Tuition: Why We Pay So Much

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Abstract

As the cost of tuition continues to rise across the nation, many students are left asking why they have to pay so much in order to obtain a degree. There are numerous external factors that are correlated with the difference between in-state and out-of-state tuition in each state. Those factors include the percentage of people that voted for President Obama in the 2012 election by state, the percent of the population that is between the ages of 18 and 24, the enrollment at the flagship four-year university in each state, the percentage of people 400% or more above the poverty line, and the number of colleges in the state. This paper uses econometric regressions and empirical analysis to suggest that these variables affect the average premium between in-state and out-of-state tuition at public four-year universities in every state.
Introduction

What economic and political factors are the most influential in determining the premium between in-state and out-of-state tuition at public four-year higher education institutions? The premium between in-state and out-of-state tuition is the difference between how much a public university charges in-state students and out-of-state students on average. In order to attempt to answer this question, I will look at many different variables including political data such as the party affiliation of the governor and both senators in each state, as well as what percentage of the state voted for Barack Obama in the 2012 Presidential election. Also, I will look at important economic factors such as the average state tax rate for every state, median income, and the distribution of the state budget. Finally, I will look at college data as well, which includes the total enrollment in higher education institutions in the state and the number of colleges per state.

Importance

The price of attending an institution of higher education has continued to rise at an astounding rate over the last decade and a half. The increases have come from many different factors. The price of college has increased 80% from 2003 to 2013 (Kurtzleben 2015). During that time, the overall price index has only increased around 34%. For example, in 1974 the average cost of attending a public four-year university was $2,469. By 2015, the cost had increased to $9,139 per year (College Board 2015). (The College Board is a nonprofit organization that helps develop standardized tests for schools and conducts research on education from kindergarten to PhD programs.) Increases in tuition have greatly outpaced the increases in the price of other goods and services, with tuition more than tripling in 40 years. Because of this, if students attend college, they will more than likely have to take out loans and then spend a good amount of time after college paying off those loans. All of this is happening as the United States
falls farther and farther behind in its education statistics, such as math, science, and reading scores, compared to other countries. However, even as it is still a key goal of the government to try to bolster these numbers, state funding for higher education has taken a backseat to other spending like Medicare and the prison system due to politicians and citizens making these alternative uses of funds a higher priority. Also, President Barack Obama, instead of offering more funding for higher education institutions, has threatened to cut funding if universities continue to increase their tuition. Therefore, institutions are in a lose-lose situation because if they stop increasing tuition, they may run into financial troubles, but if they increase tuition, they may lose most of their federal aid and students.

Also, President Obama, in a post on the White House website, has “challenged every American to commit to at least one year of higher education or post-secondary training” (White House 2015). On the same page, Obama notes that United States is being outpaced in higher education. The outpacing comes from the inability of lower income students and families in particular to afford higher education, also known as the attainment gap. The importance that Barack Obama and other politicians have put on higher education makes it seem that higher education is a necessity nowadays and not just something that only the privileged can take advantage of. Because of that importance, we would expect to see higher education becoming increasingly less costly and more attainable and more highly subsidized by the government in order to make it easier for low-income students to attend college. However, the cost of obtaining a four-year degree has continued to increase at an astounding rate, and it looks like it may never slow down.

All of the graphs below help illustrate the drastic increases in tuition that have happened in the past two decades. Graph one using 1984 as the base year, shows clearly the relative
increases in tuition and fees at public four-year universities, public two-year colleges, and private nonprofit four-year colleges and universities. By 2014-2015, tuition and fees at a public four-year university has increased 3.25 times or 325%. Graph two shows published and net tuition and fees and published and net tuition and fees and room and board for in-state undergraduate students at public four-year institutions. In 1994, average published tuition and fees were just above $4,000, by 2015 tuition and fees had skyrocketed to almost $10,000. Even though aid has increased a large amount, the high published tuition and fees may scare a potential student away if they do not know how much they will receive in aid. Also, from this graph, it can be seen that room and board has increased considerably and there has not been nearly as large an increase in aid for room and board as there has been for tuition and fees.

The third graph shows average per-student state funding for higher education and the average tuition and fees at public institutions from 1983-84 to 2014-15. This graph shows that as average state funding decreases per student, universities have to increase their tuition and fees to
help recover some of the money that the state is no longer giving them. For example, in 2001-02, state funding decreased by slightly more than 5% due to lack of state budgetary dollars during a recession. In order to compensate for the money that the university was not receiving from the state, tuition and fees increased over 10% in 2001-02. It is also interesting how state funding only decreased by 5% but institutions increased their tuition and fees by over 10%. The fourth and final graph shows the average annual percentage increase in tuition and fees and tuition and fees and room and board. Tuition and fees at public four-year institutions has seen the largest percentage increase in tuition and fees for every 10 year period except when public two-year institutions had a 4.6% increase in tuition and fees and public four-year institutions had a 4.4% increase.

3) Annual Percentage Change in Inflation-Adjusted Per-Student State Funding for Higher Education and in Tuition and Fees at Public Institutions, 1983-84 to 2013-14 via College Board

4) Average Annual Percentage Increase in Inflation-Adjusted Published Prices by Decade, 1984-85 to 2014-15 via College Board

One of the reasons that it is so shocking to see the price of attending college increase so rapidly is because of the returns and social necessity and economic benefits of attending a higher education institution and, more importantly, obtaining a degree from that institution. According
to a report put out by College Board (2013), “median earnings of bachelor’s degree recipients…in 2011 were $56,500, $21,100 more than median earnings of high school graduates.” As students are better informed about this gap between the earnings of college graduates and high school graduates, they realize that they must attend college. Also, just like the continuous increase in sticker price and tuition, the returns from going to college are expected to increase. The “difference between median earnings” of men and women high school and college graduates between 1991 and 2011 increased 14% from 56% to 70% (College Board 2013). Perspective students see these returns, and they know that they have almost no choice other than to try and attend a college or university, increasing the demand for and the price of college education. Therefore, the institutions are in control and have continued to increase their tuition prices. Even while politicians and universities have allowed the cost of attending a four-year institution to increase, the government continues to express concern how the United States is falling behind other countries in higher education. One would think the government would then try to decrease the cost of obtaining a higher education degree in order to increase accessibility and performance of students.

