APPLY YOURSELF: RACIAL AND ETHNIC DIFFERENCES IN COLLEGE APPLICATION

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Abstract

Access to higher education begins with a student's decision whether and where to apply to college. This paper examines racial and ethnic differences in college application behavior of high school graduates, using two recent graduation cohorts from Texas. We estimate racial and ethnic differences in the probability of applying to college, controlling for a student's college readiness, high school quality, certainty of college admissions, and high school fixed effects. We then investigate racial and ethnic differences in the choice of where to apply. We enhance the typical model of college matching by considering the social setting and high school feeder patterns of state universities. We find that racial and ethnic gaps in application rates, particularly for Hispanic students, are not explained by differential levels of college readiness, high school quality, or information regarding college admission processes. When applying to college, minorities are influenced by more than just matching their academic ability to the institution, and prefer institutions with a large proportion of same-race students and campuses where same-race students from their high school have been successful in the past.

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1. INTRODUCTION

Substantial disparities in college enrollment rates exist across racial and socioeconomic groups in the United States. Nationally, only 62 percent of black and 60 percent of Hispanic high school graduates enrolled in college the fall semester after high school graduation, compared with 71 percent of white graduates (NCES 2016). A key goal of education policy is to help remediate this inequity by providing equal opportunity and access to all students. However, to develop better policy, one needs to understand the underlying causes of these disparities. There are many possible explanations, including lack of information and different preferences. Selective admissions processes can limit college access among minorities if high school quality and high school outcomes are unequally distributed by race and ethnicity. Even before a student can enter an admissions process, she must apply—a process that may be particularly daunting for a potential first-generation college student. Although there are a few studies that investigate the admissions and enrollment process for minority students, most begin with a sample of students who express college interest by taking a college entrance exam (SAT or ACT). In this study, we first investigate racial and ethnic differences in the initial step in college enrollment—the application decision—using two full cohorts of recent Texas high school graduates. Because there is a common college application in Texas (see www.ApplyTexas.org, hereafter referred to as ApplyTexas), we are able to observe whether each student applied to each of the thirty-seven, four-year public postsecondary institutions in the state. Importantly, because we observe the population of students and not just those students who applied or took the SAT or ACT exam, we can learn more broadly about differences in college application behavior. We do so in order to assess the differential roles of student demographics, high school quality, and student preparedness in the college application decision. Importantly, we also allow for effects of race to differ based on student and high school characteristics.

Once we have done this, we then examine the decision of where to apply, conditional on applying. When deciding to apply to a college, students can incorporate a number of different elements, including their level of preparedness (which could be a function of their high school quality and their performance in high school, family characteristics and financial factors, as well as the probability of acceptance.) We focus on understanding the importance of student–campus fit by estimating the influence of academic match, campus demographics, and high school feeder patterns on behavior regarding where students apply to college.[1]

One possible explanation for the observed racial and ethnic disparities is that students have incorrect assessments of the likelihood of gaining admission to a college, and this varies by race and ethnicity. To address this possibility, we take advantage of a unique institutional feature of the Texas public university system. Texas is one of several states that uses both "percent plan" and holistic admissions policies. During the time period under study, students who graduated from the top 10 percent of their senior class at *all* Texas public high schools were eligible for automatic admissions to *all* Texas public universities, including the highly selective flagship campuses of the University of Texas

1. Note that the decision to apply to a particular college could depend on the characteristics of the other colleges to which the student applies. Although this is likely to be the case, our estimation strategy does not allow for this type of dependence.

at Austin (UT Austin) and Texas A&M University at College Station (TAMU). Academic slots not filled by automatically-admitted students were given to students who underwent a more traditional holistic admissions process that included race as one of many background factors. Top 10 percent students were informed during their junior year of high school of their guaranteed admissions status and provided with information about campus options (Top Ten Percent Plan), whereas students below the top 10 percent faced the uncertainty and costs associated with a typical college search and application process. Thus, comparing the application choices of top 10 percent graduates, who were guaranteed college admission, against all high school graduates is particularly useful for understanding the interaction of race/ethnicity and admissions uncertainty. Finally, we examine whether black and Hispanic students respond differently than white and Asian students to the Top Ten Percent Plan in terms of application choices to assess whether perfect information about admissions might reduce inequalities in access. We find the largest effects of automatic admissions on Hispanic students, suggesting that admissions information and policies might be a pathway to improve college quality for these students.

