Relation of Financial Aid and Retention Rate in Public Colleges

A Graphical Representation

Nicholas Quandt
Mathematics Major, Marquette University
Milwaukee, Wisconsin
nicholas.quandt@marquette.edu

ABSTRACT

This paper is intended to illustrate the correlation between the dollar amount of financial aid supplied by a public post-secondary institution and the retention rate of freshman students to their second year.

CCS CONCEPTS

• **Applied computing** → *Economics*;

KEYWORDS

Financial Aid, Public College, Python, Data Science

1 INTRODUCTION

With the upbringing of post-secondary eduction, students have found themselves with the stressful decision of where to apply, and which school could be best for them. Often, the deciding factors come down to which school has a program that interest them, but also the amount of financial aid they will receive. How could someone decide on college, when they know they can not afford it? Further, if a student finds themselves struggling to justify the cost of school compared to their aid, they may not stay past a year. This paper hypothesizes students are less likely to remain at a public institution past their first year, with less financial aid relative to the cost of attendance, and shall argue such through graphical representation of data[2] accumulated from a plethora of schools across the United States.

2 THE DATA SET

The data set being used for this argument was found through *Data.World*, and is a collection of financial, population and retention values of various colleges in the United States. In order to better understand the effect of each schools supplied aid, I evaluated *aid_to_exp* as *aid_value/exp_award_value*, which was not previously included in the data. Also for a later graphical representation the given latitude and longitude of each school within the data set was converted to a FIPS code. Further all schools with incomplete data rows were removed, as in any with a blank for the cost of attending or aid value. Outlier data was removed as well using the interquartile range method, thus eliminating data that seemed too extreme, or may have been miss calculated. All data cleaning techniques, methods, and codes can be found on my personal github repository[3].

College	State	Type	Student Count	Financial Aid Given	Cost of Attending til Gradution	Aid/Cost
Faith Evangelical College & Seminary	Washington	Private not-for-profit	135	5447	20536	0.2652415270744059
Salve Regina University	Rhode Island	Private not-for-profit	2026	16775	71513	0.2345727350271978
Olivet Nazarene University	Illinois	Private not-for-profit	3335	16403	46132	0.3555666348738402
Kaplan University at Hagerstown	Maryland	Private for-profit	845	5012	38380	0.1305888483585200
International Academy of Design and Technology at Tampa	Florida	Private for-profit	474	5099	70533	0.0722924021380063
Louisiana State University at Eunice	Louisiana	Public	2673	3984	46360	0.0859361518550474
Central Maine Community College	Maine	Public	3109	4430	30347	0.1459781856526180
Husson University	Maine	Private not-for-profit	2350	15472	50604	0.3057465812979211
Strayer University-Kentucky	Kentucky	Private for-profit	424	4988	79599	0.0626641038203997

Figure 1: Sample Data from our Set[1]

3 CLAIM

From a common sense standpoint, it would be appropriate to claim students who receive more money would be more likely to stay in school. Though professional insight would benefit the argument. Student researcher Emily Carpenter of the University of Nebraska-Lincoln, states that "descriptive evidence suggests that it is the financially constrained who are most likely to exit college without a degree"[1]. Following directly with our pursuit to show the relation of aid to cost, Carpenters work parallels and thus supports. Further more Vincent Tinto Ph.D. of Syracuse University, "students who are more financially restrained are more likely to drop out"[4]. Tinto pushes more into the actual financial burdens of students with his work, but nonetheless argues to say less aid leads to lower retention.

4 ANALYSIS

To properly assess relationship, the dataset was cleaned to only include public schools and four year institutions. Thus going forward any graphs are comprised of four year public universities.

