Applying Early Decision: Student and College Incentives and Outcomes

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May 11, 2011

JEL classifications: I23, I24
Keywords: early decision; college admission

Abstract:

Colleges' *early decision* admission policies require accepted students to commit to attend the school without comparing outside options. With data from two liberal arts schools we find evidence that students with higher willingness and ability to pay and lower measured ability levels are more likely to apply early decision. Consistent with research on more elite colleges, on average applying early decision to the liberal arts schools raises the probability of acceptance by 40 percentage points. We address the potential selection of students into Early Decision in a variety of ways, including estimating an upper bound of 46 percentage points following Altonji et al. (2005). Colleges also appear to use the early decision process to screen higher income applicants and applicants with high SAT scores, which allows them to avoid the potential adverse selection of applicants in the regular decision process. Finally, even conditional on higher socioeconomic status and other observable characteristics, applying early decision is correlated with higher financial aid packages, perhaps because the college's financial aid resources are higher earlier in the admission process.

1 INTRODUCTION

The entering fall college freshmen classes are coming from U.S.'s largest graduating high school senior classes 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 a 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 high school seniors' stress levels.

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 binding nature of early decision. Proponents argue that early decision allows colleges to learn who most wants to attend their school and, therefore generates better matches between students and

[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] Coincidentally, 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 'would be seriously disadvantaged relative to other schools." (Arenson, 2001). 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 moved from early decision to non-binding early action programs. Harvard and Princeton eliminated their early admissions programs in 2007.

colleges, while relieving the students' stress of waiting through the college application process.[4] 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 (Schneider, 2008) and discriminate against less privileged students who are more likely to need to compare financial aid packages.

Using admissions data from two liberal arts colleges, we add to the knowledge of the early decision process put forth by Avery, Fairbanks and Zeckhauser [hereafter AFZ] (2002, 2003) in their article and book that targeted students and their parents. In our liberal arts colleges that have many more close substitutes than the elite schools studied by AFZ, we also find that applicants with higher incomes and non-minorities are more likely to apply early decision. In addition, applicants with lower measured academic ability are more likely to apply early decision. One reason students with lower academic qualifications may disproportionately apply early decision is that applying early decision is rewarded highly in the admissions decisions –the average acceptance probability of applying early decision is approximately 40 percentage points higher than under regular decision, all else equal.

We address the potential that students who apply early decision select into that choice because of an unobservable characteristics in a variety of ways. Applying the methodology of (Altonji et al., 2005) we estimate an upper bound on the effect of applying early decision on college acceptance of 46 percentage points. We also test the possibility that selection in the early decision choice manifests itself in subsequent college performance. Consistent with recent work

[4] The arguments are laid out by Arenson (2001, 2002 and 2003), Flores (2003), Hoover (2002), Hoover and Young (2002), Marklein (2003) Toor (2001), Young (2002) in media coverage around the time of the Atlantic Monthly article. More recent articles include Kahlenberg (2010) and Massa (2010).

by Jensen and Wu (2010), we find almost no evidence that enrolled students who applied early decision show differential academic and social performance than regular admission students.

As a final perspective of the equity implications of early decision applications, we directly address the question of whether applying early decision is correlated with financial aid offers. Conditional on observable characteristics applying early decision is positively correlated with financial aid offers, which may reflect that a limited pool of financial resources are depleted by the timing of regular decision. Of course, this practice may further disadvantage lower-income students who cannot afford to forgo the ability to compare financial aid offers with an early decision application.

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

2. INSTITUTIONAL DETAILS

College admission is a complicated process marked by differing deadlines and application procedures. The deadline for *regular admission* applications at most schools is January 1st. Colleges 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.

Generally, there are two forms of early admissions: *early decision (ED)* and *early action (EA)*.[5] Both policies notify an applicant of their acceptance early in the admissions process. ED

[5] 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) describe the more subtle distinctions.

is a more restrictive policy where students may apply ED to only one school. Under an ED policy an applicant typically applies by mid-November 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, conditional on a sufficient offer of financial aid. Once an ED applicant is notified of acceptance, he or she must withdraw applications from other pending schools.[6] In contrast, EA allows a student to apply to a college, typically in 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 EA 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 (AFZ, 2003). However, because financial aid is determined later in the admissions process, the cost of reapplying to other schools may be very high and the acceptance may be revoked if an applicant reneges on the ED commitment. Likewise, there may be direct pressure from the colleges and guidance counselors, whose reputations are at state, which limits the number of persons requesting a release (AFZ, 2003).

According to *The State of College Admission 2008*, 18 percent of four-year colleges offer an earlier admissions process in 2007, up from 15 percent in 2005 (National Association for College Admission Counseling[7], 2008). The distribution of schools is skewed toward selective institutions: 55 percent of colleges that accepted fewer than 50 percent of applicants have ED

[6] See the form for the Common Application used by more than 150 schools at: https://www.commonapp.org/CommonApp/docs/downloadforms/ED_Agreement2008.pdf

[7] http://www.nacacnet.org/PublicationsResources/Research/Documents/SOCA2008ppt.ppt accessed June 17, 2009

programs and only 13 percent of colleges that accepted 71 to 85 percent of applicants have ED programs. In 2000/2001, 70 percent of colleges with an average SAT score of more than 1200 employed ED programs in their admissions and fewer than 30 percent of colleges with average SATs below 1000 did (AFZ, 2003). AFZ (2003) report that the number of schools offering ED program increased dramatically in the 1990s. As of the mid-2000s 30 of the 38 "most selective" universities and 24 of the 25 most selective liberal arts school in *US News and World Report* offer ED admissions (Avery and Levin, 2010).

When narrowing down the list of prospective colleges, a high school senior is likely to consider the desirability of attending each school, the probability of being admitted to each school, and the costs of attending each school. Applying early admission to a college has the potential to influence all of these variables and, therefore, influence the choice set of schools. The following section reviews the existing theoretical and empirical treatment of these incentives.

3. PREVIOUS LITERATURE

The earliest theoretical literature considered early admissions as a special case of early contracting benefits for only the more competitive applicants. Roth and Xing (1994) argue 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 early decision policies, Roth and Xing suggest early contracting has the potential to create mismatches because transactions take place before all information is known. 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 this early literature is that higher quality applicants apply early decision to remove uncertainty and to secure acceptance early in the admissions process.

The more recent theoretical literature (Avery and Levin, 2010; Kim, 2010; Lee, 2009) specifically models the binding nature of the early decision contract, which allows colleges to identify demand certainty and control for the quality of their product.[8] Kim (2010) argues that early decision is a sorting mechanism for schools that want to maintain need-blind admissions policies that promise to meet 100 percent of financial aid needs up to a standard level. Lower need students are willing to forgo the opportunity to compare financial aid packages across schools and therefore are more likely to apply ED. Therefore, unlike the previous contracting literature, his model is consistent with lower ability, high income students applying early decision because early decision improves a student's chance of admissions.

Lee (2009) also argues that early decision 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. Students with an enthusiasm for attending the college signal this otherwise unobservable characteristic by applying ED. His model explains that standards should be higher in the regular admissions process to avoid the adverse selection of students rejected from other schools and implies that the average quality of the marginal matriculant should be the same in ED as in regular admissions.

Avery and Levin (2010) incorporate the early contracting literature and the sorting models to suggest that both are at work in the decision of lower ranked schools to adopt early decision policies.[9] The binding nature of ED allows some lower ranked schools to lock-in highly qualified students who have uncertainty about their ability in the application process. Also, the

[8] 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 (that is, race, sex, income class, alumni relations).
[9] They also provide a model for why the most elite colleges prefer early action over early decision.

favoritism shown to early applicants provides incentives for students to signal their interest to their most preferred school.

In more conceptual work, Afram (2006) focuses on whether early decision programs violate Civil Rights and Antitrust Laws. Her argument is motivated on the findings of AFZ (2003) that ED applicants are more likely to be white and higher income. She expresses skepticism that colleges can or would respond in their regular decision process to make up for any shortfall in minority ED applicants.

Overall, the theoretical/conceptual literature portrays colleges as having an objective function with a number of features: minimizing uncertainty over student body composition and financial obligations; maximizing student quality, which includes diversity and screening the best "matches" between students and schools; and maximizing perceived quality in the form of measures used by ranking organizations such as yield rates.

The existing theoretical literature concludes the following types of students are most likely to apply ED: (1) those who are willing to forgo the opportunity to compare financial aid packages from multiple schools;(2) those who want to take advantage of lower admissions standards; (3) students who want to eliminate the uncertainty associated with the college application process; and (4) those who want to signal their strong commitment to the school.

The Early Admissions Game (AFZ, 2003)[10] 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 when assessing an applicant's admission chances. They estimate that applying ED increases an applicant's probability of admission by an average of 28 percent (AFZ

[10] AFZ (2001) is an unpublished working paper with the regression results used for their book.

2003).[11] To consider whether admissions officers are observing some characteristics of the students not captured in recorded admission data, they include admissions office ratings as an independent variable and find that the results change very little. They confirm these results with a 1999-2000 survey of 3,294 students at prominent private and public high schools throughout the country that shows applying ED increases the probability of admission by 29 to 33 percent.[12]

The links between ED and college outcomes is a point of contention in the theoretical research. Depending on the student's rationale for the early commitment, reducing uncertainty (Roth and Xing, 1994; Li and Rosen, 1998; Li and Suen, 2000) or signaling unobservable match quality (Avery and Levin, 2010, and Lee, 2009), early decision may manifest itself in lower or higher performance, conditional on observables, once enrolled in a college. If unobservable match quality exists, it might manifest itself in better college outcomes, all else equal. One existing study casts doubt on these theories: Jensen and Wu (2010) use eight years of data from Hamilton College, a liberal arts college in upstate New York, to show that applying ED is negatively correlated with college GPAs (1st semester, 1st year and cumulative at graduation) and other academic honors.