There are several key findings from our analysis. First, we find that lower Hispanic college enrollment begins with a lower propensity to apply to college—that is, Hispanic students are *less* likely to apply to college than all other races, despite having higher average college readiness than black students. These results are robust to controls for student-level college readiness measures, high school characteristics, and high school fixed effects. Second, black students are in fact *more* likely to apply to college than students of other races with similar college readiness and high school quality, but this effect is concentrated among black students who are less prepared for college. Finally, we find racial and ethnic differences in the selection of college applied to, with black and Asian students preferring campuses with students within their own racial group, and black and Hispanic students responding to the prior experiences of their high school peers on the campus. Thus, inequality in college access and quality begins with the decision to apply to college, and is influenced by college factors including student demographics and past high school feeder patterns.

The paper unfolds as follows. Section 2 provides a brief overview of related literature. Section 3 describes the data. Section 4 examines racial and ethnic differences in college application decisions, controlling for individual preparation and high school characteristics. Section 5 allows for heterogeneity in the decision to apply to college by race and ethnicity based on high school characteristics and individual preparedness. Section 6 then examines the decision of which college to apply to, conditional on applying, as a function of student, high school, and college characteristics, focusing primarily on student racial and academic match. Finally, we examine the role of information by exploiting variation in student admission expectations induced by the Top Ten Percent Plan. Section 7 includes a discussion of these results.

2. RELATED LITERATURE

When considering the application behavior of underrepresented minorities, it is important to consider the context in which these decisions are made. Most significantly, college decisions are made in light of existing affirmative action policies; in Texas,

for example, the admissions environment includes both holistic admissions, in which race and ethnicity can be a factor, and race-neutral automatic admissions through the Top Ten Percent Plan (Dickson 2006; Daugherty, Martorell, and McFarlin 2014; Black, Cortes, and Lincove 2015). In addition, college application decisions are integrally related to issues of college mismatch; that is, whether students choose colleges that are the best fit for their level of ability and interests (Walton and Cohen 2007; Arcidiacono and Lovenheim 2016; Cortes and Lincove 2016, 2019).[2] As a result, our work relates to a number of literatures on the application decisions of minority students. One strand of literature examines how the presence or absence of affirmative action changes college application and enrollment decisions. Mark Long (2004a) uses data from the College Board containing a 10 percent random sample of SAT takers, and considers how white and minority applications changed with the elimination of affirmative action in California and Texas. He finds that both minority and nonminority students changed their behaviors; white and Asian students increased the selectivity of schools to which they applied, whereas underrepresented minority students applied to less selective schools. Although he cannot observe the actual colleges to which the student applied, he can observe SAT score reports. He finds that, relative to white and Asian Americans, underrepresented minorities significantly lowered the number of score reports sent to in-state public colleges, regardless of quality; these results are slightly stronger in California than in Texas.[3] Card and Krueger (2005) also use a sample of SAT takers to examine how application decisions responded to the elimination of affirmative action and find little evidence of a change in the propensity of high-ability minorities to apply to at least one selective public institution in California and Texas.

Whereas the aforementioned papers analyze the implications of changes in affirmative action policies on college application behaviors, we focus on a variety of other factors, such as differences in student preparation and differences in high school quality, using data on the full population of high school graduates in Texas; we are thus not limited to students who reveal their college preferences by taking entrance exams. In addition, we consider black and Hispanic students separately while prior studies consider both groups in an aggregate category of underrepresented minorities. A limitation of our work is that it is purely descriptive in nature (and does not, for example, take advantage of a natural experiment for identification.) As a result, we view our study as a complement to the existing work, not a substitute.

2. See Page and Scott-Clayton (2016) for an excellent review of the literature on additional barriers to college access.
3. Considering the role of the Texas Top Ten Percent Plan on minority decision making, Niu, Tienda, and Cortes (2006) analyze a representative survey of Texas high school seniors in the spring of 2002, who were reinterviewed one year later to evaluate differences in college preferences and enrollment decisions, according to three criteria targeted by the Top Ten Percent Plan: high school type, class rank, and minority status. They find that Texas seniors, and top 10 percent graduates in particular, consider institutional selectivity in making college choices. Moreover, graduates from feeder and resource-affluent high schools are more likely to prefer selective institutions, whereas graduates from resource-poor high schools and high schools that rarely feed to selective state universities are less likely to choose selective institutions as their first preference. Also, both for first college preference and enrollment decisions, black and Hispanic students are less likely than white students to opt for selective universities. Mark Long (2004b) uses data from the National Education Longitudinal Study (NELS) and documents that there would be substantial changes in the racial composition of universities following the elimination of affirmative action, even holding application behavior constant.