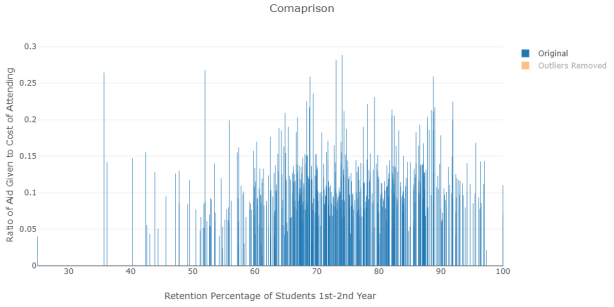

Figure 2: Comparison of Aid Ratio to Retention Rate

Figure 2 does not show much correlation between retention and

aid. Seemingly retention isn't related aid at all given this depiction. Through a basic IQR outlier analysis, the spikes were removed

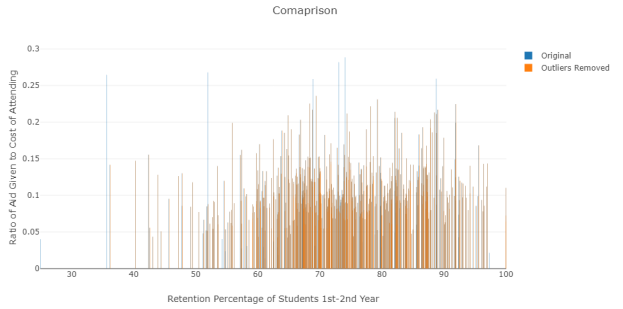

Figure 3: Comparison of Aid Ratio to Retention Rate Outliers Removed

from the dataset in order to have a smoother view of any possible relationship, noted with Figure 3. There is no apparent patterns or relationships visible in the Bar Graphs presently. But looking at a scatter plot of the same data, Figure 4, we see a dense area near seventy-five percent retention. Following on the idea of a dense re-

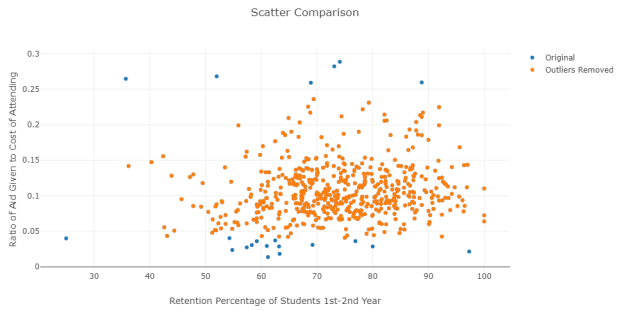

Figure 4: Scatterplot of the Previous Bar Data

gion, it would be appropriate to create a density plot, Figure 5. Thus confirming the previous assumption that the seventy-five percent retention mark was dense, we now see visually that there is a fairly normal distribution or bell curve distribution of the the schools retention rates around that percentage. Also showing that the ".1" ratio is a more common position for financial aid. This means that awarding students with ten percent of the total cost of attending in financial aid is the most used stance of public schools.

Prior, with the bar graphs, we saw no correlation, now we see a definite pattern with the 2 dimensional density plot. This begins to accent our argument of the effects of aid on retention. I wondered if there was a geographical relationship as to where schools gave larger amounts of aid, or retention was higher. Figures 6 and 7 show map plots of these values. Unfortunately there doesn't seem to be a state driven relationship. We can quickly see though that California

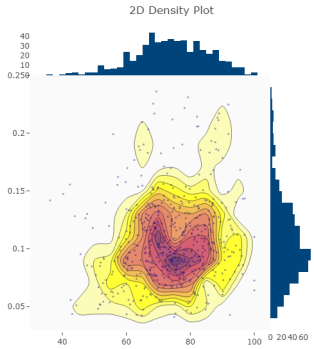

Figure 5: Density Plot of the Previous Scatter Data

has a higher average ratio of aid to cost. So lets run a scatter plot of California only.