Increased pay is not the only beneficial return to students who chose to attend college. According to the same report by the College Board (2013), students who attend college are also less likely to smoke and more likely to exercise. This shows people who decide to attend college are overall healthier and make smarter decisions because of the knowledge they gain and experiences they have in college. Also, 65% of people who attend college and receive a degree are given health insurance and retirement benefits from their employers, while only 52% of high school graduates receive the same benefits from their employers (College Board 2013). These statistics and examples provide even more of a reason for institutions to charge a higher price
and make students pick up more of the cost. The positive personal returns for obtaining a college degree are massive, and students know that now it is more important than ever to obtain a degree from a higher education institution.

Even though college prices continue to increase, it has not completely deterred students from attending college. According to research by the Institute of Education Sciences (the research division of the Department of Education), “In fall 2012, total undergraduate enrollment in degree-granting postsecondary institutions was 17.7 million students, an increase of 48 percent from 1990 when enrollment was 12.0 million students. The rate of growth was 10 percent between 1990 and 2000 and 37 percent between 2000 and 2010” (National Center for Education Statistics 2014). Some of the growth can be understood because there were increasing numbers of young people around college age from 1990 to around 2008. However, since 2008 the number of college-aged people has decreased, yet enrollments continue to increase, even increasing an astounding 37% from 2000 to 2010. Even though the increasing cost of attending college has yet to deter a large percentage of the college age population from attending, there is a chance that the price may be reach its tipping point soon and become too expensive. If the factors that affect the increasing cost in higher education do not slow down or stop increasing at such a high rate, the attainment gap may increase and the United State may fall farther behind in higher education because not enough people can afford going to college. If we are able to find the main reasons for the increases, then there is a chance that there may be a resolution to the problem.

**Literature Review**

Michael T. Jackson (2012) looked at the determinants of out-of-state tuition at public universities. Jackson used “a multiple linear regression model with 21 independent variables” (1). This seemed like a large number of variables to test when looking to explain tuition price,
but Jackson noted that there were two reasons as to why he chose 21 variables for his regression. Jackson said that the literature points to there being a lot of different factors that affect college tuition. Also, he said that he uses “several interaction variables and one multi-level variable” (1). Jackson found that 11 of his 24 tested variables had a significant impact on the price of out-of-state tuition. Jackson found that in-state college tuition is positively correlated to out-of-state tuition. He also found that the prestige of a public university, the research activity of the university, and the appropriations by the government to higher education all were positively related to an increase in out-of-state tuition. Due to Jackson using many variables and finding eleven that were statistically significant in this regression, it was a great starting point when I begin to look for data to use in my research.

Charles Lenth (1993) found that states vary greatly with how they fund public higher education institutions. Also, William R. Doyle (2012) found that directly or indirectly political legislators and governors have an effect on the cost of tuition at higher education institutions. In both of these instances, it appeared that political control of each state has an effect on the rate of increase in tuition at public four-year institutions. “Interestingly, per-capita aid was low in the Southwest, but was equally low in the Rockies/Plains, and not much higher in the Southeast and Northwest. Each of those four regions committed far less to financial aid than the Northeast and Midwest” (Hearn, Griswold, and Maine 1996, 256). This was very interesting because during the time this was published the South and Rockies/Plains regions were primarily held by Republicans. Republicans have tended to be more conservative when it comes to spending money and it would be more likely for them to reduce budgetary spending on higher education. Finally, in the aforementioned study by Hearn, Griswold, and Marine, they concluded that “region is without question the most significant factor in tuition in 4-year institutions” (262).
This may be because of the political affiliations of those states, or there might be another reason. Some of the other reasons could be related to the economic makeup or demographics of state. However, taking all of this evidence into account, it appeared that there was some correlation between the increasing college tuition costs and the political control of each state.

When it came to economic factors and how they affect tuition increases, there were already some very interesting studies that looked at these relationships. Rizzo and Ehrenberg (2012, 303) found that “the recent economic downturn in the United States has led to severe current and projected budget deficits in most states. Sharp rises in health care costs and increased competition for state funds from other sources has concurrently led to a decrease in the shares of state budgets earmarked for the higher education sector.” Given limited financial resources, it appeared college subsidies had suffered relative to other, more pressing, obligations for state finances. Because of this, it will be important to see how each state’s budgetary decisions affect the amount of money that is given to each public college and university.

Rizzo and Ehrenberg’s (2012) study was not the only study that has looked at how state funding affects college tuition prices. Quigley and Rubinfeld (1993) found that a high migration of students out of a state tends to have a negative effect on how much money a state will allocate to higher education. The migration of students means that the students are leaving their home state in order to pursue a college degree in another state. When a government sees more and more of its students leave the state to pursue a college degree, they are less likely to provide funding to higher education. However, the state government may have chosen to spend their budgetary dollars in different areas and that increased tuition. In turn, higher education would be more expensive in that state, and then more students would migrate out of the state in order to pursue a college degree. There could be two different explanations as to why a higher migration
level led to higher tuition costs, but no matter what reason it was, it will be an important variable to look at.

Also, a decline in state support had also caused an increase in tuition levels at public higher education institutions. Kane, Orszag, and Gunter, (2003, 3) found that higher education support fell from 7.3% in 1977 to 5.3% on average in state budgets in 2000 during the period that corresponds to both increasing enrollments and increasing tuition at state institutions. The authors also found that there is a negative correlation between an increase in Medicaid and funding for higher education (10). These findings suggested that other areas like healthcare were more important to states at this point than higher education. This could be due to a higher amount of seniors voting. Therefore, state politicians were more likely to put money towards areas that will get them more votes. Not only could healthcare be more important to a state, but the prison system or public transportation may also be more important than higher education. Finally, states with less money will not have as much to allocate to higher education and these other areas of public funding are more pressing and viewed more as a necessity than higher education by the politicians.

