Financial Aid and Student Bargaining Power

by David M. Lang[□]
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Department of Economics
Washington University
One Brookings Drive, Campus Box 1208
St. Louis, MO 63130-4899

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Abstract

It is an understatement to say that financial aid is a key component of the college admissions process. For the student and her family, financial aid is a way to afford quality post secondary education that otherwise may have been unobtainable. For the college, financial aid is a method to compete for the best and brightest students. For policymakers, financial aid is a subsidy for educational expenses where constituencies often differ over its merits. This research attempts to analyze the financial aid process by considering the ability of a student to act strategically through the bargaining process. A theoretical model is developed using a first-price sealed auction model. This model is evaluated using empirical evidence from the 1996 National Postsecondary Student Aid Study (NPSAS:96). It is shown that a student can maximize her financial aid offer by increasing the number of schools to which she has been accepted after controlling for ability, demographics, and institutional characteristics.

Introduction

"To make the American Dream achievable for all, we must make college affordable for all."

-President William J. Clinton, 2000 State of the Union Address

"College is every parent's dream for their children and we should make this opportunity available to all students. It's the path to achievement."

- President George W. Bush, August 30, 2000

The National Center for Education Statistics (NCES) estimates that 56.4% of the 7.4 million full-time undergraduate students in the United States receive some type of financial aid.[1] This research will use the National Postsecondary Student Aid Study (NPSAS) data to model the effect of financial aid amounts and composition on choice of college. By composition, I mean the make-up of a student's financial aid package in terms of percentages of loans and grants. This process can be viewed as a game theoretic model with the student and the universities to which the student was accepted as the players. I propose that once the student has been accepted to some subset of the universities to which she applied, a new market has been created with the student as the sole buyer in this market and the subset of schools as the sellers. If the student was only accepted at one school, then the student has very little bargaining power in terms of acquiring a good price, which in this market, is represented by a favorable financial aid package. If, on the other hand, the student has been accepted at four colleges, for example, then the student has the ability to bargain with these schools for the best deal possible. In other words, the market changes from looking like a monopoly to looking more like a competitive market. In addition, these results may help address the issue of price sensitivity for college quality. I

expect to find that students who were accepted at many institutions will have more favorable financial aid packages than those students who were accepted only at the institution they are attending. The idea here is that with multiple acceptances, the student has gained some bargaining power in the financial aid process.

Many of the families with students receiving financial aid were already aware of the procedure involved in obtaining financial aid by the time they were applying for college admission. Most of these colleges require interested students to fill out detailed financial information forms including both federally mandated forms and college-specific forms. Once these forms have been processed, the school comes up with a financial aid package for the student. This "package" consists of a combination of different types of aid, such as grants, loans, work-study, and other miscellaneous aid.[2] What most families do not completely understand is exactly how this package is determined.

While colleges have some restrictions on what they can and cannot do in terms of financial aid, they also have a lot of freedom to choose their own financial aid policies. One set of restrictions involves the loan amounts that the school can award its students. Currently, there is a cap on subsidized loans at $2,625 for Freshmen, $3,500 for Sophomores, and $5,500 for Juniors and Seniors, a cap on unsubsidized loans at $4,000 for Freshmen and Sophomores and $5,000 for Juniors and Seniors, and a cap on Perkins[3] loans at $3,000 for all students. In addition, there is an overall limit on total borrowed money that an undergraduate dependent student can have at $23,000. Restrictions on work-study aid are less specific. Students can

[1] U.S. Department of Education (1997).
[2] By grants, I am including all forms of direct gift aid to the student, in other words, a dollar for dollar reduction in the student's bill to the college. Loans here include student loans, both subsidized and unsubsidized. Parent loans are considered other aid.
[3] Federal Perkins loans are low interest loans for students with exceptional need.

devote no more than 20 hours per week to this program; however, schools can choose the hourly wage.

Other than these restrictions and a few others insuring that there is no unfair discrimination in the process, the colleges can choose both the level and composition of the financial aid package. For example, schools do receive a report from the government based on their formula that indicates the "expected family contribution" (EFC). This is a figure that measures how much a family can reasonably afford to pay for college. It is calculated based on a complicated formula that includes such things as parent and student assets and income, number of family members in college, etc. This EFC, however, is only used by most colleges as a guideline for financial aid, not a rule. Schools generally use their own financial aid forms in conjunction with this government-reported EFC to arrive at their financial aid package.

As can be imagined, there are often substantial differences in the financial aid offerings from different schools to the same student. One reason for these differences is the different formulas used by these colleges, as suggested previously. Another reason is that schools often take the quality of the student into account when making these decisions. For example, consider the following example from a selective private college. This school calculates the expected family contribution based on its own formula. This formula is generally more generous to the student than the government's suggested EFC. Along with this formula, the university then attaches a "quality rating" to the student ranging from A to G based on the student's application for admission. The application contains detailed information including test scores, grades, and extra-curricular activities. Using all of this information, the school then develops the financial aid package for the student. A student with a high quality rating will receive more total aid and,

in addition, the aid that she is offered consists of a higher proportion of grants than a lower-rated student's aid package.

The process would appear fairly straight-forward if it ended here. However, in many cases, families will negotiate with the colleges in an attempt to acquire a better financial aid offer. This can be accomplished in two ways. First, the families may have additional information that suggests the need for more aid than was offered originally. An example of this might be large medical bills or a change in family structure. The second method used in the bargaining process is forcing the schools to compete with one another. A student may indicate to one school that a second school has offered more aid and ask them to meet or beat this package. This is where the strategic behavior of this process enters. Although many publicly deny it, colleges may engage themselves in this bargaining game with the students. This essay investigates whether or not there is evidence of this game. Going back to our example of the selective private college, their financial aid office has indicated that once a student is accepted for admission, they will do everything within reason to insure that the student attends. In other words, they will compete for students with other schools. They further indicate that if a student says that he/she will go to another school that is offering a better financial aid package and provide proof, then they will usually meet or beat this offer, regardless of the other school in question. Even Harvard University now calls its need-based financial aid policies "competitively supportive" and asks its students to ask Harvard to meet offers of aid from other leading institutions.[4] Of course, it may be a bit of a stretch to think that an elite institution, like Harvard, would enter into a bidding war with a much lower-ranked institution. In the following section, I will attempt to model the financial aid process. In addition, I will test the robustness of the

[4] McPherson and Schapiro testimony before the Committee on Governmental Affairs (2000).

results considering the rank of the second choice school to determine whether any particular school would view all other schools as competitors.

