schools have better systems in place to get people to go to school without having to take on so much debt.

A specific variable I wanted to look at was the size of the student loan a student had to deal with. Enterprise Data Warehouse (Federal Student, 2018) had data breaking up loans into different monetary decrements also showing how many people or “borrowers” were included in that loan amount category. This information is helpful in providing an idea of what sizes of loans people are dealing with, which can be helpful when trying to find out the effect these loans are having on recently graduated college students. This information was not available on a state by state basis, but I was able to view this variable to put into perspective what amounts of debt most college graduates are dealing with.
When looking at the distribution of different loan sizes, the loans that make up the greatest number of borrowers are within the 10k to 20k range and the 20k to 40k range. Past the 40k mark, the numbers of borrowers drop off, leaving most students with somewhere between 0 debt and 40k worth of debt. Those with up to 40k worth of debt makes up of 34.8 million borrowers of the 45.1 million borrowing across the nation.

After explaining the importance of the variables I wanted to include in my linear regression and what I hypothesized would be the importance of these variables, I constructed a linear regression model. My dependent variable in my model will be the average debt of graduates per state. This will allow me to see the impact that different regions (states) have on the amount of debt carried from student loans. Because this is the average debt, I will be able to avoid the size of the states being a factor of the amount of debt and smaller states will not have much different numbers than bigger states. My independent variables, which I explained above, will be per capita income, population, percent of population that graduated high school, percent of the population with a bachelor’s degree, state public enrollment, state tuition revenue, and state appropriations. My model is as followed:

\[
\text{averagedebt} = b0 + b1\text{income} + b2\text{population} + b3\%\text{highschool} + b4\%\text{bachelor’s} + b5\text{publicenrollment} + b6\text{tuitionrevenue} + b7\text{appropriations}
\]

It is important to note that in order to prevent the different sizes of the states impacting my data (besides the population variable), I created ratios for dollar amounts used and divided by the population. These ratios represent the ratio of the variable presented to the number of people in that state. I did this for the state public enrollment, state tuition revenue, and state appropriations variables.
While not all my variables were strong indicators of average student debt, my statistical analysis did contain variables that can be deemed as strong indicators of how average debt is affected. Shown below are the results from this linear regression:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
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<td>0.251718871</td>
</tr>
<tr>
<td>per capita income</td>
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<td>0.000806973</td>
</tr>
<tr>
<td>population</td>
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<td>0.294307395</td>
</tr>
<tr>
<td>% Highschool graduate</td>
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<td>0.983112163</td>
</tr>
<tr>
<td>% Bachelor's degree</td>
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<td>0.020881393</td>
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<tr>
<td>enrollment ratio</td>
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<td>0.407280502</td>
</tr>
<tr>
<td>tuition ratio</td>
<td>366593.5724</td>
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<tr>
<td>appropriations ratio</td>
<td>-453819.2261</td>
<td>0.000456059</td>
</tr>
</tbody>
</table>

For each of our independent variables, we want to start by looking at the p-values, or the predicted values. We are looking for low P-values that are below 0.05. These variables have been determined by the model that these are the variables that can be used to tell how they will affect the average debt for graduates.

What is interesting is our two “population” variables for the population per state and the enrollment ratio both have high P-values. This can be a sign that population size does not affect the average debt for graduates like we thought it might. This could very well be because the factors we talked about that might be affected due to overcrowding are in fact not affected, such as funding by the state or limiting opportunities for potential students to go to school that have potential but do not realize that them going to school is an option after seeing the larger amount of other people going to college.
Next, we want to look at our “education” variables of the percent of the state with a high school degree and the percent of the state with a bachelor’s degree. When looking at the p-values, the variable for the percent of the state that graduated high school has a p-value that is much too high, so we can also disregard that variable. For the percent of the state with a bachelor’s degree, a p-value of .0209 is within the desired p-value, so we can look at the sign of the coefficient for that variable. Seeing that its negative, that means that as the average debt of graduates in the state falls, the percent of people with bachelor’s degrees is going to increase. This is an interesting variable in the model as it can help draw a link to more educated populations with bachelor’s degrees will have less student loans.

Lastly, we can look at the “financial status” variables for per capita income, tuition revenue received through public universities, and appropriations allotted per each state. We can see that all variables in this category have low p-values of .0008, .0065, and .0005 respectively. This is understandable that these variables would have the best predicted values for average debt of graduates as debt often has the most to do with financials such as the ones used.