Quigley and Rubinfeld (1993, 255) also found that states with a higher percentage of students enrolled at private institutions and states with higher numbers of private colleges and universities charged a higher tuition rate at their public universities. There could be many different reasons for public institutions doing this. One is that the average cost of higher education is higher in that state, so the public universities can charge a higher rate because it is more comparable to private institutions. However, public institutions may also have to charge a higher tuition rate because they do not have as many students attending public institutions, so they need to get more money from each student in order to get enough money to keep the
institution afloat. Whatever the reason, there seems to be a good amount of research and findings to support the idea that the enrollment rate in private institutions affects the amount charged for tuition at public colleges and universities.

Donald Heller (1997, 624) found that “Lower-income students are more sensitive to changes in tuition and aid”. Not only did Heller see a relationship between the income of a student and an effect on tuition, he also saw it correlated with race; he stated that blacks were more responsive to changes in tuition than whites and Hispanics (646). Even though these two findings from his research did not prove that there was a relation between increasing tuition and race and income, it provided a background to think that this might be the case. If a state was very concerned about its residents attending college, then we would expect to see lower tuition prices in states with more low-income and African-American residents. However, there is a chance that states may actually decrease their funding for higher education institutions due to these factors. Due to a large number of low-income families, a state may not have the resources to provide a lot of funding for higher education and may have to spend it in other areas instead. Quigley and Rubinfeld (1993, 268) also found that higher income states have higher enrollments than other states. This may again signal that higher-income states have the ability to give more budgetary dollars to subsidize the cost of attending a higher education institution. Finally, Quigley and Rubinfeld found the same conclusions from the data that Heller did when looking at races: “States with substantial black populations tend to offer lower levels of public enrollment” (269). Due to these conclusions, it will be very important to include both race and income data in a study focusing on the tuition premium between in-state and out-of-state tuition.

Another reason that tuition at certain institutions may have increased so much was because of the financial status of the college or university. Helmet and Marcotte (2011, 442)
found that increases at a certain institutions could “signal that a school is performing or planning poorly or is in dire financial straights”. However, according to an article in the *New York Times* only “a handful of colleges have closed, merged, or been bought by for-profit colleges in recent years” (Selingo 2013, 1). Therefore, this was a relatively unlikely case, because young people now see how important a college education is and therefore more people are going to college. Although this may not be the most likely explanation as to why college prices have increased, it could help explain some of the variability in the prices over the years.

Other researchers have looked at the rising cost of tuition through the lens of a strictly economic theory, supply and demand.

“Demand theory holds that the quantity of a particular good or service demanded is a function of price, the money income of the buyer, the prices of other goods and services, and the buyers' tastes or preferences. The theory as applied to higher education has been used to suggest that (1) enrollment rates will be negatively associated with prices charged students, especially tuition prices; (2) enrollment rates will be positively associated with amounts spent on student aid, since student aid can be viewed as reducing net prices or increasing student money income; and (3) enrollments in higher education institutions or groups of institutions will be associated positively with the tuition prices charged by competitors - for example, public college enrollments with private college tuitions and vice versa - as students exercise their preferences” (Leslie and Brinkman 1987, 181).

This was how many researchers attempted to think about higher education and why they believed costs were increasing during the 1980’s and early 1990’s. However, as federal subsidies have decreased and subsidies from the institution have increased, people now look at the increasing cost of education differently than they did 30 years ago.

Supply and demand could also help explain what Quigley and Rubinfeld (1993) referenced in their aforementioned study. They found there was a positive correlation between the demand for higher education and the percentage of the population in a state between the ages of 18 and 24 (267). Therefore, if the supply and demand theory of higher education prices held
true, there would be a higher price in states that had a low migration of students out and a high percentage of the population that is between the ages of 18-24. So, from this it was possible to infer that states with a larger population between the ages of 18 and 24 could have a higher cost for attending a higher education institution because of the higher demand which led naturally to the price increases.

Another factor that could increase tuition price at public institutions was something that was seen more as a luxury, but was very important when a student is attempting to pick a college or university to attend. According to a study by the United States General Accounting Office, student-related expenditures have played a large role in the increase in tuition at public universities (Schumer 1998). During the time of this study, student-related expenditures per student fell overall, but institutions that saw the largest increases in student-related expenditures, saw the largest increases in tuition. Even though this factor had an effect on tuition, it was hard to find specifically what each institution spends per student on these expenses. These student-related expenditures included items like museums, galleries, academic support, computers and technology, and luxuries like fitness centers and expanded dining choices. Some of these were necessary, while others were not, but schools that chose to spend a lot of money in these areas per student were more likely to have a higher enrollment and charge a higher rate for tuition in order to provide better services.

Another factor that had an impact on tuition at public institutions was the amount of money spent on research (Schumer 1998, 9). More and more undergraduate students found that an university with strong undergraduate and graduate research and having faculty with a strong research backgrounds was an important part of their college choice, and because of that more institutions were putting more of their money towards supporting various types of research.
According to the General Accounting Office, “After controlling other factors, including changes in all current revenue, schools with larger increases in research expenditures were more apt to have larger increases in tuition” (Schumer 1998, 9). In order to maintain a large research agenda a university needed to build large labs and have expensive equipment. This meant that they will likely increase tuition in order to pay for their research agenda. Therefore, a school, that brought in a lot of students because the students puts an importance on the university’s research prowess, was more than likely to charge their students a higher price in order to continue their research because that was one of the reasons a student chose to attend that college.

Finally, there was one more factor that appeared to affect college tuition quite a bit and it had increased substantially in the most recent years. Mark Schneider (2009, 3) found that “we see that more money is allocated into administration than instruction.” This has been a trend recently in higher education. More and more administrators have been hired and the salaries paid to them are greatly outpacing the salaries for instructors and professors. Also, because some administrators received a higher salary than professors by hiring more of them even more money has been budgeted towards them. It appeared as student needs were of a higher importance and complexity, universities hire more administrative staff to take care the issues and it then led to higher costs. This was another important factor when it comes to increasing tuition, but it may be hard to quantify on a state to state basis.

