

Price Discrimination in College Tuition: An Empirical Case Study

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Abstract

This paper looks empirically at the financial aid award practices at a small, Midwestern, private university. By awarding more financial aid, colleges and universities effectively price discriminate; that is, they charge some students more than others. The results indicate that students with better high school records and test scores and with more financial need are given more aid. Nonwhite students also receive considerably higher aid. While these results can not be generalized, this analysis should be easy to replicate at other colleges.

Introduction

Like any two passengers on an airliner who pay different prices for the flight, the tuition paid by any two students sitting in a college classroom is likely to be quite different. One may be a gifted student from a relatively poor family receiving a full or nearly full scholarship while the other may be an average student from a wealthy family who receives very little financial aid. Although the published tuition is the same for both students, the net tuition, i.e., the tuition after factoring in financial aid, is very different.

Colleges and universities appear to use their financial aid awards as a part of a price discrimination strategy. By awarding larger scholarships and grants to some students, the schools effectively lower net tuition costs to certain students. As a result, different students pay different amounts for essentially the same college education. The purpose of this paper is to investigate how aid is awarded among students at one university. Although colleges and universities will differ in how they award aid, the following can serve as an example to students about how price discrimination in higher education takes place. This analysis should be easy to replicate at other colleges, and could be used as a tool to teach about price discrimination and applied econometrics.

Price Discrimination

A working definition of price discrimination is a situation where a firm charges different prices (relative to marginal costs) to different customers for the same product. In order to effectively price discriminate, firms must have some market power to raise (or lower) the price to some customers. In addition, it must not be possible for consumers to resell the product to others.

The higher education market, while highly competitive, is not perfectly so. Institutions of higher education compete by selling highly differentiated products in terms of quality, major offerings, location, sports teams, etc. As a result, the institutions are price searchers and have the ability to increase tuition without losing all customers. Furthermore, the university can identify and charge each student a different tuition by awarding different levels of financial aid. Students are not permitted to resell their enrollment spots so the university need not worry about the low-price students reselling spots to high-price students on a secondary market. In the market for higher education, price discrimination manifests itself by discounting tuition through scholarships, grants and loan opportunities, described as financial aid.

The standard theory of price discrimination suggests that the price will be lower for the group of consumers with the highest price elasticity. In the case of colleges, it is generally thought that better

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students are more price elastic because they have more college options and thus are in a better position to shop on the basis of price. Poorer students also are assumed to be more price elastic inasmuch as college tuition represents a relatively large share of the family budget; small tuition reductions represent large savings in terms of the family budget. Thus, we should expect better and poorer students to get the lowest net tuition prices, i.e., the best financial aid offers. By charging these highly price elastic students less, colleges and universities are able to attract them to enroll; meanwhile less price elastic students, i.e., those with lesser academic credentials or from richer families, are charged more. Because this latter group is less price sensitive the school does not risk losing many of these students. The overall result for the university should be greater overall enrollment and enhanced revenue.

A Brief Review of the Literature

There is a body of literature that examines the pricing practices of colleges and universities. Much of this literature is descriptive, often lacking analytical rigor. Some is rigorous but purely theoretical. Also, most existing work discusses the phenomenon at the industry level. There is very little work that examines the practice of price discrimination empirically at the firm level.

McPherson, Schapiro, and Winston (1996, pp. 76) write, “the price is...systematically adjusted for individual students according to their individual characteristics.” Though there is some debate about exactly which attributes schools evaluate concerning applicants, it is generally known that schools price discriminate in favor of (1) merit as measured by standardized test scores and/or high school performance measures and (2) financial need as determined by Free Application for Federal Student Aid (FAFSA) form that all students are required to fill out.

Frank (2001) asserts that students who perform better on standardized tests will receive more aid than students who do worse. However, since poor students tend to be weaker students, and since poor students also qualify for more aid, it is not clear that more total aid does to go smarter students on net. At top universities Frank notes that the average scores on standardized tests affect widely publicized college rankings, thus it has become more important to reward stronger students rather than fiscally poor students in order to maintain rankings. This stance is supported by Rolfe (2003) who found that colleges are actively working to either maintain or improve reputations. If this is indeed the main goal of schools, one would expect that strong students to receive the highest aid packages.