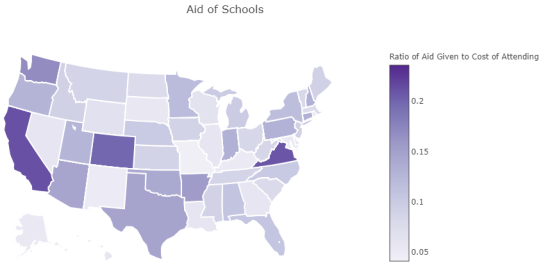

Figure 6: Map Plot of Aid/Cost Ratio

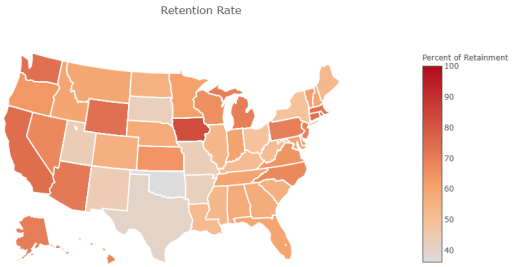

Figure 7: Map Plot of Retention Rates

. Immediately from Figure 8 we can note that all values are above seventy percent retention rates, thus California in itself has a high retention rate. Further note the majority of the plot is above ".15" ratio, agreeing with the map of Figure 7.

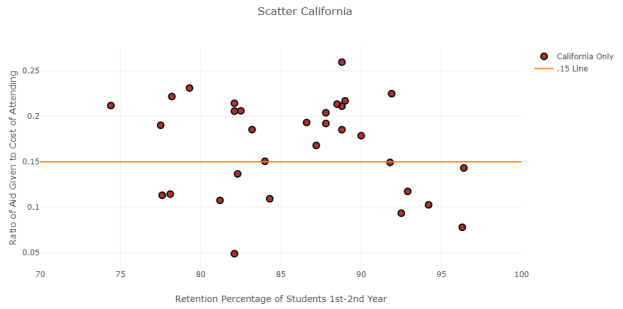

Figure 8: Scatter Plot of California Schools Only

5 LITERATURE

My primary source for reference is Emily Carpenter, mentioned earlier for her work at the University of Nebraska. She stated it is "apparent that students who must worry about having enough money to complete a college degree are often subject to deterred or hindered academic progress"[1]. Although the majority of her article contributed first year to second year retention to psychological principles of student academia and minority status, I find that she runs not far off from what I too am stating. It is her argument that there is a "correlation between at risk students and their ability to be retained based on their financial aid package at a large, Midwestern university"[1] that parallels the work shown here. Her work is highly statistical in nature, and her conclusion decided that "vast majority (77%) of students who receive the maximum aid amount are retained to their sophomore year compared to their peers"[1]. This supports the claim that students are more likely to retain enrollment given more financial aid.

6 CONCLUSION

College these days is an expensive endeavor, with financial aid playing a role in the enrollment and retainment of students within universities. This paper aimed to state that there was a direct correlation between the amount of aid given to a student and their retention from freshman to sophomore year. Unfortunately it would seem that the hypothesis was incorrect, given the graphical representations provided. In order for this to be the case, a increasing tendency would have to be present in the scatter plot, but instead it is a blob like graph. The density plot, Figure 5, does however provide insight into the the common choice of aid to cost ratio throughout public four year institutions. Most seem to give students ten percent of the total cost of attending, and this choice, relatedly seems to give a seventy-five percent retainment rate. Despite seeming sensibly true, we can not say from our graphs that retention rate is dependent or related to financial aid, there are other factors included when determining retention rates.

REFERENCES

[1] Carpenter, E. First to second year retention based on financial aid package: A quantitative study. *Educational Administration: Theses, Dissertations, and Student Research.*, 144 (September 2013).

[2] Ortiz, J. *College Completion Datasets*, June 2017. https://data.world/databeats/college-completion.

[3] Quandt, N. Github repository project 1. https://github.com/nquandt98/project1cosc3570nquandt.

[4] Tinto, V. Leaving college: Rethinking the causes and cures of student attrition. *The University of Chicago Press* (1993).

[1] https://data.world/databeats/college-completion/file/cc_institution_details.csv