2021

College Application Fee Effects on Applicant Volume, Diversity, and Academic Quality

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Honors Thesis

Colby College Department of Economics

May 2021

Abstract

I use U.S. News data spanning 2002-2019 on 200 U.S. liberal arts colleges to examine the effect of the application fee on four outcome variables: applications, nonwhite undergraduates, mean undergraduate SAT scores, and number of first-years from the top ten percent of their high school class. I find strong evidence that schools enroll more nonwhite students and have lower mean SAT scores in years when they do not charge an application fee, although there is no effect of the fee on first-years from the top ten percent of their high school class. Notably, I find that removing the application fee has no effect on the number of applications that a school receives. Removal of the application fee appears to increase diversity at liberal arts colleges, with no effect on academic quality as measured by number of first-years from the top ten percent of their high school class.

Acknowledgments

I would like to thank Professor Sam Gunter for working with the ten thesis students this year. She was a massive help in giving us tips and keeping us on schedule. I would like to thank Professor Ben Scharadin for being my second reader, and for numerous conversations about my project, particularly with regards to my empirical section. I would like to thank Professor Tim Hubbard for working with me on this project from late August, when I did not yet have an idea for a project, all the way through its completion in May. His constant willingness to meet and give advice were essential to the successful completion of this paper. Finally, thank you to all professors in the Colby Economics Department. Without all of the support, both during the project and over the past four years, I would not have been able to complete this.

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1 Introduction

In 2020 the average college application fee amount was only $44 among 936 ranked colleges that provided U.S. News with application fee data (Kerr 2020). The highest fee belonged to University of California San Diego at 105 dollars, while Arkansas Baptist's 100-dollar fee was the only other fee in the triple digits. A $44 average fee seems insignificant. However, most students apply to multiple schools, so a $44 average fee can easily turn into $300 or more spent on applications alone. A 2019 report from the National Association for College Admission Counseling found that since the fall of 2014, the percentage of freshmen applying to seven or more colleges has hovered between 35 and 36 percent (Clinedinst 2019). Further, more than 80 percent of all freshmen have applied to at least three colleges since the fall of 2013. These numbers suggest that application costs can add up quickly. For example, a student applying to seven schools, each with an average fee of $44, would end up paying over $300 in application fees, and some students apply to more than seven schools, each of which could possibly have a fee greater than $44. These statistics shed some light on how a seemingly small barrier to apply can deter many students.

While the focus of the following pages is to analyze the effect of college application fees on four outcome variables, I place a secondary emphasis on commenting on the effects of two additional admissions policies: Common Application membership and standardized test requirements. Choosing to join the Common Application is a choice with fewer tradeoffs for colleges than the choice to

remove the standardized test requirement. In order to join the Common Application, a college pays an annual fee based on the number of applications the school receives (Liu et al. 2007). In return, the school makes the application process significantly more efficient for students. By simply filling out the Common App and any additional school-specific essays, a student can apply to many schools with ease. Standardized test requirements, however, come with more tradeoffs. Many colleges prefer to maintain the appearance of elite status; requiring the submission of a standardized test score is an attempt to do that. On the other hand, there has been a push in recent years to expand access to higher education; removal of the standardized test requirement is a popular choice to attempt to achieve this end. Investigating both the merits and predictive ability of standardized tests in higher education has become a hot topic for researchers. Camara and Schmidt (1999) find stark performance differences among racial and socioeconomic groups, with white test-takers performing nearly 200 points better than their African American peers. With researchers and higher education officials calling into question both the predictive power and fairness of standardized tests, many schools, particularly liberal arts schools, have made the decision to stop requiring the submission of such scores. Figures A1 and A2 in the appendix highlight the difference between the two policy decisions. The Common App was already popular in 2002 and became more popular during the sample period. Test optional policies were rare in 2002, with only 18 schools falling into this category. This number steadily rose to 104 in 2019.

The paper proceeds as follows: section 2 reviews the application process and discusses the costs and benefits associated with applying to college; section 3 discusses application fees and the behavior of colleges; section 4 reviews previous literature on admissions policy changes; section 5 introduces the data; section 6 builds an empirical model; section 7 estimates the equations from the previous section; and section 8 discusses results and concludes the paper.

2 Application Process

In this section I give an overview of the costs and benefits associated with applying to college. The key takeaway is that removing the application fee removes a salient application cost, which decreases the price of "purchasing" an application; the result should be an increase in applications.

2.1 Application Costs

The cost of applying to a college can be broken into two broad categories: monetary costs and time costs. Monetary costs include travel costs if a prospective student chooses to visit a school before applying, standardized test costs if the school requires a standardized test, and notably, the application fee if the institution charges one. Time costs include time to research the school, time to visit the school, and time filling out the application, although the Common Application has greatly reduced the amount of time required to apply to a school. For schools that accept the Common Application, a student only needs to fill out the application and write a supplemental essay if the school requires one. College application costs can be formalized as follows:

$$Cost = M_{travel} + M_{test} + M_{fee} + T_{research} + T_{visit} + T_{app} \qquad \text{(C)}$$

where M represents monetary costs and T represents time costs.

2.2 Benefits of Applying

The major benefit of applying to additional schools is increased chance of enrollment. Smith (2013) finds that increasing the number of applications from one to two and then two to three increases a student's chances of enrollment by 40 and 10 percent respectively. The second major benefit is increased chance of matriculating at a school that is a match for the student. In higher education literature, mismatch occurs when a high ability student attends a low-quality school, or a low ability student attends a high-quality school (Dillon & Smith 2013). This is the formal definition of mismatch. However, mismatch also occurs on a more informal level; if a student does not fit in at their school, for any reason, this is also a case of mismatch. Additional applications give students the benefit of more financial aid offers, which increases the probability that they will receive a favorable aid package. Finally, students might receive application benefits in the form of externalities. For example, a student could reap the benefits of an enjoyable college visit, even if they do not end up matriculating at the school. College application benefits can be formalized as follows:

$$Benefit = B_{enroll} + B_{match} + B_{aid} + B_e \qquad \text{(B)}$$

2.3 Optimal Application Behavior

Application costs and benefits vary among students and among schools, making them difficult to formalize. However, it is still possible to draw some conclusions. Using the standard two-good choice theory framework can help show why this is the case (Varian 2010). Let's assume each school to which a student is considering applying is a separate choice problem. In this problem, let x_1 represent the school and x_2 represent all other goods. In college admissions, consumption of good 1 is binary: a student either applies or does not apply. Consumption of good 1 and good 2 depends on income, prices of goods 1 and 2, and preferences. Eliminating a fee has no effect on income; it also should not have an effect on preferences. Equation (C) above is the price of applying to each school and is unique to each school. Eliminating the fee is a reduction in price, and in the standard choice model this should induce the consumer to consume more of good 1. However, consumption in this problem is binary, so a drop in price does not necessarily mean that every student will apply to a school; it only means that the probability of applying increases for each individual student.

