

CGT 270 Fall 2018

Title: The Cost of College Related to Graduation Rates

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Abstract

Not every student who wishes to pursue a college degree has the financial means to do so, despite receiving financial aid. People who can receive the education they desire become people who can make the world a better place. The purpose of this research is to examine the costs of college as a barrier to educational attainment. Similar research compares degree completion rates between low and high income students or it assesses the effectiveness of financial aid. These studies use methods such as selecting a handful of schools to conduct a randomized experiment, or they use only Census data. My research highlights the average costs of universities and compares these numbers to household income, as well as to the amount of money distributed by the Pell Grant, per state. To explore this research topic, I acquired data to represent four pieces of information: household income, disbursement of financial aid, average costs of colleges, and graduation rate. Things I will be looked for include which states have the highest average tuition fees, the average household income, how much money is awarded by the Pell Grant, and the graduation rates for universities. I hypothesized that locations representing lower household income and lower distribution of the Pell Grant would show lower graduation rates for local universities. I found that a trend may exist between tuition price and household income, although it is weak. I conducted further research into things that could affect the trend. My findings will be illustrated as a data visualization.

KEYWORDS: college, tuition, graduation, Pell Grant, financial aid

Author Bio

I am a CGT student from Michigan pursuing a double major in Web Programming and Design and Data Visualization.

The Cost of College Related to Graduation Rates

1. Introduction

Not every student who wishes to pursue a college degree has the financial means to do so, despite receiving financial aid. People who can receive the education they desire become people who can make the world a better place. The purpose of this research is to examine the costs of college as a barrier to educational attainment.

Research question: If the ability to afford education affects the ability to attain it, will graduation rates be higher when tuition is lower? This data-driven research depicts whether or not any trend exists between these two factors, and to what degree. While investigating a possible trend, another question is this: How do these schools compare to each other? Is there a relationship between a state's average household income and average graduation rate?

Future college students will find this research useful in order to compare potential universities on a basis of graduation rate, tuition cost, and Pell Grant distribution.

2. Background

Similar research finds that finances directly affect a student's ability or desire to continue their education. In *College Student Retention: Formula for Student Success*, research shows that students are twice as likely to continue their studies between their second and third years if they receive financial assistance [4]. In a dissertation for a PhD in Community College Leadership at Old Dominion University, Carter Youmans indicates that in community colleges, the student's ability to pay tuition is related to their ability to graduate [9]. According to a study done by Douglas Webber, a professor in the economics department at Temple University, if state funding per student is cut, the result is an increase in the tuition that a student must pay [8]. This information led me to investigate possible trends.

I have never seen this data represented in a way similar to visualizations I created. I have seen visualizations for similar data but it was focused on a different research question. My goal was to show any existing trendline between tuition prices and graduation rate. This was my way to measure if the cost of college correlated with the length of time students are able to stay. There are other factors (such as students transferring schools) that could affect these numbers, but I wanted to see if the trend would be visible despite these factors.

3. Methodology/Approach

The data is publicly available, most often in the form of Excel spreadsheets. Some of the sources include an interactive means of exploring its data. Tables were separated by year and included more data than was used for this research. For example, the Pell Grant data includes both amount of money distributed per school and amount of people receiving funds per school. Only the amount of money was considered for visualization. Graduation rate data came from a large table of various measurements per college, but only the graduation rate was used from this table.

Visualizations were created in Tableau due to the volume of universities. There are 124 universities that are relevant to this research, so Tableau was ideal for minimizing human error under a time constraint.

4. Assumptions Challenges & Feedback

4.1. Assumptions

When researching my topic, I made some assumptions about the data I would need to collect and about how to best organize and represent it. I was looking for a trend between how many students complete their degree and how many students can afford their degree. There needed to be a general and dependable way to measure these specific variables. To measure a student's ability to pay for college, I looked at this information on a state-by-state basis: household income, in-state tuition price, and Pell Grant distribution. I chose in-state tuition price to filter out the possibility of out-of-state and international students. This was to make sure my state-based variables were more related, and tuition for out-of-state students can be much higher by default.

