What does Early Decision Buy: Higher acceptance and lower money?[*]

Gabrielle Chapman
Graduate School
Syracuse University
Syracuse, NY 13244
315- 443-3425
ghchapma@syr.edu

Stacy Dickert-Conlin
110 Marshall-Adams Hall
Michigan State University
East Lansing, MI 48824
517-353-7272
dickertc@msu.edu

[*] The authors would like to thank Michael Conlin, Johnny Yinger, and participants at the Michigan State University Empirical Micro Breakfast for helpful comments. We'd also like to thank Amy Brundage for research help.

1 INTRODUCTION

The entering fall 2008 college freshmen class will have been members of the U.S.'s largest graduating high school senior class in twenty years. This, coupled with an easier online application process, which has made applying to more than one college effortless, has caused applications to colleges and universities to dramatically increase.[1] Consequently, it has become increasingly difficult for students to differentiate themselves and signal their interest in the school. At the same time, colleges and universities are dealing with "phantom applicants[2]," who make selecting the truly interested students very difficult.

One strategy both students and schools increasingly rely on is early decision, which requires an applicant to sign an agreement that confirms the applicant's enrollment to the college if accepted. This trend has been heavily criticized. For example, "The Early-Decision Racket" (Fallows, 2001), published in the Atlantic Monthly, interviewed current and past college officials and alleges the bias of early decision programs towards privileged students and suggests evidence that colleges use early decision as a means of improving a college's reputation at the expense of intensifying the stress of high school seniors.

This article precipitated a national debate regarding the efficacy of early decision practices.[3] The debate centers around equity and efficiency arguments based on the

[1] The Washington Post, January 26, 2008 "Long Lines at College Gates; An application crush, driven in part by demographics, has more students bound for wait lists as schools face tricky admissions calculus."
[2] A term given to students who apply to a school they have no intention of attending. Charlotte Observer, March 6, 2008, "Getting may get harder: nation's largest senior class in 20 years, one-button online filing drive college application avalanche"
[3] While not necessarily causal in response to the article, three months after *The Atlantic Monthly* article was published in December 2001, Yale University's president, Richard C. Levin announced he would like to drop their early decision policy and "planned to put the matter before Yale's admissions committee after the Christmas vacation, but added that Yale would not abandon the early decision process alone, because it

binding nature of early decision. Opponents of early decision policies claim that early decision programs simply screen the students with the highest willingness to pay and serve as a strategy for raising a school's perceived quality by increasing measures like yield rates (the share of students who matriculate conditional on acceptance). Critics further claim that these distortionary tactics by colleges force students to make rash uninformed decisions and discriminate against less privileged students who are more likely to need to compare financial aid packages. Proponents argue that early decision allows colleges to learn who most wants to attend their school and, therefore generates better matches between students and colleges, while relieving the students' stress of waiting through the college application process.

This paper uses proprietary admissions data from two selective liberal arts colleges to shed some light on the debate. We look at both the students' decisions to apply early decision and how the colleges treat early decision applicants with respect to admission and financial aid decisions. Our data allow us to consider whether small liberal arts schools treat the process differently than the elite schools studied in the book by Avery et al. (2003). Like Avery et al., we find that the decision to apply early is positively correlated with higher incomes and private school attendance and negatively correlated with measures of academic ability, which is consistent with early decision being a way to signal a high ability to pay. One reason students with lower academic qualifications may be more likely to apply early decision is the high acceptance rate associated with early decision, conditional on observable characteristics. We provide at

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'would be seriously disadvantaged relative to other schools.'" In April of 2002, the University of North Carolina at Chapel Hill became the first major selective college to abandon early decision admissions. By November 2002, Yale and Stanford had announced their decision to eliminate their early decision practices.

least one plausible test that suggests this correlation is not due to characteristics not captured by admissions data, such as quality of match between the school and student.

While the early decision process is criticized for generating a homogeneous student body from the higher end of the income distribution, we consider whether the regular decision acceptance decisions attempt to achieve a more diverse student body. Finally, we use financial aid data from one of our schools to consider the possibility that applying ED directly affects financial aid offers. That is, do schools offer lower financial aid packages all else equal to those who apply early decision and, therefore, commit to attending conditional on acceptance?

We describe the institutional setting for early decision in Section 2. Sections 3 and 4 review the existing literature and build a conceptual framework for thinking about the issues. In section 5 we describe our proprietary data and Section 6 provides the results for our characterization of the students' and colleges' choices. Finally, we conclude in Section 7.

2. INSTITUTIONAL DETAILS

College admission is a complicated process marked by differing deadlines and application procedures. Consequently, it is necessary to understand the mechanics of the college admission process, the early decision process, and its effects on colleges and applicants. Regular admission is the traditional process for college applications. A high school senior has the first half of their senior year to visit, interview, and narrow down the list of prospective colleges from which to apply. The deadline for regular admission applications at most schools is January 1st. Colleges then notify the applicants of their acceptance or denial between March and April. If an applicant receives multiple

acceptances they must fill out enrollment forms and send a deposit by May 1st to the school of their choice.

According to *The State of College Admission 2006*, about 15 percent of four-year colleges offer an earlier admissions process (National Association for College Admission Counseling, 2006). Generally, there are two forms of early admissions: *early decision (ED)* and *early action (EA)*.[4] Both policies notify an applicant of their acceptance early in the admissions process. ED is a more restrictive policy where students may apply ED to only one school. Under an ED policy an applicant is usually notified by early or mid-December. Upon submitting an ED application to a college, the applicant and his or her guidance counselor are required to sign a written agreement which states that upon admittance to the school the applicant will attend. Once an ED applicant is notified of acceptance, he or she must withdraw applications from other pending schools. In contrast, EA allows a student to apply to a college, typically late October or early November and be notified of acceptance usually by January or February. An EA applicant may continue to apply to other schools through regular admissions and is not obligated to notify the early action school of their plans to attend before the regular admissions deadline.

We focus on the ED program, because the criticisms of early admissions programs have been on the binding nature of ED. Strictly speaking, the binding nature is not a legal agreement and early decision applicants may be released from this obligation if financial need is not met (Avery et al. 2003). However, the reputation of guidance counselors may be at stake. Also, if students determine that their financial need is not

[4] The distinctions are more subtle as described by the National Association for College Admissions Counseling (http://www.nacacnet.org/NR/rdonlyres/C041226C-4DE2-4D37-A111-5119F011A1C0/0/06SOCA_Chapter3.pdf, accessed 7/24/06) and Avery et al. (2003).

met ex post to withdrawing their applications from other colleges, the cost of reapplying may be very high.

3. PREVIOUS LITERATURE

A. Empirical

Although *The Atlantic Monthly* article brought national attention to early decision admission policies, Fallows (2001) was not the first to consider the issue. In fact, his article cites a working paper (Avery et al., 2001), now a published book, The Early Admissions Game, by Avery et al. (2003) that is the first empirical study to focus on the effects of early action and early decision policies. The authors use more than 500,000 applications from the admissions offices of 14 elite colleges between 1991 and 1997 to control for factors such as SAT I score, high school grade point average, legacy status, athlete status and type of high school to assess an applicant's admission chances. They estimate that applying ED increases an applicant's probability of admission by approximately 25 percent (Avery et al. 2003).[5] To consider whether admissions officers are observing some characteristics of the students not captured in recorded admission data, they include admissions office rating as an independent variable and find that the results change very little. Their results are confirmed using a 1999-2000 survey of 3,294 students at prominent private and public high schools throughout the country, which find that applying ED increases the probability of admission by 31 to 37 percent.[6] The remainder of their paper focuses on the optimal strategy of choosing a school to apply

[5] The authors estimate that EA increases an applicant's probability of admission by 18.9 percentage points, which correspond to an increase in the EA applicant's SAT I score of 100 points.

[6] Survey participants from public schools were among the top 10 percent of their class and survey participants from private schools were among the top 20 percent of their class. Their guidance counselors selected the participants based on their high grades and provided information from the common admission application and additional personal information about their accomplishments, applications, and application outcomes. The common application is a universal application used by 241 colleges and universities that students can fill out and submit to numerous schools. (www.commonapp.org).

early decision to. The level of discussion is mostly applicable for sophisticated college applicants.

B. Theoretical

The earlier theoretical literature considered early admissions as a special case of early contracting benefits only the more competitive applicants. Roth and Xing (1994) identify stiff competition as an explanation for market transactions to take place before the final known transaction date and their application is with respect to matching entry level professional employees with employers. In the context of early admissions the corollary is that it is advantageous for schools to be among the first to seek applicants and for applicants to be among the first seeking admittance to the schools. However, much like the controversy surrounding ED policies, Roth and Xing suggest early contracting has the potential to create inefficient market outcomes because transactions take place before all information is known. Consequently, as more information is revealed early contracts can result in mismatches.