In the following section we describe our data, which allow us to consider the ED process from application to college performance,

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

[12] 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).

4. DATA

Our primary data come from two schools in the north east, each with approximately 1800 students enrolled.[13] 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 that include race, gender, and legacy status. The data include characteristics of the high school such as type (private or public) and state. In addition, the data identify whether the applicant intended to apply for financial aid, and, in the case of College X, we know the amount of financial aid College X offered the student. The datasets include the admissions decision made on the applicant, accept or not, and enrollment decision. These data are similar across the colleges. The data also contain a numerical score given by the colleges' admission departments that represents the applicant's "quality". Finally, the data contain numerous college performance measures for those who enroll in College X and a few of these measures for College Y.

We purchased a data match from the College Board that augments the admissions data and includes SAT I scores, SAT II scores[14], and AP test scores. Both of these colleges allow students to choose whether to submit their SAT I scores or not, so-called *optional SAT* schools, so the match provides SAT I scores for those who chose not to submit them.[15] The College

[13] 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.

[14] 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.

[15] The optional SAT policy was in place at College X for 5 years before our data extract and it was the first year of the policy for College Y.

Board data include responses to the student descriptive questionnaire (SDQ) that students fill out at the time they take their SATs. These include self-reported data on high school experience, high school grades[16], college intentions and family income.[17] To bolster our knowledge of the socioeconomic status of the applicants, we also match the zip codes of applicants to the 2000 Census to measures of the median income in the zip code, and other demographic characteristics of the zip code such as percent white and percent urban.

Appendix Table 1 describes the colleges' admissions pools.[18] By our measures, applicants are from the high end of the income distribution. Conditional on self-reporting a family income, and about half do not, income greater than $100,000 is the most common response. The average zip code median income 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 are from the northeast United States, including the states where the colleges reside. Overall, ED applications are more likely to come from zip codes with higher income, be white and be a legacy, than regular decision applicants. Likewise, ED applicants perform worse in high school and on standardized tests than regular decision applicants.

Table 1 highlights the significance of Early Decision in the colleges' application and acceptance process. At College X, 6.1 percent of all applicants apply ED, yet 42 percent of the enrolled freshmen applied ED. This is a combination of the, unconditionally, high acceptance

[16] High school GPA has the potential to be crucial in analyzing student and college behavior. Unfortunately, GPA scales as reported on applications are not standardized across high schools (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.

[17] 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.

[18] The sample in Appendix Table 1 and other descriptive statistics (including Table 1) are applicants who have non-missing values for the variables used in the Table 2 regression, columns (1) and (3).

rates among ED applicants (86 percent) relative to regular decision applications (38 percent) and the very high yield (matriculation/acceptance) rates among ED applications (96 percent) relative to regular decision applicants (21 percent). At College Y, 10 percent of applicants choose ED, and, again, more than 40 percent of their freshman class is students who applied ED.[19] Relative to College X, the disparity in the acceptance rates for ED (64 percent) and regular decision applicants (47 percent accepted) is not as large, despite substantially higher internal rankings for regular decision applicants. The following section conditions on observable characterisics to further investigate the decision to apply early decision and its relationship to college admission and other outcomes.

5. EMPIRICAL RESULTS

5.1 Applying early decision

To understand the population applying early decision to College X and College Y, we estimate the following probit model:

$$Apply\ ED_i = X_i\beta + \varepsilon_i \qquad (1)$$

where *i* indexes the individual, *Apply ED* is an indicator for whether the student applies 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), whether test scores were revealed to the school, region of the country, number of high school extracurricular activities, number of high school sports participated in, and a dummy for whether the applicant intends to play varsity sports in college.

[19] AFZ (2002) report similar shares of the class from ED applicants from Columbia (45 percent) and Penn (42 percent) in the Fall of 1999 entering classes. Harvard (69 percent) and Brown (73 percent) are much higher and Stanford (29 percent) is lower. In all schools they report from Table 1b, the admissions rate is substantially higher for ED than regular decision, although the absolute numbers are much lower for the Ivy League schools and Stanford.

β is a vector of parameters to be estimated. For students with a valid zip code *X* also includes 2000 Census zip code data on income, urbanicity and neighborhood racial composition, which results in smaller sample sizes for College X, but provides additional details about the applicants' backgrounds. In particular, the self-reported income measures are often missing and self-reported income data from college students are not particularly reliable (Winston and Hill, 2006; Winston et al., 2007). The error term is ε.

Our results are in Table 2, with the first two columns showing the regression results for College X with and without census data. Columns (3) and (4) show the results for College Y and last two columns show the results for Equation 1 when we pool College X and Y data. We expect ability to pay to be positively correlated with the decision to apply ED because higher income students can more easily forgo the opportunity to compare financial aid packages. Table 2 shows the coefficients on self-reported income below $100,000 are consistently negative, but never statistically significant. Residing in a zip code with a higher income is positively correlated with applying early, although the coefficient is only statistically significant in the pooled sample at the 5 percent level.

Our income data are not ideal, yet we have other student characteristics that are likely to be correlated with income, including legacy status and race. Legacy status and race may also be correlated with match quality – legacy students have a preexisting connection to the school because a close relative attended the school and minorities are less likely to be well-matched to these small liberal arts colleges with little racial or other diversity. Supporting both the ability to pay and match quality hypotheses for applying ED, all else equal, legacies are three to six percentage points more likely to apply ED than non-legacies. The coefficient is statistically significant at the one percent level in the pooled sample, but only at the 5 percent level in College Y and not statistically significant for College X. African American students are 3 to 5

percentage points less likely to apply ED at College X and 6 to 10 percentage points less likely at College Y, relative to their white counterparts. Asian American applicants are also less like to apply ED than white students, by 3 to 4 percentage points. Note that when we include the additional income data from the census (columns (2), (4) and (6)), the coefficients on the dummies representing minority status are generally smaller, which does suggest that race proxies for income. Jensen and Wu (2010) point to a perception that athletes are associated with early decision because they are recruited by coaches attempting to achieve certainty in their teams. We find that the number of high school seasons played is positively associated with applying ED, but only statistically significant at the 10 percent level for College X, and the intent to play varsity level in college is actually negatively correlated with applying ED, although not statistically significant. Lending some support to the hypothesis that match quality motivates applying ED, students who are not from the NE, and therefore are less similar to the students enrolled at Colleges X and Y, are less likely to apply ED, all else equal.

Table 1 is consistent with students choosing to apply ED to College X and Y as a strategy to increase their 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. A student with a 100 point lower SAT, all else equal, is 1 to 2 percentage points less likely to apply ED. For College Y, a high school GPA of an A plus, relative to a B, is correlated with a 7 percentage point decline in the probability of applying early. These results are consistent with the theory proposed by Kim (2010) that lower ability, high income students are willing to trade off the ability to compare financial aid packages for an increased probability of admission.

The pooled sample indicates that, all else equal, applicants to College X are more 3.5 percentage points more likely than applicants at College Y to apply ED. This is not true

unconditionally, as shown in Table 1. However, Table 1 also shows that the unconditional marginal benefit of applying ED, as measured by acceptance probability, is higher at College X than at College Y. In the following sections, we investigate whether this holds conditionally and how the selection into applying ED may affect the college acceptance decision.

5.2 Admissions Decision

To assess the marginal benefits of applying early decision, we turn to the college's decision of whether or not to accept students.[20] To verify whether this regularity simply reflects better students applying ED, we estimate the following probit model, where *i* indexes the individual applicant:

$$Accepted_i = X_i\beta + \delta ED_i + \varepsilon_i \qquad (2)$$

Accepted is a 1 if the applicant is accepted and zero otherwise[21]; X_i is a vector of individual characteristics observed by the college and; ED_i is a dummy variable that is 1 if the applicant applies early decision and zero otherwise.

Table 3 shows coefficient estimates for equation (2). The unconditional mean differences in acceptance probabilities, shown in Columns (1), (3) and (7) show that the probability of acceptance is higher by 46 percentage points at College X, 20 percentage points at College Y and 35 percentage points in the pooled sample for applying ED relative to applying regular decision. The difference between acceptance probabilities of ED and regular decision applicants is even

[20] We exclude applicants who withdrew from the application process before an admissions decision was made and therefore the sample sizes are smaller than in the previous section.

[21] It is possible for the colleges to defer students from the ED process to the regular decision process. We cannot identify students at College X, for whom this happens. For College Y, we have 78 of 390 students who applied ED were deferred to regular the regular decision applicant pool. Of those, 28 were accepted and 50 were rejected. We do not differentiate between those who are accepted in the regular decision process and those who are accepted in the ED process because of the small sample size. However, from both the students' and schools' perspectives, admission during ED is potentially a very different outcome than during the regular decision process. Ideally we could understand more fully whether students who are deferred from ED to regular decisions are treated differently than other regular decision students, but we simply do not have sufficient observations on these students to do so.

higher when conditioning on the *X* variables: the remaining columns of Table 3 show that applying ED, all else equal, is correlated with an increase of 49 percentage points in the probability of acceptance at College X, 32 percentage points at College Y and 40 percentage points in the pooled sample. This increase in the coefficient on ED after conditioning on covariates suggests that, on average, ED applicants have weaker backgrounds than regular decision applicants. For both colleges, the difference in admission probability between applying ED and regular decision is larger than the difference between a high school GPA of a B compared to an A plus. The marginal benefit for applying ED is higher for College X than for College Y, even conditional on the observable characteristics of the applicants. Recall that AFZ (2003) used admissions data from selective colleges and estimated applying ED increased the average applicant's probability of acceptance by an average of 28 percentage points. It is possible that ED is a more important tool for less selective schools because they have more close substitutes and therefore have more uncertainty about their class size and composition; consistent with the theory paper of Avery and Levin (2010).