There is also a recent and influential literature examining underserved populations and their decisions to apply to selective institutions (Griffith and Rothstein 2009; Hoxby and Avery 2013; Hoxby and Turner 2013; Smith, Pender, and Howell 2013; Pallais 2015; Dillon and Smith 2017b). In general, this literature examines a sample of students who are applying to college and tries to understand the college choices they make. Work by Hoxby and Avery (2013) focuses on high-ability high school students to examine the phenomenon of "undermatching." They show that low-income, high-achieving students who are likely to undermatch are those who are more isolated from other achieving students; those who do not undermatch tend to be highly concentrated in a small number of high schools. Pallais (2015) documents that low-income students may be more sensitive to application costs; she shows that a decline in the cost of applying to an additional college, generated through a decline in the cost of sending one's ACT scores to an additional university, leads students to apply to more selective universities. Finally, Dillon and Smith (2017b) use the National Longitudinal Survey of Youth 1997 to document the degree of "mismatch" among students in the survey. Importantly, these data include a variety of demographic characteristics, and the authors use a unique definition of mismatch—the difference between a student's percentile in the ability distribution and the percentile of her college in the student-weighted distribution of a college quality index. They find that a large fraction of students is either undermatched or overmatched, and this is due to student decisions. They also find that features of the state university system the student faces affect the probability of mismatch. Our research focuses on racial and ethnic differences, considers the population of high school graduates, and examines a much broader set of institutional characteristics on which students may base their college application decisions.[4]

Finally, there is also a recent literature examining racial and ethnic differences in college enrollment. Reardon, Baker, and Klasik (2012) document differences in enrollment patterns in highly selective colleges by race/ethnicity and income, and find that both black and Hispanic students are underrepresented in the most selective colleges, even after controlling for family income. Clotfelter, Ladd, and Vigdor (2015) use data from North Carolina to examine the role of the public university system in explaining the racial disparities in college enrollment and completion. They document significant racial and socioeconomic disparities in the likelihood of obtaining a four-year college degree at a University of North Carolina campus. However, these disparities can be fully explained by differential student readiness; once they control for eighth-grade test scores, black students are more likely to enroll and succeed than non-Hispanic white students, largely due to the presence of historically black universities.

Our study builds on this literature using the population of students from Texas, with a focus on the racial and ethnic differences in college application behavior. In addition, because we have such a large sample, we are able to estimate differences in application behavior across students within the same high school. Finally, Texas's automatic admissions policy enables us to examine the issue of application behavior for a

4. More recent work by Dillon and Smith (2017a) also shows that student ability and college quality strongly improve degree completion and earnings; this work suggests, on average, students benefit from "overmatch" of the sort generated by affirmative action in admissions.

subsample of high school graduates who are guaranteed college admission, thereby ruling out mistaken beliefs in the probability of acceptance as an explanation for differential college application behavior.

3. DATA

The data sources for this study were collected by the Texas Workforce Data Quality Initiative (WDQI) at UT Austin, funded by the United States Department of Labor. The dataset includes high school enrollment and performance measures for all Texas public school students who graduated in 2008 and 2009. High school measures of college readiness (such as type and number of courses completed, and performance on high school exit exams) and basic demographics (race and ethnicity, eligibility for free lunch, English proficiency) were obtained from high school academic records. The WDQI database improves on datasets from prior studies of race/ethnicity and admissions by including all high school graduates rather than just those who expressed interest in college and by including a sufficient minority population to disaggregate effects for blacks and Hispanics. In addition, links between high school and university administrative datasets allow for estimation of within high school differences by race and ethnicity, as well as measurement of a high school's historical feeder relationship with a university campus. Finally, the Texas context allows us to directly test the role of admissions uncertainty by comparing automatically admitted students to students who must undergo holistic admissions.

The two high school graduation cohorts include over 490,000 individuals. Reflecting the diversity of Texas, 44 percent of high school graduates in our analysis are white, 39 percent Hispanic, 14 percent black, and 4 percent Asian American.[5] We are able to include approximately 430,000 graduates in our regressions after excluding those with incomplete data and high schools that graduated fewer than five students within a year.[6]

Table 1 displays post–high school college enrollment choices by race and ethnicity. Both black and Hispanic students are underrepresented in enrollment at elite state flagship universities, other selective state universities, Texas private universities, and out-of-state universities.[7] Black students make up some ground in total enrollment at open-enrollment state universities, and Hispanic students are most likely to not enroll in any type of higher education. In this study, we examine whether these inequalities begin with college application behavior.[8]