For the per capita income variable, the coefficient is a positive and it is .9646. This means that for every dollar of average debt more per state, there is about a 96-cent increase in the per capita income in that state. This is a bit of a surprise as I would have expected the more income per capita in a state to lead to there being less debt in that state because of the increased ability to pay that loan off.

Our other two variables dealing with financial status of the public schools in a state were the tuition revenue received by public universities and the appropriations the state government allocated to the public universities. Looking at the “tuition revenue” ratio, its coefficient is positive. This means that the higher the tuition revenue received by the state universities gets per
state population, the more average debt for graduates will be in that state. This makes sense as the correlation between that revenue increase from tuition would mean there is higher amounts of spending on education, leading to higher amounts of student loans. This variable should be taken into careful consideration since this type of relationship may just be from an increase in spending and might not have to do with the amount of debt at all.

The variable that represents the appropriations the state government allocated to the public universities had a negative coefficient. This means that the more appropriations allocated to education for the public universities of that state, the less student debt there would be. This makes sense as there is more money going towards public universities, so there might be more financial assistance in scholarships offered at those universities in order to get people to go to school and not have to take on loans.

**Conclusion**

Across the nation, it is evident that people that choose to obtain higher education often must take on the burdens of student loans. These student loans can stack up quickly with no easy way to pay them off, leaving the student “stuck” with no easy way to pay those loans off in a quick and efficient way. Through analyzing different aspects of these loans, we can begin to see the impact the loans have on a student trying to progress in their lives who are trying to start their career and be able to afford their own place to live but are hindered by the amount of student loans they must pay off.

Through my analysis in debt size, I see that there is a sizable number of borrowers that take up to 40k worth of student loans. These students need to find a way to start paying off those debts right out of college slowly while also maintaining other costs such as living arrangements
for wherever their new job is. With a much larger debt amount, it may be harder for those graduates to get back on their feet and start making purchases they would hope to in their life.

It is clear that certain regions suffer more from high levels of student debt, mostly in the Midwest and the East Coast. The western region was shown to be one of the best regions for student debt, keeping debt much lower than Eastern states. The linear regression model constructed helped explain how different variables might affect the amount of student loans in different regions, as regions by state have a big impact on how much debt graduates will have.

As my original hypothesis was that this difference in the amount of debt by region was based off the population size of those state, my model proved to show that population was not a strong indicator of debt using the population variable and the enrollment ratio variable used for people that enrolled in public universities per the population size.

As for education gained in different regions affecting student debt, the model showed that the amount of high school graduates was not a good predictor of debt per state. I would think that this is because high school has such little to do with high education that it does not show a difference in debt amounts. If the high school graduation rate is high, that does not necessarily mean more people are going to school for more education. Those same people could very well be going straight into the work force or doing something else with their lives and high school does not directly connect with people going to college.

The model however showed that the higher the rate of people with bachelor’s degrees in a state, the less debt there will be. This variable I was interested to see how it would turn out. In this case with there being a negative relationship, I would assume that because there are more people with bachelor’s degrees in the state, there may be more wealthier people in that state that
are able to pay off their debt. I originally thought that a larger number of people with bachelor’s degrees would mean that the amount of debt would be higher because there was more debt gained when getting those degrees.

The per capita income variable used in the linear regression model found that there is a positive relationship between debt and income level. This contradicts my hypothesis of expecting that the more income per capita that is in a state will lead to there being less debt in that state because of the increased ability to pay that loan off. My thoughts are that the more income per capita there is leads to more people going to college and being able to afford part of their education, but then having to take out loans to finish school. Even with this contradicting my hypothesis, I was not surprised that my financial variables were the strongest indicators of if state were going to have a large amount of average debt per graduate.

It would be interesting for future studies to analyze the impact of how education levels in different states affect the amount of debt in that state. Further variables to be investigated would be other levels of education, such as potentially master’s degrees and doctorate degrees. More analysis could be done looking at how different schools promote higher education and how well the local government runs education programs and education funding, similar to my appropriations variable.

The variable in the model representing the appropriations the state government allocated to the public universities is also another good topic to further look into. My model determined that there was a negative relationship between debt and appropriations. That could possibly mean that the money normally being borrowed does not need to be borrowed because the state is allocating funds to public universities that are able to close the gap to an affordable education. Another theory is that schools that have higher appropriations for public universities have an
increased importance emphasized on education, therefore doing their best to make college as affordable as possible, even if that means spending tax dollars on appropriations to close the gap.
References

Ambrose, B. W., Cordell, L. R., & Ma, S. (2015). The impact of student loan debt on small business formation. 32 pages.