I also assumed that degree completion would be best measured by graduation rates. When I conducted this research and realized that the graduation rate was relatively low on average for every state, I realized that there were other variables such as transferring students or illness that could affect the results.

4.2. Challenges

During the process of filtering and the process of manually creating a sheet of data, I noticed some errors and outliers. Some community colleges had been categorized as 4-year universities. This was a mistake that I noticed only by looking at each university one at a time. There would be a mismatch in the data sources with one indicating that the school was a community college and the other indicating that it was a 4-year school. Further research was necessary in order to determine which categorization was correct.

Outliers included schools with a tuition price less than \$1,000. These were schools such as Haskell Indian Nations University, which is federally operated.

Another challenge was deciding which visualizations would best communicate the message of this research. Four were selected for the research poster, with two being side by side maps.

4.3. Feedback from Undergraduate Research Symposium

I received a lot of helpful feedback from the poster symposium. There were basic suggestions about my poster format and how my visualization were labelled, and there were suggestions about how to analyze the data. Viewers suggested their own readings of the data, factors that might influence it.

These are some examples of their questions:

1. Who is paying the tuition? Is it the student or parents? Could this affect the results?
2. How many people per state attend college? That might affect graduation rate.

3. How would other types of schools compare, such as private and community?

One person suggested doing a two-factor statistical test to explore multiple variables. A few people wanted to know which circle represented which university. This was a feature unique to the interactive graph, not visible on the poster.