Li and Rosen (1998) and Li and Suen (2000) further address early contracting. Li and Rosen (1998) suggest that early contracts disadvantage less promising applicants because they have less time to even out their qualifications. Li and Suen (2000) identify a "top clearing" pattern in which more qualified and competitive applicants have an incentive to sign early contracts. The consensus in both theoretical papers is that higher quality applicants sign early contracts as a form of insurance against uncertainty in competitive markets. ED policies are marketed in the same manner as they offer students an opportunity to secure acceptance early in the admissions process.

The insurance provided by the early contract ignores the binding nature of the ED contract, which allows colleges to identify demand certainty and control for the quality of their product.[7] Kim (2007) and Lee (2002) specifically model the binding nature of the ED contract through the joint decisions of colleges to offer early admissions and students to take advantage of early admissions. Kim (2007) argues that ED is a sorting mechanism for schools that are need-blind and therefore promise to meet 100 percent of financial aid needs up to a standard level. Lower need students forgo the opportunity to compare financial aid packages across school and therefore are more likely to apply early. Therefore, unlike the previous contracting literature, his model is consistent with lower ability students applying ED because ED improves a student's chance of admissions. He concludes that ED programs can improve efficiency.

Lee (2002) also argues that ED can improve efficiency by allowing schools to avoid the adverse selection of enrolling students who have been rejected from other universities, regardless of the school's financial aid policy. His model implies that the average quality of the marginal matriculant should be the same in ED as in regular admissions, not below like Kim's model suggests, because their ED choice is viewed as a signal of match quality by the college, rather than a signal of being willing to forgo financial aid.

C. Other

Afram (2006) in *The Yale Law Review* focuses on whether ED programs violate Civil Rights and Antitrust Laws. Her argument is motivated on earlier findings (Avery et al., 2003) that those who use ED applications are more likely to be white and higher income.

[7] Ehrenberg and Sherman (1984) develop a model for a university's welfare and suggest a university's quality is based on the combination of enrolled student characteristics (i.e. race, sex, income class, alumni relations etc.)

She expresses skepticism that colleges can or would respond in their regular decision process to make up for any shortfall in minority ED applicants.

4. CONCEPTUAL FRAMEWORK

Every applicant faces the choice of whether to apply early decision or regular decision to a college. Each applicant has a perceived quality, which we will refer to as ability. Suppose there exist two types of ability: low ability or high ability. The marginal benefit to either type of applicant of applying early is the security of finding out acceptance early in the admissions process. The marginal benefit is even higher for those applicants who have a strong preference for attending the school. In addition, anecdotal and empirical evidence from highly selective schools suggests that applying early increases in the probability of being accepted, which provides a higher marginal benefit of ED for the low ability applicants. The marginal benefit of ED is lower for high ability applicants because a binding early decision agreement may result in greater loss of outside opportunities, including securing admission at a higher ranked school or passing up scholarship opportunities at other schools.

In this framework, the marginal benefits and costs of ED applications depend on individual ability, preference, and willingness to pay. Using proprietary admissions data, we consider whether these factors are correlated with the decision to apply early to the liberal arts colleges in our sample.

The persistence of binding early decision policies provides evidence that such policies are an effective tool used to select potential applicants. The college admission process is a very competitive process for schools. We assume colleges are maximizing

the quality of the student body, subject to a budget constraint.[8] In attempting to secure these goals, colleges need to balance accepting high quality applicants with the probability that accepted applicants will attend. While many student characteristics are revealed in the applications, the student's preference is not. ED is one way for a college to increase the certainty over their student body. Offering early decision is a screen imposed by the college that enables enthusiastic applicants to signal their preference to the school. Alternatively, schools that promise to meet all financial needs can reduce uncertainty by screening high income students in the ED process because low-income students are not willing to forgo comparing financial aid packages. Avery et al. (2003) suggest that the guarantee of enrollment provides insurance for the college and as a result admission rates for early decision applicants are higher than of regular applicants.

Empirically, we test whether the benefit of applying early decision includes an increase in the probability of acceptance as anecdotal and empirical evidence on selective colleges suggests (Avery et al., 2003). We have college performance data that allow us to test whether the ED enrolled students have characteristics unobservable to the researchers, such as match quality with the college, that manifest themselves in outcomes such as first year grade point average, graduation probability and final grade point average, college performance.

We further test if specific individual characteristics of ability and willingness to pay have differential effects on this outcome. Specifically, we are interested in

[8] Based on his experiences in the administration at Cornell University, Ehrenberg in his 1999 Journal of Economic Perspective article casts doubt on whether a research university maximizes a single well-defined objective function. Despite his reservations for large research universities, Ehrenberg states that a single objective function may explain "fairly well the behavior of small liberal arts colleges…" (page 101). Epple, Romano and Sieg (2006) make a similar assumption to ours.

answering whether colleges appear to respond to the composition of the student body attained in ED by providing higher acceptance rates among minorities and lower income families in the regular decision process.

Finally, we look at the financial aid grant received by applicants in one of our colleges and directly test whether the college penalizes early applicants with less aid as a result of signing the binding contract.

5. DATA

We turn to the data to inform our understanding of the early decision process. Our primary data come from two schools in the north east, each with approximately 1800 students enrolled.[9] Both report a typical SAT I score in the upper 1200s (out of 1600 and relative to a mean score for all persons taking the SAT I of approximately 1020 [College Board, 2002]). For College X, we have two recent years of data and for College Y, we have one recent year of data.

Our primary data source is all the details from the applications that were entered into the admissions' databases. Of course, we know whether the student chose to apply early or regular decision. More generally, the data contain characteristics of the applicants, including race, sex, legacy status, zip code of residence, some test score data, and financial aid intent. In addition, it includes characteristics of the high school such as type (private or public) and high school name. The dataset also contains the admissions decision made on the student, accept or not, and whether the student enrolls in the college. These data are similar across the colleges. For both colleges we know the freshman grade point average of those who enrolled and completed their freshman year.

[9] We signed agreements with the colleges and College Board to allow us to use the data. This agreement stipulates that we cannot reveal the names of the colleges.

For College Y, we also have the financial aid grants offered during the admissions process and information on who graduated and with what final grade point average.

We purchased a data match from the College Board that augments the admissions data and includes SAT I scores, SAT II scores[10], and AP test scores. Both of these colleges allow students to choose whether to submit their SATI scores or not, so the match provides SATI scores for those who chose not to submit them. The College Board data also includes responses to the student descriptive questionnaire (SDQ) that students fill out at the time they take their SATs. This includes self-reported data on high school experience, high school grades[11], college intentions and family income.[12]

We also match the zip codes of applicants to the 2000 Census to create measures of the median income in the zip code, and other demographic characteristics of the zip code such as percent white and percent urban.

Table 1 describes the colleges' admissions pools. Applicants are from the high end of the income distribution. Conditional on self-reporting a family income, and many do not, income greater than $100,000 is the most common response. The average zip code median income data is more than $70,000 for College X and just under $70,000 for College Y. Between one-third and one-half attended private high schools. More than 65 percent of applicants are female at College X, while around 50 percent are female for College Y. More than 83 percent of all applicants are white and more than three-quarters

[10]We create an "average SAT II score", which is the average of up to three SAT II scores from either the college data base or the College Board match. Each test is out of 800 points.

[11] As an alternative measure of academic preparedness, high school GPA has the potential to be crucial in analyzing student and college behavior. Unfortunately, GPA scales as reported on applications are not even remotely standardized across high schools and therefore standardizing our measures is extremely difficult (see Chaker, 2003). College Y did not even record high school GPA for many of their applicants in their admissions data. We contacted as many high schools as possible and asked them for their GPA scales but the resulting data were extremely complicated, giving us little confidence in their usefulness.

[12] We drop a very small share of domestic students for whom we cannot identify an SAT I score and we drop all international students for comparability reasons.

are from the northeast United States, including the states where the colleges reside. For College X, 6.1 percent of the 7554 applicants applied early decision, while 10.1 percent of the 3710 applicants from College Y applied early decision.

6. EMPIRICAL RESULTS

6.1 Applying Early Decision

Table 1 provides evidence that early applicants exhibit a lower ability but a greater willingness to pay, relative to regular decision applicants. ED applicants' average combined SAT I scores for College X (1219) and College Y (1213) are more than 30 points lower than the average scores of regular applicants (1255 for College X and 1263 for College Y). This score differences arises from, on average, worse performances by early applicants on both the individual verbal and math sections of the SAT by 20 to 30 points. SAT 2 scores, for those that have a score reported, are also lower for ED applicants at statistically significant levels. Self-reported high school GPAs are also lower for early applicants compared to regular applicants. For example, a higher share of regular applicants report an A+ GPA relative to ED applicants. ED applicants also report fewer honors classes.