In the next section, I propose a theoretical model of the financial aid process. Next, descriptive statistics are presented and analyzed with particular attention given to the differences between public and private institutions and the students that they tend to attract. In the 'Results" section, several regression specifications are studied to attempt to test the theory and measure the effects of student bargaining in this process. The paper concludes with a discussion about policy implications as well as directions for further related research.

The Theoretical Model

Here I develop a model of the financial aid process. This model will be used to evaluate the effect of increased acceptances on a student's financial aid package. My thought here is that if a student gets accepted into a relatively large number of colleges/universities, then that student has gained some bargaining power that will present itself through a more favorable financial aid package for that student.

The Student's Decision:

Turning attention to the student's decision, the student will want to maximize total utility, which will be defined as follows:

$$\Psi = U(l,r) - t(l,r) - mc + b_i(n(m))$$

c is the application cost (including opportunity cost) for each of the *m* colleges to which the student applies. *t(l,r)* is the tuition for a college with location *l* and reputation r. *U(l,r)* is the utility that the student receives from going to a college with location *l* and reputation *r*, regardless of cost to the student. b_i is the financial aid offered by the college. b_i is a function of the number of schools (n) accepting the applicant, that in turn is a function of the number of schools (m) to which a student applies.[5] In order to maximize total utility, ψ, the student will choose *l*, *r*, and *m* such that the following relationships hold:

$$\frac{dU}{dl} = \frac{dt}{dl}$$

[5] In order to obtain a non-infinite number of optimal applications, the marginal financial aid received from an additional acceptance must be diminishing.[5] The gains in financial aid from more and more acceptances should fall.

This states that the student will choose a location such that the marginal increase in utility will equal the marginal tuition increase. Notice that this model allows for students to measure location in many ways. It could be distance from home or it could be rural vs. urban setting, etc.

$$\frac{dU}{dr} = \frac{dt}{dr}$$

This condition states that the student will choose a college's reputation such that the marginal increase in utility will equal the marginal tuition increase. Again, reputation can be considered either academic reputation as a whole or faculty reputation, etc. Both of these first 2 conditions are important to consider but are beyond the scope of this paper and the data. Further research must be done to consider these testable implications. Finally,

$$\frac{db_i}{dn}\frac{dn}{dm} = c$$

This first order condition states that the marginal financial aid received from an additional acceptance multiplied by the increase in acceptances from each additional application should be equal to the application cost in equilibrium. In other words, the student should continue applying to schools up to the point where the expected gain in aid from applying is equal to the costs of the application. Application costs do not vary in this model and we will assume that there is some constant percentage, ρ, of accepted applications. ρ is between 0 and 1.

$$n = \rho m$$

The College's Decision:

In order to examine the college's decision, I will use the first-price sealed auction model and literature.[6] Consider *n* potential schools attempting to get a particular student to enroll. These are schools to which a student has applied and at which she has been accepted. I will assume that each heterogeneous student is in a market all by herself once they have reached this point in the college admissions process. These *n* schools will play by the rules of a first-price sealed auction. Each school submits a bid, (i.e. a financial aid package), and the student attends the school that yields the highest utility, (some function of tuition, financial aid, application costs, and school characteristics). If the schools knew the willingness to pay of the other schools in this game, it would be optimal for the school with the highest valuation to slightly outbid the other *n-1* schools.

Assuming, however, that the schools' valuation of the student is private information, we now have a game with incomplete information. Assume that the schools' valuations of the student lie in the interval (0, V], and that the probability of having a particular valuation, v_i, is the same for all schools. This valuation reflects the dollar amount that the specific student is worth to the specific university. This amount can reflect many different attributes of the student that the school deems important including the student's aptitude, potential for the future, expected future alumni contributions, and contribution to the diversity of the student body. This valuation is indexed by bidder (i.e., by college) illustrating the fact that each school may have a different measure of valuation.

[6] I have chosen to use the first-sealed bid auction in this model. In my opinion, this is the model the most closely resembles the market for financial aid that I am observing. The same analysis can be done using the second-sealed bid auction, or Vickrey auction. The results of the model would not change, nor would the discussion that follows it.

The schools' valuations are being drawn randomly from this interval according to a uniform probability distribution represented by $F(v) = v/V$ *for* v *in the interval* $(0, V]$. Schools' types are just their valuations. Thus, the probability of any specific combination of types below $(v_1, \ldots, v_n)$ is $F(v_1)^* \ldots ^*F(v_n)$. Each school has a strategy that is a bid, b_i (i.e. the financial aid offer). The payoff for school i from bids $(b_1, b_2, \ldots, b_n)$ is:

$v_i - b_i$ *if* $b_i = max\{ b_1, b_2, \ldots, b_n\}$

0 *otherwise*

We know from the previous literature concerning this set of assumptions and the first-price sealed auction that if a school wants to maximize its payoff, then the optimal bid for the school is as follows[7]:

$$b_i^* = [(n-1)/n]v_i$$

It seems fairly straight-forward from this condition that as the total number of competing bidders, n, increases, the financial aid offer will also increase.[8] This result is usually used in the literature to point out that as the number of competitive bids increases, the optimal bid approaches the true valuation of the object being offered. In our adaptation of this theory, we can say that the student's financial aid package will approach the best possible financial aid offer that the student can obtain as she gets accepted to more and more schools. In other words, it is in the student's best interests to get accepted to as many schools as possible in order to maximize the financial aid that the student receives.

There are, of course, different ways in which this goal of large numbers of acceptances can be accomplished. One way is for the student to have characteristics that schools are typically

[7] This result can be found in many papers and textbooks. For an example of such, see Eichberger (1993).
[8] The first derivative of this optimality condition is as follows:

$$\frac{\partial b_i}{\partial n} = \frac{v_i}{n^2} > 0$$

looking for, such as successful grades, high standardized test scores, and involvement in extra-curricular activities.[9] This is probably the best advice for students desiring acceptance into many schools. In terms of our model, this would increase the colleges' bids in addition to the number of schools accepting the student's application. Another way to increase the number of acceptances is to simply increase the number of schools to which a student applies. If a very solid candidate applies to only 2 colleges, she can, at most, get accepted into these 2 schools. Of course, completing applications to colleges and universities has become a fairly expensive process in some cases. In addition to the obvious opportunity costs of time involved with the writing of essays, gathering of recommendations and transcripts, and filling out resume-type information, there are often application fees that the student must pay. These fees typically range from $25 to $60. Therefore, if a student would simply apply to a school with the hopes of raising her eventual financial aid elsewhere, she must take into account the costs of applying compared to the expected gains in aid contingent on being accepted into one more school.