Among the other observable covariates shown in Table 3, legacies and private high school attendance, which likely proxy for both willingness to pay and ability, are also more likely to be accepted, all else equal. The probability of acceptance is lower if students revealed their SAT I, but increasing in SAT I scores for those who reported their scores. Some of the other coefficients likely 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 relative to higher income applicants, although the opposite is true for College Y. 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.

5.3 Early Decision and Selection

While Table 3 provides evidence that ED applicants have an advantage in the admissions process, all else equal, the source of the advantage is unclear. In this section, we address the possibility that there are unobservable characteristics that are correlated with the decision to apply ED. We have already addressed what some of these might be: match quality with the school, knowledge of the school's incentives to choose a large share of a class from the ED applicant pool[22], risk aversion. If the college admissions officers observe some of these in their admission decision, the coefficient on applying ED will be biased.

We first address this possibility in the most direct way – we include colleges' internal ratings of the students as an independent variable in the acceptance regression, with the assumption that these ratings reflect characteristics of the students observed only by the school in outlets such as the applicants' interviews or essays. Controlling for the college's evaluation of the student in equation (2) does not substantially change the finding that ED applicants in our analysis (the coefficient on the Early Decision covariate is 0.4518 [se=0.0150] and 0.3258 [se=0.0175] for College X and Y respectively and these full results are available upon request) or those of AFZ (2002), who use a similar specification. A difficulty with these admissions rankings as a measure of match quality is that they are likely to be endogenous to the acceptance decision.[23] For, example, the rankings for *regular admissions* students are generated when the admissions officers know the composition of the class from the ED applicants.

[22] AFZ (2003) show that in a survey of high school seniors, more than 70 percent believe that apply ED provides an advantage in the admissions decision.

[23] In specification checks, we regress the colleges' internal admissions ratings on the ED indicator and the remaining covariates. For College X we find that applying 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.

A second strategy for dealing with the potential endogeneity of the ED variable is to identify an instrumental variable for ED that is correlated with the decision to apply early, but uncorrelated with the acceptance decision. However, we believe that most observable characteristics that influence the decision to apply early are also likely to directly affect the acceptance decision.[24] Instead we estimate two additional specifications that make assumptions about the nature of the unobservable characteristics.

First, we estimate a matching model (Abadie et al., 2001) in which we assume that applying early is random for individuals with similar values of the covariates and, therefore the selection into applying early is entirely on observable characteristics. In other words, we assume that applying early is totally independent of the college's acceptance decision, conditional on the covariates. This might hold if, for example, a guidance counselor happened to mention to one student the possibility of early admission, but forgot to mention it to another identical student. The results of the nearest neighbor matching estimates, shown in Table 4, continue to suggest large, statistically significant effects of applying ED on the probability of being accepted. In particular, the average effect of applying ED is an increase in the probability of acceptance by 48 percentage points for College X, 26 percentage points for College Y and 40 percentage points for the pooled sample.

As an alternative, we make another extreme assumption based on the work of Altonji et al. (2005). In this case, we assume that the selection on unobservables is the same as the selection on observables and estimate the effect of how large the effect of applying early would be on college acceptance if this were true. Because we have a large set of covariates on each individual that are likely to be important in the acceptance decision and, therefore the selection on unobservables is

[24] Robinson and Monks (2005) consider another college application decision – whether to submit SAT scores to a college with optional SAT submission. They estimate a bivariate probit for the decision to submit and the admissions decision, excluding the family financial contribution from the acceptance equation. We do not have data on family contribution in our data. On a related point, the schools in our data also have these optional SAT policy. Because our focus is on the ED choice, we do not directly address the potential endogeneity of these variables in our estimates. We do, however, run the regressions without the score choice variables and find no difference in the estimates of our ED coefficients, suggesting that their inclusion is not biasing our coefficient of interest.

likely to be less strong than selection on the observables, our estimates under this assumption provide a bound. This application is very similar to the Altonji et al. (2005) application, which estimates the effect of attending Catholic high school on high school graduation.

Our results from estimating the effect of ED on acceptance under this strong assumption are in Table 4.[25] We estimate that the *upper* bound of the marginal effect is 0.52 (se=0.16) for College X, 0.40 (se=0.17) for College Y and 0.40 (se=0.02) for the pooled sample, all statistically significant at the one percent level, using the bootstrapped standard errors.[26] The fact that the estimates yield an upper bound is, in itself, noteworthy because it implies that the causal effect of applying ED on the probability of acceptance may be even larger than those estimated by a probit, because the unobservable characteristics are negatively correlated with college acceptance. In the Altonji et al. (2005) work, the estimates yield a lower bound because the selection on unobservable characteristics into Catholic school is positively correlated with high school graduation. Perhaps the unobservable characteristics in our case include a level of savvy or college preparation gamesmanship that are not attractive to college admissions officers.

Finally, as an alternative test of whether there is something unobservable about students admitted through ED, we consider whether post-enrollment college performance measures differ by ED application status. This analysis is very similar to Jensen and Wu (2010), who use a single college over multiple years. The idea is that if ED represents something unobservable to the researcher about the applicant, such as match quality, we might expect enrolled ED applicants to perform differently in college than regular decision applicants. One caveat to this analysis is that the sample is obviously limited to those who enroll, which is clearly not a random

[25] We are grateful to Todd Elder for providing us with the code to estimate the model.
[26] It is not surprising that the estimated marginal effects are not dramatically different than the results from Columns (3), (6) and (9) of Table 3, because we did not find a large amount of selection on observables (compare Columns (1), (4) and (7) to the subsequent columns in Table 3). Our assumption is that the selection on unobservables is as large as the effect on observables.

group of students from among the regular decision applicants – recall that Table 1 shows that only about 20 percent of those accepted in regular decision enroll.

We run the following OLS or probit regressions to analyze and isolate the effect individual characteristics and the decision to apply early have on the subsequent performance of enrolled applicants:

$$Y_i = X_i\beta + \delta ED_i + \varepsilon_i \qquad (3)$$

Where Y_i is a one of the college outcome measures, X_i is a vector of individual characteristics used in Table 2, and ED_i is a dummy variable that is 1 if the applicant applies early decision and zero otherwise. If unobservable differences determine the decision to apply ED, then holding all else equal, we might expect δ to be significantly correlated with subsequent college outcomes (Lee, 2009).

In Table 5, each cell reports the estimated marginal effect of applying early decision from a separate regression where the dependent variable is a different college outcome measure.[27] Some measures are academic, such as GPAs and academic honors. Other measures, such a retention and involvement in the social life of the college through student government, sports and study abroad, may better reflect positive non-academic outcomes. At College X, applying ED is positively correlated with retaining students until the end of their freshman year and statistically significant, but only at the 10 percent level. For College Y, the estimated effect is positive, but close to zero and not statistically significant at any standard level. When the data are pooled, the coefficient is positive and statistically significant at the five percent level.[28] Otherwise, applying early is not positively correlated at statistically significant levels with any other academic outcomes, such as freshman GPA, final GPA, Phi Beta Kappa, Summa or Magna Cum Laude, or

[27] Other work on determinants of college grade point averages includes Betts and Morel (1999), Cohn et al. (2004), and Rothstein (2004).

[28] In related work, Monks (2000) shows that legacy students are slightly less likely to earn to the highest college grade point averages, relative to non-legacy students.

dual major, which might show academic breadth. Like Jensen and Wu (2010), who have larger sample sizes than us, we do find that applying ED is negatively correlated with freshman and final college GPAs, although our estimates are never statistically different than zero at standard levels. For College X we also have measures of social success outcomes, such as student government participation or study abroad, although applying early is not statistically significantly related to most of those measures with the exception of sports participation, where applying ED is positively correlated with the number of sports seasons played at College X, although at only the 10 percent level. We hypothesize that match quality may be stronger between athletes and the schools because they are recruited and counseled about the admissions process more heavily than a student who is not an athlete.

In sum, we find very large marginal benefits of applying early in the acceptance decision: between 0.49 and 0.52 for College X and between 0.26 and 0.40 for College Y. In addition, we find only very limited evidence that ED applicants perform better than one might expect, conditional on their observable characteristics.

5.4 Differential Benefits of Applying Early Decision

The ED process generates a substantial share of the freshman class – recall that Table 1 shows that both schools enroll more than 40 percent of their freshman class from the ED applicants, who are, on average high income and white. Because of the high enrollment rate among accepted ED applicants, 97 percent for College X and 91 percent for College Y, ED is an effective tool for reducing uncertainty about the characteristics of the freshman class. Kim (2010) argues that ED is a policy tool that allows colleges to screen high income students and Afram (2006) expresses skepticism that colleges would strive to reverse the selection of high income, white applicants in the regular decision process. Lee (2009) argues that higher standards might be applied in the regular decision process to avoid the adverse selection. These arguments

suggest that there are differential benefits to applicant characteristics in the admissions decision, depending on whether applicants apply ED or regular decision. To test whether the acceptance decisions are consistent with these arguments, we run a set of regressions interacting *Early Decision* with covariates. We report the marginal effects from the probits for simplicity, but the results from the matching and Altonji et al. (2005) method are available upon request.