Using proxies of willingness to pay, ED applicants come from zip codes in which median household income is an average of more than $3,000 higher than regular applicants and this difference is significant at least at the 10 percent level. In addition, on average ED applicants are less likely to indicate intent to apply for financial aid and this difference is significant at the 1 percent level. Legacy status, an applicant who had a family member graduate from the college, may also proxy for willingness to pay because

it indicates an applicant's affiliation with the college. ED applicants are more likely to be legacies and this difference (3.7 percent versus 2.3 percent for College X and 10.4 percent versus 5.6 percent for College Y) is significant at standard levels.

Overall, few minorities apply to these school, but even fewer apply ED: 88 percent of ED applicants to College X are white and 93 percent of ED applicants to College Y are white, compared to 83 and 87 percent of regular applicants.

Of course, many of these characteristics are correlated with one another and we turn to regression results in Table 2 to see how our variables of interest are correlated with the admission decision, holding all else equal. We estimate the following probit model, where *i* indexes the individual, *Apply ED* is an indicator for whether the student applied early decision, *X* is a vector of student characteristics that includes the applicant's sex, race, high school GPA, class rank, combined SAT I score, average SAT II score (if we have one for them), ACT score (if we have one for them) the test scores revealed to the school, zip code information, region of the country, intent to apply for financial aid, and number of high school extracurricular and high school sports activities participated in; and β is a vector of parameters to be estimated. The error term is ε.

$$\text{Apply ED}_i = X_i\beta + \varepsilon_i$$

The second and fourth columns of Table 3 include the 2000 Census data, which results in smaller sample sizes for College X, but provides additional details about the applicants' backgrounds.

The results in Table 2 suggest that the willingness to pay for college is highly correlated with the decision to apply early decision. Students who intend to apply for financial aid are less likely (1.4 to 3.9 percentage points) to apply ED - the commitment

to the school precludes comparing financial aid packages from other schools. Somewhat surprisingly, the coefficients on our measures of income are never statistically significant at standard levels, either individually or jointly, although this may be due to our imprecise measures of income. All else equal, legacies are four to six percentage points more likely to apply ED. Minorities are also less likely to apply early decision, which probably reflects that these small liberal arts colleges with little racial diversity are not good matches for these students.

Table 2 provides some evidence that students are acting strategically when applying early decisions in response to a view that applying early increases the probability of acceptance. Students with lower measures of academic ability such as SAT I scores, SAT II scores, and high school GPAs, all else equal, are more likely to apply ED.

6.2 Application and Admissions Decision

Next we turn to the colleges' decisions about who to accept. This analysis excludes applicants who withdrew from the application process before an admissions decision was made and therefore the sample sizes are reduced. Table 3 shows that College X has a slightly lower acceptance rate (41 percent) than College Y (45 percent). However, both colleges have much higher acceptance rates among ED applicants relative to regular applicants. In particular, College X accepts 84 percent of their ED applicants and College Y accepts 64 percent of their ED applicants versus 38 and 43 percent of their regular applicants, respectively.

To verify whether this regularity simply reflects better students applying ED, we estimate the following probit model, where i indexes the individual applicant:[13]

$$Accepted_i = X_i\beta + \delta ED_i + \varepsilon_i$$

where Accepted is a dummy variable that is 1 if the applicant is accepted and zero otherwise; X_i is a vector of individual characteristics and; ED_i is a dummy variable that is 1 if the applicant applies early decision and zero otherwise.

Table 4 shows coefficient estimates for equation (2). Columns (2), (3), (5) and (6) show that applying ED, all else equal, is correlated with an increase of 58 percentage points in the probability of acceptance at College X and 45 percentage points at College Y.[14] These differences are even larger than the unconditional mean differences in Table 3 and columns (1) and (4), reflecting the weaker applicant pool in the ED process. Recall that, Avery et al. (2003) estimated applying early decision increased the average applicant's probability of acceptance by around 35 percentage points. Avery et al. also find that applying ED has a greater effect on the acceptance probability for the less selective schools in their sample and, by at least some measures, the schools in our sample are less selective than any in theirs.[15]

The actual SAT I score is positively and statistically significantly related to the probability of acceptance. Recall that the school does not observe the actual SAT I for

[13] Avery et al. (2003) also suggest that students believe that applying early affects their probability of acceptance. Although a system of equations that simultaneously estimates the decision to apply early and the acceptance decision may be appropriate, there do not appear to be any reasonable exclusion restrictions that predict the decision to apply ED but do not influence the probability of being accepted. To avoid identification on functional form alone, we simply estimate equation (2) individually.

[14] We also regressed the colleges' internal admissions ratings on the ED indicator and the remaining covariates. For College X we find that ED is positively and statistically correlated with the admissions ratings, but there is no statistically significant link between ED and College Y's ratings. These results are available upon request.

[15] We hypothesize that at the highest end of the distribution, ED students are more likely to be signaling their match with the school rather than attempting to increase their probability of being admitted.

those who don't submit it. The coefficient on whether the student requested that their score be used is negative and statistically significant for both schools. We interact whether the student requested that the school use their SAT I score with their actual SAT I Score/100 and find that those that reveal higher scores are more likely to be accepted. Table 4 also shows that other measures of academic ability, such as SAT II scores and high school GPAs are positively correlated with the probability of acceptance. Legacies and those that attended private high schools, probably proxies for both willingness to pay and ability, are also more likely to be accepted, all else equal. As another measure of willingness to pay, the intent to apply for financial aid is negatively and statistically significantly correlated with the probability of acceptance.

Some of the other coefficients reflect economic, racial and geographic diversity goals of the college. For example women are less likely to be accepted at College X where more than 65 percent of applicants are women. College X is also more likely to accept applicants with lower income. In both schools, racial minorities are more likely to be accepted. Individuals from the Midwest are more likely to be accepted by College X and individuals from the South are more likely to be accepted by College Y, all else equal.

Given the binding nature of ED, accepting an ED applicant lowers uncertainty for the student and the college. Table 3 shows that 96 percent of those admitted under ED for College X and almost 90 percent of those admitted under ED for College Y ultimately enroll, compared to only about 20 percent of those who apply in the regular decision process. Table 3 also shows that approximately 40 percent of the student body is determined in the ED process. We also know that the students from the ED pool are

higher income and less likely to be minorities. We now consider the possibility that in their regular decision process, the colleges attempt to increase diversity that is minimized by the ED applicant pool.

Table 5 contains essentially the same regression as in Table 4, except that we interact the *Early Decision* variable with a set of covariates. First consider the interaction with ED and being African American. The coefficient on African American is positive, but the interaction is negative. For College X the coefficients are 0.48 and -0.36 and both are statistically significant at standard levels. This implies that all else equal, being African American is positively correlated with being accepted; however, the differential benefit of being African American is higher during the regular admission period (0.48) compared to the ED period (0.48-0.36=0.12). This is consistent with the college attempting to increase diversity in the regular decision period through increasing the probability of accepting minority students. The point estimates suggest that the same is true for College Y, but the coefficient on the interaction term is not statistically different from zero.

The results are not consistent across the colleges when we use measures of financial aid need to proxy for a measure of income diversity. For College X, the interaction terms between early decision and low income (self reported income below $100,000) or early decision and financial aid intent are both negative, although the coefficient on the interaction between early decision and low income is not statistically significant at standard levels. The signs, again, are consistent with the college attempting to increase economic diversity in the regular decision period, relative to the early decision period. However, the results for College Y suggest the opposite. Students who self

report low income or an intent to apply for financial aid are relatively more likely to receive an acceptance in the early period relative to the late period. This is consistent with the school's need-aware admissions policy that makes decisions on the margin during the regular decision period based on financial aid need. College X reports a similar policy, so this doesn't fully explain the difference.

One other interaction terms provide suggestive evidence about the schools' behaviors. Note that the interaction between the SAT I score and the Early Decision dummy are positive and, for College X, statistically significant. This suggests that students with particularly high SAT I scores are more likely to be accepted in ED, relative to regular decision. Given that these are schools are selective, but not necessarily highly selective, the schools may view students with high SATI scores who apply regular decision as unlikely to enroll conditional on acceptance, thus lowering their yield rate if they choose to accept them. However, if students with relatively high SATI scores apply ED, they are very likely to attend and the schools are more likely to view this as a signal of strong personal preference from the student.