Though merit and need based aid tend to be the largest cited reasons for price discrimination, Kane (1999) points out that private institutions can give aid for any reason ranging from religious affiliation to athletic talent. During the 1997-98 schools year, he found that 42 percent of private school attendees received some type of aid that is non-need based, while only 11 percent of their public school counterparts received this type of aid.

Tiffany and Ankrom’s (1998) theoretical work and empirical analysis based on data from private universities during 1991-1995 reveals an increase in the practice of tuition discounting and rising sticker prices over time. They show the result was an increase in revenues and enrollment as predicted by the standard model.

Doti (2004) examines the differences in the abilities of schools to price discriminate. He argues and finds that schools with lower selectivity need to price discriminate by offering larger discounts (i.e., financial aid) than do higher selectivity schools.

Vedder (2004, pp. 67-72) provides one of the clearer discussions of how colleges and universities price discriminate. He suggests that because colleges are aware of students’ financial situations, they can estimate the elasticity of demand for each individual based on their family incomes. Vedder also discusses racial, athletic and other criteria as part of the admissions and aid process as well. He writes,

Colleges and universities practice price discrimination as well, but they generally disguise it. Instead of overtly having many different tuition rates for different classes of people, universities typically charge a single rate and then individually offer customers discounts from it, ranging from zero to the full amount. Scholarships (and fellowships at the graduate level) are the major device used to implement this price discrimination. (pp. 72)

Not all writers have been comfortable with the price discrimination argument. Mumper (2001) argues that tuition prices are set by a purely political process, and argues against assigning any economic rationality to the process.

Rothschild and White (1995) do not see different tuition rates necessarily as evidence of price discrimination. They note that higher education is an investment in human capital that will pay different rates of return to different students. And since different students will acquire different levels of human capital gains they will pay different tuition amounts. Since it is thought that better qualified and poorer students receive more aid, their argument suggests that these students are getting lower rates of return to their human capital investment than less qualified and richer students.

Even though there is a consensus about merit and need being important determinants of financial aid awards, there is little evidence about *how* important these factors are. That is, there has been no work attempting to quantify the financial aid decision-making black box. How much more aid money will a 33 ACT student get over a 23 ACT student? How much more will a very poor student get compared to a middle income student? The next sections attempt to shed some light on these questions.

The Data

The data reflect a single entering class of traditional-aged students at the same university in fall of 1999. The university is located in the Midwest of the United States and has a regional reputation. The university is private and is affiliated with a major religious denomination. It has a mixture of professional and liberal arts programs. Though the university also has non-traditional programs, the data for those programs are not included in the data set. Tuition and general fees for the year of these data was approximately \$16,000. Including room and board, the total was over \$23,000.

All of the information used in this study was available to the university at the time of admissions and financial aid decision-making either from the admissions application or from the students' Federal Application for Federal Student Aid forms (FAFSA). Using the FAFSA information, the university is able to compute the "estimated family contribution" toward college. Need is determined by subtracting the estimated family contribution from the expected costs of education. In addition to the financial need information, the university collects information on academic performance in high school and test scores in addition to demographic information.

The following variables are used in the analysis: total aid awarded, need, high school grade point average, high school percentile, ACT composite score, ACT math score, ACT English score, gender, ethnicity, religious affiliation and out-of-state. See Table 1 for an overview of the variables and descriptive statistics. Total aid awarded is the financial aid package that the university granted the student, including university and outside scholarships and grants. 533 total observations were included in the original data set, but only 440-441 observations had complete information.

There were two attributes of potential interest that were not available. Although the university is a NCAA Division III school and cannot give athletic scholarships, many grants, such as leadership grants, are often awarded to athletes, and there is widespread speculation that Division III schools favor athletes in the financial aid process. Also legacies, the children or grandchildren of alumni, could not be identified in the data. It is publicly known that legacies are eligible for some scholarships that non-legacies are not. It is sometimes argued that legacies may receive more aid because the university has incentive to please alumni donors. On the other hand, legacies may be more attached (that is, have a more inelastic demand) to the university and hence should receive less aid according to standard price discrimination theory. In any case, the data are limited in not being able to identify either athletes or legacies.