If we substitute the college's optimal bid solution into our student's first order condition, we obtain the following optimal number of application to submit:

$$m^* = \sqrt{\frac{v_i}{c}}$$

This implies that if application costs rise, a student will apply to fewer schools, which is quite intuitive. Further, it implies that as the colleges' perceived value of the student increases, the student will increase applications. See the appendix for the appropriate derivatives.

Substituting m^* into the college's solution for b^*, we obtain a revised b^*:

[9] Of course, by involvement in extra-curricular activities, I am considering prolonged and dedicated involvement, not last-second temporary involvement. I presume that the admissions committees and financial aid offices at the prospective colleges can tell the difference, as is often the case.

$$b^* = v_i - \frac{\sqrt{v_i c}}{\rho}$$

This yields further testable implications concerning the financial aid award. Specifically it is predicted that as the colleges' perceived value of the student increases, the financial aid awarded to the student will increase (provided that the student is valued greater than a fairly low threshold.[10]) As the application costs increase, the financial aid offer will decrease. And as the acceptance rate increases, the financial aid offer will increase. For the derivatives used in this analysis, see the appendix.

A critique of this model has been that another theory may garner the same testable implications. In particular, consider an individual student drawing financial aid offers from some distribution and then choosing the best offer. It seems clear that the more draws that are taken, (i.e. the more schools the student is accepted to) the more likely that one of the offers is randomly "high." However, what this implies is that the "best" offer is necessarily the "highest" offer. This would be true if students always attended the school that offers the most financial aid. Of course, students often make their attendance decision not merely by comparing financial aid packages, but based on other comparisons as well. Table A in the Appendix lists the most important reason for selecting which college to attend across all undergraduates in 1996. 15.5% indicated that the most important reason was cost-related. The remainder claimed that factors such as school reputation and location were more important to their decision. Also, the testable implication is not exactly the same between the presented model and this alternative model. In the alternative model, the highest financial aid offer would increase with additional acceptances

[10] As can be seen in the appendix, this is true as long as $v_i > [c/4\rho^2]$. For the average student, the acceptance rate is .88 and the application costs are around $40. This means that the predicted sign is accurate as long as the colleges' value of the student exceeds $12.91 which seems fairly reasonable to assume.

while in the proposed model, the highest offer, as well as the average offer would increase with additional acceptances.

A Word about Market Structure:

What market structure exists in higher education? This issue is addressed by looking at the degree of price discrimination in this marketplace. By offering different financial aid packages to different students, schools are engaging in some amount of price discrimination. Colleges are in a good position to price discriminate. They have downward-sloping demand curves due to the heterogeneity of colleges and they have the ability to identify the willingness to pay of their customers. For a student who is accepted into only one institution, the market is monopolistic where the college can make a take-it-or-leave-it offer to the student. If a student is accepted into multiple schools, however, the market changes from looking like a monopoly to looking more like a competitive market, or at least monopolistically competitive.

In May of 1991, the Justice Department reached a settlement with the eight Ivy League universities[11] to end alleged price-fixing for tuition and financial aid. This was a result of a 1989 civil antitrust lawsuit. Although the schools did not admit that they had done anything wrong in the past, they agreed to no longer "collude or conspire" on financial aid. Up until this point, the schools had held annual meetings to exchange financial aid and tuition information. MIT, also named in the lawsuit, did not join in the agreement.[12] In December of 1993, the Justice Department reached a settlement with MIT that allows colleges to exchange limited information concerning financial aid. With this agreement, schools that agree to admit students regardless of finances may discuss financial aid policies but may not compare individual financial aid awards.[13] Although the nine schools that make up the Ivy League and MIT are not nearly representative of all institutions of higher learning in the United States, looking at the results of

[11] The Ivy League consists of Brown, Columbia, Cornell, Dartmouth, Harvard, Princeton, Pennsylvania, and Yale Universities.
[12] See Seper (1991).

this case do indicate the incentives inherent in the system. Since 1993, there has been a lot of discussion about 'price-discounting' in higher education. Price-discounting is when colleges give merit-based financial aid to students in an effort to compete with the other schools that the student is considering for admission.[14]

[13] See Stecklow and Bulkeley (1993) and Daly (1993).
[14] See Gose (2000), Kane (1999) and McPherson and Schapiro (1998) for a more complete discussion of this price- or tuition-discounting issue.

The Data

I evaluate this model using data from the 1995-96 National Postsecondary Student Aid Study (NPSAS 96). The NPSAS is a nationwide survey of undergraduate students conducted by the U.S. Department of Education. It contains detailed information about the composition and quantity of financial aid received by college students as well as various demographic, financial, and opinion data from the students and their families and institutional information from the college the student is attending. This data has not been studied extensively by economists interested in human capital investment. Dick and Edlin (1997) completed previous work using the 1993 wave of this data set. In their article, "The implicit taxes from college financial aid," they consider the fact that families who save for college receive less financial aid and that this is essentially an implicit tax.

The database has 48,389 observations. For our analysis, only the nationally representative sample of undergraduate college freshmen at four-year institutions is included. In addition, the institutions must have a Carnegie Classification[15] of Baccalaureate II or higher and

[15] The Carnegie Classification was developed by Clark Kerr in 1970, primarily to improve the precision of the Carnegie Commission's research. *This is taken directly from the codebook for the NPSAS data as provided by the National Center for Education Statistics*.

Research Universities I:
These institutions offer a full range of baccalaureate programs, are committed to graduate education through the doctorate, and give high priority to research. They award 50 or more doctoral degrees each year. In addition, they receive annually $40 million or more in federal support.

Research Universities II:
These institutions offer a full range of baccalaureate programs, are committed to graduate education through the doctorate, and give high priority to research. They award 50 or more doctoral degrees each year. In addition, they receive annually between $15.5 million and $40 million in federal support.

Doctoral Universities I:
These institutions offer a full range of baccalaureate programs and are committed to graduate education through the doctorate. They award at least 40 doctoral degrees annually in five or more disciplines.