3 Application Fees

This section explores reasons why a school would charge a fee, and why some schools have decided to remove their fee. On average, schools that do not charge a fee are of lower quality than schools that do charge a fee, although this trend has been changing in the last decade with highly ranked schools like Carleton College, Colby College, and Grinnell College deciding to remove their fees. The mean

acceptance rate for these three schools across all 18 years of the sample period was 31%. However, the median national liberal arts college rank among schools without a fee in 2019 was 96, while the median rank for schools with a fee was 71. This illustrates the distinction in quality between schools with and without a fee.

3.1 Reasons to Charge a Fee

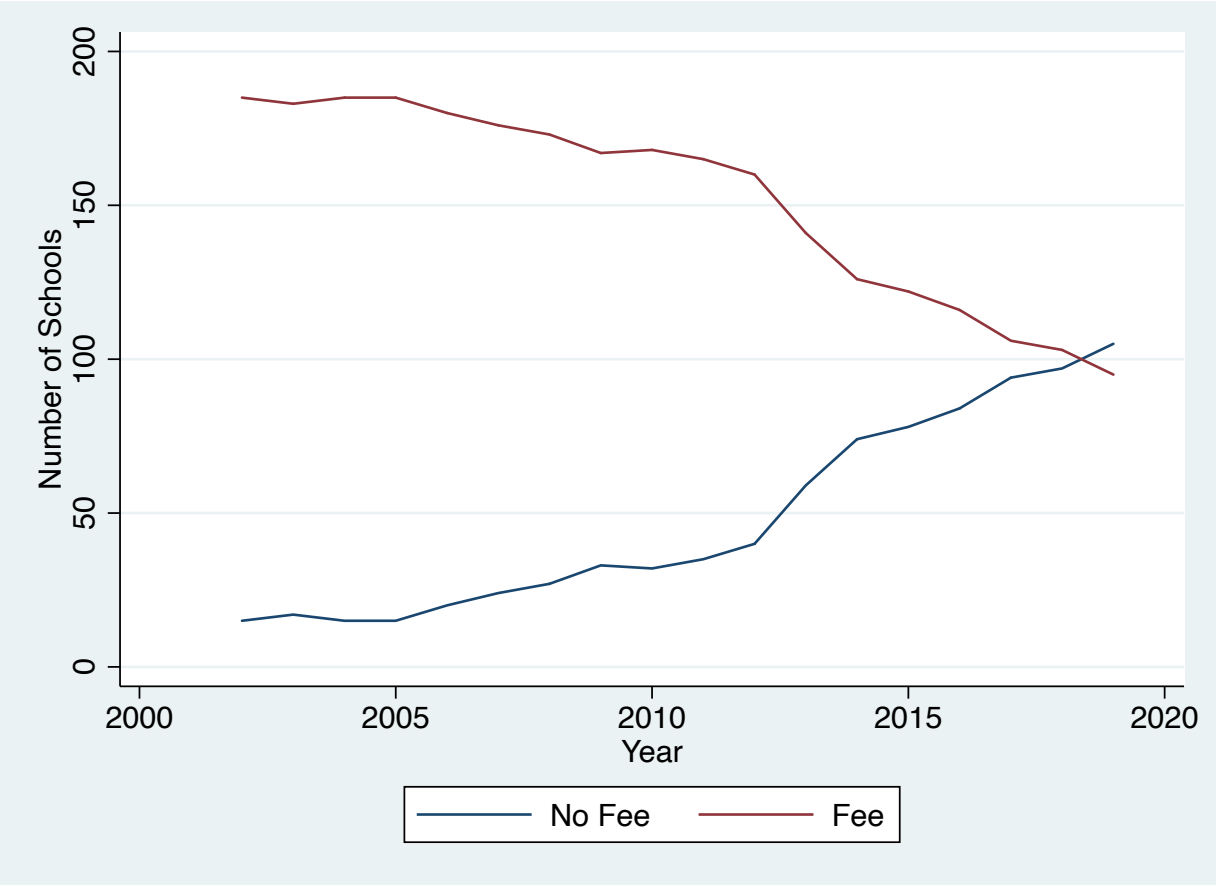
There are several reasons why a college would charge an application fee. Kirkman (1962) performed a survey on 117 colleges and universities across the United States to determine the extent to which colleges require an application fee or a room deposit. 33 of these colleges charged an application fee; they cited a number of reasons to justify the decision. 24 of the schools claimed that the fee helped in the cost of processing applications, 16 stated that the fee served as a barrier meant to ensure that only "serious" students submitted an application, 10 stated that the fee served to reduce the number of students applying to multiple schools, and 2 used the fee to discourage unqualified students from submitting an application. Seven other reasons were cited by only a single college. These included: making for early applications, discouraging "frivolous" applications, stabilizing applications, state policy, making applications more official, being able to make more accurate enrollment projections, and curtailing "insurance" applications. Notably, none of the schools indicated that they charged a fee as a status symbol.

3.2 Reasons to Eliminate a Fee

The obvious reason for eliminating the application fee is to increase access to a school. If the fee acts as a hurdle, albeit a small one, eliminating the fee should

remove the hurdle and allow easier access to a school. Figure 1 below shows the number of schools that have removed the fee over time. The plot shows a few schools removing their fee in the first several years of the sample, followed by a slight uptick from about 2012 onward. In 2019, the first year with more schools not charging a fee, 95 schools still charged a fee while 105 did not.