5. Appendix table A.1 provides additional summary statistics by various college application behaviors.
6. Typically, missing data are college readiness measures for students who transferred into Texas public schools in their junior or senior year. These students have incomplete high school coursework records and were not required to take the Texas high school exit exam.
7. In table 1, and throughout our analysis, we identify three types of Texas public universities based on the selectivity of their holistic (non–top 10 percent) admissions processes. Texas flagship universities (UT Austin and TAMU) are the state's elite campuses and considered the most selective, "other universities with selective admissions" are non-flagship campuses where non–top 10 percent applicants undergo a holistic admissions review, "public universities with open enrollment" admit all applicants who meet minimum criteria and no qualified applicants are rejected.
8. The cost of postsecondary education in Texas is about the same across public universities, and it is significantly more expensive for a Texas resident to enroll out-of-state. For example, in 2006, the total cost of attendance (tuition, fees, plus room and board) ranged from $11,919–$12,845 at Texas flagship universities, and from

Table 1. Summary Statistics—Racial and Ethnic Composition of High School Graduates by College Enrollment

	Texas Flagship	Other Texas Public Universities with Selective Admissions	Texas Public Universities with Open Enrollment	Texas Private 4-Year College or University	Out-of-State 4-Year College or University	Texas Public 2-Year College	Not Enrolled
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
White (non-Hispanic)	0.638	0.474	0.438	0.584	0.622	0.468	0.351
Black	0.049	0.115	0.403	0.126	0.180	0.125	0.140
Hispanic	0.188	0.337	0.136	0.234	0.139	0.369	0.482
Asian	0.123	0.070	0.020	0.053	0.053	0.033	0.023
Number of observations	23,836	66,744	14,233	21,155	18,660	128,341	217,738

Note: Based on enrollment in fall semester following high school graduation.

Sources: Authors' calculations from Texas Workforce Data Quality Initiative Database, graduating student cohorts from spring 2008 and 2009. National Student Clearinghouse data from the 2008–09 and 2009–10 academic years. Universities with selective admissions have an applicant screening process and do not admit all applicants. Open enrollment universities admit all applicants who meet minimum requirements with no selective admissions processes.

Table 2 displays summary statistics for all high school graduates and then disaggregated statistics by race and ethnicity. The graduates were 50 percent female, 44 percent eligible for free or reduced-price lunch (FRPL) and were, on average, 17.1 years old the September of their senior year in high school. In terms of college readiness, graduates average 2.5 semesters of Advanced Placement (AP) or International Baccalaureate (IB) courses. Twenty-four percent took AP English, 15 percent took AP mathematics, and 12 percent took AP science.[9] The average graduate attended a high school that is 44 percent FRPL-eligible, 14 percent black, and 41 percent Hispanic. In terms of the high school's emphasis on college readiness, graduates on average attended schools where 11 percent of students earn college credit by passing an AP exam (by achieving a score of 3 or higher), 67 percent took SATs (or ACTs), and SAT (or converted ACT equivalent) scores averaged 976.

On average, black and Hispanic students have both lower individual college readiness and lower average high school college readiness than white and Asian students. For example, black and Hispanic students attended high schools where, on average, fewer than 9 percent of students earned credit by AP exam, and average SAT scores were below 950. Black students had lower average individual college readiness than Hispanic students across AP coursework and exit exam scores. Black and Hispanic students attended high schools with similar college readiness, but Hispanic students attended schools with a larger percent of minority and FRPL-eligible students, on average. In addition, black and Hispanic students were more likely to attend high schools whose students, on average, had received a scholarship to a flagship campus. Specifically, the Century Scholars (CS) program at TAMU, which began in 1999, is a

$7,445–$13,027 at other Texas public universities. Thus, cost of attendance at state universities, relative to other college options, is not the driving mechanism behind the low enrollment rates, in particular for Hispanic students, observed in table 1.

9. AP mathematics include the following subjects: Calculus, Computer Science, and Statistics. AP science includes the following subjects: Biology, Chemistry, and Physics.