6.2 Enrolled Applicants

While Table 4 provides evidence that ED applicants on average have an advantage in the admissions process, all else equal, the source of the advantage is unclear. Descriptive statistics of applicants overall (Table 1) and results from acceptance decision (Table 4) reveal that early applicants have lower average qualifications (including SAT I scores, high school GPAs) than regular applicants. Enrolled[16] students' freshman GPA outcomes may shed light on whether there is additional information

[16]We define enrolled applicants as any applicant for whom the college submitted a first year GPA. This ignores those who did not finish their first year, but these numbers are small.

contained in the decision to apply ED which we, as researchers, do not observe. For example, suppose that the admissions officers understand that applying ED provides information that the student will be a particularly good match with the college and, therefore, their acceptance rate reflects this belief. GPA is a standardized outcome measure for all students[17] and presumably, unlike admissions officer ratings, this measure cannot be manipulated by the admissions office. We run the following OLS regression to analyze and isolate the effect individual characteristics and the decision to apply early have on the subsequent performance of enrolled applicants:

$$FYGPA_i = X_i\beta + \delta ED_i + \varepsilon_i$$

Where FYGPA is the first year grade point average for student *i* on a 0 to 4.0 numerical scale for College X and 0 to 100 numerical scale for College Y. X_i is a vector of individual characteristics defined earlier and ED_i is a dummy variable that is 1 if the applicant applies early decision and zero otherwise.

If the decision to apply early is determined by unobservable differences among applicants, then holding all else equal, we might expect the ED coefficient to be positive and significant. However, Table 6 shows that applying ED is negatively or not at all correlated with freshman GPA, and these coefficients are not statistically significant at any standard level. We cannot reject the hypothesis that the decision to apply early is uncorrelated with subsequent first year performance. This result is not consistent with the contracting theory that suggests the increase in the probability of being accepted found in Table 4 is due to more qualified applicants applying early. The results support the

[17] There may, of course, be differences in course selection that we are not capturing in this single summary number. However, freshman course selections are more standardized than subsequent years. We have data on majors for those who graduate, so we can consider this as a dependent variable as well.

hypothesis that early applicants realize they are less competitive students and apply early to avoid the competition of the larger regular applicant pool.

As the other coefficient estimates indicate, SAT I scores are positively correlated with freshman GPA (see Rothstein, 2004), but we can reject that the coefficients are equal to zero only for College X. SAT II scores, which are more curriculum-based, and high school GPAs are positively correlated for both College X and College Y. Minorities consistently perform worse and women consistently perform better, all else equal.

We also have data on whether the enrolled students graduate and the final GPA for the students that graduate and the results are similar: Early decision is not correlated with a higher performance level by those measures, all else equal.

6.3 Financial Aid

Finally, we consider the possibility that colleges price discriminate based on the binding nature of the early decision agreement. Our prediction is that students who signal their preference for the school or their willingness to forgo the opportunity to entertain alternative financial aid packages through ED receive lower financial aid packages.

For College Y we have the financial aid package offered to admitted students. In the reported table, we restrict the sample to those who reported intending to apply for financial aid as a proxy for those who did apply for financial aid, but the results are similar if we include all applicants. Letting i index the individual student, the Tobit model is

$$FAGRANT_i = X_i\beta + \delta ED_i + \varepsilon_i$$

Where FAGRANT is the financial aid grant awarded to the applicant, X_i is a vector of individual characteristics defined earlier, and ED_i is a dummy variable that is 1 if the applicant applies early decision and zero otherwise.

As Table 7 shows, there is a *positive* correlation between applying ED and financial aid and the coefficient is statistically significant at standard levels. In other words, all else equal, financial aid packages are more generous, by an average of about $2,400, for those who apply early. Price discrimination appears to exist only in the sense that higher income students are more likely to be ED students. There is no direct price discrimination where, all else equal, students who apply early receive lower financial aid offers. In fact, the need aware admissions policy may be responsible for lower income students receiving more financial aid if they apply early, when more funding is available, all else equal.

Otherwise, the financial aid package is statistically correlated with measures of income. Students who report lower income receive more generous financial aid packages. Some of our coefficients may reflect our poor measures of income. For example, the positive coefficient on "missing income" and negative coefficient on "attended private high school" suggest that these variables proxy for income measures, low and high respectively. Minority students receive higher average financial aid packages. While students who achieved high grades in high school receive higher average financial aid packages, there is no evidence that a student's SAT score significantly influences the financial aid package.

7. CONCLUSION

Large inequalities exist in higher education. Haveman and Wilson (2007), for example, show that there is an almost 50 percentage point gap in college attendance between students in the top and bottom economic quartiles. The list of explanations for the persistence of this inequality is long and varied. Admissions policies that are deemed to favor higher income students occupy space on the list, including legacy preference and and early decision. Early decision is said to favor higher income students because the binding nature of early decision precludes comparing financial aid packages and higher income students are more likely to be aware of the potential benefits of applying early decision, that may include a higher acceptance rate.

Our paper considers the early decision policies at two liberal arts schools during the 2000s. Like previous empirical work on that focused on very highly selective universities, we find that higher income, non-minorities are more likely to choose Early Decision . In addition, we find that applying Early Decision is very highly correlated with acceptance, all else equal, so that apply Early Decision appears to compensate for lower standardized test scores or high school grade point averages. Our correlations are even higher than among the more selective colleges previously studied by Avery et al. (2003).

Given the binding nature of Early Decision, an acceptance to an ED applicant results in much less uncertainty for the student and the college and we also know that the students from the ED pool are higher income and less likely to be minorities. We contribute to the existing knowledge about the Early Decision process by questioning whether colleges attempt to add diversity to the student body they attain in the early

decision admissions by accepting a more diverse population in the regular admissions process. We find some evidence that, for example, the differential benefit of being African American is higher during the regular admission period compared to the ED period, which is consistent with the college attempting to increase diversity in the regular decision period.

To our knowledge, we are the first to investigate whether there is some characteristic unobservable to the researcher, such as match quality with the college, which manifests itself in higher subsequent performance among enrolled early decision applicants. We find that applying early decision is not positively correlated with freshman GPA, graduation from the college, or final GPA. This evidence discounts the possibility that the admissions standards for early and regular admissions applicants are the same once we control for unobservable qualities. In other words, admission standards appear to be lower for early decision applicants.

Finally, we directly address the question of whether colleges price discriminate if a student applies early decision. Using the financial aid awards from one of the schools, we find that, all else equal, financial aid packages are more generous for those who apply early. The need-aware admissions policy may be responsible for lower income students receiving more financial aid if they apply early, when more funding is available, all else equal. A perception that financial aid is less generous for those who apply early is most likely based on the fact that the pool of applicants has lower financial need and, therefore, are less likely to receive financial aid.

With the increasing level of competition in the college admission process, the early decision process is likely to continue playing a very large role in determining the

student bodies of colleges. Our paper finds some evidence that colleges are not directly price discriminating against those who apply early and are attempting to offset their less diverse early decision acceptances with more diverse regular decision acceptances.

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Table 1

Descriptive Statistics of Applicants
Mean and Standard Deviation

Variable	Regular Decision	Early Decision	Regular Decision	Early Decision
Income Missing (sr)	0.464	0.450	0.564	0.541
	(0.499)	(0.498)	(0.496)	(0.499)
Income <50K (sr)	0.091	0.085	0.079	0.075
	(0.288)	(0.279)	(0.270)	(0.263)
50K <Income <100K (sr)	0.176	0.178	0.150	0.155
	(0.380)	(0.383)	(0.357)	(0.362)
Income >100K (sr)	0.269	0.287	0.207	0.229
	(0.444)	(0.453)	(0.405)	(0.421)
Intend to Apply for Financial Aid	0.487	0.435	0.573	0.477
	(0.500)	(0.496)	(0.495)	(0.500)
SAT1 Score (1600 max)	1255	1219	1263	1213
	(133)	(130)	(140)	(118)
SATI Math Score (800 max)	624	606	633	611
	(74)	(75)	(77)	(69)
SAT1 Verbal Score (800 max)	631	613	630	603
	(79)	(72)	(81)	(70)
Chose not to submit SATI Score	0.143	0.270	0.245	0.219
	(0.350)	(0.444)	(0.430)	(0.414)
SAT2 Score(s) available (1=yes)	0.855	0.822	0.714	0.683
	(0.352)	(0.383)	(0.452)	(0.466)
Average SAT2 Score	560	535	679	644
	(71)	(60)	(75)	(70)
ACT Score(s) available (1=yes)	0.014	0.011	0.183	0.205
	(0.118)	(0.104)	(0.387)	(0.404)
Average ACT Score	26.3	26.2	26.6	25.6
	(3.6)	(3.2)	(3.7)	(3.8)
No High School GPA reported (sr)	0.259	0.261	0.342	0.333
	(0.438)	(0.440)	(0.475)	(0.472)
HS GPA A+ (SR)	0.041	0.024	0.064	0.016
	(0.199)	(0.153)	(0.245)	(0.126)
HS GPA A (sr)	0.161	0.128	0.166	0.163
	(0.367)	(0.335)	(0.372)	(0.370)
HS GPA A- (sr)	0.231	0.187	0.173	0.152
	(0.422)	(0.390)	(0.379)	(0.360)
HS GPA B+ (SR)	0.178	0.233	0.149	0.181
	(0.383)	(0.423)	(0.356)	(0.386)
HS GPA B (SR)	0.101	0.130	0.082	0.120
	(0.302)	(0.337)	(0.274)	(0.325)
HS GPA B- (SR)	0.022	0.030	0.018	0.029
	(0.147)	(0.172)	(0.132)	(0.169)
HS GPA C or below (sr)	0.006	0.007	0.006	0.005
	(0.078)	(0.081)	(0.077)	(0.073)
Class rank missing (sr)	0.313	0.320	0.359	0.360
	(0.464)	(0.467)	(0.480)	(0.481)
Class rank 1st 10^{th} (sr)	0.221	0.154	0.209	0.141
	(0.415)	(0.362)	(0.407)	(0.349)
Class rank 2^{nd} 10^{th} (sr)	0.189	0.239	0.135	0.155
	(0.392)	(0.427)	(0.341)	(0.362)
Class rank 2^{nd} 5^{th} (sr)	0.111	0.126	0.075	0.077
	(0.315)	(0.332)	(0.264)	(0.267)