Figure 1: Schools Charging a Fee Over Time



4 Literature Review

This paper fits into a body of literature that has looked at the effect of screening mechanisms in the college application process on application volume, student body quality, and student body diversity. Screening mechanisms that have been analyzed in addition to the application fee include standardized test

requirements, Common Application membership status, and supplemental essay requirements. This paper deviates from previous work in several ways, including the recency of the data, the focus on private liberal arts colleges, and coding the key explanatory variable, the application fee, as an indicator. My work most closely follows the paper by Belasco, Rosinger, and Hearn (2015). They assess the relationship between test optional policy implementation on four key outcomes: proportion of low-income students, proportion of minority students, application volume, and average test scores. They find that test optional policies enhance the perceived selectivity of institutions rather than the diversity of participating institutions. Utilizing a difference-in-difference strategy on 180 liberal arts colleges between 1992 and 2010, they find that test optional policies yield no effect on the percentage of minority and low-income students that a college accepts. Further, they find mixed evidence that these policies increase the number of applications that a school receives. Not surprisingly, they find that test optional schools report higher average SAT scores than schools that require standardized tests for admission consideration. Because of the similarity between our variables of interest and our focus on liberal arts colleges, I closely follow their model in my empirical section. The major difference is that the policy change they focus on is the decision to go test optional, while the policy change that I focus on is the decision to eliminate the application fee.

Smith, Hurwitz, and Howell (2014) look at the effect of both application fees and admissions essay requirements on several key outcomes, including number of

applications, acceptance rate, yield, retention rate, student body composition, and average SAT scores. They find that both the application fee and the essay requirement are negatively related with the number of applications a school receives. Additionally, they find that eliminating application fees is a good policy tool to increase the number of minority students at an institution. My work deviates from theirs in several ways. First, I code my key variable of interest as an indicator, while they take the log of the application fee. I do this because I am primarily interested in treating the decision to eliminate the application fee as a policy change; I am not concerned with analyzing the effects of fluctuations in fee amounts. Second, I use a data set that spans to 2019, the most recent year with available data. Their data spans 2003 to 2011. Lastly, and similarly to Belasco et al. (2015), I focus on liberal arts colleges, while Smith et al. (2014) do not restrict their sample based on type of college.

Liu, Ehrenberg, and Mrdjenovic (2007) look at the effect of Common Application membership on application volume. They find that Common Application membership increases applications by 5.7 to 7.0 percent, decreases SAT scores, and increases the percentage of students of color. While not the focus of their paper, Smith et al. (2014) find that adoption of the Common Application leads to no significant change in the volume of applications received. They attribute this finding to the fact that the Common Application was already fairly widespread at the time of their paper. While the application fee is the primary variable of interest, I also include a Common App variable in three out of five of my models and

therefore will be able to comment on how this impacts college admissions for private liberal arts colleges.

Pallais (2015) analyzes a 1998 policy change that increased the number of free ACT score report sends from three to four. She finds, not surprisingly, that this policy change led to a sharp increase in the number of students sending four score reports and a nearly identical drop in the number of students sending three score reports. At the time of her paper, the cost of sending an additional ACT score after send number four was only 6 dollars. Thus, the change in behavior that she analyzes occurred after a seemingly small change in cost, which offers evidence that prospective students respond to small changes in price when those changes are from a positive cost to zero. She also finds that students sent more applications following the policy change. Her final finding of note is that low-income ACT takers attended more selective colleges following the policy change.

5 Data

Data come from several sources, including the U.S News and World Report, the Common Application, and the Integrated Postsecondary Education Data System (IPEDS). The vast majority of data are from the U.S. News and World Report. This data includes information on application fees, as well as critical dependent variables, such as number of applications, diversity statistics, average SAT scores, and percentage of first-years from the top ten percent of their high school class. Data span 2002-2019, which is the most recent year with available data.

5.1 Sample Selection

Included in the original data from U.S. News is information on 221 liberal arts colleges. I drop schools from the data for two reasons. I first drop 14 schools from the sample that either shut down or were bought by another school during the sample period. I do this because 12 of the 14 schools in this group did not have data for the entire period. Additionally, schools facing the prospect of a shutdown likely have severe demand issues that could interfere with potential effects of the fee. I next drop 7 schools that did not shut down during the sample period, but for some other reason did not report data for the entire period. This leaves me with a balanced panel of 200 schools that reported data for 18 years, resulting in 3600 total observations. The schools are generally ranked in or near the top 200 in the U.S. News and World Report National Liberal Arts Colleges rankings.

5.2 Additional Data Sources

I integrate additional data from the Common Application. This data tells me which schools use the Common Application and when they joined. The Common Application data that I have only runs to 2009-2010. I identified more than thirty schools that have joined the Common App since then. Through emails to school admissions departments, I was able to fill in many of these gaps in the data. However, I am left with nine schools that currently utilize the Common App but the year they joined is unknown. To alleviate this problem, I first assume that these nine schools joined the Common App in 2020; this year is later than the data that I have, which means for the purposes of this paper I treat these schools as not being

part of the Common App at any point. This is the assumption that I make for the results I present in section 7. I next assume that these nine schools all joined the Common App in 2010-2011, the first year for which I do not have data. I estimate equation (5), which I present in the following section, on each of the four key outcome variables using this assumption; these results are located in Table A2 in the Appendix. Another potential issue with the Common App data is that schools that used the Common App in 2009-2010 could have left in the period between then and now; this is unlikely given that only two schools withdrew from the Common App between 2002 and 2010, but it is still a consideration worth noting. The results from Liu et al. (2007) indicate that Common Application schools receive more applications than non-member schools, holding all else fixed. For this reason, I utilize Common Application data to control for the fact that ease of application as a result of being a Common App member school should have a positive effect on the number of applicants a school receives. Returning to the discussion of costs and benefits of applying to college in section 2, a school joining the Common Application reduces the time needed to apply. This reduction in time leads to a reduction in the cost of applying, which should increase applications to a school.