Table 6 shows selected results from each regression – reporting the coefficients on being an ED applicant, as well as the coefficient on the covariate of interest, and the interaction term between the two. First consider the interaction with ED and being a minority (African American, Asian American, Hispanic or Native American). The coefficient on being a minority group is positive, but the interaction is negative. For College X the coefficients are 0.1966 (se=0.0195) and -0.2194 (se=0.0567) and both are statistically significant at standard levels. This implies that all else equal, being a minority is positively correlated with being accepted, but only in the regular decision process. For College Y, minorities have a higher acceptance rate in both the early and regular decision process than non-minorities, but the differential is larger in the regular decision process. Because we do not have reliable income data on individuals and minority proxies somewhat for income, these results are consistent with the college screening high income applicants in the ED round of applications, as well as attempting to increase diversity in the regular decision period through increased acceptance rates of minority students.

When next use more direct measures of income, specifically median zip code income and self-reported low income (income below $100,000), in the interaction terms. These results are the second and third sets of results in Table 5. For College X we find no statistically significant coefficients on the interaction terms. For College Y, applicants with higher median zip code income have lower acceptance probabilities in the ED process, all else equal, which is not consistent with using the ED process to screen higher income families. That said, this college

practices need-based admissions, so that later in the admission process, admissions decisions are based on financial aid need, which is consistent with this negative coefficient estimate on the interaction term.

We also interact being an ED applicant with SAT score. All else equal, the probability of acceptance is higher at both College X and College Y with higher SAT scores. For College X, the interaction term with Applying Early Decision and SAT Score is positive, suggesting that higher SAT scores are rewarded more in the ED process. This results is consistent with College X is using the ED process to avoid the adverse selection of the regular decision process, as suggested by Lee (2009) – admissions standards are higher in the regular decision process to avoid attracting students who were rejected from their first choice college. In other words, students with higher SAT scores presumably have more outside options for college attendance, but accepting those with high SAT scores in the ED process is a way for colleges to identify the students who are most committed to the college. At College Y, the interaction term between SAT score and ED applicant is close to zero in magnitude and statistically insignificant.

In the final sets of regression, College X again shows results consistent with the hypothesis that ED is a tool to avoid adverse selection. Recall that 65 percent of applicants to College X are female and this is true in both the regular decision and early decision process. Overall, women are less likely to be accepted than men, presumably to maintain a level of gender diversity in the student body. However, the penalty in the probability of being admitted is lower during ED when women are 5 percentage points less likely to be accepted than men compared to 16 percentage points less likely to be accepted during the regular decision process. Again, these results are consistent with the colleges using the ED process to identify the women who are most committed to the college. And, again, these results do not hold for College Y. For the year of

data we have, all else equal women are more likely to be accepted than men, but only in the regular decision process.

College X and College Ys' behaviors are consistent with screening higher income students in the early admission process, with higher admission probabilities for white students in the ED process relative to the regular decision round. This is also consistent with colleges trying to increase diversity during the regular decision process that they did not obtain in the ED process. However, using more direct measures of income does not yield the same pattern of results. College X appears to reward high SAT scores and women more in the ED process relative to the regular decision process, which is consistent with attempting to secure students who are expressing a desire to come to the college. The same is not true for College Y, for which we have only a single year of data, but none the less, makes the results difficult to generalize.

5.5 Financial Aid

Finally, we consider the possibility that colleges price discriminate based on the binding nature of the early decision agreement. How price discrimination may manifest itself is ambiguous – because acceptance requires a student to commit to the college, colleges may offer lower financial aid to the students who have revealed themselves as willing to pay via ED applications (see AFZ, 2003, Chapter 6). However, the pool of financial aid resources at small liberal arts schools are limited so that financial aid may be more scarce later in the admissions process – many schools practice need-aware admissions, where admission decisions are based on

financial need.[29] This implies that, conditional on observables, early applicants may be more likely to receive financial aid.[30]

We have financial aid grant data from only College Y that shows that, among the accepted students, applicants who apply ED receive similar financial aid grants, $6,345, to applicants who apply in the regular decision process, $6,164. Once we condition on students who report intending to apply for financial aid, which is the best proxy we have for actual financial aid applicants, the ED applicants receive statistically and economically larger awards: $13,214 for ED applicants versus $11,249 for regular applicants, which is consistent with ED applicants being overall less financially needy and with the school offering fewer resources later in the admissions process.

To take advantage of additional information we have on the applicants and their financial needs, we run the following Tobit regression, letting *i* index the individual student:

$$FAGRANT_i = X_i\beta + \delta ED_i + \varepsilon_i \qquad (4)$$

$FAGRANT_i$ is the financial aid grant awarded to the applicant i, X_i is a vector of individual characteristics used in equation (1), and ED_i is a dummy variable that is 1 if the applicant applies ED and zero otherwise. Unfortunately, X_i does not contain the detailed income data on the students as observed by the colleges, but we use the self-reported income data together with the

[29] College X and Y are both need-aware, meaning that they make admissions decisions later in the admissions process based on financial aid need, favoring students with higher ability to pay. Kim' (2010) model of ED is suggests that ED programs allow colleges to screen higher income applicants and, therefore, eliminate the need to state that they are need-aware in their admission practices.

[30] A recent SmartMoney article (Andriotis, 2009) answers the question: "Do Early Decision Students Get More Aid?" like this: "However, many aid packages like state and college grants are finite and often are doled out on a first-come, first-served basis…Depending on the university, students who are admitted during early admission could see some financial aid perks. 'The early decision kids have the first crack at the money,'says Kalman Chany, the president of New York-based Campus Consultants, which advises college students and their families on financial aid. Those students are often courted by colleges into applying early because of their extraordinary grades or athletic skills, and they can end up with sizable financial aid packages. There are also drawbacks. When students apply early decision, they're essentially telling the university that it's their first choice, so the university can more confidently try to pinpoint the smallest amount of financial aid it will take for the student to attend, says Chany. http://www.smartmoney.com/personal-finance/college-planning/do-early-decision-students-get-more-financial-aid/

data on their zip code income to capture financial need. We restrict the sample to those who reported intending to apply for financial aid, but the results are similar if we include all applicants and are available upon request.

Table 7 reports the marginal effect of the covariates on the observed variable, financial aid grant. There is a *positive* correlation between applying ED and financial aid and the coefficient is statistically significant at the one percent level. In other words, all else equal, financial aid packages are more generous for those who apply ED, by an average of about $5500. For College Y, price discrimination does not appear to occur in the form of the school penalizing students who commit to the ED process, but rather appears to exist only in the sense that there is less competition for financial aid early in the process.[31]

Otherwise, the financial aid package is statistically correlated with measures of income such that students who self-report income below $100,000 and students who come from zip codes with higher median income receive less 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 applicants receive higher average financial aid packages. College Y also awards higher financial aid for students with higher standardized test scores and high school GPAs.

[31] This is consistent with a recent blog in the New York Times by Robert Massa of Lafayette College who reports: "Colleges do not deplete their financial aid budgets during early decision (and here I am referring to the majority of colleges with early programs – not to the handful that have huge endowments, allowing them to admit students regardless of need AND to meet the needs of all admitted students)"(http://thechoice.blogs.nytimes.com/2010/12/13/the-case-for-early-decision/ accessed 5/11)

6. 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 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, which may include a higher acceptance rate. Some of the theoretical literature on early decision is consistent with these views (Kim, 2010). However, proponents of early decisions and other researchers suggest that the benefits to such policies are large because they generate better matches between students and schools and reduce uncertainty (Lee, 2009 and Avery and Levin, 2010).

Our paper considers the early decision policies at two liberal arts schools during the 2000s. Like previous empirical work on ED 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 applying early decision appears to compensate for lower standardized test scores or high school grade point averages. In our pooled sample with both College X and College Y, we find the marginal effect of applying ED ranges from 0.40 to 0.46, depending on how we account for selection. Our estimates of the upper bound of the effect (Altonji et al., 2005) suggest that the factors unobservable to us that determine the admission decision are negatively correlated with the admission process.

This negative selection into ED is further borne out by the lack of consistent evidence enrolled students who apply ED perform consistently better in college than their regular decision counterparts. In one exception, for one of the one of the colleges, retention is higher at the end of the first year among ED students, which is suggestive that students applying early decision are signaling their match quality with the school. However, this correlation does not persist to the final graduation retention or other measures of academic and social success such as GPA and student government participation. The lack of consistent correlations discounts the possibility that unobservable student characteristics drive the differences in the admissions standards for early and regular admissions applicants, and suggests that the other arguments in the colleges' objective functions are more important than identifying match quality, such as reducing uncertainty in class size and financial aid.

We also find some evidence that colleges attempt to add racial diversity to the relatively homogenous student body they attain in the early decision admissions by accepting a more diverse population in the regular admissions process. Specifically, the differential benefit of being a minority is higher during the regular admission period compared to the early decision period. This finding is consistent with the claims in a recent *New York Times* article (Steinberg, 2009):

> While nearly 40 percent of the seats in next year's freshman class at Cornell are now reserved [through early decision], the university has still allowed itself much flexibility for the main round of admission, when most students will apply. Moreover, colleges like Cornell are committed to assembling the most diverse classes possible -- including racially and socio-economically diverse classes -- and many of those who apply early tend to be white and of some means.
>
> "Colleges are hesitant to go beyond a certain line when it comes to the percentage of the incoming class that they obtain through early decision," said David Hawkins, director of public policy and research for the National Association for College Admission Counseling. "They're aware of the research, and the potential inequities they might produce if they cross that line."

Finally, we directly address the question of whether colleges price discriminate if a student applies early decision. Using the financial aid awards available from one of the schools,

we find that, all else equal, financial aid packages are more generous for those who apply early, which may be due to the fact that financial aid is limited and more is available if students apply early, 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 ED applicants has lower financial need.