Class rank middle or bottom (sr)	0.166	0.161	0.222	0.267
	(0.372)	(0.368)	(0.416)	(0.443)
Female Student	0.678	0.650	0.510	0.464
	(0.467)	(0.477)	(0.500)	(0.499)
White	0.832	0.874	0.871	0.933
	(0.374)	(0.332)	(0.336)	(0.250)
African American	0.032	0.017	0.037	0.019
	(0.176)	(0.131)	(0.188)	(0.136)
Native American	0.003	0.009	0.002	0.003
	(0.052)	(0.093)	(0.042)	(0.052)
Asian American	0.041	0.022	0.052	0.024
	(0.199)	(0.146)	(0.221)	(0.153)
Hispanic	0.038	0.046	0.039	0.021
	(0.192)	(0.209)	(0.194)	(0.145)
Unknown Race	0.054	0.033		
	(0.225)	(0.178)		
Legacy (1=yes)	0.023	0.037	0.056	0.104
	(0.150)	(0.189)	(0.231)	(0.306)
Attended Private HS	0.480	0.461	0.373	0.389
	(0.500)	(0.499)	(0.484)	(0.488)
From State where College resides	0.129	0.163	0.313	0.323
	(0.335)	(0.370)	(0.464)	(0.468)
From Northeast	0.624	0.626	0.512	0.568
	(0.484)	(0.484)	(0.500)	(0.496)
From Midwest	0.056	0.048	0.048	0.040
	(0.230)	(0.214)	(0.213)	(0.196)
From West	0.088	0.096	0.072	0.048
	(0.283)	(0.294)	(0.258)	(0.214)
From South	0.102	0.067	0.056	0.021
	(0.303)	(0.251)	(0.230)	(0.145)
Filled in College Board Survey (sdq)	0.878	0.883	0.811	0.787
	(0.328)	(0.322)	(0.391)	(0.410)
# of HS Extracurricular Activities	4.732	4.761	3.717	3.965
(sr)*Filled in sdq	(3.370)	(3.321)	(3.436)	(3.454)
# of HS sports (sr)*Filled in sdq	2.131	2.243	1.829	2.163
	(2.010)	(2.074)	(1.976)	(2.158)
# of HS offices/awards (sr)*Filled in	0.939	0.928	0.764	0.784
sdq	(1.430)	(1.487)	(1.378)	(1.299)
# of HS honors classes (sr)*Filled in	3.552	3.248	2.999	2.317
sdq	(4.414)	(4.264)	(4.381)	(3.842)
Zip Code Median Income	72709	76278	67625	70713
	(29747)	(30684)	(29557)	(32608)
Zip Code Percent Urban	0.871	0.868	0.839	0.783
	(0.260)	(0.250)	(0.284)	(0.329)
Zip Code Percent African American	0.059	0.045	0.060	0.035
	(0.125)	(0.099)	(0.129)	(0.075)
Zip Code Percent Less than $30,000	0.065	0.061	0.068	0.067
income	(0.033)	(0.033)	(0.036)	(0.037)
N	7094	460	3335	375
N with zip code match	6668	425	3335	375

Table 2
Probit of Accept (1= School Accepts)
Marginal Effects, Standard Errors in Parentheses

	College X		College Y	
	(1)	(2)	(3)	(4)
Income Missing (sr)	-0.0012	-0.0012	0.0019	0.0004
	(0.0076)	(0.0078)	(0.0141)	(0.0140)
Income <50K (sr)	-0.0030	0.0005	0.0076	0.0068
	(0.0107)	(0.0113)	(0.0222)	(0.0219)
50K <Income <100K (sr)	0.0032	0.0033	0.0139	0.0107
	(0.0087)	(0.0089)	(0.0175)	(0.0171)
Intend to Apply for Financial Aid	-0.0149**	-0.0135**	-0.0390*	-0.0366*
	(0.0060)	(0.0063)	(0.0110)	(0.0113)
SAT1 Score (1600 max)	-0.0083*	-0.0083*	-0.0207*	-0.0214*
	(0.0028)	(0.0029)	(0.0049)	(0.0050)
SAT2 Score(s) available (1=yes)	0.0392**	0.0322	0.1369*	0.1315*
	(0.0200)	(0.0226)	(0.0353)	(0.0354)
Average SAT2 Score	-0.0099***	-0.0080	-0.0296*	-0.0282*
	(0.0055)	(0.0056)	(0.0097)	(0.0097)
ACT Score(s) available (1=yes)	-0.0674*	-0.0634*	-0.0394	-0.0488
	(0.0055)	(0.0057)	(0.0631)	(0.0580)
Average ACT Score	0.0305*	0.0249**	0.0020	0.0023
	(0.0110)	(0.0124)	(0.0031)	(0.0031)
No High School GPA reported (sr)	0.0024	0.0035	-0.0159	-0.0180
	(0.0123)	(0.0125)	(0.0206)	(0.0203)
HS GPA A+ (SR)	-0.0196	-0.0188	-0.0606*	-0.0618*
	(0.0137)	(0.0141)	(0.0167)	(0.0158)
HS GPA A (sr)	-0.0146	-0.0179***	-0.0015	-0.0045
	(0.0103)	(0.0100)	(0.0219)	(0.0213)
HS GPA A- (sr)	-0.0191**	-0.0193**	-0.0215	-0.0228
	(0.0087)	(0.0088)	(0.0174)	(0.0170)
HS GPA B+ (SR)	0.0009	0.0010	-0.0040	-0.0043
	(0.0097)	(0.0098)	(0.0182)	(0.0180)
HS GPA B- (SR)	0.0082	0.0147	-0.0020	0.0006
	(0.0195)	(0.0211)	(0.0321)	(0.0327)
HS GPA C or below (sr)	-0.0066	-0.0042	-0.0507	-0.0467
	(0.0300)	(0.0309)	(0.0341)	(0.0365)
Class rank missing (sr)	0.0004	-0.0010	0.0321	0.0324
	(0.0098)	(0.0098)	(0.0209)	(0.0207)
Class rank 1st 10^{th} (sr)	-0.0050	-0.0082	0.0201	0.0191
	(0.0110)	(0.0109)	(0.0251)	(0.0249)
Class rank 2^{nd} 10^{th} (sr)	0.0134	0.0111	0.0310	0.0277
	(0.0107)	(0.0106)	(0.0247)	(0.0241)
Class rank middle or bottom (sr)	-0.0132	-0.0165	0.0387	0.0369
	(0.0129)	(0.0126)	(0.0333)	(0.0329)
Female Student	-0.0066	-0.0065	-0.0222**	-0.0222**
	(0.0059)	(0.0060)	(0.0096)	(0.0095)
African American	-0.0353*	-0.0245***	-0.0633*	-0.0388***
	(0.0089)	(0.0127)	(0.0126)	(0.0219)
Native American	0.0762	0.0914	0.0137	0.0078
	(0.0684)	(0.0729)	(0.1077)	(0.1001)
Asian American	-0.0307*	-0.0273*	-0.0467*	-0.0408**
	(0.0091)	(0.0097)	(0.0155)	(0.0165)