I integrate data from IPEDS to control for differences in testing policies among the sample of schools. Some schools require prospective students to submit standardized test scores, namely the ACT or SAT, while others recommend but do not require standardized test scores, while still others are indifferent as to whether or not a prospective student submits standardized test scores. The elimination of a

standardized test requirement should induce more students to apply, as students who are hesitant to apply due to poor test scores no longer have to deal with this reservation. Robinson and Monks (2004) performed a case study on test optional policy implementation at Mount Holyoke College. Unsurprisingly, they found that students who did poorly on the SAT relative to their high school GPA were more likely to withhold their test scores. Further, they found that students who withheld their scores were rated more highly by the admissions department than they would have been rated had they submitted their score. This demonstrates that students behave strategically in college admissions. Schools fall into one of several categories with regards to testing policy. Schools either require the submission of standardized test scores, recommend submission, neither require nor recommend them, or consider but do not require them. I simplify schools into two categories: schools that strictly require the submission of at least one standardized test score for consideration, and schools that do not require the submission of a standardized test score.

5.3 Summary Statistics

Table 1: Summary Statistics for Schools not Charging a Fee in 2019

Variable	Min (all years)	Max (all years)	2002	2019
No Fee	0	1	0.12 (0.33)	1 (0)
Common App	0	1	0.61 (0.49)	0.81 (0.39)
Test Optional	0	1	0.06 (0.23)	0.53 (0.50)
Acc. Rate	4	100	72.27 (14.46)	63.96 (19.55)
Enrollment	196	3128	1341.63 (564.11)	1319.90 (592.53)
Tuition	507	61,100	20,321.75 (5580.58)	42,667.09 (11,416.64)
Expenditure	3,948,994	168,000,000	24,400,000 (1,500,000)	41,500,000 (28,000,000)
Package	8081	56,230	16,820.17 (3451.68)	36,647.93 (8054.65)
Apps	105	13,584	1680.08 (1007.55)	3465.21 (2267.10)
Nonwhite	9.77	1536.64	231.78 (175.06)	451.53 (257.69)
SAT	704	1440	1157.88 (89.29)	1185.65 (105.31)
Top Ten	3.48	556.14	135.98 (95.02)	124.39 (107.17)
Institutions			105	105

Standard deviations in parentheses

Table 1 above, Table 2 below, and Figure 2 below illustrate the differences between schools that do not charge a fee and schools that do charge a fee. Schools with a fee have higher enrollments, SAT scores, and lower acceptance rates on average. This is true in both 2002 and 2019. Further, schools with a fee offer higher financial aid packages and have more financial resources than non-fee schools. In part because of higher enrollments, fee schools enroll more nonwhite students and more first-years from the top ten percent of their high school class in both periods. These facts illustrate that in general, schools that eliminate their fee are of a lower quality compared to schools that choose to charge a fee.

Table 2: Summary Statistics for Schools Charging a Fee in 2019

Variable	Min (all years)	Max (all years)	2002	2019
No Fee	0	1	0.02 (0.14)	0 (0)
Common App	0	1	0.71 (0.46)	0.79 (0.41)
Test Optional	0	1	0.13 (0.33)	0.51 (0.50)
Acc. Rate	7	100	57.07 (20.81)	52.03 (25.55)
Enrollment	96	3755	1680.40 (640.00)	1759.73 (695.06)
Tuition	4392	61,062	21,799.51 (6738.84)	43,879.58 (14,705.54)
Expenditure	2,935,558	192,000,000	35,500,000 (21,900,000)	69,100,000 (44,900,000)
Package	3500	59,966	18,344.36 (5250.54)	39,967.53 (12,981.75)
Apps	39	13,264	2741.96 (1700.00)	5416.91 (3098.57)
Nonwhite	8.92	3711.73	513.79 (497.07)	737.25 (460.62)
SAT	663	1520	1198.39 (143.25)	1253.34 (151.46)
Top Ten	3.54	660.33	206.05 (142.55)	210.65 (163.83)
Institutions			95	95

Standard deviations in parentheses

5.4 Change in Outcome Variables

Figure 2 below shows the change in the mean of the four outcome variables for schools that did not charge a fee in 2019 (dashed line) and schools that did charge a fee in 2019 (solid line). The dashed line plots changes for the 105 schools without a fee in 2019 over the 18-year period; the solid line plots changes over time for the 95 schools with a fee in 2019. The upper left panel, corresponding to the change in applications over time, reveals two things. First, schools with a fee always receive more applications. Second, although applications have steadily been on the rise for both schools, the gap between schools without a fee and schools with a fee has increased during the sample period. The upper right panel shows a steady

increase over time in the number of enrolled nonwhite students at liberal arts colleges. Again, schools with a fee always enroll more nonwhite students, partly because they have higher enrollments than non-fee schools. The gap between the two types of schools remains stable over time. The lower left panel reveals that mean SAT scores fell for both types of schools from 2005 to about 2016, and then jumped sharply. This could be due to a declining reliance on the SAT from 2005 to 2016, followed by an increase in the number of schools going test optional. The results from Belasco et al. (2015) suggest that schools that do not require the submission of standardized test scores report higher mean SAT scores than schools that do. Finally, the lower right panel shows that fee schools always enroll more first-years who finished in the top ten percent of their high school class

Figure 2: Change in Outcome Variables Over Time (dashed line = no fee in 2019)

6 Empirical Models

6.1 Models

I closely follow the model presented by Belasco et al. (2015) when constructing models to estimate the effects of college application fees. They answer a similar question with a focus on liberal arts colleges; the key difference is our independent variable of interest. Covariates that they include are full-time enrollment, annual tuition and fees, institutional grant award per full-time enrollment, education and related expenditures per full-time enrollment, admission rate, and a dichotomous variable indicating whether a college adopted a no-loan financial aid policy in a given year. Financial variables as well as enrollment are logged to ease interpretation, a practice I adopt in my own estimations. Equation (5) below, the most complete model, most closely resembles the equation that Belasco et al. (2015) estimate, with a few minor changes.

I begin with a fixed-effects regression of each outcome variable on the key independent variable, while also including college fixed effects. The first model looks as follows:

$$Y_{st+1} = \beta_0 + \beta_1 NoFee_{st} + S + \epsilon \qquad (1)$$

where Y_{st+1} is the dependent variable, $NoFee_{st}$ is the independent variable of interest and is equal to one in years when a school did not charge an application fee, S are college fixed effects, and ϵ is a randomly distributed error term. I shift the

dependent variables forward by one year because applications in year *t* should be dependent on the characteristics of a school in year *t-1;* shifting dependent variables forward by one year produces the same effect as would lagging independent variables by a year. I include college fixed effects to control for differences between schools that are stable within a school over time. For example, campus size and location are characteristics of colleges that differ among schools but are not likely to change over time.