Dependent and Special Interest Variable

The dependent variable for this study will be the difference between the average in-state tuition and average out-of-state tuition of public four-year universities by state. There will be many different variables that I hypothesize will help explain the variation between in-state and
out-of-state tuition. However, there is one variable that draws a lot of interest and that will be the percentage of people that voted for current President Barack Obama in the 2012 Presidential Election. This variable should help explain if states that are held more predominately by Democrats fund more or less of out-of-state tuition compared to in-state tuition than those held by Republicans.

**Description of Variables and Data**

One of the most important steps when building an econometric regression is data collection. When it comes to deciding the sample size for the analysis, it is a simple decision; all of the states in the United States (not including Washington D.C). Choosing to look at all fifty states is an important choice because there will be a good representation of data from all different places. By choosing all states, there is a wide range of incomes, political dominance, government subsidies, and difference in tuition.

The dependent variable for this research is the *premium* [Premium]. The premium is a measurement of the average difference between in-state tuition and out-of-state tuition at a public four-year university in each state. This variable is calculated by taking the average out-of-state tuition cost at public four-year universities per state and subtracting the average in-state tuition cost at public four-year universities per state. The data for the average cost of attending a public four-year university was collected from a study by the College Board. The College Board does a study every year that analyzes the trends in college pricing and I used the most recent study that reported average tuition cost for 2014-2015.

When it comes to analyzing the data, there is a great variance in premium. The minimum differential was found in South Dakota with a difference of only $2,257 between in-state and
out-of-state tuition. The maximum premium was found in Michigan with a premium of $20,072. The mean for premium was $13,522. The large separation in minimum and maximum shows there is great variability between how much each state charges out-of-state students compared to in-state. This data is already in 2014 dollars and that is how it is kept for the data analysis of the research.

The special interest variable for this regression is percentage of people who voted for Barack Obama [Obama]. This variable is the percentage of people that voted for Barack Obama in the 2012 Presidential Election by state. By using this variable instead of other political variables, such as the political affiliations of the Senators or Governors of each state, it will capture the political dominance of each state in 2012. This data was taken from the Federal Election Commissions website. The special interest variable shows a variance of 45% between the state that had the most people vote for Obama, and the state that had the least. The highest percentage of people voting for Obama was 70.55% in Hawaii. Hawaii is where Barack Obama was born and grew up, so this might only show a hometown bias for him and not have a great effect on college tuition premium. However, Hawaii is also a predominantly Democratic held state, so it could still show a positive relationship with premium. The lowest percentage to vote for Obama was 24.75% in Utah. The mean for the Obama voters was 48.19%.

According research on the subject of how political affiliations affect college tuition subsidies, it would appear that if the state is a more Democratic state that will result in a lower difference between in-state and out-of state tuition. This is because Democrats tend to have larger budgets and are willing to spend more. Because they are willing to spend more they are more likely to provide higher subsidies to public four-year universities for all students who attend and those universities will pass the funding on to both in-state and out-of-state students. If
the state is more Republican held, there is a better chance that they will give less to state universities and then the universities will have less money to subsidize out-of-state students.

Another variable that is included in the regression is Number of Colleges [NoC]. Number of colleges is the total number of public four-year universities in each state. This variable could either have a positive or negative relationship to premium because there are two ways to look at it. If there are more public universities in each state, the state governments may not be able to fund as much towards each university. Then, universities must pass the cost along to out-of-state students which would increase the premium and number of colleges would have a positive relationship. However, it could also have a negative relationship because as there are more universities they have to compete against other public universities. The competition would lower their prices and lower the premium between in-state and out-of-state tuition. Also, more public universities could mean that the state values higher education more and they may actually spend more of their budget on providing subsidies to public institutions. The state with the fewest number of public colleges is Wyoming with only three, which makes sense because it is not a highly populated state. California has the highest number of public universities with 221. The mean for number of colleges is 54.92. Both the minimum and maximum are large outliers compared to the mean. However, this is because of the correlation that NoC has with the population of a state. This data was collected from The Public Agenda’s website which showed all higher education institutions by state as well as the number of public colleges and universities in a state in 2010. The Public Agenda is a nonprofit organization that offers nonpartisan information on numerous political and economic issues. The data is from 2010, but there are few new public colleges and universities that have been opened in the past four years.
A variable that should have a positive relationship to Premium is the \textit{Percent of the Population Between 18 and 24 per state or College Age Population} [CAP]. The minimum for CAP is 8.73\% which is in Maine and the maximum is North Dakota at 12.27\% with a mean of 9.98\%. South Dakota has a very large percent of the population that is college age, but they are one of the states with the lowest number of public universities with only 15. However, Maine is also a state with a smaller number of colleges. Therefore, it is likely that this data will provide a different impact than NoC. This variable should have a positive relationship with premium because as the percentage of the population between the ages of 18 and 24 increases, there is a higher chance that there will be more people attending a higher education institution. This would increase demand for in-state students to attend college and because there are more in-state students who want to attend. The increase for demand could increase the tuition for in-state students because the university will only take so many in-state students and that would decrease the premium because universities would be charging in-state students more and out-of-state students the same amount. However, there could be an increase in premium because the state charges a higher premium to out-of-state students in order to decrease out-of-state demand and leave more spots at the university open for in-state students.