Despite not being able to directly account for student athletes and legacies, the data may allow for some very imperfect proxy estimations. For example, a large percentage, if not all, out-of-state students attending this university are in fact athletes. Also, there are many more male athletes than female athletes. To a certain extent the gender (male) and out-of-state dummy variables may proxy for student athletes. Similarly, the religious affiliation dummy variable may be a crude proxy for legacies as most legacies are members of the university-affiliated church.

Table 1. Variable Definitions and Descriptive Statistics

<i>Part 1. Variable Definitions</i>	
Independent Variables	Definition
Need	The amount of financial need in dollars as determined by the FASFA
High School Percentile	High school class rank in the form 1-(class rank/ number in class)
High School GPA	Raw high school GPA
ACT	Raw ACT composite score as reported by the testing service
ACT-Math	Raw ACT Math section score as reported by the testing service
ACT-English	Raw ACT English section score as reported by the testing service
Female	A dummy variable that equals 1 for females and 0 for males
Non-white	A dummy variable that equals 1 for non-whites and 0 for whites
Religion	A dummy variable that equals 1 for members of the same denomination as the university and 0 for others
Out-of-state	A dummy variable that equals 1 for students who are non-state residents and 0 for students who are state residents
<i>Part 2. Descriptive Statistics</i>	
Dependant Variable	Definition
Financial Aid Awarded	The total financial package awarded by the university including outside loans and scholarships

Variable	N	Mean	Standard Deviation	Min.	Max.	Correlation Coefficient with Financial Aid Awarded
Financial Aid Awarded	441	15,776	6,058	541	24,334	-
Need	441	14,570	7,702	0	24,334	0.452*
HS Percentile	441	72.70	18.97	5.33	99.76	0.172*
HS GPA	441	3.27	0.47	2.09	4.49	0.159*
ACT	441	22.74	3.42	15.00	33.00	0.075
ACT-Math	441	21.83	3.99	14.00	33.00	-0.011
ACT-English	441	22.14	4.39	11.00	34.00	0.075
Female	441	0.57	0.50	0	1	0.027
Non-White	441	0.10	0.30	0	1	0.153*
Religion	441	0.19	0.39	0	1	-0.049
Out-of-State	440	0.04	0.19	0	1	0.085*

* statistically significant at 90% level of confidence

The Empirical Results

The general theory is that financial aid is granted based on two major attributes: merit and need. However, theory alone does not provide much guidance with respect to functional forms or specifications.² Table 3 reports the results of eight regressions. Four regressions include only merit and need variables, while four regressions include the need and merit variables and add the demographic variables (non-white, female, religion, and out-of-state).

²Alternative functional forms using quadratic and logged versions of the various independent variables were also attempted. In no case was a squared independent variable found to be statistically significant. Including logged versions of the independent variables resulted in similar results as the linear versions, but with worse overall regression fits. As a result, the regressions presented here are only the linear functional forms.

Table 3: The Determinants of Financial Aid Award

Dependant Variable: Financial Aid Awarded								
Independent Variables	1	2	3	4	5	6	7	8
Need	366.50 (10.95)	354.29 (10.51)	364.54 (11.17)	352.31 (10.70)	363.70 (10.80)	352.28 (10.38)	360.93 (11.01)	350.08 (10.59)
HS Percentile	37.45 (2.56)	37.93 (2.54)			41.67 (2.84)	43.92 (2.92)		
HS GPA			204.36 (3.27)	211.30 (3.25)			235.29 (3.74)	253.47 (3.86)
Composite ACT	185.57 (2.25)	219.47 (2.64)	110.32 (1.27)	140.63 (1.60)				
Math ACT					-82.70 (1.05)	-68.24 (0.84)	-116.00 (1.45)	-111.98 (1.35)
English ACT					190.25 (2.68)	207.42 (2.85)	133.70 (1.87)	154.12 (2.13)
Female		-100.73 (0.19)		-43.17 (0.08)		-197.92 (0.36)		-377.30 (0.07)
Non-White		2332.18 (2.70)		2247.43 (2.64)		2242.14 (2.60)		2147.09 (2.52)
Religion		-217.94 (0.30)		-225.02 (0.31)		-240.00 (0.33)		-198.18 (0.27)
Out-of-state		1161.77 (0.87)		1005.36 (0.77)		913.61 (0.69)		738.61 (0.57)
Intercept	3494.74	2540.72	1217.40	244.39	5040.67	4211.73	2343.36	1337.68
Adjusted R ²	23.00	24.45	23.48	24.55	24.22	25.92	23.72	24.74
Sample Size	441	440	441	440	441	440	441	440