In the next model I incorporate year fixed effects to control for differences that occur from year to year that affect all schools in the sample. For example, a year with more high school graduates than other years might have a positive effect on the number of applications that schools across the country receive. Year fixed effects control for differences of this type. The second model with year fixed effects looks as follows:

$$Y_{st+1} = \beta_0 + \beta_1 NoFee_{st} + S + T + \epsilon \qquad (2)$$

where T represents year fixed effects.

I next integrate the Common Application data discussed in the previous section. The results from Liu et al. (2007) suggest that the convenience to apply to a school as a result of utilizing the Common App has a positive effect on the number of applications that a college receives. The third model looks as follows:

$$Y_{st+1} = \beta_0 + \beta_1 NoFee_{st} + \beta_2 CommonApp_{st} + S + T + \epsilon \qquad (3)$$

where $CommonApp_{st}$ is equal to one in years that a school accepted the Common App. Having this data will allow me to comment on the findings of Liu et al. (2007), who found a positive relationship between Common App membership and applications, and the findings of Smith et al. (2014), who found no relationship between Common App membership and applications.

In model four I bring in the test requirement data from IPEDS. The results from Belasco et al. (2015) suggest that test optional policy has an effect on college admissions; namely, schools that are test optional should see a boost in applications and mean SAT scores. The fourth model looks as follows:

$$Y_{st+1} = \beta_0 + \beta_1 NoFee_{st} + \beta_2 CommonApp_{st} + \beta_3 TestOptional_{st} + S + T + \epsilon \qquad (4)$$

where $\beta_3 TestOptional_{st}$ is an indicator variable specified in section 5.2.

Finally, I integrate variables from Belasco et al. (2015). These are variables that differ among colleges and within a college over time; because of this they would not be captured by either college or year fixed effects. The five additional variables I include are acceptance rate, enrollment, tuition, expenditures, and average financial aid package. Acceptance rate should have a negative effect on applications because schools with higher acceptance rates are likely to be worse quality and therefore should see fewer applications. Enrollment should have a positive effect on

applications, as schools with higher enrollments likely receive more applications than schools with lower enrollments in order to maintain their higher enrollment. Belasco et al. (2015) find that tuition has no effect on applications. However, assuming that high-quality schools charge higher tuition than low-quality schools, it would make sense for tuition to have a positive effect on applications. The expenditures variable is equal to the sum of instruction expenditures, institutional support expenditures, and academic support expenditures; this is analogous to the education and related expenditures variable from Belasco et al. (2015). Expenditures should have a positive effect on applications because expenditures are a good proxy for endowment, and schools with high endowments have the capacity to advertise more heavily than schools with low endowments. Average financial aid package is simply the average financial aid package among undergraduates. This variable is also correlated with endowment and therefore should have a positive effect on applications. I take the natural log of the previous variables except for acceptance rate. The final model, including college and year fixed effects, Common Application data, and five variables based on the model from Belasco et al. (2015) looks as follows:

$$Y_{st+1} = \beta_0 + \beta_1 NoFee_{st} + \beta_2 CommonApp_{st} + \beta_3 TestOptional_{st} + \gamma X_{st} + S + T + \epsilon \quad (5)$$

where X_{st} represents the five variables from Belasco, including: acceptance rate, logged enrollment, logged tuition, logged expenditures, and logged average financial aid package.

6.2 *Potential Shortcomings*

With the previous five equations in mind, it is important to acknowledge any shortcomings or potential sources of bias. Omitted variable bias results when two conditions are met (Hanck et al. 2020). First, an omitted variable must be correlated with the regressor. In this case the regressor is the application fee. Second, an omitted variable must also be correlated with the outcome variable. I have four outcome variables to consider. Several controls attempt to alleviate the first problem. For example, schools might eliminate their fee in response to declining enrollment as a way to stimulate applications; including the natural log of enrollment attempts to control for this issue. However, there could be reasons that a school eliminates its fee which I have not included in the empirical models. The second problem is more difficult to alleviate. One reason for this is that I focus on four outcome variables. This means that the omitted variables that cause bias could be different for each dependent variable. Finally, there are some variables that I would have liked to access but simply could not. These include supplemental essay requirements, whether or not a school allows for early decision or early action, and application deadline.

7 Results

7.1 Applications

Table 3: Application Fee Effects on ln(Applications in *t+1*)

VARIABLES	(1)	(2)	(3)	(4)	(5)
No Fee	0.30***	0.03	0.03	0.03	-0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Common App			0.03	0.03	0.08*
			(0.05)	(0.05)	(0.04)
Test Optional				0.01	0.06**
				(0.03)	(0.03)
Acc. Rate					-0.01***
					(0.00)
ln(Enrollment)					0.64***
					(0.13)
ln(Tuition)					0.40***
					(0.13)
ln(Expenditure)					-0.09
					(0.08)
ln(Package)					-0.10
					(0.08)
College FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes
Constant	7.80***	7.52***	7.51***	7.50***	2.05
	(0.01)	(0.02)	(0.04)	(0.04)	(1.98)
Observations	3,265	3,265	3,265	3,265	2,858
R-squared	0.07	0.30	0.30	0.30	0.42
Number of ID	200	200	200	200	198

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

I first estimate each of equations (1)-(5) on the natural log of applications in period *t+1*. Following the work of Smith et al. (2014), I convert applications to log form to make for easy interpretation. Results for the estimates of the effect of the fee on the natural log of applications in period *t+1* are found in Table 3 directly above. The first and simplest model produces a significant coefficient of 0.30,

implying that schools receive 30% more applications in years when they do not charge a fee compared to years in which they do. This is a promising early result, but given the simplicity of this model, I need to find significance in the more advanced models in order to be confident that there is a positive relationship between going fee free and seeing an increase in applications. However, estimates for columns (2), (3), and (4) are identical and insignificant, suggesting the fee does not have an effect on the number of applications a school receives. The last and most complete model produces another insignificant coefficient, suggesting no change in applications if a school removes their fee. This is a puzzling finding given previous literature on the subject, particularly that of Smith et al. (2014). I offer several possible explanations for this result in the following section. Also of note, the Common Application is positive and significant in the final model, suggesting Common App membership is associated with an 8% increase in applications, holding all else fixed. This aligns with the findings of Liu et al. (2007) and runs contrary to the findings of Smith et al. (2014). However, this result should be interpreted with some caution given the Common App data issues I discussed earlier. Finally, schools receive 6% more applications when they do not require the submission of a standardized test score for consideration in admissions, holding all else fixed in the model. This finding supports the work done by Belasco et al. (2015), and offers some evidence that students respond to changes in application policies.