Table 2. Summary Statistics—Student and High School Characteristics by Race and Ethnicity

	Black (1)	Hispanic (2)	Asian (3)	White (4)	All Graduates (5)
Demographics					
Female	0.518	0.507	0.488	0.494	0.502
Age, years	17.12 (0.500)	17.16 (0.526)	17.03 (0.539)	17.11 (0.434)	17.12 (0.486)
Free/reduced-price lunch eligible	0.503	0.626	0.251	0.134	0.435
Limited English proficient	<0.01	0.059	0.055	<0.01	0.036
High school coursework:					
No. of AP/IB courses completed (semesters)[a]	1.56 (3.31)	1.94 (3.66)	6.72 (7.08)	2.90 (4.59)	2.50 (4.34)
Took AP English language arts	0.182	0.200	0.449	0.277	0.241
Took AP mathematics	0.074	0.096	0.437	0.184	0.145
Took AP science	0.064	0.081	0.387	0.141	0.117
No. of courses failed (semesters)	3.54 (4.67)	4.01 (5.20)	1.47 (3.22)	2.01 (3.66)	2.97 (4.54)
High school exam exit (z-scores)					
English language arts	−0.224 (0.947)	−0.187 (0.958)	0.313 (1.003)	0.213 (0.975)	0.008 (0.989)
Mathematics	−0.366 (0.860)	−0.212 (0.928)	0.660 (1.094)	0.243 (0.982)	0.008 (0.992)
Science	−0.34 (0.872)	−0.268 (0.907)	0.477 (1.049)	0.301 (0.983)	0.008 (0.991)
Social studies	−0.24 (0.936)	−0.243 (0.949)	0.379 (0.983)	0.261 (0.962)	0.009 (0.989)
High school characteristics:					
% Free or reduced-price lunch eligible	0.490 (0.213)	0.587 (0.247)	0.300 (0.200)	0.305 (0.175)	0.439 (0.249)
% Black	0.338 (0.237)	0.105 (0.136)	0.168 (0.131)	0.108 (0.105)	0.141 (0.163)
% Hispanic	0.327 (0.193)	0.636 (0.291)	0.285 (0.186)	0.256 (0.183)	0.414 (0.292)
% Earning AP credit	0.087 (0.110)	0.086 (0.114)	0.188 (0.141)	0.130 (0.132)	0.110 (0.125)
% SAT tested	0.659 (0.195)	0.636 (0.216)	0.767 (0.182)	0.688 (0.209)	0.667 (0.211)
Average SAT score	941.51 (100.02)	934.13 (92.98)	1031.51 (88.93)	1018.32 (75.44)	976.00 (96.19)
Flagship scholarship program[b]	0.159	0.161	0.023	<0.01	0.087
Number of graduates[c]	67,215	188,835	19,405	213,486	490,707
Percent of graduates	0.14	0.38	0.04	0.44	1.00

Notes: Summary statistics for graduates of Texas public high schools from 2008 and 2009. Standard errors are in parentheses for continuous variables.

[a]Total number of Advanced Placement (AP) and International Baccalaureate (IB) courses completed (semesters). AP mathematics include the following subjects: Calculus, Computer Science, and Statistics. AP science includes the following subjects: Biology, Chemistry, and Physics.

[b]The Century Scholars program at Texas A&M University began in 1999.

[c]The sum of black, Hispanic, Asian, and white students does not add up to the total number of all graduates because there were 1,766 students who did not report their race/ethnicity or reported multiple races/ethnicities.

Sources: Authors' calculations from Texas Workforce Data Quality Initiative Database, graduating student cohorts from spring 2008 and 2009.

scholarship program that targets high-ability students, namely, top 10 percent students, at low-income high schools in Texas. The CS program provides both financial aid and academic support once students enroll at TAMU (see, for example, Domina 2007;

Andrews, Ranchhod, and Sathy 2010; and Andrews, Imberman, and Lovenheim 2016, for further details on Texas flagship scholarship programs).[10]

K–12 public school data were merged with college application data for all those who applied to Texas public colleges and universities. Because all Texas public universities use ApplyTexas, we are able to observe application behavior to any Texas public university. We used these records to identify students who applied to any public four-year university within one year of high school graduation. The application data also provide additional information on family income, parent education, and college readiness, including SAT scores and eligibility for top 10 percent automatic admissions, which is not provided in the high school dataset.[11] We also can observe enrollment, financial aid, college grades, and college graduation data for all those who enrolled in any Texas public university.