(t-statistics in parentheses)

Throughout all specifications, the family need variable is an important and robust determinant of aid awards. The results show that, all else constant, for every \$1,000 of need, the university grants approximately \$360 of financial aid. At the extreme, a student from a very poor family unable to contribute anything toward college would receive approximately \$8,500 in financial aid, *ceteris paribus*.

High school percentile is robust as well. For every one-percentage point increase in high school percentile, a student will be granted about \$40. Thus a high school valedictorian would receive about \$2,000 more than a student ranked in the 50th percentile of her high school class. Alternatively, the coefficients for raw GPA range from \$204 to \$253 for every one-tenth of a point increase in GPA. Using the midpoint of these estimates, a student with a 4.0 high school GPA would receive an additional \$2,285

in assistance compared to a 3.0 student. Because of the collinearity between high school percentile and high school GPA, no regressions use both variables at the same time.

It is not easy to separate the effects of ACT scores and high school performance on financial aid because they are so highly correlated. When composite ACT is included with high school percentile, its coefficient indicates that for every point increase in composite ACT, the financial aid package will increase about \$200. However, when composite ACT score is included with high school GPA, its coefficient falls (and becomes statistically insignificant). Nevertheless, it appears that ACT scores exhibit a small independent influence on financial aid awards even after controlling for different measures of high school performance. Using \$150 as a reasonable estimate for the ACT coefficient would lead us to estimate that a student with a 33 ACT would receive about \$1,500 more aid than a 23 ACT student.

Half of the regressions utilize the English ACT and Math ACT scores instead of the composite score. There are four parts to the ACT (English, Reading, Science, and Math) but the English, Reading, and Science scores are so collinear that we look only at the English and Math scores. Surprisingly, when using just the English and Math scores, the Math coefficient is statistically insignificant in all four regressions. Two possible explanations for this result are that the university takes into account only the composite score, which would be weighted towards the correlated Reading, English and Science sections, or the university puts less emphasis on Math scores. Anecdotal evidence suggests that the university focuses solely on the composite ACT score in financial aid decisions.

When the demographic variables are included in the regressions only one is very important. A non-white student can expect to receive about \$2,240 dollars more on average than a white student, *ceteris paribus*, accounting for about 14% of the \$16,000 tuition.

The average male student receives about \$190 more (using the average of the four coefficients) than the average female, which is only 1% of the total tuition costs. Meanwhile, out-of-state students garner larger aid awards, about \$950 on average. Neither result is statistically significant however. Students sharing the same religious affiliation as the university receive slightly less aid than other students, but again this result is statistically insignificant. It does not appear that the university is using financial aid awards to butter up alumni or others affiliated with the church.

Conclusions

As expected, our findings support the widely held notion that colleges and universities use financial aid awards to systematically favor better and poorer students. These results are consistent with a price discrimination story since better and poorer students are likely to be highly price elastic.

The empirical estimates indicate that the university in question gave approximately \$360 of aid for every \$1,000 of financial need after controlling for other factors. Students who perform well in high school and score well on standardized tests receive considerably more than average students. Also, the university places value on racial diversity as indicated by the average of \$2,240 awarded to students who are nonwhite, after controlling for other factors. The results of this study clearly indicate that university financial aid awards are based on merit, need and minority status. There is no strong evidence that the university favors other groups that we can measure with the available data.

While this study examines only one university, the analysis should be easy to replicate at other colleges and universities. Such an analysis would make an excellent project for an undergraduate or even master's thesis. In addition, the results provide good talking points for professors teaching about price discrimination.

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