7.2 Diversity

Table 4: Application Fee Effects on ln(Enrolled Nonwhite Students in *t+1*)

VARIABLES	(1)	(2)	(3)	(4)	(5)
No Fee	0.38***	0.12***	0.12***	0.12***	0.11***
	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
Common App			0.18***	0.19***	0.20***
			(0.07)	(0.07)	(0.07)
Test Optional				0.01	0.03
				(0.03)	(0.03)
Acc. Rate					-0.00
					(0.00)
ln(Enrollment)					0.72***
					(0.12)
ln(Tuition)					0.11
					(0.13)
ln(Expenditure)					0.01
					(0.08)
ln(Package)					0.32***
					(0.09)
College FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes
Constant	5.84***	5.56***	5.44***	5.44***	-4.15*
	(0.01)	(0.02)	(0.05)	(0.05)	(2.12)
Observations	3,215	3,215	3,215	3,215	2,840
R-squared	0.15	0.51	0.52	0.52	0.60
Number of ID	200	200	200	200	198

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The second outcome variable of interest is the logged number of nonwhite undergraduates in period *t+1*. Results for this variable are found in Table 4 directly above. The first estimate is a significant coefficient of 0.38, implying that schools

increase their enrollment of nonwhite students by 38% when they eliminate the application fee. The magnitude of the final four estimates drops substantially from this initial coefficient, but they remain stable and significant. The second model yields a coefficient of 0.12; including year fixed effects greatly diminishes the effect of the fee on the percentage of enrolled nonwhite students, although the effect is still positive. The R-squared of this model also jumps to 0.51 from 0.15 in the previous model. Including the *Common App* and *Test Optional* variables in the third and fourth models does not change the estimate. The final model produces a nearly identical coefficient of 0.11. This final and most important result suggests that schools enroll 11% more nonwhite students in years without a fee compared to years with a fee, all else fixed. These five estimates are consistent in suggesting a positive relationship between the elimination of the fee and the percentage of enrolled nonwhite students. Also of note, Common App membership has a large, positive effect on enrolled nonwhite students in all three models it is present, suggesting schools enroll 20% more nonwhite students when they join the Common Application, holding all else fixed in the final model. Test policy does not have an effect in either of the final two models. Results for the second variable strongly suggest that although schools see no change in applications when they do not charge a fee, they do enroll more nonwhite students.

7.3 SAT Scores

Table 5: Application Fee Effects on Mean SAT Scores of Enrolled Students in *t+1*

VARIABLES	(1)	(2)	(3)	(4)	(5)
No Fee	-0.82	-13.98***	-13.99***	-14.37***	-12.13***
	(4.05)	(3.71)	(3.68)	(3.70)	(3.66)
Common App			-10.60	-9.75	-2.05
			(6.64)	(6.81)	(7.34)
Test Optional				11.67**	13.48**
				(4.86)	(5.20)
Acc. Rate					-0.28**
					(0.13)
ln(Enrollment)					42.10***
					(12.97)
ln(Tuition)					-17.60
					(23.13)
ln(Expenditure)					20.02*
					(11.35)
ln(Package)					10.48
					(10.99)
College FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes
Constant	1,178.56***	1,178.27***	1,185.68***	1,184.24***	630.60**
	(0.81)	(2.54)	(5.14)	(5.39)	(305.25)
Observations	2,910	2,910	2,910	2,910	2,595
R-squared	0.00	0.27	0.27	0.28	0.31
Number of ID	194	194	194	194	194

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

The next set of estimates seek to identify the effect of the application fee on the average SAT scores among all undergraduates in period *t+1*. Results for the third variable of interest are found in Table 5 directly above. The first model returns an insignificant coefficient, implying the application fee has no effect on the average SAT scores at a college. However, because of its simplicity and the fact that the R-squared is 0, I can dismiss this model and instead rely on models (2)-(5) to comment on the effect of the application fee on mean SAT scores. Introducing year

fixed effects into the model yields a significant coefficient of -13.98, implying that schools have average undergraduate SAT scores that are 13.98 points lower when they do not charge an application fee compared to years in which they do. Further, the R-squared jumps to 0.27, a large increase in predictive power from the previous R-squared of 0. The addition of the *Common App* variable to the model does not change the magnitude of the *No Fee* coefficient in a meaningful way. The fourth model, with the addition of the test policy variable, raises the magnitude slightly to -14.37. As expected, test optional policy has a positive effect on mean SAT scores. The final estimate returns a significant coefficient of -12.13. The *Test Optional* variable has a higher magnitude of 13.48, implying schools have mean undergraduate SAT scores that are 13.48 points higher when they are test optional, all else fixed. This finding aligns with the work of Belasco et al. (2015), although they found that test optional policy had a larger effect on SAT scores than I did. I can conclude with a fair degree of confidence that eliminating an application fee has a negative effect on the average SAT scores of a school; this result follows from the negative and significant coefficients in the four most advanced models. Finally, whether or not a school uses the Common App does not have an effect on mean SAT scores. Results from the first three variables suggest schools enroll more nonwhite students and have lower mean SAT scores when they do not charge a fee.