5. Visualization & Analysis

Tuition Cost and Graduation Rate 2016

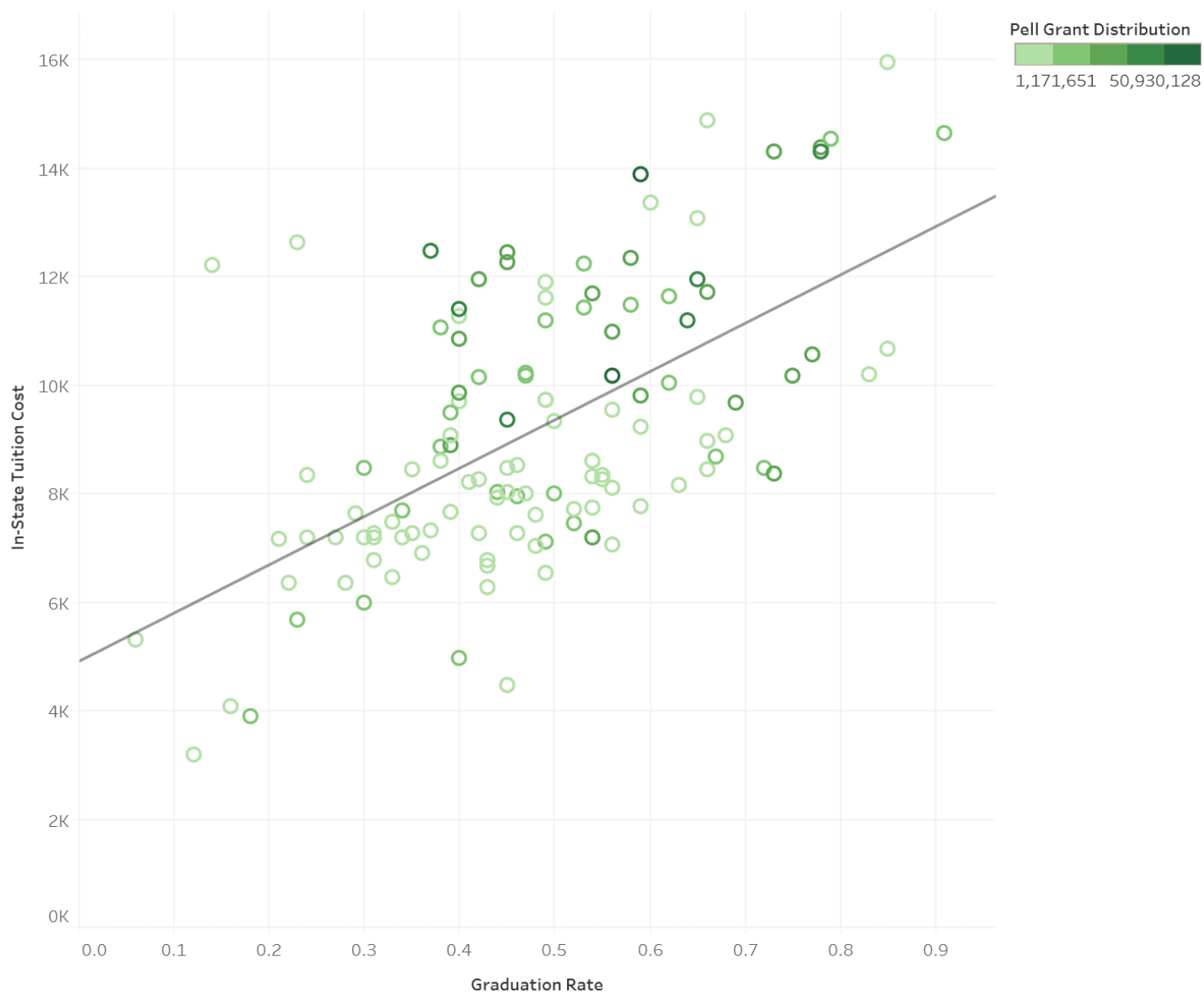
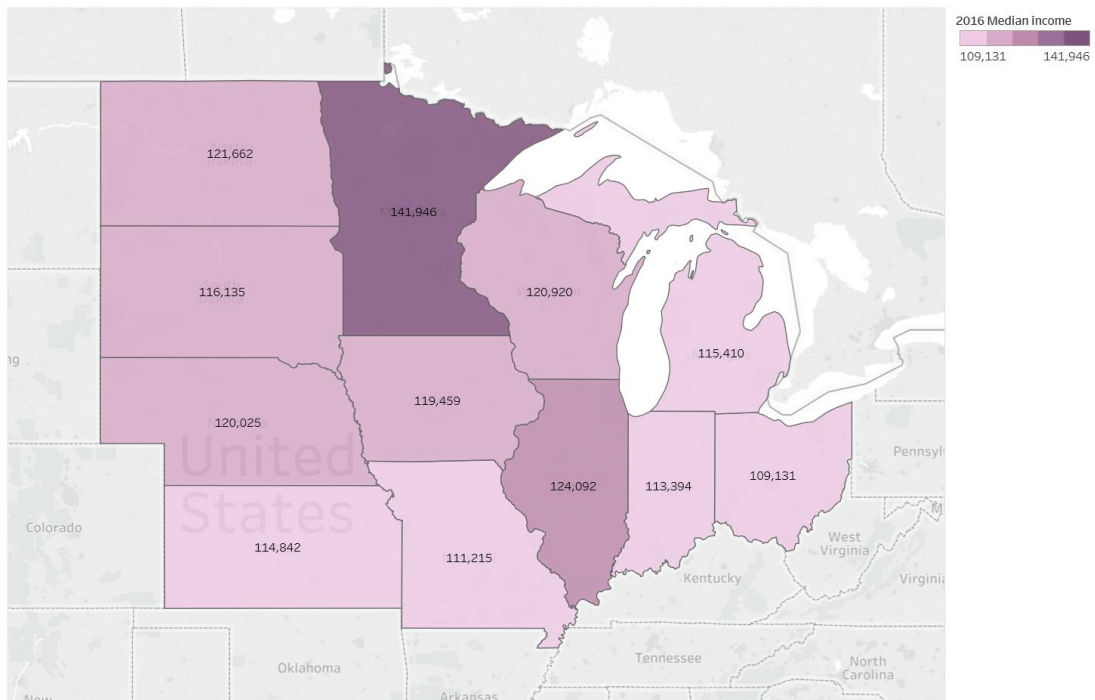


Figure 1: In-state tuition cost adjusted for inflation [5], and graduation rate [2] trend line with circles representing schools and circle color representing Pell Grant distribution [7] to the school. P-value: < 0.0001. R² value: 0.345794.