Doctoral Universities II:

the students must have no missing values for the key variables in the analysis. This leaves 2749 observations in the analysis.[16]

Following the notation of Dick and Edlin (1997) and the other literature on this topic, I construct a variable called 'Aid Value'. This Aid Value will serve as an index of the value of the financial aid award to the student. The idea here is that students do not value a one dollar loan the same that they value a one dollar grant. This is due to the fact that at some point, the loan

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These institutions offer a full range of baccalaureate programs and are committed to graduate education through the doctorate. They award annually at least ten doctoral degrees-in three or more disciplines-or 20 or more doctoral degrees in one or more disciplines.

Master's (Comprehensive) Colleges and Universities I:
These institutions offer a full range of baccalaureate programs and are committed to graduate education through the master's degree. They award 40 or more master's degrees annually in three or more disciplines.

Master's (Comprehensive) Colleges and Universities II:
These institutions offer a full range of baccalaureate programs and are committed to graduate education through the master's degree. They award 20 or more master's degrees annually in one or more disciplines.

Baccalaureate (Liberal Arts) Colleges I:
These institutions are primarily undergraduate colleges with major emphasis on baccalaureate degree programs. They award 40 percent or more of their baccalaureate degrees in liberal arts fields and are restrictive in admissions.

Baccalaureate Colleges II:
These institutions are primarily undergraduate colleges with major emphasis on baccalaureate degree programs. They award less than 40 percent of their baccalaureate degrees in liberal arts fields or are less restrictive in admissions.

Associate of Arts Colleges:
These institutions offer associate of arts certificate or degree programs and, with few exceptions, offer no baccalaureate degrees.

Professional and Specialized Institutions:
These institutions offer degrees ranging from the bachelor's to the doctorate. At least 50 percent of the degrees awarded by these institutions are in a single discipline.

Other specialized institutions:
Institutions in this category include graduate centers, maritime academies, military institutes, and institutions that do not fit any other classification category.

Tribal colleges and universities:
These colleges are, with few exceptions, tribally controlled and located on reservations. They are all members of the American Indian Higher Education Consortium.

[16] This may seem like a very small sub-sample of the database. The National Center for Education Statistics at the Department of Education has assured me that with the selection criteria that have been chosen, the remaining number of observations is plausible. Eliminated from the sub-sample are a large number of students from vocational schools and community colleges.

needs to be paid back. The loan is worth something to the student, however, since the student generally is thought to have a discount rate that is significantly higher than the interest rate of the loan, which is generally subsidized. Work-study and other aid do not enter into this measure of Aid Value since a student must give up time and effort to obtain this aid. In addition, work-study and other aid are generally the smallest components of the overall financial aid package. Therefore, the Aid Value variable is a good proxy for the value of the financial aid package to the student. The following measure will be used:

Aid Value = Total Grant Aid + .5(Total Loan Aid)

The coefficient of .5 on the total loan aid is dependent on the current interest rate for loans as well as the estimated discount rate that college students use. The value of .5 used in this paper is the same that is used in McPherson and Schapiro (1991), Edlin (1993), Dick and Edlin (1997), and Bosworth, Carron, and Rhyne (1987). In Bosworth, Carron, and Rhyne (1987), this figure is found by calculating the subsidy costs of a student loan at various discount rates and indicating that this is the value of the loan to the student. Feldstein (1995) claims that the coefficient should be about .6 but bases this figure solely on intuition. In this paper, the .5 value is obtained by calculating the present value of the loan to a student borrowing the maximum loan amounts at various discount rates. At a discount rate of 9 percent, a one dollar loan is worth 47 cents; at a discount rate of 10 percent, it is worth 48 cents; and at a discount rate of 12 percent, the one dollar loan is worth 51 cents. Since the actual discount rate is unknown, .5 is a fairly plausible estimate. In the results that follow, the .5 value is used in all calculations of aid value. However, the significance of the results in these regressions holds consistent for all values from 0 to 1. Only the magnitudes of the coefficients change.

Descriptive statistics of the data used can be found in Table 1. Note that all means are weighted appropriately as specified by the guidelines of the NPSAS 96 Methodology Report issued by the National Center for Education Statistics (NCES) including adjustments for design effects. More than half (55%) of the sampled students are female while the vast majority is unmarried (99%) citizens (93%) who attend on a fulltime (92%) basis. Roughly two-thirds of the sample are the only member of their family in college. As for the variables of particular importance to the analysis, on average, students were accepted to three schools. About one-quarter (24%) of the students were only accepted at the one school that they are attending. 18% were accepted at five or more schools. The average student receives just over $7,800 per year in total financial aid, over half (53%) of which is grant aid and a third (33%) of which is student loans.

Table 1[a]

Weighted Means and Standard Deviations for Selected Variables – NPSAS 1996

Variable	Mean	Standard Deviation		Variable	Mean	Standard Deviation
Age	18.32	.62		# Acceptances	3.09	2.20
Fulltime	.92	.27		1 Acceptance	.24	.43
Citizen	.93	.25		2 Acceptances	.22	.42
Married	.01	.08		3 Acceptances	.21	.41
Female	.55	.50		4 Acceptances	.15	.35
Family in College	1.34	.98		5+ Acceptances	.18	.39
No College Sibs	.66	.47		Total Aid	7824.07	6389.39
1 College Sibling	.27	.45		Total Grant	4285.91	4835.59
2+ College Sibs	.06	.23		Total Loan	2086.47	1827.66
Parents' Income	53590.87	35615.94		Total Work-Study	293.18	614.26
Enrollment Size	15709.59	13299.73		Total Other Aid	1158.50	3119.68
Private	.43	.49		Grant/Total Aid	.53	.36
Research	.34	.47		Loan/Total Aid	.33	.31
Doctoral	.11	.32		Work/Total Aid	.03	.08
Comprehensive	.33	.46		Other/Total Aid	.10	.24
Tuition	8004.19	6047.99		Total SAT	1014.45	205.53
Fulltime Budget	15179.06	6501.76		In State	.71	.45

[a] A few words should be said about the variables here. The following variables are dummy variables: Fulltime, Citizen, Married, Female, No College Sibs, 1 College Sibling, 2+ College Sibs, Private, Research, Doctoral, Comprehensive, 1 Acceptance, 2 Acceptances, 3 Acceptances, 4 Acceptances, 5+ Acceptances, and In State. The means listed for these variables represent the percentage of students that fit into this category. For example, 55% of the sample is female and 43% are at a private institution. The Research, Doctoral, and Comprehensive variables again refer to the Carnegie classifications previously discussed. For the analysis, Research indicates either a Research I or Research II institution, Doctoral indicates either a Doctoral I or Doctoral II institution, and Comprehensive indicates either a Comprehensive I or Comprehensive II institution.