Unfortunately, we do not have access to college application information for students who applied only to out-of-state schools. However, we were able to use the National Student Clearinghouse (NSC) data from the 2008–09 and 2009–10 academic years to identify Texas high school graduates who did not apply to any four-year Texas public university but who did enroll at a four-year university in the United States in the fall following graduation.[12] Individuals who applied to any Texas public university *or* enrolled in any other university are considered to be college applicants in our analysis.[13] We are thus missing individuals who applied only to private or out-of-state colleges and ultimately did not enroll anywhere; as discussed below, this is likely to be a very small fraction and is unlikely to affect our results. When we consider applications to

10. The goal of the CS program is to offer financial assistance and academic support services to students from schools that did not historically place many students at TAMU. To be eligible a student must attend a high school identified by TAMU as historically under- or nonrepresented at this flagship campus. These students received a scholarship of $5,000 per year for four years and access to a four-year learning community (the learning community aims to help students develop during their time at TAMU). UT Austin had a similar scholarship program called the Longhorn Opportunity Scholarship (LOS), but in 2003 the LOS program was discontinued and replaced with the Discovery Scholars Program (DSP). DSP has many of the same features as the LOS program, but DSP eligibility is *individual based* rather than *high school based* (Andrews, Ranchhod, and Sathy 2010; Andrews, Imberman, and Lovenheim 2016).
11. In the data, we only observe a top 10 percent indicator for students who applied to college. It is important to note that class rank may be an important omitted determinant of the college application behavior; to the extent that it is correlated with other variables of interest, our results may be biased. However, we do include a standardized test score as a proxy for class rank, which should limit the bias induced by this omission. A concern, however, is that the measurement error is correlated with other unobserved characteristics also correlated with race. As an example, it may be the case that, in high-performing high schools, there is little correlation between test scores and class rank (as a larger fraction of the students perform well on the standardized tests), while in lower-performing schools there is a stronger correlation between test scores and class rank. To the extent that minorities are disproportionately at lower-performing schools and are lower-ranked, that might bias the coefficients on the race dummies to be more negative. However, when we break our sample by high school characteristics, including the percentage of Hispanics in the school, we find very similar results, suggesting that this type of bias is unlikely to be driving our conclusions. (Results available on request.)
12. National Student Clearinghouse, a nonprofit organization, collects data on student enrollment and completion and covers over 90 percent of U.S. universities. See Dynarski, Hemelt, and Hyman (2015) for more details.
13. In 2008 and 2009, Texas had a total of thirty-seven public four-year universities, all of which participated in ApplyTexas. This includes campuses of the UT system, TAMU system, Texas State system, University of Houston system, Texas Tech University, and several other campuses. A full list of included public universities is available from the authors.

Table 3. Summary Statistics by Four-Year College Application Rates for Texas High School Graduates

	Black (1)	Hispanic (2)	Asian (3)	White (4)
Applied to any college	0.351	0.267	0.524	0.364
Applied to any college or enrolled	0.393	0.295	0.613	0.434
Applied to flagship	0.050	0.054	0.295	0.141
Applied to flagship or enrolled at higher-ranked campus	0.053	0.056	0.326	0.147
Applied to an open enrollment (nonselective) campus	0.154	0.024	0.032	0.052
Applied *only* to flagship	0.016	0.017	0.144	0.076
Applied *only* to open enrollment campus	0.077	0.010	0.011	0.029
Applied to multiple campuses	0.183	0.110	0.304	0.174
Applied to a high-SAT campus	0.094	0.079	0.365	0.204
Applied to a low-SAT campus	0.159	0.077	0.047	0.046
Number of graduates	67,215	188,835	19,405	213,486
Percent of graduates	0.14	0.38	0.04	0.44

Notes: Includes all Texas high school graduates from 2008 and 2009. Application data are available for students who applied to Texas public universities. Additional enrollment data are available for all U.S. universities through the National Student Clearinghouse (NSC). A high-SAT campus is defined as one in the top quartile in the state in terms of median SAT score, and a low-SAT campus is in the bottom quartile in the state in terms of median SAT score.

Sources: Authors' calculations from Texas Workforce Data Quality Initiative Database, graduating student cohorts from spring 2008 and 2009. NSC data from the 2008–09 and 2009–10 academic years. Schools ranked higher than Texas flagships universities were identified from the 2008 U.S. News & World Reports U.S. college rankings.

the most selective institutions, we include individuals who applied to the state flagship campuses of UT Austin and TAMU or who were observed to have enrolled at an out-of-state college that was ranked higher by U.S. News & World Report (2007) than either Texas flagship university for 2008 (UT Austin was ranked 44th, and TAMU was ranked 62nd).

Table 3 presents the application decisions by race and ethnicity for our graduation cohorts. Row 1 presents statistics for the sample observed in the Texas public university application sample, and row 2 then presents similar statistics when we augment the sample with the NSC enrollment data. For four-year public universities in Texas, black and white application rates were similar, at 35 percent for black and 36 percent for white students, and the Asian student application rate was substantially higher at 52 percent. Hispanic students, who make up the second largest group of graduates, have a much lower application rate at only 27 percent. The adjustment resulting from incorporating the NSC data is relatively small; the gaps are largest for white and Asian students, with 9 percent of Asian students and 7 percent of white students appearing as enrolled in the NSC without applying to any four-year public university in Texas. The gaps are smaller for black and Hispanic students at only 4 and 3 percent, respectively.