Household Income 2016



Average Tuition Cost 2016

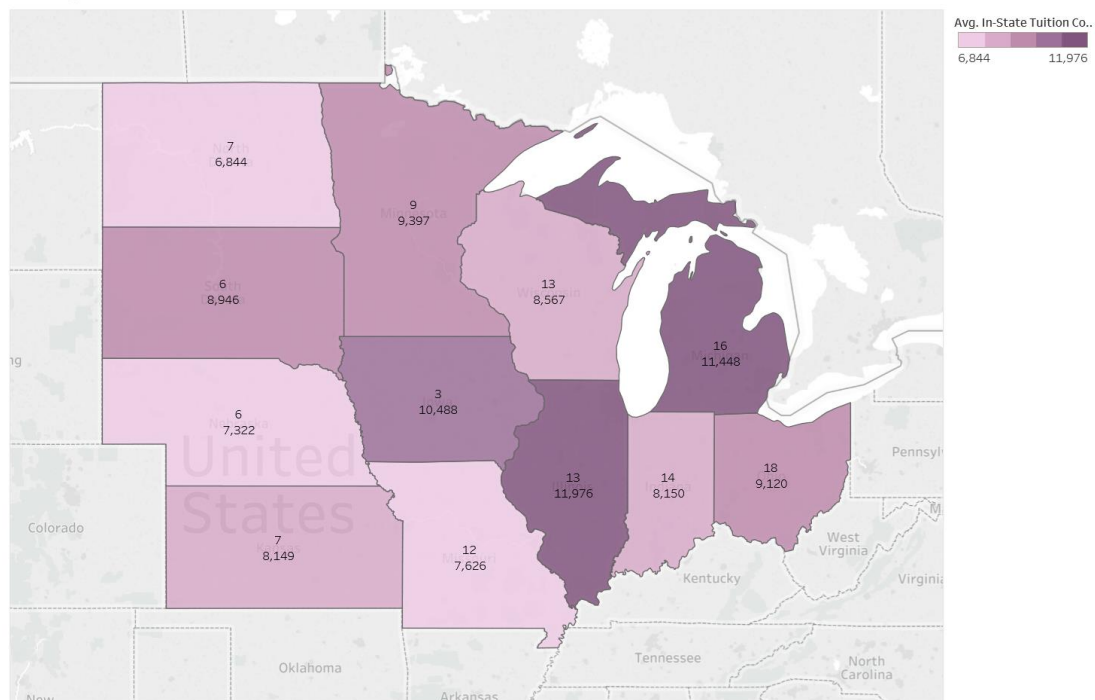


Figure 2: Two maps of the Midwest. The top shows average household income per state [6]. The bottom shows average in-state tuition cost per state [5]. The tuition is indicated by the large numbers. The small numbers indicate how many schools were counted in the research, per state.