Hispanic	-0.0006	0.0036	-0.0526*	-0.0447*
	(0.0134)	(0.0144)	(0.0151)	(0.0172)
Race Unknown	-0.0224**	-0.0278*		
	(0.0097)	(0.0091)		
legacy	0.0327	0.0319	0.0498**	0.0483**
	(0.0211)	(0.0214)	(0.0227)	(0.0224)
Attended Private HS	-0.0081	-0.0090	-0.0113	-0.0059
	(0.0059)	(0.0061)	(0.0102)	(0.0104)
From State where College resides	0.0128	0.0112	-0.0047	-0.0006
	(0.0085)	(0.0085)	(0.0108)	(0.0111)
From Midwest	-0.0136	-0.0115	-0.0194	-0.0100
	(0.0100)	(0.0106)	(0.0201)	(0.0219)
From West	0.0062	0.0109	-0.0272***	-0.0172
	(0.0100)	(0.0111)	(0.0159)	(0.0176)
From South	-0.0173**	-0.0172**	-0.0568*	-0.0537*
	(0.0079)	(0.0083)	(0.0132)	(0.0136)
Filled in College Board Survey (sdq)	-0.0068	-0.0085	-0.0345	-0.0343
	(0.0191)	(0.0199)	(0.0355)	(0.0353)
# of HS Extracurricular Activities (sr)*Filled in sdq	0.0008	0.0008	0.0033	0.0032
	(0.0012)	(0.0013)	(0.0023)	(0.0023)
# of HS sports (sr)*Filled in sdq	0.0006	0.0008	0.0063**	0.0057***
	(0.0016)	(0.0017)	(0.0032)	(0.0032)
# of HS offices/awards (sr)*Filled in sdq	0.0004	0.0003	0.0042	0.0040
	(0.0021)	(0.0022)	(0.0041)	(0.0041)
# of HS honors classes (sr)*Filled in sdq	-0.0001	-0.0001	-0.0016	-0.0011
	(0.0008)	(0.0008)	(0.0015)	(0.0015)
Zip Code Median Income		0.0001		0.0003
		(0.0002)		(0.0003)
Zip Code Percent Urban		0.0024		-0.0353**
		(0.0109)		(0.0159)
Zip Code Percent African American		-0.0546***		-0.1398**
		(0.0309)		(0.0583)
Zip Code Percent Less than $30,000 income		0.0404		0.1792
		(0.1407)		(0.2230)
Observations	7550	7089	3710	3710

Sources: Authors' calculations from College X and Y admissions data merged with College Board Data
Notes: sr is "self reported" on SDQ. Omitted Categories: Income >$100K (sr); Race = white; HS GPA B, From Northeast. All students who have no SAT 1 score or withdrew their application before an acceptance decision was made are excluded. Standard errors in parentheses: *** significant at 10%; ** significant at 5%; * significant at 1%

Table 3
College Rating, College Acceptance and Yield Rates

	College X			CollegeY		
Acceptance Rate	.414			.454		
Early Decision Rate	.068			.108		
	Early	**Regular**	**ss**	**Early**	**Regular**	**ss**
N	447	6120		369	3049	
Academic Rating	3.263	3.741		3.995	4.636	***
	(1.033)	(1.089)		(1.373)	(1.549)	
Final Rating	3.668	3.83		5.019	5.674	*
	(0.859	(0.993)		(1.432)	(1.613)	
Acceptance Rate	0.843	0.383	***	0.638	0.433	***
	(0.486)	(0.364)		(0.481)	(0.496)	
Yield (Matriculate/Accepted)	0.957	0.212	***	0.898	0.187	***
	(0.201)	(0.408)		(0.302)	(0.390)	
Share of Freshman Class from ED	0.421			0.455		

Notes: Excludes students who withdrew before the acceptance decision was made. Significance is the difference between Early and Regular. *** indicates significance at the 1 percent level, ** indicates significance at the 5 percent level, * indicates significance at the 10 percent level
Source: College Admissions Data supplemented with College Board and Census Data.

Table 4
Probit of Accept (1= School Accepts)
Marginal Effects, Standard Errors in Parentheses

	College X			College Y		
	(1)	(2)	(3)	(4)	(5)	(6)
Applied Early Decision	0.4602*	0.5777*	0.5829*	0.2045*	0.4504*	0.4575*
	(0.0183)	(0.0143)	(0.0149)	(0.0265)	(0.0235)	(0.0234)
Income Missing (sr)		0.0701*	0.0741*		0.0298	0.0346
		(0.0202)	(0.0208)		(0.0307)	(0.0307)
Income <50K (sr)		0.1241*	0.1162*		-0.0533	-0.0540
		(0.0289)	(0.0301)		(0.0439)	(0.0442)
50K <Income <100K (sr)		0.0394***	0.0324		-0.0787**	-0.0736**
		(0.0226)	(0.0235)		(0.0347)	(0.0350)
Intend to Apply for Financial Aid		-0.0297***	-0.0479*		-0.0930*	-0.0898*
		(0.0157)	(0.0165)		(0.0227)	(0.0237)
SAT1 Score (1600 max)		0.0776*	0.0808*		0.0879*	0.1001*
		(0.0176)	(0.0181)		(0.0305)	(0.0307)
Requested school use SAT1 Score		-0.5319*	-0.5639*		-0.7322*	-0.7205*
		(0.1445)	(0.1394)		(0.0352)	(0.0376)
Requested school use SAT1 Score* SAT1 Score/100		0.0354**	0.0385**		0.1215*	0.1112*
		(0.0179)	(0.0184)		(0.0297)	(0.0298)
SAT2 Score(s) available (1=yes)		-0.7190*	-0.7276*		-0.7995*	-0.7952*
		(0.0270)	(0.0276)		(0.0481)	(0.0494)
Average SAT2 Score		0.1643*	0.1654*		0.1805*	0.1782*
		(0.0154)	(0.0159)		(0.0226)	(0.0226)
ACT Score(s) available (1=yes)		-0.3669*	-0.3950*		-0.3318**	-0.3320**
		(0.1108)	(0.0189)		(0.1522)	(0.1529)
Average ACT Score		0.0230	0.0405		0.0162**	0.0166**
		(0.0221)	(0.0259)		(0.0080)	(0.0080)
No High School GPA reported (sr)		0.1817*	0.1858*		0.2051*	0.2088*
		(0.0350)	(0.0361)		(0.0496)	(0.0496)
HS GPA A+ (SR)		0.3468*	0.3369*		0.3334*	0.3431*
		(0.0398)	(0.0423)		(0.0561)	(0.0556)
HS GPA A (sr)		0.3256*	0.3156*		0.3250*	0.3362*
		(0.0314)	(0.0329)		(0.0471)	(0.0470)
HS GPA A- (sr)		0.2518*	0.2506*		0.2714*	0.2765*
		(0.0293)	(0.0304)		(0.0453)	(0.0453)
HS GPA B+ (SR)		0.1618*	0.1674*		0.2005*	0.2010*
		(0.0298)	(0.0307)		(0.0460)	(0.0461)
HS GPA B- (SR)		-0.1173**	-0.1334**		-0.0731	-0.0914
		(0.0527)	(0.0531)		(0.0883)	(0.0869)
HS GPA C or below (sr)		-0.2051**	-0.1849***		0.0394	0.0177
		(0.0919)	(0.0963)		(0.2138)	(0.2089)
Class rank missing (sr)		0.0541**	0.0693**		-0.0211	-0.0212
		(0.0274)	(0.0283)		(0.0428)	(0.0429)
Class rank 1st 10^{th} (sr)		0.1545*	0.1505*		0.1614*	0.1661*
		(0.0300)	(0.0310)		(0.0481)	(0.0483)
Class rank 2^{nd} 10^{th} (sr)		0.0816*	0.0874*		-0.0037	-0.0002
		(0.0274)	(0.0282)		(0.0460)	(0.0463)
Class rank middle or bottom (sr)		-0.0556	-0.0345		-0.0230	-0.0269
		(0.0446)	(0.0471)		(0.0722)	(0.0723)
Female Student		-0.2088*	-0.2073*		0.1188*	0.1171*