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. Although we have a small sample size of two schools and three years, our current research sheds some light on the students' tradeoffs between maximizing their probability of acceptance and financial aid and colleges' tradeoffs over maintaining diversity while minimizing uncertainty about class sizes and financial aid.

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Table 1
College Rating, Acceptance Rates and Yield Rates by Early Decision Status
Means and Standard Deviations

	College X			College Y		
Acceptance Rate	.361			0.486		
Early Decision Rate	.061			0.100		
	Regular	Early	ss	Regular	Early	ss
N	7085	459		3429	382	
Internal Academic Rating	4.265	4.171	*	4.643	3.984	***
	(1.088)	(1.035)		(1.546)	(1.372)	
Internal Final Rating	4.294	4.334		5.681	5.001	
	(0.989)	(0.861)		(1.607)	(1.435)	
Acceptance Rate	0.331	0.824	***	0.470	0.639	***
	(0.471)	(0.382)		(0.499)	(0.481)	
Yield (Matriculate/Accepted)	0.219	0.976	***	0.173	0.906	***
	(0.414)	(0.153)		(0.009)	(0.293)	
Share of Freshman Class from ED	0.417			0.443		

Notes: Excludes students who withdrew before the acceptance decision was made. The Academic and Final ratings for College X are on a 1-7 scale with 7 being the most favorable. The academic ratings for College Y are on a 1-7 scale with 1 being the most favorable and the final ratings are on a 1-9 scale with 7 and 9, respectively being the most favorable. Significance is the difference between Early and Regular decision applicants. *** significant at 1%; ** significant at 5%; * significant at 10%

Source: College admissions data from College X and College Y.

Table 2
Probit: Early Decision (1=Student Applied Early Decision) Marginal Effects

	College X		College Y		College X and Y pooled	
	(1)	(2)	(3)	(4)	(5)	(6)
Census Data	No	Yes	No	Yes	No	Yes
Income Missing (sr)	-0.0033	-0.0024	-0.0049	-0.0041	-0.0050	-0.0041
	(0.0080)	(0.0082)	(0.0144)	(0.0144)	(0.0072)	(0.0074)
Income <50K (sr)	-0.0102	-0.0054	-0.0073	-0.0055	-0.0101	-0.0065
	(0.0097)	(0.0106)	(0.0196)	(0.0205)	(0.0092)	(0.0098)
50K <Income <100K (sr)	-0.0036	-0.0019	-0.0039	-0.0021	-0.0045	-0.0025
	(0.0081)	(0.0086)	(0.0158)	(0.0162)	(0.0075)	(0.0079)
Zip Code Median Income		0.0002		0.0005*		0.0003**
		(0.0002)		(0.0003)		(0.0001)
Zip Code Percent Less than $30,000 income		0.0618		0.2430		0.1333
		(0.1468)		(0.2308)		(0.1246)
Attended Private HS	-0.0073	-0.0078	-0.0051	0.0010	-0.0055	-0.0043
	(0.0060)	(0.0061)	(0.0104)	(0.0107)	(0.0054)	(0.0055)
Legacy	0.0357	0.0355	0.0612	0.0561**	0.0477***	0.0456***
	(0.0218)	(0.0222)	(0.0232)	(0.0229)	(0.0153)	(0.0153)
African American	-0.0390***	-0.0272*	-0.0762***	-0.0486**	-0.0517***	-0.0342***
	(0.0092)	(0.0140)	(0.0129)	(0.0224)	(0.0074)	(0.0122)
Native American	0.0665	0.0899	-0.0011	0.0076	0.0470	0.0727
	(0.0627)	(0.0706)	(0.0879)	(0.0987)	(0.0522)	(0.0610)
Asian American	-0.0311***	-0.0275*	-0.0492***	-0.0454**	-0.0373***	-0.0340***
	(0.0101)	(0.0108)	(0.0172)	(0.0189)	(0.0089)	(0.0096)
Hispanic	-0.0030	0.0019	-0.0630***	-0.0528***	-0.0232**	-0.0155
	(0.0132)	(0.0143)	(0.0164)	(0.0191)	(0.0104)	(0.0118)
Race Unknown	-0.0232**	-0.0293***			-0.0266**	-0.341***
	(0.0102)	(0.0099)			(0.0118)	(0.0117)
		0.0061		-0.0366**		-0.0105
Zip Code Percent Urban		(0.0113)		(0.0170)		(0.0092)
Zip Code Percent African American		-0.0560		-0.1461**		-0.0838***
		(0.0341)		(0.0616)		(0.0317)
Female Student	-0.0062	-0.0061	-0.0239**	-0.0226**	-0.0120**	-0.0115**
	(0.0061)	(0.0062)	(0.0097)	(0.0098)	(0.0052)	(0.0054)
From State where College resides	0.0136	0.0119	-0.0053	0.0008	0.0047	0.0058
	(0.0089)	(0.0089)	(0.0112)	(0.0118)	(0.0065)	(0.0066)
From Midwest	-0.0222**	-0.0201*	-0.0172	-0.0060	-0.0228**	-0.0183*
	(0.0100)	(0.0104)	(0.0218)	(0.0241)	(0.0095)	(0.0103)
From West	0.0027	0.0071	-0.0260	-0.0138	-0.0053	0.0016
	(0.0100)	(0.0108)	(0.0179)	(0.0202)	(0.0090)	(0.0099)
From South	-0.0200**	-0.0203**	-0.0617***	-0.0571***	-0.0308***	-0.0302***
	(0.0082)	(0.0085)	(0.0157)	(0.0171)	(0.0076)	(0.0081)
SAT1 Score (100: 16 max)	-0.0087***	-0.0089***	-0.0196***	-0.0222***	-0.0122***	-0.0130***
	(0.0030)	(0.0031)	(0.0046)	(0.0048)	(0.0025)	(0.0027)
SAT2 Score(s) available (1=yes)	0.0375	0.0302	0.1542***	0.1518***	0.0686***	0.0625***
	(0.0245)	(0.0272)	(0.0455)	(0.0464)	(0.0211)	(0.0224)
Average SAT2 Score	-0.0087	-0.0069	-0.0291***	-0.0286***	-0.0144***	-0.0130**
	(0.0057)	(0.0059)	(0.0098)	(0.0100)	(0.0050)	(0.0052)
ACT Score(s) available (1=yes)	-0.0696**	-0.0551*	-0.0339	-0.0513	-0.0546*	-0.0485
	(0.0297)	(0.0322)	(0.0736)	(0.0700)	(0.0300)	(0.0320)

Table 2 (continued)
Probit: Early Decision (1=Student Applied Early Decision) Marginal Effects

	College X		College Y		College X and Y merged	
	(1)	(2)	(3)	(4)	(5)	(6)
Census Data	No	Yes	No	Yes	No	Yes
Average ACT Score	0.0043**	0.0034*	0.0017	0.0024	0.0031*	0.0027
	(0.0018)	(0.0019)	(0.0033)	(0.0034)	(0.0016)	(0.0017)
No High School GPA reported (sr)	0.0027	0.0036	-0.0128	-0.0180	-0.0040	-0.0051
	(0.0130)	(0.0133)	(0.0210)	(0.0212)	(0.0110)	(0.0112)
HS GPA A+ (SR)	-0.0234*	-0.0216	-0.0695***	-0.0706***	-0.0418***	-0.0414***
	(0.0137)	(0.0144)	(0.0172)	(0.0174)	(0.0102)	(0.0106)
HS GPA A (sr)	-0.0183*	-0.0207**	-0.0044	-0.0039	-0.0167*	-0.0178*
	(0.0103)	(0.0103)	(0.0214)	(0.0220)	(0.0097)	(0.0099)
HS GPA A- (sr)	-0.0216**	-0.0213**	-0.0270	-0.0255	-0.0245***	-0.0241***
	(0.0091)	(0.0092)	(0.0174)	(0.0178)	(0.0083)	(0.0085)
HS GPA B+ (SR)	0.0002	0.0008	-0.0075	-0.0047	-0.0032	-0.0023
	(0.0100)	(0.0102)	(0.0184)	(0.0189)	(0.0090)	(0.0093)
HS GPA B- (SR)	0.0078	0.0146	0.0069	0.0047	0.0059	0.0093
	(0.0204)	(0.0219)	(0.0347)	(0.0353)	(0.0176)	(0.0186)
HS GPA C or below (sr)	-0.0063	-0.0045	-0.0193	-0.0526	-0.0087	-0.0190
	(0.0331)	(0.0337)	(0.0518)	(0.0364)	(0.0286)	(0.0262)
Class rank missing (sr)	-0.0005	-0.0015	0.0307	0.0328	0.0084	0.0078
	(0.0104)	(0.0103)	(0.0215)	(0.0220)	(0.0099)	(0.0100)
Class rank 1st 10th (sr)	-0.0071	-0.0093	0.0151	0.0202	-0.0014	-0.0025
	(0.0112)	(0.0112)	(0.0241)	(0.0254)	(0.0109)	(0.0112)
Class rank 2nd 10th (sr)	0.0142	0.0123	0.0268	0.0283	0.0184*	0.0171
	(0.0110)	(0.0109)	(0.0236)	(0.0242)	(0.0107)	(0.0107)
Class rank middle or bottom (sr)	-0.0124	-0.0161	0.0387	0.0384	-0.0006	-0.0041
	(0.0146)	(0.0143)	(0.0332)	(0.0337)	(0.0144)	(0.0143)
# of HS Extracurricular Activities (sr)*Filled in sdq	0.0007	0.0008	0.0038	0.0039	0.0017	0.0018
	(0.0013)	(0.0014)	(0.0024)	(0.0024)	(0.0012)	(0.0012)
# of HS sports (sr)*Filled in sdq	0.0009	0.0010	0.0073**	0.0062*	0.0026	0.0024
	(0.0018)	(0.0018)	(0.0034)	(0.0034)	(0.0017)	(0.0017)
Intend to play varsity sports (sr)* *Filled in sdq	-0.0021	-0.0018	-0.0181	-0.0177	-0.0057	-0.0057
	(0.0068)	(0.0071)	(0.0129)	(0.0131)	(0.0063)	(0.0065)
# of HS offices/awards (sr)*Filled in sdq	0.0005	0.0004	0.0038	0.0042	0.0015	0.0017
	(0.0024)	(0.0024)	(0.0042)	(0.0042)	(0.0021)	(0.0022)
# of HS honors classes (sr)*Filled in sdq	-0.0003	-0.0002	-0.0014	-0.0011	-0.0006	-0.0005
	(0.0008)	(0.0008)	(0.0016)	(0.0016)	(0.0007)	(0.0008)
Filled in College Board Survey (sdq)	-0.0037	-0.0051	-0.0246	-0.0329	-0.0133	-0.0171
	(0.0198)	(0.0207)	(0.0343)	(0.0360)	(0.0178)	(0.0188)
Year 2	0.0057	0.0018				
	(0.0055)	(0.0056)				
College X					0.0354***	0.0357***
					(0.0069)	(0.0069)
Year 2*College X					0.0072	0.0025
					(0.0065)	(0.0066)
Observations	7544	7083	3811	3710	11355	10793
R-squared	0.0310	0.0350	0.0634	0.0711	0.0461	0.0514