The financial aid offices at private colleges and universities operate in a very different manner than their public counterparts. State governments do not directly subsidize private schools. This is very different from the public schools that are heavily subsidized and can, therefore, offer lower tuition. Table 2 looks at these differences between these two sectors by comparing the means of the relevant variables.

Table 2

Comparing Means between Private and Public Schools and their Students

Variable	Mean for Public	Mean for Private		Variable	Mean for Public	Mean for Private
Age	18.33	18.30		# Acceptances	2.86	3.40
Fulltime	.89	.96		1 Acceptance	.27	.21
Citizen	.91	.96		2 Acceptances	.24	.20
Married	.01	.01		3 Acceptances	.21	.20
Female	.54	.57		4 Acceptances	.14	.15
Family in College	1.32	1.36		5+ Acceptances	.14	.23
No College Sibs	.68	.65		Total Aid	5038.40	11575.61
1 College Sibling	.26	.28		Total Grant	2293.43	6969.25
2+ College Sibs	.05	.06		Total Loan	1672.19	2644.41
Parents' Income	50574.93	57652.53		Total Work-Study	136.25	504.54
Enrollment Size	22236.76	6919.24		Total Other Aid	936.54	1457.42
Private	0.00	1.00		Grant/Total Aid	.49	.59
Research	.46	.18		Loan/Total Aid	.38	.28
Doctoral	.12	.10		Work/Total Aid	.02	.04
Comprehensive	.38	.25		Other/Total Aid	.11	.09
Tuition	3923.50	13499.78		Total SAT	1005.04	1027.13
Fulltime Budget	10939.65	20888.39		In State	.86	.52
Total ACT	22.88	24.26		GPA	2.56	2.53
Accepts/Appls.	.88	.88		Aid Value	3129.52	8291.45

Private schools charge higher tuition, give more aid, and have fewer students than their public school counterparts. In addition, they attract wealthier students from a wider geographic area with higher SAT and ACT scores and accept more students, although the ratio of

acceptances to applications is .88 for both institutional types. There is substantial variation in the composition of the financial aid that public and private colleges award. Private schools give a higher proportion of grants than public schools (.59 vs. .49).

Results

The following three charts illustrate the changes in aid composition as the number of schools accepting a student increases. Figure 1 shows that while the average overall aid and average grant aid increase with acceptances, average loan aid stays fairly constant. In fact, the average loan amount ranges between $2045 and $2368 and does not increase monotonically with number of acceptances. Similar stories can be told about Figure 2 and Figure 3.