Another factor that should have a relationship with the premium paid by out-of-state students is the \textit{Log of Higher Education Spending Per Capita by State} [LNHIED]. The original data was published as budgetary spending in millions of dollars by each state government by the Kaiser Family Foundation. The Henry J. Kaiser Family Foundation is a non-profit and non-partisan foundation that focuses on global health issues and the United States’ role in global health policy. Because of this, they look at how many different areas affect the U.S. healthcare system including how a state chooses to allocate its budgetary dollars. In order to make it more
workable and useable for the regression, the data was turned into per capita data by dividing it by the population of each state. Then, in order to obtain a percentage, the data was logged. This will also help in decreasing potential problems in interpretation that could result from heteroskedasticity in the data. This resulted in a maximum of 6.38% in Alaska which is interesting due to the smaller population that Alaska has. Also, Alaska has a good amount of public parks and recreation areas that one would think might pull away from higher education spending. The low was found in Oregon with only 4.48% which is interesting because Oregon is not an outlier with a low population or in any other area. Oregon might have fewer budgetary dollars to spend and sees other areas of public spending as being more important. The mean for the data was 5.43%. There is not a lot of variability in this data due to changing it into a percentage. According to previous literature on the subject, more spending on higher education would mean more funding for higher education institutions. Therefore, state universities and colleges would be likely to pass the government funding on to both in-state and out-of-state students, and this would decrease the difference between in-state and out-of-state tuition.

The *Log of College Enrollment* [LNEnrollment] looks at how a percentage change in enrollment at all public four-year universities in the state affects college tuition premium. The college enrollment data was taken from the College Board website that showed different higher education data for every state. The mean for the data was 11.41%, the maximum was found in California with a value of 13.32%. The minimum was found in 9.31% in Wyoming. California has a large number of people that are college age, so it makes sense that they have the highest college enrollment. Also, Wyoming has the smallest number of public universities; therefore, the college enrollment data helps show that they do not have a large number of students enrolled in public universities. In order to change the data into a better fit for the regression, it was logged so
it is now measured at as a percentage change. This data is much like [18-24] in that it could have two effects on the premium paid by out-of-state students. If the theory of supply and demand holds, more students enrolling in public universities would mean that the universities would charge a higher price. However, if the universities decide to take advantage of economies of scale, the price will drop due to the universities being able to decrease the average cost of educating each student. From previous literature, it is more likely that as enrollment increases, the tuition premium will increase because universities will be able to make more money due to the fact their education is in higher demand.

The last variable that has been included in the final regression is the *Percent of the Population 400%+ above the Poverty Line* [Pov]. This data is a good representation of how wealthy a state is. For example, the poverty line for a family of four in 2014 is $23,492 and it varies depending on how many people are in the family. On average, the poverty line is drawn at around $5,000-$6,000 of income per person in the household. The maximum for the data was 47% which was in New Hampshire. This shows that the state is relatively wealthy because almost half of the state is 400% above the poverty line. The minimum in the sample was Mississippi which is not surprising due to Mississippi being a historically impoverished state. Mississippi only has 22% of the population that is 400% or higher above the poverty line. The mean for the variable was 33.16% which helps show that it is relatively evenly distributed due to the mean being close to the average between the minimum and maximum. If the state is wealthier they will have more tax revenue and therefore more money to spend on subsidizing higher education if the government chooses to spend their tax revenue on education. Therefore, an increase in the percentage of the population of the state that is 400% above the poverty line will be negatively correlated with college tuition premium. This is because as the state has more
money to give to higher education, the institutions will pass the subsidies along to all students of the institutions because they now have more money to give. This data seems to work better in the regression than median income and is a good substitute for that data. This data was collected from the Kaiser Family Foundation website and it listed various types of poverty data by state.

There was a large amount of other data that was collected and added to the regression, but did not make it into the final regression. Some variables were highly correlated with others and because of that they were excluded. When two variables are highly correlated to one another it is called multicollinearity. When multicollinearity is present it greatly affects the value of the t-statistics and that makes it difficult to determine the statistical significance of the independent variables.

A variable that was highly correlated with a variable that did not make it into the regression was *Average Median Income by State* [MedianIncome]. MedianIncome was highly correlated with Poverty at .759 and also slightly correlated with Obama at .423. Also, the *Percentage of the Population with a Bachelors Degree* [BachelorsDegree] was highly correlated with poverty .772 and Obama .630. When running preliminary regressions, it appeared that Poverty and Obama both had greater effects than MedianIncome and BachelorsDegree. Therefore, these two variables were left out of the final equation.

Also, there were a few dummy variables that were added to preliminary regressions but did not seem to add to the regression. A dummy variable represents the presence or absence of a qualitative characteristic within a regression. The values of dummy variables are either zero or one, where one indicates that the quality you are measuring is present, while zero indicates that the quality is not present. For example, I looked at the political affiliation of the Senators and
Governors of each state. If the governors or senators were labeled as Republican they received a one, but if they were Democrat, Independent, or other they received zero. However, since none of these variables added to the explanatory power of the regression and were not statistically significant, they were excluded.

Regression Equation

In econometrics and statistics, regression analysis is a commonly used technique to test hypothesis by using different types of independent variables to find relationships with a dependent variable. In order to find a relationship between many different economic and political variables and the difference of in-state and out-of-state tuition by state, regression analysis is the type of analysis that will work the best.

Using the data and variables previously discussed, the final regression equation appears as this:

\[ \text{[Premium]} = \beta_0 + \beta_1\text{[NoC]} + \beta_2\text{[PAC]} + \beta_3\text{[Obama]} + \beta_4\text{[LNHiEd]} + \beta_5\text{[LNEnroll]} + \beta_6\text{[400]} + \varepsilon \]

The final equation for this linear regression represents a linear relationship between the variables above and the premium that out-of-state college students pay relative to in-state students. To interpret this, each \( \beta_n \) shows how much the dependent variable will change when the “nth” independent variable increases by one unit, holding all other variables constant. \( \beta_0 \) is the constant term. This is the value of the dependent variable when all other variables equal zero. The \( \varepsilon \) represents that variance in the equation that is not explained by all other independent variables in the regression. This term is called the stochastic error term.
The technique that is used is called Ordinary Least Squares or OLS. OLS is used to estimate the parameters in a linear equation. The goal of OLS is to minimize the squared residual error, which is the difference between the actual data from the dependent variable and the estimate of the dependent variable. OLS uses the sum of the squares to estimate the relationship between numerous independent variables and one dependent variable. The resulting $\beta$’s are the coefficients of the equation which tell how each independent variable is related to the dependent variable.