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, Class Rank in 2nd 5th; From Northeast. All students who have no SAT 1 score or withdrew their application before an acceptance decision was made are excluded. Robust standard errors in parentheses: *** significant at 1%; ** significant at 5%; * significant at 10%

Table 3
Probit (1= School Accepts Applicant) Marginal Effects

	College X			College Y			College X and College Y Pooled		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Census Data	No	No	Yes	No	No	Yes	No	No	Yes
Early Decision Applicant	0.4614***	0.4865***	0.4877***	0.1980***	0.3162***	0.3244***	0.3466***	0.4006***	0.4032***
	(0.0182)	(0.0145)	(0.0152)	(0.0263)	(0.0191)	(0.0190)	(0.0160)	(0.0124)	(0.0127)
Income Missing (sr)		0.0509***	0.0528***		0.0113	0.0135		0.0422***	0.0432***
		(0.0152)	(0.0157)		(0.0209)	(0.0210)		(0.0126)	(0.0129)
Income <50K (sr)		0.0784***	0.0680***		-0.0639**	-0.0545*		0.0322*	0.0323*
		(0.0213)	(0.0222)		(0.0300)	(0.0307)		(0.0181)	(0.0188)
50K <Income <100K (sr)		0.0229	0.0137		-0.0762***	-0.0720***		-0.0071	-0.0129
		(0.0157)	(0.0164)		(0.0224)	(0.0229)		(0.0133)	(0.0138)
Zip Code Median Income			-0.0004			0.0007*			0.0000
			(0.0003)			(0.0004)			(0.0003)
Zip Code Percent Less than $30,000 income			0.2238			0.1157			0.1409
			(0.2782)			(0.3344)			(0.2210)
Attended Private HS		0.0396***	0.0307**		0.0709***	0.0663***		0.0511***	0.0440***
		(0.0115)	(0.0120)		(0.0151)	(0.0155)		(0.0094)	(0.0097)
Legacy		0.2226***	0.2093***		0.0874***	0.0926***		0.1341***	0.1293***
		(0.0356)	(0.0367)		(0.0290)	(0.0286)		(0.0231)	(0.0233)
African American		0.3620***	0.3625***		0.4000***	0.3638***		0.3727***	0.3537***
		(0.0279)	(0.0323)		(0.0244)	(0.0333)		(0.0200)	(0.0247)
Native American		0.0270	0.0317		0.3316***	0.2986**		0.1307*	0.0989
		(0.0958)	(0.0973)		(0.1048)	(0.1207)		(0.0786)	(0.0783)
Asian American		0.1451***	0.1443***		0.2796***	0.2830***		0.1973***	0.1936***
		(0.0276)	(0.0281)		(0.0302)	(0.0311)		(0.0212)	(0.0219)
Hispanic		0.1336***	0.1346***		0.3526***	0.3442***		0.2298***	0.2246***
		(0.0301)	(0.0312)		(0.0323)	(0.0338)		(0.0236)	(0.0245)
Race Unknown		-0.0595***	-0.0684***					-0.0711***	-0.0744***
		(0.0225)	(0.0232)					(0.0225)	(0.0233)
Zip Code Percent Urban			-0.0489**			0.0171			-0.0057
			(0.0208)			(0.0258)			(0.0167)
Zip Code Percent African American			0.0083			0.2808***			0.1054**
			(0.0546)			(0.0775)			(0.0463)
Female Student		-0.1597***	-0.1578***		0.0887***	0.0834***		-0.0607***	-0.0578***
		(0.0116)	(0.0119)		(0.0139)	(0.0140)		(0.0092)	(0.0094)

Table 3 (continued)
Probit (1= School Accepts Applicant) Marginal Effects

	College X			College Y			College X and College Y Pooled		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Census Data	No	No	Yes	No	No	Yes	No	No	Yes
From State where College resides		0.0116 (0.0158)	0.0190 (0.0162)		0.0143 (0.0164)	0.0124 (0.0167)		0.0090 (0.0114)	0.0093 (0.0116)
From Midwest		0.1055*** (0.0243)	0.1135*** (0.0252)		-0.0187 (0.0335)	-0.0306 (0.0338)		0.0672*** (0.0209)	0.0644*** (0.0215)
From West		0.0051 (0.0194)	0.0167 (0.0208)		0.0174 (0.0272)	0.0005 (0.0276)		0.0137 (0.0164)	0.0136 (0.0172)
From South		-0.0306* (0.0177)	-0.0259 (0.0190)		0.1124*** (0.0343)	0.1154*** (0.0351)		0.0044 (0.0161)	0.0126 (0.0170)
Requested school use SAT1 Score		-0.5485*** (0.0059)	-0.5523*** (0.0057)		-0.5342*** (0.0067)	-0.5344*** (0.0067)		-0.5462*** (0.0042)	-0.5478*** (0.0043)
Requested school use SAT1 Score* SAT1 Score/100		0.0828*** (0.0064)	0.0870*** (0.0065)		0.1870*** (0.0064)	0.1857*** (0.0064)		0.1516*** (0.0041)	0.1543*** (0.0042)
Requested school use SAT2 Score		-0.4860*** (0.0092)	-0.4884*** (0.0095)		-0.4626*** (0.0067)	-0.4623*** (0.0068)		-0.0069 (0.0243)	-0.0041 (0.0248)
Requested school use SAT2 Score* SAT2 Score/100		0.1439*** (0.0116)	0.1447*** (0.0119)		0.0827*** (0.0132)	0.0811*** (0.0137)		0.0060*** (0.0023)	0.0056** (0.0024)
Requested school use ACT Score		-0.0816*** (0.0313)	-0.0726** (0.0316)		-0.3298* (0.1691)	-0.3957*** (0.0958)		-0.0509 (0.0316)	-0.0387 (0.0317)
Requested school use ACT Score* ACT Score		0.0046*** (0.0012)	0.0042*** (0.0013)		0.0231** (0.0117)	0.0291** (0.0117)		0.0043*** (0.0012)	0.0039*** (0.0012)
No High School GPA reported (sr)		0.1342*** (0.0252)	0.1369*** (0.0260)		0.1386*** (0.0322)	0.1455*** (0.0325)		0.1421*** (0.0200)	0.1457*** (0.0205)
HS GPA A+ (SR)		0.2704*** (0.0332)	0.2614*** (0.0348)		0.2313*** (0.0398)	0.2404*** (0.0398)		0.2545*** (0.0255)	0.2493*** (0.0265)
HS GPA A (sr)		0.2514*** (0.0244)	0.2430*** (0.0254)		0.2332*** (0.0328)	0.2402*** (0.0329)		0.2446*** (0.0199)	0.2367*** (0.0205)
HS GPA A- (sr)		0.1903*** (0.0215)	0.1899*** (0.0224)		0.1821*** (0.0310)	0.1846*** (0.0313)		0.1835*** (0.0179)	0.1832*** (0.0185)
HS GPA B+ (SR)		0.1187*** (0.0217)	0.1231*** (0.0225)		0.1371*** (0.0305)	0.1353*** (0.0311)		0.1257*** (0.0179)	0.1280*** (0.0184)
HS GPA B- (SR)		-0.0826* (0.0443)	-0.0955** (0.0451)		-0.0763 (0.0680)	-0.0820 (0.0702)		-0.0887** (0.0379)	-0.0955** (0.0387)
HS GPA C or below (sr)		-0.1678 (0.1047)	-0.1522 (0.1082)		0.0759 (0.1807)	0.0533 (0.1885)		-0.0777 (0.1020)	-0.0734 (0.1054)