Figure1

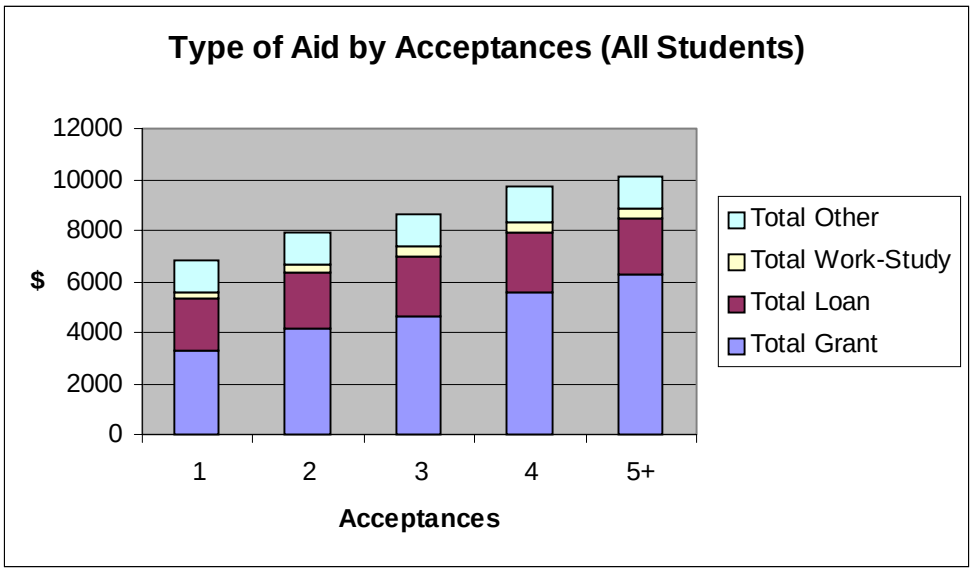


Figure 2

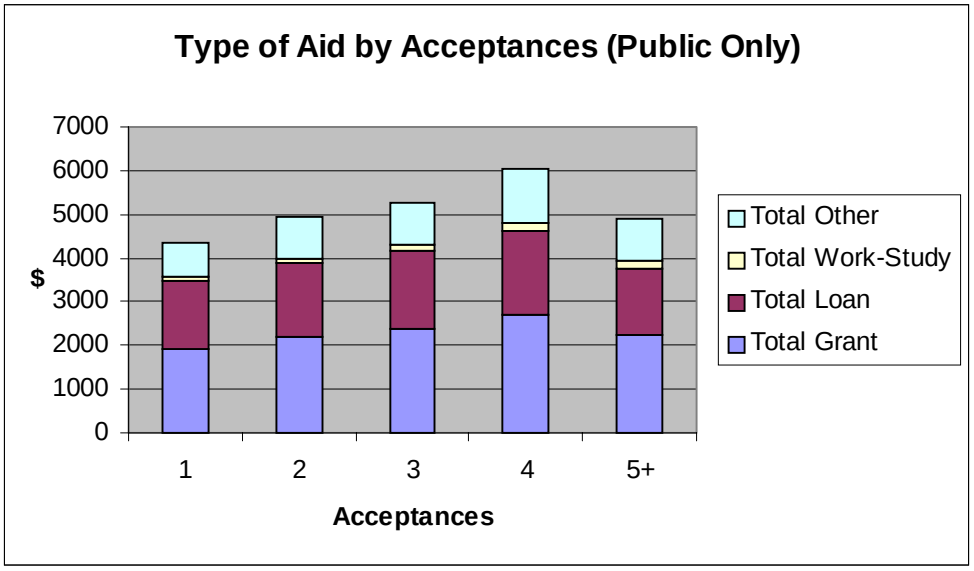
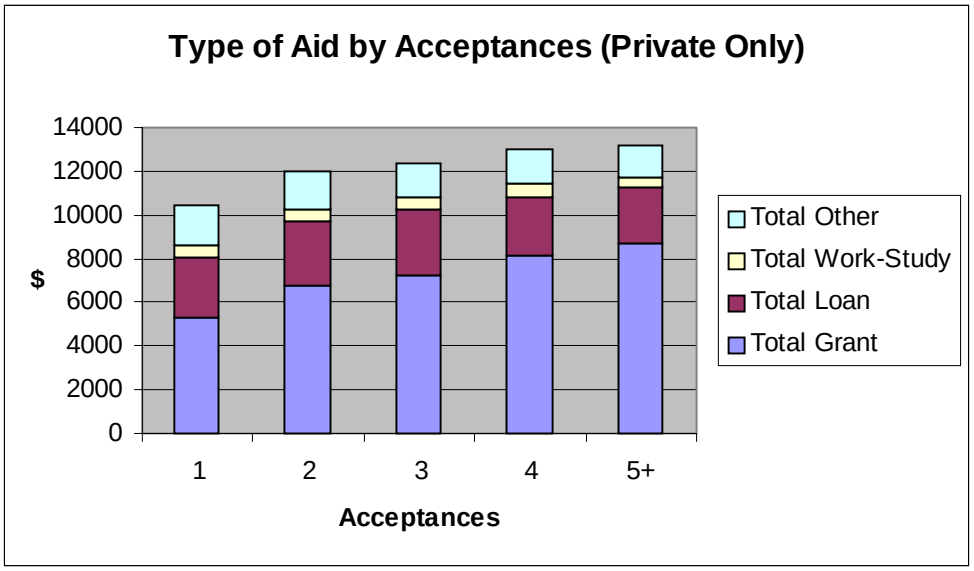


Figure 3



Weighted[17] OLS regressions were run in order to evaluate whether students with more acceptances receive more financial aid. Table 3 shows selected results. Specification I regresses

[17] The regressions must be weighted appropriately to account for the non-randomness of the sub-sample used in this analysis. The appropriate weight were obtained courtesy of the National Center for Educational Statistics.

'total aid' on institutional characteristics (enrollment size, Carnegie classification, and whether the college is private or public) and student characteristics (fulltime status, number of siblings in college, parent's income, SAT score, GPA, whether or not the student lives in the state where the college is located, and number of acceptances). All coefficients were found to be significant at the .05 level with the exception of the '1 college sibling' dummy variable. Notice that for every additional $100 in parental income, the total aid awarded to the student decreases by $4.70. Also, we find that for every additional 100 points on the SAT, the student receives $293 more in financial aid. Of particular interest to this paper is the significance and sign of the 'number of acceptances' and 'acceptances – squared' variables. The coefficient on 'number of acceptances' is positive (687.40) indicating that as acceptances increase, the total financial aid offered to the student also increases. The negative coefficient on the squared-term (-46.33) was also predicted. This insures diminishing returns to additional acceptances.

Specification II is identical to Specification I except that SAT is replaced with ACT. This dramatically decreases the number of observations due to the relative popularity of the SAT compared to the ACT among colleges and universities. While the significance of several of the variables is lost at the .05 level, the signs have been maintained. In addition, the coefficient on 'number of acceptances' remains positive and significant. Specification III replicates Specification I accept that a two-stage instrumental variable approach is now used.[18] It has been argued that the number of acceptances for a student has merely another measure of her ability.[19] Even with this approach, the coefficients remain positive and significant.

[18] The number of schools to which a student applies is used here as the instrument for number of acceptances.
[19] I maintain the argument that the number of acceptances for a student is mostly a function of the number of applications that the student completes. In Table B of the appendix, it is shown that while there is a substantial relationship between the number of applications and acceptances, there is a relatively weak relationship between acceptances and each of the ability measures.

Specifications IV and V repeat Specification I and III but use 'Aid Value' as the dependent variable as opposed to 'Total Aid'. While the magnitudes of the coefficients have changed, most have remained significant. Number of acceptances remains a positive and significant factor in determining financial aid.

Table 3[a]

Selected Regressions of 1995-1996 Financial Aid for Freshmen at 4-year Institutions

Independent Variables	Total Aid I	Total Aid II	Total Aid III	Aid Value IV	Aid Value V
Intercept	**2561.93** (3.11)	2757.52 (1.56)	**2196.88** (2.62)	-1193.20 (-1.93)	**-1354.94** (-2.08)
Enrollment Size	**-.035** (-2.77)	-.056 (-1.84)	**-.034** (-2.63)	**-.026** (-2.73)	**-.025** (-2.64)
Research	**2305.91** (6.36)	**2082.31** (2.58)	**2266.30** (6.23)	**1493.24** (5.05)	**1475.69** (4.98)
Fulltime	**1001.76** (2.50)	649.35 (.74)	**1010.52** (2.50)	**714.24** (2.34)	**718.12** (2.34)
1 College Sibling	461.21 (1.88)	451.21 (.85)	454.38 (1.85)	355.13 (1.91)	352.10 (1.89)
2+ College Siblings	**2112.02** (5.22)	1221.50 (1.36)	**2088.14** (5.17)	**1791.66** (5.31)	**1781.08** (5.29)
Parent's Income	**-.047** (-11.45)	**-.047** (-6.79)	**-.047** (-11.38)	**-.051** (-12.50)	**-.051** (-12.46)
# acceptances	**687.40** (6.27)	**600.95** (2.52)	**911.75** (6.11)	**600.38** (6.94)	**699.78** (5.73)
Acc.- squared	**-46.33** (-5.75)	-28.52 (-1.72)	**-60.96** (-6.01)	**-34.07** (-5.03)	**-40.55** (-4.69)
Total SAT	**2.93** (4.61)	NA	**2.78** (4.34)	**3.74** (6.92)	**3.67** (6.77)
Total ACT	NA	**200.83** (3.39)	NA	NA	NA
GPA	**294.17** (2.23)	77.67 (.24)	**288.92** (2.20)	**517.90** (5.72)	**515.57** (5.70)
In State if Public	**-1899.83** (-3.67)	**-2429.46** (-2.04)	**-1830.15** (-3.57)	-427.40 (-1.12)	-396.53 (-1.04)
Private	**4851.19** (8.97)	**4499.80** (3.41)	**4887.58** (9.11)	**4551.36** (11.42)	**4567.48** (11.47)
Observations	2582	549	2582	2582	2582
R-squared	.383	.402	.382	.439	.438
Acc. – instruments?	No	No	Yes	No	Yes

[a] Coefficients in **bold** are significant with $\alpha = .05$. The t-statistics are in parentheses. The omitted category is a student who is attending part-time at a non-research public institution with no siblings in college.