When we look at applications to elite state flagship universities in row 3, black and Hispanic student application rates fall to only 5 percent, compared with 14 percent for white and nearly 30 percent for Asian students. Row 4 then uses the NSC data to incorporate those who enrolled in four-year universities ranked higher than the flagship universities (according to U.S. News & World Report) and who did not apply to either flagship in Texas. We see that approximately 3 percent of Asian students appear as enrolled at elite universities without applying to either flagship university in Texas. The

gaps for other groups are quite small. Only 0.6 percent of white, 0.3 percent of black, and 0.2 percent of Hispanic students appear as enrolled in higher-ranked universities without also applying to at least one Texas flagship university. Because the gaps for black and Hispanic students are always lower than for white students, omitted information for students who apply only to non-Texan universities and do not enroll is likely to result in understating racial and ethnic differences, as it is likely that more white than black or Hispanic students also apply and do not enroll.

Finally, we can also look in more detail at a student's portfolio of applications and how he differs by race and ethnicity. Black students are substantially more likely to apply to an open enrollment campus, with 15 percent of them doing so, whereas only 5 percent of white, 3 percent of Asian, and 2 percent of Hispanic students do. In contrast, Asian students are much more likely to apply to multiple campuses, with 30 percent doing so, whereas only 11 percent of Hispanic, 17 percent of white, and 18 percent of black students are doing so. A total of 36.5 percent of Asian students apply to a high-SAT campus (defined as the top quartile in the state in terms of median SAT score), and only 5 percent of Asian students apply to a low-SAT campus (defined as the bottom quartile in the state in terms of median SAT score). This pattern reverses among black students, with 16 percent applying to a low-SAT campus and only 9 percent applying to a high-SAT campus. Hispanic students split evenly, with about 8 percent applying to a high-SAT campus and 8 percent applying to a low-SAT campus.

4. DECISION TO APPLY

These summary statistics suggest that racial and ethnic gaps in college access can be partially explained by differential application behavior; however, these statistics do not account for students' preparation and ability, which vary by race/ethnicity and influence the likelihood of college admission. In this setting, it is possible that high school sorting and college readiness explain much of the difference in college application behavior for Hispanic students, and it is unclear why black students have similar application rates to white students.

To better understand the relationship between student characteristics and their application decisions in the context of high school sorting, we next examine the decision to apply to college, controlling for individual and high school characteristics. Importantly, we want to identify whether racial and ethnic differences in the likelihood of applying to college (or the likelihood of applying to a flagship university) are a function of the level of preparation, high school characteristics, and geographic proximity.

To do so, we estimate the following simple model:

$$y_{ist} = \alpha \cdot Race_i + X_i \cdot \beta + \gamma \cdot Z_{st} + \eta_t + \pi_s + \varepsilon_{ist}, \quad (1)$$

where y_{ist} is an indicator of whether student i, who attended high school s and graduated at time t, applied to any four-year college. $Race_i$ represents several indicator variables for race or ethnicity (black, Hispanic, Asian, and white [omitted comparison group] are included in all regressions), X_i is a vector of individual student characteristics, such as college readiness and indicators for FRPL-eligibility and limited English proficiency (LEP). Z_{st} is a time-varying vector of high school characteristics related to both the demographics, college geographic proximity, and the college preparedness of graduates,

and η_t represents graduation year indicators.[14] We estimate this equation as a linear probability model both with and without high school fixed effects, π_s.

Table 4 presents results for regression specifications for the full sample of high school graduates for our two main outcomes of interest. As noted earlier, our first outcome is an indicator of whether an individual applies to a four-year university—this is equal to one if the student either applied to any four-year Texas public university or appeared in the NSC as enrolled at any four-year university (panel A). Our second outcome is an indicator of whether an individual applied to a selective university—this is equal to one if the individual applied to either Texas flagship university or appeared in the NSC as enrolled in a four-year university ranked higher by U.S. News & World Report than the Texas flagships (panel B).

We first consider the probability of applying to a four-year college. Column 1 presents the results from a simple model that controls for race and ethnicity along with a parsimonious set of demographic controls that includes graduation year, age, gender, and indicators for LEP and FRPL-eligibility in high school. This specification confirms substantial differences across races, controlling for this limited set of demographics, in the probability of applying to a public university, with black and Asian students significantly more likely to apply and Hispanic students significantly less likely to apply than white students.