Table 3 (continued)
Probit (1= School Accepts Applicant) Marginal Effects

	College X			College Y			College X and College Y Pooled		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Census Data	No	No	Yes	No	No	Yes	No	No	Yes
Class rank missing (sr)		0.0433**	0.0558***		-0.0133	-0.0096		0.0385**	0.0458***
		(0.0206)	(0.0211)		(0.0310)	(0.0311)		(0.0174)	(0.0177)
Class rank 1st 10^{th} (sr)		0.1151***	0.1128***		0.1188***	0.1277***		0.1277***	0.1317***
		(0.0230)	(0.0237)		(0.0340)	(0.0342)		(0.0195)	(0.0200)
Class rank 2^{nd} 10^{th} (sr)		0.0610***	0.0650***		-0.0074	-0.0006		0.0506***	0.0562***
		(0.0202)	(0.0208)		(0.0320)	(0.0322)		(0.0175)	(0.0179)
Class rank middle or bottom (sr)		-0.0437	-0.0260		-0.0105	-0.0030		-0.0221	-0.0057
		(0.0349)	(0.0365)		(0.0533)	(0.0538)		(0.0298)	(0.0307)
# of HS Extracurricular Activities (sr)*Filled in sdq		0.0040	0.0033		-0.0049	-0.0031		0.0011	0.0011
		(0.0025)	(0.0026)		(0.0037)	(0.0037)		(0.0021)	(0.0022)
# of HS sports (sr)*Filled in sdq		-0.0069**	-0.0051		0.0064	0.0060		-0.0034	-0.0021
		(0.0033)	(0.0034)		(0.0051)	(0.0051)		(0.0028)	(0.0029)
Intend to play varsity sports (sr)* *Filled in sdq		0.0175	0.0191		-0.0097	-0.0078		0.0145	0.0166
		(0.0131)	(0.0136)		(0.0185)	(0.0184)		(0.0111)	(0.0114)
# of HS offices/awards (sr)*Filled in sdq		0.0080*	0.0089*		-0.0008	0.0001		0.0051	0.0056
		(0.0045)	(0.0047)		(0.0061)	(0.0061)		(0.0037)	(0.0038)
# of HS honors classes (sr)*Filled in sdq		0.0015	0.0015		0.0030	0.0027		0.0029**	0.0030**
		(0.0015)	(0.0015)		(0.0020)	(0.0021)		(0.0012)	(0.0013)
Filled in College Board Survey (sdq)		-0.0507	-0.0315		-0.0087	-0.0182		-0.0425	-0.0323
		(0.0405)	(0.0419)		(0.0532)	(0.0537)		(0.0325)	(0.0334)
Year 2		0.0144	0.0115						
		(0.0104)	(0.0107)						
College X								-0.0389**	-0.0375**
								(0.0160)	(0.0163)
Year 2*College X								0.0176*	0.0142
								(0.0106)	(0.0110)
Observations	6560	6560	6156	3602	3602	3504	10162	10162	9660
R squared	0.0424	0.2460	0.2470	0.0107	0.4946	0.2999	0.0270	0.2232	0.2258

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, Class Rank in 2^{nd} 5^{th}; From Northeast. We exclude students who have no SAT 1 score or withdrew their application before an acceptance decision was made. Robust standard errors in parentheses: *** significant at 1%; ** significant at 5%; * significant at 1%

Table 4
Marginal Effects, Probit, Bivariate Probit (Altonji, Elder and Taber, 2005) and Matching Estimates
(1= School Accepts Applicant) Marginal Effects

	College X			College Y			College X and Y pooled		
	Probit Table 3 (3)	AET	Matching	Probit Table 3 (6)	AET	Matching	Probit Table 3 (9)	AET	Matching
Early Decision Applicant	0.4877*** (0.0152)	0.5183*** (0.1644)	0.4835*** (0.0203)	0.3244*** (0.0190)	0.4037*** (0.1710)	0.2589*** (0.0283)	0.4032*** (0.0127)	0.4648*** (0.1446)	0.3959*** (0.0170)

Sources: Authors' calculations from College X and Y admissions data merged with College Board Data
Notes: The estimates condition on the X variables from Table 3. For the Altonji, Elder and Taber (2005) estimates, we bootstrap the standard errors with 500 replications. *** significant at 1%; ** significant at 5%; * significant at 1%.

Table 5
Marginal Effects from Probit and OLS Regressions: Dependent Variables College Performance Measures
Coefficient and Standard Error on *Early Decision Applicant*

Dependent Variable	College X	College Y	College X and Y Pooled	Sample
Freshman GPA	-0.0020 (0.0272) 4.0 Scale	-0.6472 (0.5056) 100 point scale	-0.0094 (0.0188) Standardized 4.0 scale	Completed Freshman Year N_X=795 N_Y=466 N_{XY} =1261
Freshman Retention	0.0188* (0.0107)	0.0032 (0.0146)	0.0184** (0.0091)	Enrolled As Freshman N_X=816 N_Y=486 N_{XY} =1302
Graduate	0.0377 (0.0297)			Enrolled As Freshman
Final GPA	-0.0011 (0.0222) 4.0 scale			Graduates N_X=637
Dual Major	-0.0478 (0.0346)			Graduates
Phi Beta Kappa	-0.0478 (0.0346)			Graduates
Summa or Magna Cum Laude	-0.0349 (0.0322)			Graduates
Student Government Participant	-0.0301 (0.0219)			Graduates
Played College Sports	0.0628 (0.0381)			Graduates
Number of Sports Seasons	0.2346* (0.1399)			Graduates
International Study	-0.0202 (0.0396)			Graduates

Sources: Authors' calculations from College X and Y admissions data merged with College Board Data.
Notes: Full regression includes all covariates from Table 2 with Census variables. We exclude students who have no SAT 1 score and report marginal effects from probit regressions when the dependent variable is dichotomous and robust standard errors for all specifications. *** significant at 1%; ** significant at 5%; * significant at 10%

Table 6
Selected Marginal Effects from Probit Regressions: (1= School Accepts Applicant)
Interaction Terms of Early Decision with Select Characteristics
(Each block represents a different set of regression)

	College X	College Y	College X and Y pooled
Coefficient on:			
Minority	0.1966***	0.3352***	0.2460***
	(0.0195)	(0.0213)	(0.0152)
Early Decision Applicant	0.5031***	0.3360	0.4149***
	(0.0146)	(0.0187)	(0.0127)
Applied ED*Minority	-0.2194***	-0.1967**	-0.1809***
	(0.0567)	(0.0816)	(0.0486)
Zip Code Median Income	-0.0007***	0.0009	-0.0001
	(0.0002)	(0.0003)	(0.0002)
Early Decision Applicant	0.4423***	0.3968***	0.3932***
	(0.0498)	(0.0344)	(0.0325)
Applied ED* Zip Code Median Income	0.0009	-0.0014**	0.0002
	(0.0008)	(0.0007)	(0.0005)
Low Income	0.0370**	-0.0716***	0.0054
	(0.0156)	(0.0220)	(0.0132)
Early Decision Applicant	0.4963***	0.3164***	0.4079***
	(0.0169)	(0.0214)	(.0144)
Applied ED* Low Income	-0.0556	0.0483	-0.0284
	(0.0537)	(0.0569)	(0.0382)
SAT Score (100)	0.0847***	0.1866***	0.1523***
	(0.0065)	(0.0070)	(0.0042)
Applied Early Decision	-0.0813	0.4016**	0.0038
	(0.2463)	(0.1788)	(0.2125)
Applied ED* SAT Score (100)	0.0519**	-0.0090	0.0350
	(0.0233)	(0.0235)	(0.0177)
Female	-0.1631***	0.0936***	-0.0629***
	(0.0121)	(0.0147)	(0.0097)
Early Decision Applicant	0.4407***	0.3568***	0.3731***
	(0.0330)	(0.0248)	(0.0213)
Applied ED* Female	0.1101**	-0.0943**	0.0717**
	(0.0562)	(0.0424)	(0.0351)

Sources: Authors' calculations from College X and Y admissions data merged with College Board Data. Notes: Includes all covariates from Table 3 Columns (3), (6) and (9), with the exception of the regressions with the income variables – we only include the income variable shown and exclude the others. We exclude students who have no SAT 1 score or withdrew their application before an acceptance decision was made. Robust standard errors in parentheses: *** significant at 1%; ** significant at 5%; * significant at 10%

Table 7
Marginal Effects on Observed Variable from Tobit Regressions:
Dependent Variable Financial Aid Grant
Conditional on Intent to Apply for Financial Aid at College Y

	(1)	(2)	(3)
Census Data	No	No	Yes
Early Decision Applicant	3300***	5543***	5619***
	(807)	(749)	(745)
Income Missing (sr)		4018***	3813***
		(767)	(761)
Income <50K (sr)		4822***	4446***
		(596)	(615)
50K <Income <100K (sr)		4070***	3745***
		(608)	(617)
Zip Code Median Income			-73***
			(20)
Zip Code Percent Less than $30,000 income			-7798
			(11396)
Attended Private HS		-422	-706
		(523)	(536)
Legacy		1741**	1605*
		(846)	(847)
African American		5004***	4340***
		(597)	(748)
Native American		3408	1932
		(2395)	(3176)
Asian American		5000***	4820***
		(517)	(528)
Hispanic		5612***	5334***
		(529)	(552)
Zip Code Percent Urban			391
			(746)
Zip Code Percent African American			-947
			(1948)
Female Student		943**	842*
		(444)	(441)
From State where College resides		11	-534
		(489)	(506)
From Midwest		1377	1254
		(1016)	(1023)
From West		-1669	-1542
		(1095)	(1091)
From South		-690	-936
		(1116)	(1157)
Requested school use SAT1 Score		-11164***	-11496***
		(822)	(829)
Requested school use SAT1 Score* SAT1 Score/100		2447***	2549***
		(211)	(214)
Requested school use SAT2 Score		-23668*	-21922
		(13458)	(13312)
Requested school use SAT2 Score* SAT2 Score/100		1171***	1100***
		(395)	(393)

Table 7 (continued)
Tobit Financial Aid Grant, conditional on Intent to Apply for College Y
Marginal Effects