Table 4 presents specifications similar to those in Table 3 except that separate regressions are run for Public institutions and Private institutions. In particular, compare Specification VI which looks at Private colleges and universities and Specification VIII which looks at Public schools. For Private schools, enrollment size no longer is significant while for Public schools, fulltime status and SAT score are not significant. These findings have some strong intuition behind them. Public schools generally have much higher enrollments than Private schools and are, therefore, more constrained when it comes to dividing up financial aid. Also, the price-discounting discussed previously is generally associated with Private institutions. Therefore, it was expected that SAT score would play a role in determining aid for these schools. Furthermore, notice that the coefficient on the 'number of acceptances' variable remains positive and significant for those attending Private and Public colleges. However, the magnitude is much higher for Private schools (912.34) than for Public Schools (223.63). In addition, when using the instrumental variable technique, the coefficient loses significance for those in Public colleges. This seems to be strong evidence that Private schools do compete for students while it is not clear whether Public schools engage in these activities.

Table 4[b]

Regressions of 1995-1996 Financial Aid – Public vs. Private Institutions

Independent Variables	Aid Value VI	Aid Value VII	Aid Value VIII	Aid Value IX
Intercept	-1413.13 (-1.38)	-1646.62 (-1.54)	**2860.67** (4.01)	**2898.41** (3.96)
Enrollment Size	-.016 (-.78)	-.018 (-.87)	**-.027** (-2.80)	**-.028** (-2.83)
Research	**1833.49** (3.07)	**1848.85** (3.09)	**1497.42** (4.39)	**1504.17** (4.45)
Fulltime	**1923.09** (2.51)	**1924.83** (2.51)	315.46 (1.06)	313.55 (1.05)
1 College Sibling	496.76 (1.54)	498.09 (1.55)	143.28 (.72)	144.15 (.72)
2+ College Siblings	**2034.20** (3.64)	**2029.10** (3.62)	**1856.47** (4.40)	**1858.08** (4.41)
Parent's Income	**-.066** (-14.29)	**-.066** (-14.27)	**-.038** (-6.60)	**-.038** (-6.62)
# acceptances	**912.34** (7.20)	**1088.07** (5.44)	**223.63** (2.20)	199.07 (1.41)
Acc.- squared	**-52.81** (-6.79)	**-63.22** (-5.36)	-10.16 (-1.26)	-8.27 (-.72)
Total SAT	**6.95** (9.19)	**6.81** (9.06)	.65 (.84)	.66 (.85)
GPA	**626.66** (3.71)	**619.35** (3.67)	**457.85** (4.86)	**458.65** (4.86)
In state, if public	NA	NA	-689.83 (-1.67)	-695.28 (-1.67)
Observations	1224	1224	1358	1358
R-squared	.317	.316	.257	.257
Public or Private?	Private	Private	Public	Public
Acc. – instruments?	No	Yes	No	Yes

[b] Coefficients in **bold** are significant with $\alpha = .05$. The t-statistics are in parentheses. The omitted category is a student who is attending part-time at a non-research institution with no siblings in college.

Next, it is important to consider the bias caused by omitting tuition from the regression equation. Certainly schools that charge higher tuition offer more average financial aid. Thus far, tuition has been omitted from the regressions in order to see the partial effects of the school characteristics on the total aid. Due to severe multicollinearity concerns, we cannot include tuition as an independent variable along with Carnegie classification, Private/Public status, and

enrollment size. The relationship between these variables and tuition is just too strong.[20] Table 5 looks at specifications replacing the institutional characteristics with tuition.

Table 5[c]

Regressions of 1995-1996 Financial Aid with 'Tuition'

Independent Variables	Total Aid X	Total Aid XI	Aid Value XII	Aid Value XIII
Intercept	**2367.96** (4.04)	**2398.56** (3.97)	-278.20 (-.57)	-162.97 (-.32)
Tuition	**.67** (32.68)	**.67** (32.66)	**.48** (28.28)	**.48** (28.27)
Fulltime	595.38 (1.66)	593.83 (1.65)	453.18 (1.66)	447.34 (1.64)
1 College Sibling	380.79 (1.66)	381.32 (1.67)	308.06 (1.71)	310.04 (1.72)
2+ College Siblings	**1844.98** (4.95)	**1847.06** (4.95)	**1607.76** (4.95)	**1615.59** (4.98)
Parent's Income	**-.051** (-12.51)	**-.051** (-12.52)	**-.054** (-12.95)	**-.054** (-13.00)
# acceptances	**369.85** (3.74)	**346.31** (2.53)	**363.09** (4.55)	**274.43** (2.39)
Acc.- squared	**-28.08** (-4.02)	**-26.55** (-2.86)	**-20.36** (-3.58)	-14.59 (-1.83)
Total SAT	.72 (1.33)	.73 (1.35)	**1.89** (4.23)	**1.94** (4.32)
GPA	226.53 (1.94)	226.72 (1.94)	**492.06** (5.91)	**492.78** (5.93)
Observations	2582	2582	2582	2582
R-squared	.470	.470	.487	.487
Acc. – instruments?	No	Yes	No	Yes

[c] Coefficients in **bold** are significant with $\alpha = .05$. The t-statistics are in parentheses. The omitted category is a student who is attending college part-time with no siblings in college.

In each of these specifications, the coefficient on the 'number of acceptances' variable remains positive and significant, although the magnitude of these coefficients has fallen substantially.

Table 6 addresses the concerns presented earlier that colleges may choose *not* to enter into a bidding war against substantially lower-ranked schools. If it is unlikely that a student would choose some particular low-ranked school over the first-choice school, then why would

[20] See Table B in the appendix for the partial correlation coefficients of these variables and tuition.

the first-choice school compete with this school? The NPSAS data does not specifically rank the schools to which a student applies. Rather, they simply list the colleges to which a student sends the federal financial aid information. Using the US News and World Report's ranking for 1996, I have then defined the second-choice college to be the highest ranked college receiving financial information about the student that the student does not attend. In Specification XIV, the sample in the regression consists of those students whose second-choice college is ranked no worse than 10 positions below the school attended. I arbitrarily claim that these second-choice colleges are 'competitive' with the actual school attended.[21] This is to be compared directly to Specification XVI which consists of students whose second-choice school is at least 11 places lower on the US News and World Report rankings. In the competitive case, the coefficient on 'number of acceptances' remains positive and significant (618.09) while for the non-competitive case, this coefficient is no longer significant and, when the instrumental variable is used, is also negative. This confirms the belief that colleges will only competitively bid against those schools that are viewed as a plausible threat to enroll the desired student.