Outgoing Transfer Rate Compared to In-state Tuition and Graduation Rate

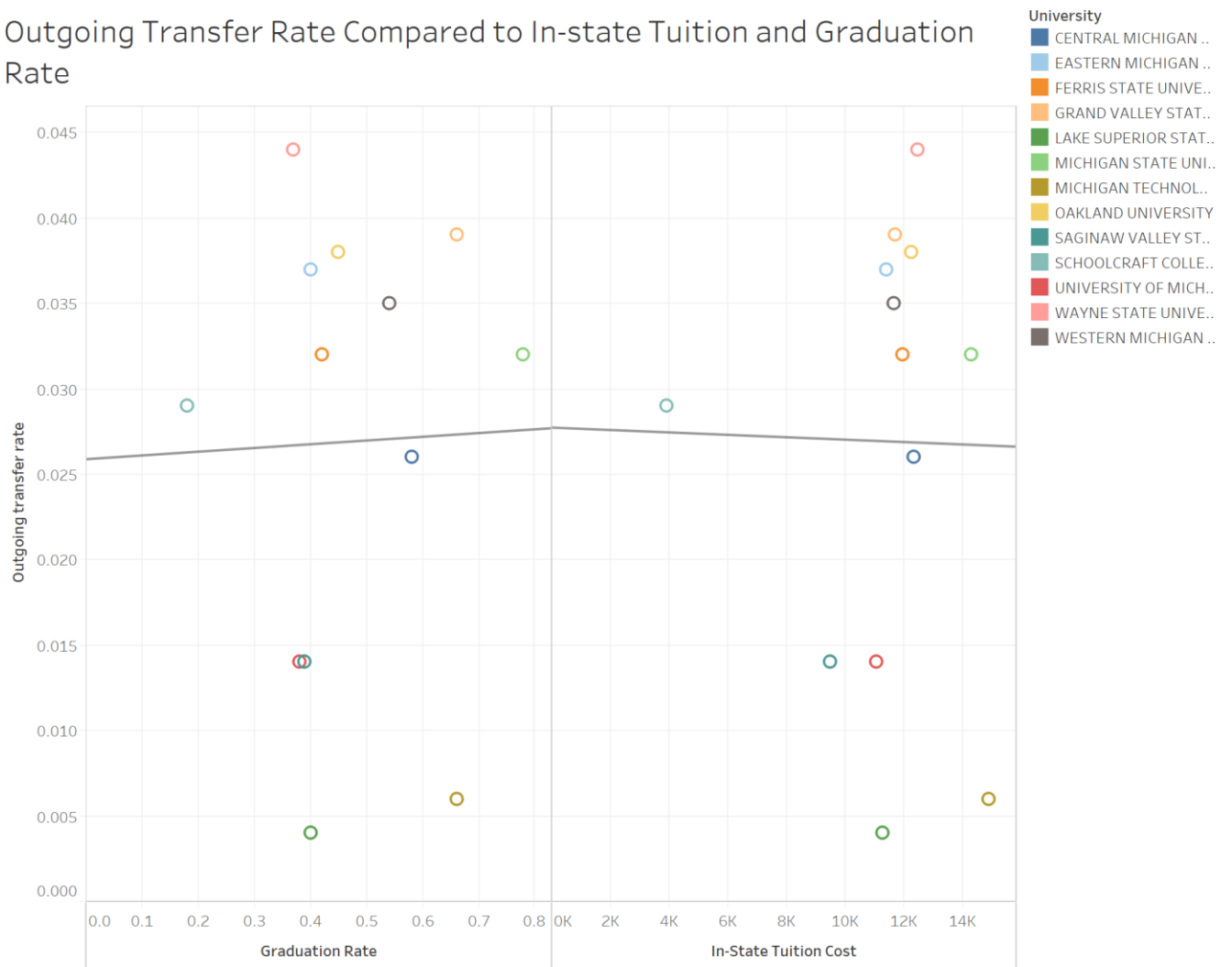


Figure 3: A Scatterplot comparing outgoing transfer rate (meaning students who leave their school to attend another one) to both graduation rate and in-state tuition cost. This data contains 13 public 4-year universities receiving the Pell Grant in Michigan.

6. Discussion

Figure 1 shows a scatterplot with each circle representing a university. It was created with Tableau. The circles are color-coded to show Pell Grant distribution to each school, with darker circles representing schools that are awarded more financial aid. The y-axis is tuition cost and the x-axis is graduation rate. This scatterplot indicates that the trend between the variables I selected (tuition price and graduation rate) exists to some extent. The R^2 Value is 0.3, meaning that the trend is on the weaker side. An interactive version of this graph allows the user to find and filter specific universities. At the poster convention, views seemed to like this visualization the best, so I referred to this one the most. I noticed that there wasn't a strong trend between Pell Grant distribution and graduation rate either. The dark circles for higher Pell Grant distribution start at the 40 percent mark, but there are also many light green circles for the higher graduation rates. There are two light green circles at the far left of the graph. These are Chicago State University at a 14 percent graduation rate, and Northeastern Illinois University at 23%. Their tuitions are about \$12,400, which is on the higher end. An article published by the Illinois Business Daily speculates that a possible reason for Chicago State University's abnormally low graduation rate is the fact that the school is not strict about which students are accepted. They have allowed students with GPAs under 3.0 to attend [1].