	(1)	(2)	(3)
Census Data	No	No	Yes
Requested school use ACT Score		-12015	-15517
		(15134)	(15948)
Requested school use ACT Score* ACT Score		527	601*
		(354)	(351)
No High School GPA reported (sr)		2188**	1822*
		(1091)	(1099)
HS GPA A+ (SR)		3179***	2780***
		(960)	(993)
HS GPA A (sr)		2412**	1992**
		(969)	(988)
HS GPA A- (sr)		1386	1188
		(968)	(971)
HS GPA B+ (SR)		1100	1313
		(1004)	(979)
HS GPA B- (SR)		-5730*	-4824
		(3313)	(3177)
HS GPA C or below (sr)		-5465	-5676
		(5205)	(5152)
Class rank missing (sr)		-2939***	-2578**
		(1077)	(1054)
Class rank 1st 10^{th} (sr)		-338	-432
		(1028)	(1025)
Class rank 2^{nd} 10^{th} (sr)		-2863**	-2755**
		(1156)	(1140)
Class rank middle or bottom (sr)		-3006	-2409
		(1849)	(1790)
# of HS Extracurricular Activities (sr)*Filled in sdq		-188*	-206*
		(109)	(109)
# of HS sports (sr)*Filled in sdq		0	-43
		(147)	(146)
Intend to play varsity sports in college (sr)* Filled in sdq		-304	-160
		(559)	(552)
# of HS offices/awards (sr)*Filled in sdq		333**	311*
		(165)	(164)
# of HS honors classes (sr)*Filled in sdq		49	77
		(59)	(59)
Filled in College Board Survey (sdq)		1324	1592
		(1839)	(1847)
Observations	2060	2060	2006
R-squared	0.0007	0.0220	0.0234

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, Class Rank in 2^{nd} 5^{th}; From Northeast. We exclude all students who have no SAT 1 score or withdrew their application before an acceptance decision was made and include students who expressed an intent to apply for financial aid.
Robust standard errors in parentheses: *** significant at 1%; ** significant at 5%; * significant at 10%

Appendix Table 1
Descriptive Statistics of Applicants - Mean and Standard Deviation

	College X			College Y		
Variable	Regular Decision	Early Decision	s.s.	Regular Decision	Early Decision	s.s.
Income Missing (sr)	0.464	0.449		0.567	0.542	
	(0.499)	(0.498)		(0.496)	(0.499)	
Income <50K (sr)	0.091	0.085		0.079	0.076	
	(0.288)	(0.279)		(0.270)	(0.265)	
50K <Income <100K (sr)	0.176	0.179		0.149	0.152	
	(0.380)	(0.383)		(0.356)	(0.359)	
Income >100K (sr)	0.269	0.288		0.204	0.230	
	(0.444)	(0.453)		(0.403)	(0.422)	
Zip Code Median Income	72.715	76.295	**	67.625	70.713	*
	(29.723)	(30.718)		(29.557)	(32.608)	
Zip Code Percent Less than $30,000 income	0.065	0.061	*	0.068	0.067	
	(0.033)	(0.033)		(0.036)	(0.037)	
Intend to Apply for Financial Aid	0.488	0.436	**	0.573	0.474	***
	(0.500)	(0.496)		(0.495)	(0.500)	
Attended Private HS	0.480	0.460		0.383	0.403	
	(0.500)	(0.499)		(0.486)	(0.491)	
Legacy	0.023	0.037	*	0.056	0.105	***
	(0.150)	(0.189)		(0.229)	(0.307)	
White	0.832	0.874	**	0.866	0.932	***
	(0.374)	(0.333)		(0.341)	(0.252)	
African American	0.032	0.017		0.038	0.018	**
	(0.176)	(0.131)		(0.192)	(0.134)	
Native American	0.003	0.009	**	0.002	0.003	
	(0.052)	(0.093)		(0.045)	(0.051)	
Asian American	0.041	0.022	**	0.054	0.026	**
	(0.199)	(0.146)		(0.225)	(0.160)	
Hispanic	0.038	0.046		0.040	0.021	*
	(0.192)	(0.209)		(0.195)	(0.143)	
Unknown Race	0.054	0.033	*			
	(0.225)	(0.178)				
Zip Code Percent Urban	0.871	0.870		0.839	0.783	***
	(0.260)	(0.247)		(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)	
Female Student	0.677	0.651		0.511	0.458	**
	(0.468)	(0.477)		(0.500)	(0.499)	
From State where College resides	0.129	0.163	**	0.308	0.317	
	(0.335)	(0.370)		(0.462)	(0.466)	
From Northeast (except state where college resides)	0.624	0.625		0.507	0.568	**
	(0.484)	(0.485)		(0.500)	(0.496)	
From Midwest	0.056	0.048		0.047	0.039	
	(0.231)	(0.214)		(0.211)	(0.194)	
From West	0.088	0.096		0.069	0.047	
	(0.284)	(0.295)		(0.254)	(0.212)	
From South	0.103	0.068	**	0.056	0.021	***
	(0.303)	(0.251)		(0.230)	(0.143)	

Appendix Table 1 (continued)
Descriptive Statistics of Applicants - Mean and Standard Deviation

	College X			College Y		
Variable	Regular Decision	Early Decision		Regular Decision	Early Decision	
SAT1 Score (1600 max)	1255	1219	***	1262	1214	***
	(133)	(130)		(140)	(118)	
SAT I Math Score (800 max)	624	606	***	632	612	***
	(74)	(75)		(77)	(69)	
SAT1 Verbal Score (800 max)	631	613	***	630	603	***
	(79)	(72)		(81)	(70)	
Chose not to submit SAT I Score	0.143	0.270	***	0.245	0.217	
	(0.350)	(0.445)		(0.430)	(0.413)	
SAT2 Score(s) available (1=yes)	0.855	0.821	**	0.713	0.683	
	(0.352)	(0.383)		(0.452)	(0.466)	
Average SAT2 Score	560	536	***	679	645	***
	(71)	(60)		(75)	(70)	
ACT Score(s) available (1=yes)	0.154	0.205	***	0.182	0.204	
	(0.361)	(0.404)		(0.386)	(0.404)	
Average ACT Score	26.346	26.202		26.608	25.564	**
	(3.554)	(3.154)		(3.692)	(3.840)	
No High School GPA reported (sr)	0.259	0.259		0.347	0.338	
	(0.438)	(0.439)		(0.476)	(0.474)	
HS GPA A+ (SR)	0.041	0.024	*	0.063	0.016	***
	(0.199)	(0.153)		(0.244)	(0.125)	
HS GPA A (sr)	0.161	0.129	*	0.165	0.160	
	(0.367)	(0.335)		(0.371)	(0.367)	
HS GPA A- (sr)	0.231	0.187	**	0.172	0.149	
	(0.422)	(0.391)		(0.378)	(0.357)	
HS GPA B+ (SR)	0.178	0.233	***	0.148	0.178	
	(0.383)	(0.423)		(0.356)	(0.383)	
HS GPA B (SR)	0.101	0.131	**	0.081	0.120	***
	(0.302)	(0.337)		(0.273)	(0.326)	
HS GPA B- (SR)	0.022	0.031		0.018	0.031	*
	(0.147)	(0.172)		(0.132)	(0.175)	
HS GPA C or below (sr)	0.006	0.007		0.006	0.008	
	(0.078)	(0.081)		(0.076)	(0.088)	
Class rank missing (sr)	0.313	0.320		0.356	0.364	
	(0.464)	(0.467)		(0.479)	(0.482)	
Class rank 1st 10^{th} (sr)	0.221	0.155	***	0.209	0.139	***
	(0.415)	(0.362)		(0.407)	(0.346)	
Class rank 2^{nd} 10^{th} (sr)	0.189	0.240	***	0.134	0.152	
	(0.392)	(0.427)		(0.341)	(0.359)	
Class rank 2^{nd} 5^{th} (sr)	0.111	0.126		0.074	0.079	
	(0.315)	(0.333)		(0.262)	(0.269)	
Class rank middle or bottom (sr)	0.166	0.159		0.226	0.267	*
	(0.372)	(0.366)		(0.418)	(0.443)	

Appendix Table 1 (continued)
Descriptive Statistics of Applicants - Mean and Standard Deviation

	College X		College Y		
Variable	Regular Decision	Early Decision	Regular Decision	Early Decision	
Filled in College Board Survey (sdq)	0.878 (0.328)	0.885 (0.320)	0.806 (0.395)	0.788 (0.409)	
# of HS Extracurricular Activities (sr)*Filled in sdq	4.730 (3.370)	4.771 (3.317)	3.694 (3.435)	3.955 (3.457)	
# of HS sports (sr)*Filled in sdq	2.129 (2.010)	2.248 (2.074)	1.819 (1.977)	2.173 (2.165)	***
Played HS sporte (sr)* Filled in sdq	0.667 (0.471)	0.693 (0.462)	0.566 (0.496)	0.602 (0.490)	
Intend to play varsity sports in college (sr)* Filled in sdq	0.299 (0.458)	0.268 (0.443)	0.246 (0.431)	0.194 (0.396)	**
# of HS offices/awards (sr)*Filled in sdq	0.940 (1.431)	0.930 (1.488)	0.761 (1.379)	0.780 (1.294)	
# of HS honors classes (sr)*Filled in sdq	3.555 (4.415)	3.255 (4.266)	2.981 (4.370)	2.338 (3.849)	***
N	7085	459	3429	382	
N with zip code match	6659	424	3335	375	

Sources: Authors' calculations from College X and Y admissions data merged with College Board Data
Notes: sr is "self reported" on SDQ. We exclude all students who have no SAT 1 score or withdrew their application before an acceptance decision was made are excluded. Standard deviations in parentheses and tests for statistical difference between early and regular decision: *** significant at 1%; ** significant at 5%; * significant at 10%