The data that is used for this regression is cross-sectional data. Cross-sectional data is data collected on many different subjects, firms, variables, and states for example, at or around the same point and time. The data for this study was collected between 2009 and 2014.

**Results**

After running many different regressions, with different specifications of the independent and dependent variables, the final regression equation was estimated. The final equation had an adjusted $R^2$ value of .202. This means that 20.2% of the variation in the dependent variable, Premium, was described by the independent variables. According to the analysis of variance (ANOVA), the F-Statistic for the regression is 3.063 which shows that the equation is statistically significant at the 7% level. In a regression where the independent variables completely explain all of the variation in the dependent variable, the Adjusted $R^2$ value would be one. The value found here, 20.29% is relatively low for an econometric study, but due to the level of data that has been collected and the difficulty in finding the ideal measures, it is adequate to draw some conclusions. It is very difficult to capture all variables that effect college tuition data. There are a few examples of data that may be tough to take into account such as the
aesthetic look of the campus, a particular student’s feelings towards the college, extra amenities or benefits offered by each college in the state. Also, since it would be very difficult to look at every public institution in the country, an estimate of average tuition premium was used which cannot capture how every higher education institution handles in-state and out-of-state tuition.

The estimated coefficient for the special interest variable, Obama, is 161.393. For each 1% increase in the population that votes for Obama, the college tuition premium will increase about $161.393. Therefore, as a state that voted 60% for Obama would have a $9683.58 higher tuition premium for out-of-state students holding all other variables constant. If a state is more Democratically held there is a good chance that students that come from another state to attend a public university in the Democratically dominated state will have to pay a higher premium relative to in-state students than Republican held states. The t-statistic for Obama was 3.080 and is significant at the 1% level with a p-value of .002. This was the best significance and highest t-statistic from the entire regression. Overall, this shows that the political affiliation of each state is very important when it comes to explaining the variation in the tuition premium of higher education institutions in each state.

The special interest variable affects the regression in a very interesting way. By the coefficient being positive, it says that Democratic held states may be less likely to pass subsidies on to out-of-state students. This is a very interesting thought because Democrats usually have a more liberal and larger fiscal budget. Therefore, one would think that states that are held predominantly by Democrats would be more likely to fund more towards higher education institutions and that the higher amount of funding would help subsidize out-of-state tuition. However, according to this result, it looks like they do not. It may be that states that are
predominately Democratic do fund more towards higher education, but the universities choose to pass the subsidies on to in-state students instead of out-of-state students.

However, the coefficient can also be explained a different way. Democratic held states may have different rules in place for funding higher education institutions. What is not measured in the equation is how much in-state students in predominantly Democratic states pay. Democratic states may care more about their in-state students because they have already paid taxes to help fund in-state higher education institutions. Therefore, the rules put forth by predominantly Democratic states may actually benefit in-state students more and increase out-of-state tuition in order to offer a lower price of in-state tuition. This variable could have two different relationships to the college premium and more analysis would be qneeded in order to find the exact relationship.

According to the results of the regression, the number of public four-year universities in the state also has a significant impact on the premium. The coefficient for NoC is -32.769, which translates into -$32.77. This means that for every additional college in the state, the tuition premium paid by out-of-state students decreases by $32.77 holding all other variables constant. This would mean that a state that had 101 public universities would charge $3277 less to out-of-state students compared to in-state students than a state that had only one institution. This result is not what was hypothesized. The hypothesis was that a state with more public universities would have to spread their budgetary dollars to more institutions and therefore states with more institutions would have a higher premium.

However, the direction of this variable can be analyzed in a different way. It is very possible that the number of public universities in the state highly correlated to the population
size. If this is the case, it is likely that a state may have more tax dollars to spend on higher education. Because of this, states would be able to lower the average tuition premium within their state because they don’t have to pass the costs onto out-of-state students. However, that is only if the state chooses to allocate more of their tax revenue to higher education. Therefore, it is very possible that by using NoC without population in the regression, NoC captured the population variable. NoC is significant below the 3% level with a t-statistic of -2.006 and a p-value of .025. This means that there is only a 2.5% chance that the number of colleges is not significant in relation to the dependent variable.

It appears that college age population also has a significant effect on the regression equation. CAP is significant at just above the 5% level due to the p-value for a one-sided test being .053 with a t-statistic of 1.649. Therefore, there is 5.3% chance that CAP is not significant in relation to the premium that out-of-state students pay. The coefficient for college age population is 1180.227 which translates to $1180.23. This shows that for every one percent increase in the percentage of the population that is between the ages of 18 and 24, the premium paid by out-of-state college students will increase by $1180.23. Due to this finding, a state with a large college age population will have a higher out-of-state cost relative to its in-state cost. This result is consistent with the ongoing hypothesis. There are a few reasons as to why college age population has an increasing effect on the premium between out-of-state and in-state tuition.

One reason as to why CAP has a positive impact on the dependent variable is that there would be a lower percentage of adult working tax payers in the state. Since there are fewer tax payers, there is less money that can be given to higher education institutions. State governments then are more inclined to give the money to other public programs or do not have enough money
to give as they would like. Because of this, colleges have to pass the additional costs onto their students and they choose to do it by passing more costs on to out-of-state students.

Also, as the percentage of the college age population increases, higher education is likely to be in higher demand in the state. Due to the theory of supply and demand, institutions then know that they can charge a higher price. They are able to charge an even higher price to out-of-state students because they know that they have a large number of college-aged students in their state that may choose to go to the college. Then, the out-of-state students may not be as necessary to keep the institution running and colleges feel that they can get more out of them because they are safe with the number of college students they have in-state. Also, there could be fewer spaces to be given out to out-of-state students. This also affects supply and demand by having less spots to give out, so institutions are able to charge a higher premium because of the lack of supply.