Figure 2 consists of two images, but I included them side by side as one figure. The reason for this is to allow comparison between the two. They are both maps of the Midwest, which is the location of every school in this study. The top shows average household income per state, and the bottom shows average tuition cost per state. The bottom also shows how many schools were counted per state. I decided to compare these two maps, because I wanted to see if the colors would match in any way. If the colors matched, it would mean that lower income states have lower tuition costs and higher income states have higher tuition costs. This was not always the case though. When I presented this figure at the poster convention, viewers added some interesting factors to consider, such as how many people per state are attending college. This figure is also skewed due to the fact that some states have more schools or significantly less schools than the others.

Figure 3 shows the progress of my ongoing study, which examines a slightly different research question: will I gain interesting insight by adding new data representing out-going transfer rates per school? This figure represents that there is no apparent trendline between this new data, out-going transfer rate, and the data I had previously recorded. I thought it was interesting that in the in-state tuition graph, there is a loose cluster of points in the top right corner compared to the graph next to it which seems totally random. This observation does not indicate any sort of conclusion though, as both graphs show no trend. This data focuses on the Michigan schools in the study. It focuses on Michigan schools because I was able to find concrete reliable data for this state, but not yet for the other states. I would be interested to see how these visualizations would change with the inclusion of data from the rest of the Midwest.

7. Conclusion

My original research question was if the ability to afford education affects the ability to attain it, will graduation rates be higher when tuition is lower? For further research, I investigated a similar question: will I gain interesting insight by adding new data representing out-going transfer rates per school? By researching the answer to my first question, I discovered that while a trend may exist, it is a weaker one. I was surprised to find that there was not an obvious trend related to Pell Grant distribution. While doing this research, I learned a number of interesting things that were not directly related to my research question. I learned that Michigan and Ohio are the two states with the largest number of 4-year public universities receiving the Pell Grant. Also I saw that Iowa only had three qualifying universities. What surprised me was that the average graduation rate per state across the whole Midwest was relatively low, between 40 and 60 percent. I also saw that some of the lowest income states have some of the highest tuition prices. Overall, the insight I gained was that there are many factors that could affect the trendline I studied. The plan for my research was to see if I could represent the logic expressed by the background studies I researched, but it ended up not being that simple. If there is a way to show that thought process in the form of data, my next steps would be to figure out the best possible way. My future work is to find the most effective way to collect and examine these factors. I started this by bringing in some data for out-going transfer rates, but my goal is to find more factors and represent them in a way that makes sense.

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References

- [1] Bielanski, J. (2016). Chicago State University's 11% graduation rate 'not surprising'. Retrieved December 10, 2018, from <https://ilbusinessdaily.com/stories/510724625-chicago-state-university-s-11-graduation-rate-not-surprising>
- [2] College Scorecard Data. (2018). *Most recent data* [Data file]. Retrieved from
- [3] MI School Data. (2017). [Double bar graph showing outgoing transfer rates for Michigan colleges for the 2016-2017 school year]. *College Transfers Snapshot*. Retrieved from <https://www.mischooldata.org/CareerAndCollegeReadiness2/TheTransfer2.aspx>
- [4] Nora, A., Barlow, E., & Crisp, G. (2005). Student persistence and degree attainment beyond the first year in college. *College student retention: Formula for success*, 129-153.
- [5] The Chronicle of Higher Education. (2018). [Interactive table with bar graphs of tuition prices for various colleges, 1998 to 2017]. *Tuition and Fees, 1998-99 Through 2017-18*. Retrieved from <https://www.chronicle.com/interactives/tuition-and-fees>
- [6] U.S. Census Bureau. (2018). *Table H-8. Median Household Income by State: 1984 to 2017* [Data file]. Retrieved from <https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-households.html>

- [7] U.S. Department of Education. (2018). *Distribution of Federal Pell Grant Recipients By Type and Control of Institution Award Year 2016-2017* [Data file]. Retrieved from <https://www2.ed.gov/finaid/prof/resources/data/pell-institution.html>
- [8] Webber, D. A. (2017). State divestment and tuition at public institutions. *Economics of Education Review*, 60, 1-4.
- [9] Youmans, Carter B.. "The Effect of Tuition on Graduation Rate at Community Colleges" (2017). Doctor of Philosophy (PhD), dissertation, Educ Foundations & Leadership, Old Dominion University, DOI: 10.25777/n58s-9r42