7.4 Top Ten Percent of High School Class

Table 6: Application Fee Effects on ln(Number of First-Years from Top 10 % of High School Class in *t+1*)

VARIABLES	(1)	(2)	(3)	(4)	(5)
No Fee	-0.12***	-0.01	-0.01	-0.01	-0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Common App			0.02	0.01	0.07
			(0.04)	(0.04)	(0.04)
Test Optional				-0.02	-0.00
				(0.03)	(0.03)
Acc. Rate					-0.00**
					(0.00)
ln(Enrollment)					0.65***
					(0.11)
ln(Tuition)					-0.02
					(0.19)
ln(Expenditure)					0.14*
					(0.08)
ln(Package)					0.15
					(0.09)
College FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes
Constant	4.84***	4.85***	4.84***	4.84***	-3.37
	(0.01)	(0.02)	(0.03)	(0.03)	(2.66)
Observations	3,118	3,118	3,118	3,118	2,767
R-squared	0.02	0.08	0.08	0.08	0.14
Number of ID	199	199	199	199	196

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The final variable of interest is the logged number of enrolled first-year students in period *t+1* who finished in the top ten percent of their high school class. Results for this final variable are located in Table 6 directly above. The final variable seeks to determine if the increase in diversity that results from eliminating the fee also is associated with a change in academic quality. The results for the final variable suggest that there is no effect of the fee on academic quality as measured

by number of first-years from the top ten percent of their high school class. The first model is the only one with significance. Adding year fixed effects eliminates the significance. Models (3)-(5) remain close to zero and insignificant. *Common App* and *Test Optional* are also insignificant in all of the models they are present. The final variable of interest suggests that although schools see a drop in mean SAT scores along with an increase in diversity when they do not charge a fee, they do not see a change in academic quality as measured by number of first-year students from the top ten percent of their high school class.

8 Discussion

I do not find any evidence suggesting a positive relationship between removal of the application fee and applications. This conflicts with previous literature. I propose three reasons for this result which could be explored in more detail in further work. First, schools might eliminate their application fee in response to a decrease in demand. Thus, the proposed positive effect of eliminating the fee could be offset by a prior decline in applications. Second, the lack of significance could be the result of lack of access to data which was available to previous authors. For example, Smith et al. (2014) included many other controls which I was not able to include due to lack of access. Finally, it is possible that eliminating the application fee sends a signal of declining status to prospective students. This decrease in status could offset the monetary benefit that results from eliminating the fee. If liberal arts colleges desire a way to increase applications, removing the standardized test requirement appears to be a way to achieve this goal.

I find consistent evidence that eliminating the application fee has a positive effect on the number of nonwhite students enrolled, as all five models produce a positive and significant coefficient. This result likely follows from the fact that white households have higher incomes on average than any other group except for Asian Americans (Reardon et al. 2015). The opportunity cost of the application fee is inversely related with household income. With these two facts in mind, it makes sense that schools see an increase in the number of nonwhite students enrolled following the elimination of the fee. Further, campaigns to increase access in recent years could also have a positive effect.

I find consistent evidence that eliminating the application fee has a negative effect on the average SAT scores of a student body given that the four best models produced a negative and significant coefficient. This could result from decreasing reliance on the SAT in recent years. Figure 2 reveals a steady decline in mean SAT scores for all schools from 2005 to 2016, followed by a sharp spike in scores. This spike could correspond to a period when many schools began going test optional.

Finally, I find no effect of the application fee on the number of first-year students who come from the top ten percent of their high school class. This result is encouraging, suggesting that removal of the application fee does not have an effect on academic quality, even though it does have a negative effect on mean SAT scores. This result likely follows from research in recent years that has found a strong link between income and SAT scores, making it an imperfect measure of academic quality.

With the above results in mind, I can conclude that eliminating the application fee appears to be a sound policy tool to increase the number of enrolled nonwhite students at an institution. I cannot conclude whether this change occurs due to an increase in the number of minority students who applied or whether this change occurs because of concerted efforts by admissions departments to enroll a greater percentage of minority students. All I can say for sure is that schools enroll more minority students, on average, in years when they do not require a fee to apply. Additionally, I conclude that mean standardized test scores of enrolled students are lower when schools do not charge an application fee compared to years when they do. Again, I cannot say if this is because of a decrease in the mean test scores of applicants, or because of declining reliance on standardized tests in recent years, or because of some other reason. I did not have access to applicant data; all of the data I used in this paper, aside from number of applicants, were on enrolled students. Removal of the application fee, while a seemingly small policy change, does have effects on the makeup of schools. This policy tool has tradeoffs; mainly, schools enroll more nonwhite students following the policy change, but see a drop in their mean standardized test scores. Given the potential biases in the SAT, elimination of the application fee is a smart policy tool to increase diversity of a student body, with no change in academic quality.