Another variable that has a significant impact on the regression equation is the log of higher education per capita by each state. This variable has a coefficient of -1915.329, which means that a 1% increase in the higher education spending per person in the state will decrease the college tuition premium by $1915.33. The p-value for LNHiEd has value of .058 with a t-statistic of -1.651 which shows that the data is at least significant at the 10% level and it is almost significant at the 5% level. The negative relation that LNHiEd has on the regression is the same direction that was hypothesized. This makes sense because this shows a direct correlation between how much a state government spends on higher education and the tuition premium. As a state spends more on higher education, the public institutions in the state are able to spread out their funds to both in-state and out-of-state students. In turn, the institutions subsidize their tuition more between both types of students and it lowers the premium between the two.
The log of number of students enrolled public four-year universities in each state also has a significant impact on the regression. LNEnroll is significant at below the 5% level because the p-value is .022 and a t-statistic of 2.078. Therefore, there is only a 2.2% chance that LNEnroll is not significant in the regression equation. The coefficient for LNEnroll is 1759.587. For every 1% increase in the number of students enrolled at the flagship university, tuition premium will increase by $1759.59. LNEnroll is similar to the college age population variable in the state, and it was hypothesized that it would have a positive impact on college tuition premium. This is partially due to the aforementioned theory of supply and demand, and the idea that there are fewer tax payers in the state because people attending college do not pay nearly as much in taxes as the work age population. Also, due to the high number of students enrolled, universities may be able to capitalize on economies of scale. Therefore, they are able to spread out their costs by using less money per student.

The last variable that has a significant impact on the regression is the percentage of the population that is 400% or higher above the poverty line. This variable is the least significant of all variables that are included in the final regression. The poverty variable has a p-value value of .115 with a t-statistic of -1.214. Therefore, this means that the variable does not mean the normal standard of significance at the 10% level. However, this variable just missed being significant at the 10% level and because of the importance of needing a variable that helps capture income in a state it was left in the equation. The coefficient for the variable is -93.392, which means that for every 1% increase in the percent of the population that is 400% above the poverty level, the tuition premium will decrease by $93.39. The direction of this variable makes sense because as the size of the population with higher earnings increases, they are able to give more tax dollars to the state. The state can then give more money to higher education institutions. Then these
institutions pass the subsidies off to all of the students that attend the institution. Therefore, the premium between in-state and out-of-state tuition would decrease.

**Conclusion**

This regression is able to explain about 20% of variability in college tuition premium between out-of-state and in-state students at public four-year institutions. This is very important due to the large increase in college tuition that has happened over the past four decades. Even though this study does not address why tuition has increased substantially over time, it helps discover what increases the premium between in-state and out-of-state tuitions. This can help further research in the area and provides a beneficial starting point due to finding numerous variables that have an effect on the premium out-of-state students pay. One of the most important results from this study is seeing that political dominance of a state has such a large and significant effect on college tuition premium. Also, $LnHiEd$ has the largest effect on $premium$ at -$1915.33$. This is very important because college tuition premium can be decreased if states are mandated to spend more on higher education. Even though college tuition continues to grow, this could help a student know which state may charge them less if they want to attend a college or university out-of-state.

Also, the enrollment variable, and college age population have an impact on the amount of tuition premium that an out-of-state student must pay. These large effects are important because they again may help a prospective student decide which state they may want to choose in order to attend a university.

Even though this study finds a significant correlation between the variables studied and college premium, it only shows correlation. This study does not show causation because
econometrics and statistical studies are not able to do that. In order to help solidify these results, there needs to be duplication of the results and more studies on the subject.

There are many questions that have arisen due to this study. One of the most pressing questions is how these variables affect out-of-state or in-state tuition directly. When first attempting to do this study, I looked at in-state and out-of-state tuition directly and the variables showed little to no correlation to the dependent variables. However, with more data and more time to focus on the study, I feel that there would be many a strong correlation between some of these variables and tuition.

Also, I think it would be very interesting to look at the change in college tuition price throughout the past few decades and see how many variables have affected the change in tuition. This study would require time-series data from the past two decades for all of the variables used in the study. However, due to time and knowledge constraints, that was not able to be accomplished in this project. This type of study is something that I hope will happen in the future as college tuition continues to rise and we seek answers as to what is truly driving rapid increases.

There are also a few variables that could have been included into this regression in order to bolster the results. A variable that could be added would be the number of administrators per student at a school. In the past two decades, the number of administrators at institutions has increased greatly. Not only has the number of administrators increased, so has the amount they are paid also affecting the tuition premium difference. Also, it would be very interesting to look at the average number of administrators at public four-year universities with time-series data.
Finally, the level of student aid given to in-state and out-of-state students might be helpful if included. Even though the sticker price of college has increased greatly in the past 20 years, so has the amount of federal and institutional aid. These variables would have the greatest effect if they were looked at through time-series data. Therefore, it would be possible look at the change in both tuition and aid offered at every level.