		(0.0151)	(0.0156)		(0.0203)	(0.0204)
African American		0.4752*	0.4836*		0.5495*	0.5121*
		(0.0261)	(0.0292)		(0.0198)	(0.0287)
Native American		0.0557	0.0590		0.3839**	0.3954**
		(0.1272)	(0.1270)		(0.1602)	(0.1555)
Asian American		0.1951*	0.1941*		0.4133*	0.4122*
		(0.0333)	(0.0346)		(0.0326)	(0.0330)
Hispanic		0.1961*	0.2040*		0.4924*	0.4806*
		(0.0367)	(0.0380)		(0.0272)	(0.0292)
Race Unknown		-0.0809*	-0.0928*			
		(0.0293)	(0.0297)			
Legacy		0.2883*	0.2716*		0.1161*	0.1193*
		(0.0441)	(0.0461)		(0.0420)	(0.0421)
Attended Private HS		0.0476*	0.0315**		0.0782*	0.0728*
		(0.0153)	(0.0160)		(0.0228)	(0.0233)
From State where College resides		0.0184	0.0305		0.0197	0.0109
		(0.0213)	(0.0219)		(0.0241)	(0.0246)
From Midwest		0.1502*	0.1543*		-0.0292	-0.0577
		(0.0308)	(0.0318)		(0.0481)	(0.0479)
From West		0.0012	0.0144		0.0170	-0.0111
		(0.0245)	(0.0263)		(0.0390)	(0.0394)
From South		-0.0361	-0.0307		0.1567*	0.1540*
		(0.0226)	(0.0242)		(0.0457)	(0.0462)
Filled in College Board Survey (sdq)		-0.0638	-0.0397		-0.0602	-0.0685
		(0.0535)	(0.0552)		(0.0758)	(0.0760)
# of HS Extracurricular Activities*Filled in sdq		0.0060***	0.0051		-0.0052	-0.0043
		(0.0033)	(0.0034)		(0.0050)	(0.0050)
# of HS sports (sr)*Filled in sdq		-0.0084***	-0.0059		0.0097	0.0101
		(0.0044)	(0.0045)		(0.0070)	(0.0071)
# of HS offices/awards (sr)*Filled in sdq		0.0112**	0.0125**		0.0017	0.0016
		(0.0055)	(0.0057)		(0.0089)	(0.0089)
# of HS honors classes (sr)*Filled in sdq		0.0019	0.0019		0.0031	0.0024
		(0.0019)	(0.0020)		(0.0030)	(0.0031)
Zip Code Median Income			-0.0008***			0.0004
			(0.0004)			(0.0006)
Zip Code Percent Urban			-0.0720**			0.0317
			(0.0284)			(0.0379)
Zip Code Percent African American			0.0068			0.3870*
			(0.0674)			(0.0996)
Zip Code Percent Less than $30,000 income			0.2954			0.0657
			(0.3676)			(0.4995)
Observations	6567	6564	6160	3504	3504	3504

Sources: Authors' calculations from College X and Y admissions data merged with College Board Data
Notes: sr is "self reported" on SDQ. Omitted Categories: Income >$100K (sr); Race = white; HS GPA B, From Northeast. All students who have no SAT 1 score or withdrew their application before an acceptance decision was made are excluded. Standard errors in parentheses: *** significant at 10%; ** significant at 5%; * significant at 1%

Table 5
Selected Coefficients from Probit of Accept
Includes Interaction Terms of Early Decision with Other Characteristics

	College X					College Y				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Applied Early Decision	0.5839*	0.5855*	0.6036*	0.0462	0.5331*	0.4533*	0.4412*	0.4108*	0.4639***	0.4962*
	(0.0140)	(0.0157)	(0.0163)	(0.3096)	(0.0296)	(0.0236)	(0.0266)	(0.0342)	(0.2680)	(0.0273)
Income <50K (sr)	0.1277*	0.1279*	0.1252*	0.1233*	0.1236*	-0.0516	-0.0598	-0.0542	-0.0533	-0.0531
	(0.0289)	(0.0291)	(0.0289)	(0.0289)	(0.0289)	(0.0440)	(0.0445)	(0.0439)	(0.0439)	(0.0439)
50K <Income <100K (sr)	0.0401***	0.0426***	0.0392***	0.0388***	0.0390***	-0.0787**	-0.0857**	-0.0803**	-0.0787**	-0.0784**
	(0.0226)	(0.0228)	(0.0226)	(0.0226)	(0.0226)	(0.0347)	(0.0356)	(0.0347)	(0.0347)	(0.0347)
Intend to Apply for Financial Aid	-0.0302***	-0.0297***	-0.0228	-0.0301***	-0.0299***	-0.0931*	-0.0934*	-0.1062*	-0.0931*	-0.0946*
	(0.0157)	(0.0157)	(0.0160)	(0.0157)	(0.0157)	(0.0227)	(0.0227)	(0.0238)	(0.0227)	(0.0227)
SAT1 Score (1600 max)	0.0756*	0.0775*	0.0781*	0.0694*	0.0779*	0.0888*	0.0878*	0.0874*	0.0880*	0.0867*
	(0.0176)	(0.0176)	(0.0176)	(0.0180)	(0.0177)	(0.0305)	(0.0305)	(0.0305)	(0.0305)	(0.0305)
Female	-0.2095*	-0.2084*	-0.2085*	-0.2095*	-0.2155*	0.1190*	0.1190*	0.1197*	0.1188*	0.1354*
	(0.0151)	(0.0151)	(0.0151)	(0.0152)	(0.0155)	(0.0203)	(0.0203)	(0.0203)	(0.0203)	(0.0214)
African American	0.4878*	0.4757*	0.4748*	0.4723*	0.4757*	0.5532*	0.5495*	0.5506*	0.5496*	0.5509*
	(0.0252)	(0.0261)	(0.0261)	(0.0262)	(0.0261)	(0.0195)	(0.0198)	(0.0197)	(0.0198)	(0.0196)
Legacy	0.2884*	0.2880*	0.2878*	0.2884*	0.2881*	0.1159*	0.1152*	0.1181*	0.1160*	0.1191*
	(0.0442)	(0.0442)	(0.0442)	(0.0440)	(0.0442)	(0.0420)	(0.0420)	(0.0420)	(0.0421)	(0.0421)
Applied ED* African American	-0.3563*					-0.1750				
	(0.0377)					(0.1744)				
Applied ED* Female Student					0.1423**					-0.1484*
					(0.0690)					(0.0555)
Applied ED* SAT1 Score				0.0552**					-0.0016	
				(0.0257)					(0.0330)	
Applied ED* Intend to Apply for Financial Aid			-0.1326**					0.1163***		
			(0.0547)					(0.0642)		
Applied ED* SR Income<$100K		-0.0707					0.0634			
		(0.0675)					(0.0789)			
Observations	6564	6564	6564	6564	6564	3504	3504	3504	3504	3504

Sources: Authors' calculations from College X and Y admissions data merged with College Board Data. Notes: Includes all covariates from Table 4, only selected ones show. All students who have no SAT 1 score or withdrew their application before an acceptance decision was made are excluded. Standard errors in parentheses: *** significant at 10%; ** significant at 5%; * significant at 1%

Table 6

OLS Freshman GPA

	College X 4.0 Scale		College Y 100 Point Scale	
	(1)	(2)	(3)	(4)
Applied Early Decision	-0.0105	0.0009	-0.6106	-0.6252
	(0.0269)	(0.0277)	(0.5109)	(0.5130)
Income Missing (sr)	-0.0440	-0.0254	-0.0089	-0.0907
	(0.0376)	(0.0390)	(0.7333)	(0.7354)
Income <50K (sr)	-0.0632	-0.0530	-2.7131**	-2.7239**
	(0.0510)	(0.0530)	(1.2386)	(1.2391)
50K <Income <100K (sr)	-0.0338	-0.0357	-1.6458***	-1.7140***
	(0.0424)	(0.0439)	(0.9019)	(0.9072)
Intend to Apply for Financial Aid	0.0798*	0.0623***	0.4220	0.2479
	(0.0307)	(0.0319)	(0.6946)	(0.6994)
SAT1 Score (1600 max)	0.0377**	0.0362**	0.3826	0.3678
	(0.0162)	(0.0170)	(0.3271)	(0.3284)
Requested school use SAT1 Score	0.0344	0.0505	0.7738	0.7914
	(0.0351)	(0.0364)	(0.5690)	(0.5703)
SAT2 Score(s) available (1=yes)	-0.5187*	-0.6465*	-8.4879**	-8.7408**
	(0.1886)	(0.1940)	(3.6134)	(3.6473)
Average SAT2 Score	0.0937*	0.1150*	1.4678**	1.5282*
	(0.0298)	(0.0307)	(0.5701)	(0.5761)
ACT Score(s) available (1=yes)	-0.2664	-0.5869	-0.1958	-1.0140
	(1.2314)	(1.5013)	(5.4260)	(5.4421)
Average ACT Score	0.0128	0.0259	0.0425	0.0660
	(0.0451)	(0.0560)	(0.1955)	(0.1959)
No High School GPA reported (sr)	0.0503	0.0347	1.3759	1.2508
	(0.0633)	(0.0640)	(1.1987)	(1.2049)
HS GPA A+ (SR)	0.2275**	0.2008**	4.9575*	4.6932*
	(0.0897)	(0.0940)	(1.5626)	(1.5737)
HS GPA A (sr)	0.2321*	0.2269*	4.5465*	4.3171*
	(0.0618)	(0.0631)	(1.1841)	(1.1909)
HS GPA A- (sr)	0.0727	0.0716	2.8127**	2.6555**
	(0.0562)	(0.0573)	(1.1307)	(1.1357)
HS GPA B+ (SR)	0.0816	0.0641	2.1600**	2.3133**
	(0.0535)	(0.0542)	(1.0683)	(1.0776)
HS GPA B- (SR)	-0.3116*	-0.3470*	2.9413	2.9919
	(0.1103)	(0.1131)	(2.3785)	(2.3891)
HS GPA C or below (sr)	0.3842	0.4210	6.7942	6.2264
	(0.3781)	(0.3746)	(5.3594)	(5.3913)
Class rank missing (sr)	0.0461	0.0404	0.4741	0.5483
	(0.0515)	(0.0527)	(1.0191)	(1.0190)
Class rank 1st 10^{th} (sr)	0.1317**	0.1428**	0.8075	0.7143
	(0.0570)	(0.0591)	(1.1812)	(1.1928)
Class rank 2^{nd} 10^{th} (sr)	0.0586	0.0622	0.5200	0.3920
	(0.0508)	(0.0524)	(1.1527)	(1.1554)
Class rank middle or bottom (sr)	-0.0660	-0.0769	2.0093	1.7704
	(0.0936)	(0.0956)	(1.7026)	(1.7102)
Female Student	0.1554*	0.1383*	1.2425*	1.2613*
	(0.0278)	(0.0287)	(0.4729)	(0.4724)
African American	-0.2854*	-0.2947*	0.3400	0.4638
	(0.0806)	(0.0835)	(1.6381)	(1.9526)
Native American	-0.3228***	-0.3320**	-7.7575*	-7.8292*