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Appendix

Figure A1: Common App Membership Over Time

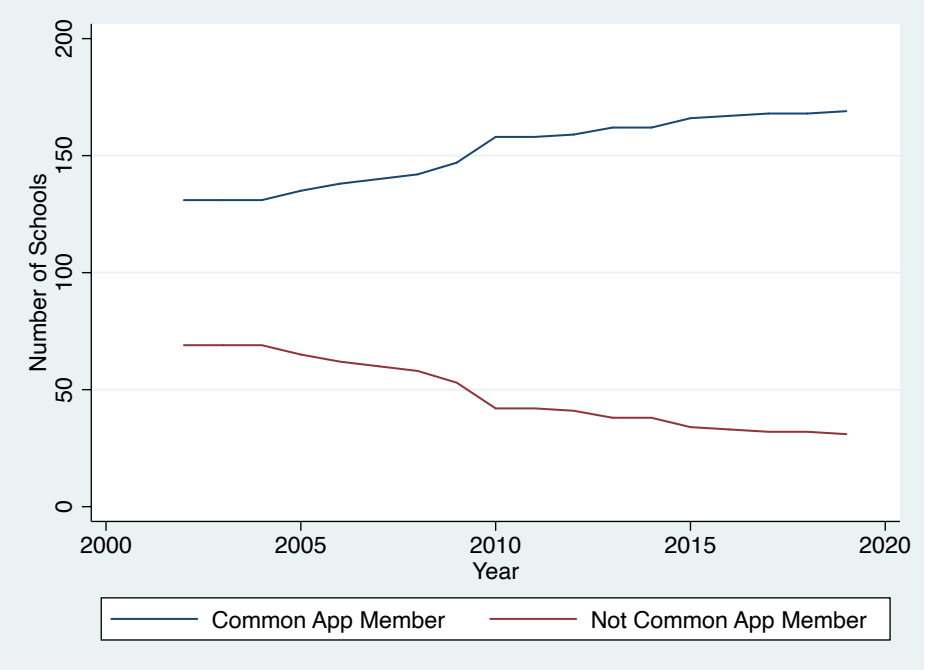

Figure A2: Number of Test Optional Schools Over Time

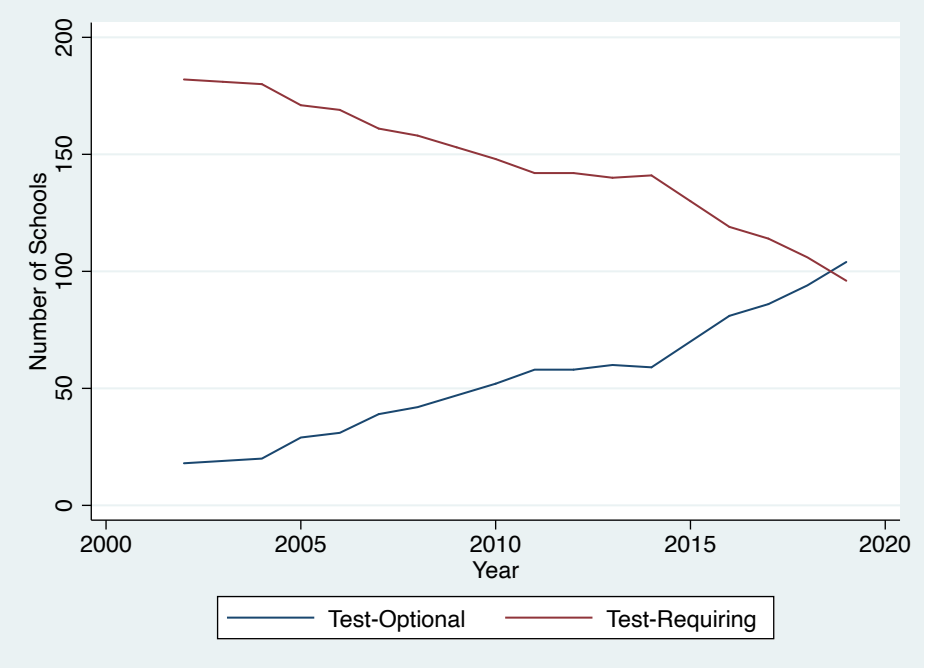

Table A1: Equation (5) Re-estimated on Period *t*

	(1)	(2)	(3)	(4)
VARIABLES	ln(Apps)	ln(Nonwhite)	Mean SAT	ln(Top Ten)
No Fee	-0.05*	0.11***	-10.60***	-0.00
	(0.03)	(0.03)	(3.48)	(0.02)
Common App	0.04	0.19***	-5.60	0.06
	(0.04)	(0.07)	(6.85)	(0.04)
Test Optional	0.08***	0.02	7.95*	0.01
	(0.02)	(0.03)	(4.41)	(0.02)
Acc. Rate	-0.02***	-0.00	-0.31**	-0.00
	(0.00)	(0.00)	(0.12)	(0.00)
ln(Enrollment)	0.92***	0.87***	40.91***	1.16***
	(0.11)	(0.12)	(12.83)	(0.08)
ln(Tuition)	0.38**	0.05	-26.02**	0.08
	(0.17)	(0.10)	(12.26)	(0.15)
ln(Expenditure)	-0.15**	-0.01	23.16*	0.08
	(0.08)	(0.08)	(12.83)	(0.07)
ln(Package)	-0.11	0.37***	6.76	0.26***
	(0.10)	(0.08)	(10.35)	(0.09)
College FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Constant	1.64	-4.91**	707.33***	-8.09***
	(1.92)	(1.96)	(263.08)	(2.13)
Observations	3,051	3,032	2,765	2,954
R-squared	0.52	0.63	0.30	0.23
Number of ID	199	199	194	198

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A2: Equation (5) Re-estimated Assuming 9 Common App Error Schools Joined in 2010-2011

	(1)	(2)	(3)	(4)
VARIABLES	ln(Apps *t+1*)	ln(Nonwhite *t+1*)	Mean SAT *t+1*	ln(Top Ten *t+1*)
No Fee	-0.01	0.11***	-12.22***	-0.00
	(0.03)	(0.03)	(3.66)	(0.03)
Common App	-0.00	0.12**	-4.67	0.05
	(0.04)	(0.06)	(6.45)	(0.04)
Test Optional	0.06*	0.03	13.33**	-0.00
	(0.03)	(0.03)	(5.19)	(0.03)
Acc. Rate	-0.01***	-0.00	-0.28**	-0.00**
	(0.00)	(0.00)	(0.13)	(0.00)
ln(Enrollment)	0.64***	0.73***	41.28***	0.65***
	(0.13)	(0.12)	(13.01)	(0.11)
ln(Tuition)	0.41***	0.12	-17.38	-0.02
	(0.13)	(0.14)	(22.90)	(0.19)
ln(Expenditure)	-0.09	0.01	19.60*	0.15*
	(0.08)	(0.08)	(11.32)	(0.08)
ln(Package)	-0.10	0.31***	10.68	0.14
	(0.08)	(0.09)	(10.95)	(0.09)
College FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Constant	2.23	-4.09*	641.36**	-3.38
	(2.02)	(2.11)	(302.74)	(2.65)
Observations	2,858	2,840	2,595	2,767
R-squared	0.42	0.59	0.31	0.14
Number of ID	198	198	194	196

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A3: Application Fee Effects on ln(First-Years with Financial Need in Period *t+1*)

VARIABLES	(1)	(2)	(3)	(4)	(5)
No Fee	0.07***	0.01	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
Common App			-0.01	-0.01	0.00
			(0.03)	(0.03)	(0.02)
Test Optional				0.00	0.02
				(0.02)	(0.01)
Acc. Rate					-0.00
					(0.00)
ln(Enrollment)					0.57***
					(0.08)
ln(Tuition)					0.16*
					(0.08)
ln(Expenditure)					-0.01
					(0.06)
ln(Package)					0.06
					(0.05)
College FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	Yes	Yes
Constant	5.54***	5.48***	5.48***	5.48***	-0.54
	(0.00)	(0.01)	(0.02)	(0.02)	(1.11)
Observations	3,089	3,089	3,089	3,089	2,783
R-squared	0.02	0.12	0.12	0.12	0.21
Number of ID	200	200	200	200	196

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1