[21] Similar results were obtained with variations on this measure of competitive schools.

Table 6[d]

Regressions of 1995-1996 Financial Aid – Competitiveness of the 2nd Choice

Independent Variables	Aid Value XIV	Aid Value XV	Aid Value XVI	Aid Value XVII
Intercept	**-1578.88** (-2.40)	**-1804.67** (-2.61)	2834.65 (1.05)	3933.27 (1.38)
Enrollment Size	**-.021** (-1.96)	-.020 (-1.87)	**-.051** (-2.74)	**-.055** (-3.00)
Research	**1155.28** (3.65)	**1110.74** (3.51)	**4059.84** (1.96)	**4280.54** (2.05)
Fulltime	530.97 (1.73)	531.61 (1.72)	**1670.36** (2.45)	**1560.16** (2.29)
1 College Sibling	**507.17** (2.60)	**504.02** (2.58)	-421.65 (-.86)	-375.57 (-.77)
2+ College Siblings	**1789.59** (5.12)	**1773.21** (5.08)	**2550.58** (2.34)	**2549.17** (2.22)
Parent's Income	**-.051** (-11.50)	**-.051** (-11.41)	**-.057** (-8.09)	**-.057** (-8.09)
# acceptances	**618.09** (6.66)	**782.65** (5.97)	302.18 (1.42)	-137.93 (-.40)
Acc.- squared	**-34.98** (-5.00)	**-45.50** (-5.12)	-16.75 (-1.12)	17.66 (.65)
Total SAT	**4.38** (7.84)	**4.25** (7.61)	-2.37 (-1.82)	-2.46 (-1.88)
GPA	**508.05** (5.33)	**501.44** (5.25)	**732.16** (2.43)	**694.24** (2.23)
In state, if public	-519.29 (-1.27)	-478.53 (-1.17)	-163.53 (-.31)	-268.98 (-.49)
Private	**4282.13** (10.15)	**4298.04** (10.22)	**6772.66** (8.56)	**6732.89** (8.47)
Observations	2180	2180	402	402
R-squared	.445	.444	.484	.479
2nd choice competitive?	Yes	Yes	No	No
Acc. – instruments?	No	Yes	No	Yes

[d] Coefficients in **bold** are significant with $\alpha = .05$. The t-statistics are in parentheses. The omitted category is a student who is attending part-time at a non-research public institution with no siblings in college.

Conclusions

These results support the predictions of the theory that an increase in acceptances increases the financial aid for the student. In addition, these results indicate that the financial aid process is one that needs to be analyzed not merely from the strategic perspective of the college, but also from the student's strategic perspective. A student and her family have the ability to place themselves in a more advantageous position by acting strategically in this process. The results suggest that there is some optimal number of schools to which a student should apply. Many students are probably currently 'under-applying' due to the shortage of information available discussing strategy from their perspective. There is a wide information gap between the colleges and the students' families when it comes to financial aid. The colleges have professionals who specialize in strategic financial aid over thousands of students and many years while the student's family many times has no other observations to learn from.

There are also policy implications associated with these results. In the model presented in the paper, there is no budget constraint on the colleges. However, in reality, some schools (in particular, the public universities) are constrained by the amount of money that trickles down to them from state and federal tax revenues. While it is not addressed in the model, it seems clear that if a college is constrained by the financial aid that they have available to award, then they are limited in terms of their ability to compete for students. Further, this constraint also may prevent students from getting their true value from these colleges.

In future research on this topic, it is necessary to consider this concept of a college being financially constrained. Also, as previously addressed in our discussion of the model, it is important to consider the tradeoffs that a student considers between the locations, reputations, and costs of the colleges in her choice set. Finally, this detailed work on financial aid awarding

makes it possible and necessary to consider the fact that the college choice and payment process is not conducted by a sole student, but rather is typically made in conjunction with the student's parents. For a complete analysis of college choice, we must know who exactly is making the important decisions. This may differ across families.

Appendix

$$\frac{dm^*}{dc} = -\frac{\sqrt{v_i}}{2\sqrt{c^3}} < 0$$

$$\frac{dm^*}{dv_i} = \frac{1}{2\sqrt{v_i c}} > 0$$

$$\frac{db^*}{dc} = -\frac{\sqrt{v_i}}{2\rho\sqrt{c}} < 0$$

$$\frac{db^*}{d\rho} = \frac{\sqrt{v_i c}}{\rho^2} > 0$$

$$\frac{db^*}{dv_i} = 1 - \frac{\sqrt{c}}{2\rho\sqrt{v_i}} > 0 \Rightarrow iff \Rightarrow v_i > \frac{c}{4\rho^2}$$

Table A

Most important reason for selecting the college attended – all undergraduates

Reason		**Percentage**
Cost-related		**15.5**
	Costs were less	6.1
	Got more financial aid	4.2
	Tuition was low	2.4
	Shorter time to finish	.5
	Other cost-related reason	2.3
Influence-related		**10.2**
	Friends went here	2.0
	Parents went here	.6
	Parents wanted student to attend	.6
	Teacher/counselor recommended	.5
	Other influence-related reason	6.5
Location-related		**20.9**
	Close to home	14.6
	Could live at home	2.3
	Close to job	.4
	Other location-related reason	3.6
Reputation-related		**33.8**
	School has a good reputation	20.7
	Liked the campus	4.4
	Job placement	4.1
	Facilities and equipment	2.7
	Faculty reputation	1.9
Other		**19.6**

Table B

Selected Partial Correlation Coefficients

# acceptances	# applications	.91
# acceptances	Total aid	.15
# acceptances	Parent's income	-.04
# acceptances	GPA	.03
# acceptances	Total ACT	.002
# acceptances	Total SAT	.16
Total ACT	Total SAT	.87
Tuition	Research	-.13
Tuition	Enrollment size	-.50
Tuition	Private	.81

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