	(0.1682)	(0.1673)	(2.9215)	(2.9312)
Asian American	-0.1040	-0.1293***	-0.4032	-0.5361
	(0.0698)	(0.0720)	(1.1817)	(1.1926)
Hispanic	-0.3837*	-0.3854*	-2.6435***	-2.6863***
	(0.0789)	(0.0789)	(1.3598)	(1.3766)
Race Unknown	-0.0910	-0.1056		
	(0.0681)	(0.0728)		
Legacy	-0.0225	-0.0253	0.3422	0.3466
	(0.0627)	(0.0628)	(0.8021)	(0.8046)
Attended Private HS	-0.0387	-0.0465	-0.7510	-1.0278***
	(0.0297)	(0.0308)	(0.5511)	(0.5692)
From State where College resides	0.0176	0.0088	-0.2535	-0.3634
	(0.0370)	(0.0378)	(0.5657)	(0.5776)
From Midwest	-0.0102	-0.0325	0.2402	0.3607
	(0.0567)	(0.0587)	(1.2156)	(1.2270)
From West	-0.0314	-0.0644	2.2975**	2.1615**
	(0.0458)	(0.0499)	(1.0231)	(1.0524)
From South	0.0319	0.0126	0.7884	0.7533
	(0.0492)	(0.0526)	(1.1315)	(1.1332)
Filled in College Board Survey (sdq)	-0.1199	-0.1536	0.7041	0.2901
	(0.1042)	(0.1065)	(1.7765)	(1.7867)
# of HS Extracurricular Activities*Filled in sdq	0.0043	0.0083	0.1334	0.1110
	(0.0060)	(0.0062)	(0.1196)	(0.1200)
# of HS sports (sr)*Filled in sdq	-0.0120	-0.0147***	-0.3334**	-0.3219**
	(0.0080)	(0.0083)	(0.1605)	(0.1620)
# of HS offices/awards (sr)*Filled in sdq	-0.0052	-0.0106	-0.0137	0.0064
	(0.0099)	(0.0103)	(0.2091)	(0.2091)
# of HS honors classes (sr)*Filled in sdq	-0.0065***	-0.0062***	0.0338	0.0316
	(0.0034)	(0.0036)	(0.0736)	(0.0738)
Zip Code Median Income		-0.0007		-0.0281**
		(0.0008)		(0.0140)
Zip Code Percent Urban		0.0142		0.1570
		(0.0499)		(0.8463)
Zip Code Percent African American		0.0623		-0.9774
		(0.1430)		(2.2615)
Zip Code Percent < $30,000 income		-0.5020		-10.4222
		(0.6926)		(11.7443)
Financial Aid Grant			0.0000	0.0000
			(0.0000)	(0.0000)
Constant	2.6887*	2.8155*	75.0289*	78.6402*
	(0.2402)	(0.2644)	(4.9022)	(5.3864)
Observations	857	792	466	466
R-squared	0.2788	0.2989	0.2695	0.2783

Sources: Authors' calculations from College X and Y admissions data merged with College Board Data
Notes: sr is "self reported" on SDQ. Omitted Categories: Income >$100K (sr); Race = white; HS GPA B, From Northeast. All students who have no SAT 1 score or withdrew their application before an acceptance decision was made are excluded. Standard errors in parentheses: *** significant at 10%; ** significant at 5%; * significant at 1%

Table 7
Tobit Financial Aid Grant, conditional on Intent to Apply
College Y Only

	(1)	(2)	(3)
Applied Early Decision	2513***	2,445**	2,374***
	(1293)	(1,243)	(1,216)
Income Missing (sr)		8,841*	8,153*
		(1,330)	(1,296)
Income <50K (sr)		15,880*	13,813*
		(1,628)	(1,608)
50K <Income <100K (sr)		11,386*	10,120*
		(1,315)	(1,289)
SAT1 Score (1600 max)		43	185
		(1,166)	(1,138)
Requested school use SAT1 Score		5,407	6,082
		(13,692)	(13,316)
Requested school use SAT1 Score* SAT1 Score/100		-160	-228
		(1,102)	(1,071)
SAT2 Score(s) available (1=yes)		6,968	4,392
		(5,696)	(5,544)
Average SAT2 Score		-950	-542
		(870)	(846)
ACT Score(s) available (1=yes)		1,312	1,207
		(8,805)	(8,570)
Average ACT Score		-46	-55
		(307)	(299)
No High School GPA reported (sr)		-3,632	-3,972
		(2,726)	(2,648)
HS GPA A+ (SR)		-4,951***	-6,441**
		(2,741)	(2,680)
HS GPA A (sr)		-4,930***	-6,098**
		(2,579)	(2,513)
HS GPA A- (sr)		-6,859*	-6,889*
		(2,514)	(2,440)
HS GPA B+ (SR)		-5,964**	-5,331**
		(2,656)	(2,581)
HS GPA B- (SR)		-5,978	-4,900
		(5,018)	(4,875)
HS GPA C or below (sr)		4,913	3,572
		(11,354)	(11,010)
Class rank missing (sr)		-3,925***	-3,820***
		(2,313)	(2,239)
Class rank 1st 10^{th} (sr)		283	-199
		(2,415)	(2,339)
Class rank 2^{nd} 10^{th} (sr)		-2,107	-2,155
		(2,444)	(2,364)
Class rank middle or bottom (sr)		-482	-1,106
		(3,727)	(3,622)
Female Student		-311	-289
		(800)	(777)
African American		1,153	1,354
		(1,834)	(1,952)
Native American		1,990	2,049
		(6,273)	(6,108)

Asian American		4,127*	4,175*
		(1,448)	(1,413)
Hispanic		5,499*	5,527*
		(1,710)	(1,680)
Race Unknown		-683	-868
		(1,770)	(1,721)
Legacy		-2,637*	-2,887*
		(945)	(925)
Attended Private HS		617	-275
		(926)	(924)
From State where College resides		1,637	2,344
		(2,027)	(2,016)
From Midwest		-176	590
		(1,703)	(1,707)
From West		-382	-633
		(1,819)	(1,782)
From South		2,564	2,441
		(3,588)	(3,489)
Filled in College Board Survey (sdq)		203	132
		(198)	(194)
# of HS Extracurricular Activities*Filled in sdq		-610**	-686*
		(271)	(265)
# of HS sports (sr)*Filled in sdq		143	163
		(294)	(285)
# of HS offices/awards (sr)*Filled in sdq		10	111
		(103)	(101)
# of HS honors classes (sr)*Filled in sdq			-102*
			(35)
Zip Code Median Income			-2,019
			(1,450)
Zip Code Percent Urban			-2,898
			(3,097)
Zip Code Percent African American			12,408
			(21,358)
Zip Code Percent Less than $30,000 income	10092*	1,226	8,674
	(480)	(15,749)	(15,732)
Observations	847	847	847

Sources: Authors' calculations from College X and Y admissions data merged with College Board Data
Notes: sr is "self reported" on SDQ. Omitted Categories: Income >$100K (sr); Race = white; HS GPA B, From Northeast. All students who have no SAT 1 score or withdrew their application before an acceptance decision was made are excluded. Standard errors in parentheses: *** significant at 10%; ** significant at 5%; * significant at 1%