Overall, this study was very successful. Even though the variables explained only 20% of the variation in college tuition premium, it still helps explain some of the difference in premium across states. Now knowing that these variables affect the college tuition premium, more studies can expand upon these variables and many more when looking at public four-year tuition and private four-year tuition. Also, due to these finding it can be seen that there is not just one culprit when it comes to the large increases in tuition. There are two political variables that have an effect with the percentage of people per state who voted for President Obama and the amount of budgetary dollars that each state spends on higher education. Also, the demographics and population are captured in the other four variables and they all play a large role as well. Therefore, it is not just politicians or universities that are choosing to increase tuition. It is a combination of both and both universities and politicians need to work together to help slow down the increases in tuition. I hope that many more students and scholars take these findings and expand upon them in many different ways.
Table 1: Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium</td>
<td>The difference between in state and out of state tuition</td>
<td>$2,257.14</td>
<td>$20,072.83</td>
<td>$13,522.83</td>
</tr>
<tr>
<td>Obama</td>
<td>The percentage of the population that voted for Obama</td>
<td>24.75%</td>
<td>70.55%</td>
<td>48.19%</td>
</tr>
<tr>
<td>CAP</td>
<td>Percent of population between the ages of 18 and 24</td>
<td>8.73%</td>
<td>12.27%</td>
<td>9.98%</td>
</tr>
<tr>
<td>NoC</td>
<td>Number of public 4-year universities in the state</td>
<td>3</td>
<td>221</td>
<td>54.92</td>
</tr>
<tr>
<td>LnHiEd</td>
<td>Percent of state budget that is given to higher education</td>
<td>4.48%</td>
<td>6.38%</td>
<td>5.43%</td>
</tr>
<tr>
<td>LnEnroll</td>
<td>Percentage of students enrolled at the flagship university</td>
<td>6.31%</td>
<td>13.33%</td>
<td>11.41%</td>
</tr>
<tr>
<td>Poverty</td>
<td>Percent of the population 400% or higher above the poverty line</td>
<td>22.00%</td>
<td>47.00%</td>
<td>33.16%</td>
</tr>
</tbody>
</table>
Table 2: Regression Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-statistic</th>
<th>One-Tailed Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obama</td>
<td>161.393</td>
<td>3.080</td>
<td>0.002***</td>
</tr>
<tr>
<td>NoC</td>
<td>-32.769</td>
<td>-2.006</td>
<td>0.051*</td>
</tr>
<tr>
<td>CAP</td>
<td>1180.227</td>
<td>1.649</td>
<td>0.106**</td>
</tr>
<tr>
<td>LnHiEd</td>
<td>-1915.329</td>
<td>-1.651</td>
<td>0.106**</td>
</tr>
<tr>
<td>LnEnroll</td>
<td>1759.587</td>
<td>2.078</td>
<td>0.044**</td>
</tr>
<tr>
<td>Poverty</td>
<td>-93.392</td>
<td>-1.214</td>
<td>0.231</td>
</tr>
</tbody>
</table>

*** Denotes significance at the 1% level
** Denotes significance at the 5% level
* Denotes significance at the 10% level

N= 50
F-statistic = 3.063
$R^2 = .299$
Adjusted $R^2 = .202$
Table 3: Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Median Income</th>
<th>Poverty Rate</th>
<th>Unemployment Rate</th>
<th>CAP Obama</th>
<th>Higher Education</th>
<th>Number of Colleges</th>
<th>College Enrollment</th>
<th>Romney With Bachelors Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correlation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Median Income</strong></td>
<td>1</td>
<td>-0.167</td>
<td>0.038</td>
<td>0.423**</td>
<td>0.014</td>
<td>0.035</td>
<td>0.068</td>
<td>-0.438**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0</td>
<td>0.245</td>
<td>0.796</td>
<td>0.002</td>
<td>0.925</td>
<td>0.811</td>
<td>0.639</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Poverty Rate</strong></td>
<td>-0.167</td>
<td>1</td>
<td>-0.03</td>
<td>0.417**</td>
<td>-0.046</td>
<td>0.019</td>
<td>0.08</td>
<td>-0.420**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0</td>
<td>0.238</td>
<td>0.824</td>
<td>0.003</td>
<td>0.753</td>
<td>0.898</td>
<td>0.583</td>
<td>0.002</td>
</tr>
<tr>
<td><strong>Unemployment Rate</strong></td>
<td>0.038</td>
<td>-0.283**</td>
<td>1</td>
<td>-0.232</td>
<td>0.006</td>
<td>-0.039</td>
<td>-0.217</td>
<td>0.22</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.796</td>
<td>0.824</td>
<td>0.046</td>
<td>0.105</td>
<td>0.967</td>
<td>0.79</td>
<td>0.129</td>
<td>0.124</td>
</tr>
<tr>
<td><strong>CAP Obama</strong></td>
<td>-0.046</td>
<td>0.006</td>
<td>0.182</td>
<td>1</td>
<td>0.816**</td>
<td>0.480**</td>
<td>-0.168</td>
<td>0.09</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.925</td>
<td>0.753</td>
<td>0.013</td>
<td>0.967</td>
<td>0.206</td>
<td>0.061</td>
<td>0.314</td>
<td>0</td>
</tr>
<tr>
<td><strong>Higher Education</strong></td>
<td>0.019</td>
<td>0.361**</td>
<td>-0.04</td>
<td>0.267</td>
<td>0.816**</td>
<td>1</td>
<td>0.544**</td>
<td>-0.242</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.811</td>
<td>0.898</td>
<td>0.01</td>
<td>0.79</td>
<td>0.061</td>
<td>0</td>
<td>0.091</td>
<td>0.242</td>
</tr>
<tr>
<td><strong>Number of Colleges</strong></td>
<td>0.08</td>
<td>0.278</td>
<td>-0.22</td>
<td>0.145</td>
<td>.480**</td>
<td>.544**</td>
<td>1</td>
<td>-0.123</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.639</td>
<td>0.583</td>
<td>0.051</td>
<td>0.129</td>
<td>0.314</td>
<td>0</td>
<td>0.394</td>
<td>0.494</td>
</tr>
<tr>
<td><strong>College Enrollment</strong></td>
<td>-0.438**</td>
<td>-0.420**</td>
<td>-0.320**</td>
<td>0.22</td>
<td>-0.997**</td>
<td>-0.242</td>
<td>-0.123</td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.001</td>
<td>0.002</td>
<td>0.023</td>
<td>0.124</td>
<td>0.244</td>
<td>0.091</td>
<td>0.394</td>
<td>0</td>
</tr>
<tr>
<td><strong>Romney With Bachelors Degree</strong></td>
<td>0.824**</td>
<td>0.772**</td>
<td>-0.017</td>
<td>-0.01</td>
<td>0.630**</td>
<td>0.09</td>
<td>0.169</td>
<td>0.099</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0</td>
<td>0</td>
<td>0.908</td>
<td>0.923</td>
<td>0.534</td>
<td>0.242</td>
<td>0.494</td>
<td>0</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).**

*Correlation is significant at the 0.05 level (2-tailed).
References