However, these application differences could be due to differences in college preparation or ability. Column 2 adds controls for observable college readiness including the total number of AP course semesters taken, indicators for whether the student took AP English, AP mathematics, and AP science courses, the total number of failing grades received on semester report cards, and performance on the state exit exam (standardized composite of English and math scores). All of these additional variables are statistically significant predictors of college application behavior in the expected direction, and the estimated racial and ethnic differences change in distinct ways. The positive black coefficient becomes even more positive, the positive Asian coefficient becomes smaller in magnitude, and the negative significant Hispanic coefficient becomes insignificant and smaller in magnitude. Thus, differences in individual college readiness variables appear to explain much of the difference between white and Hispanic and white and Asian application rates, but not the differences between black and white students.

Even controlling for student characteristics, differences in application behavior may still be due to differences in high school quality or proximity to the nearest four-year institution. School quality can affect students through a variety of channels, including college preparedness, opportunities to take AP coursework, and expectations for higher education. School quality will vary by race and ethnicity due to historic segregation of neighborhoods and school districts, as well as selective admissions at magnet high schools. It is likely that race and ethnicity also influence a student's experiences within a racially integrated high school in ways that affect college choices. To examine this, we add observable measures of high school quality, including demographic measures (logged total enrollment, percent FRPL eligible, percent black, and percent Hispanic),

14. Throughout this study, high school characteristics are lagged one year prior to the student's senior year in high school.

Table 4. Ordinary Least Squares Regression Results for Applying to College

	Panel A: Any Four-Year University				Panel B: Flagship University or Better			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Race and ethnicity								
Black	0.023*	0.127*	0.146*	0.138*	−0.074*	−0.016*	−0.009*	−0.008*
	(0.008)	(0.006)	(0.005)	(0.004)	(0.004)	(0.003)	(0.002)	(0.002)
Hispanic	−0.077*	−0.002	−0.065*	−0.061*	−0.060*	−0.025*	−0.022*	−0.021*
	(0.009)	(0.007)	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)
Asian	0.177*	0.018*	−0.036*	−0.019*	0.185*	0.048*	0.031*	0.026*
	(0.009)	(0.009)	(0.007)	(0.006)	(0.011)	(0.008)	(0.007)	(0.005)
Other demographics								
Free or reduced-price lunch (FRPL) eligible	−0.114*	−0.047*	−0.052*	−0.054*	−0.070*	−0.030*	−0.020*	−0.020*
	(0.006)	(0.005)	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
Limited English proficient (LEP)	−0.204*	−0.096*	0.011*	−0.097*	−0.060*	0.009*	−0.002*	0.011*
	(0.006)	(0.006)	(0.002)	(0.005)	(0.003)	(0.002)	(0.001)	(0.002)
High school coursework (college readiness)								
No. of AP and IB semesters		0.014*	0.010*	0.013*		0.017*	0.015*	0.018*
		(0.001)	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
Took AP English language arts		0.132*	0.129*	0.138*		0.013*	0.020*	0.019*
		(0.007)	(0.005)	(0.004)		(0.005)	(0.005)	(0.004)
Took AP mathematics		0.121*	0.121*	0.116*		0.151*	0.146*	0.140*
		(0.005)	(0.004)	(0.004)		(0.006)	(0.005)	(0.004)
Took AP science		0.051*	0.044*	0.048*		0.058*	0.054*	0.056*
		(0.006)	(0.005)	(0.004)		(0.005)	(0.005)	(0.004)
Total semesters failed		−0.020*	−0.018*	−0.020*		−0.003*	−0.003*	−0.003*
		(0.001)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
High school exit exam (z-score)[a]		0.079*	0.069*	0.067*		0.038*	0.034*	0.031*
		(0.002)	(0.001)	(0.001)		(0.001)	(0.001)	(0.001)
Geographic proximity[b]								
Distance to nearest university (100 miles)			−0.107*				−0.063*	
			(0.038)				(0.005)	
Distance squared			0.074*				0.009*	
			(0.036)				(0.001)	
Number of observations	427,300	427,300	427,300	427,300	427,300	427,300	427,300	427,300
Other controls								
High school characteristics[c]			Yes				Yes	
High school fixed effects				Yes				Yes

Notes: Robust standard errors (shown in parentheses) are clustered at the high school level. Overall college application rate to a four-year public university is 0.382 (panel A) and flagship university application rate is 0.106 (panel B). Regressions also control for graduation year, gender, and age (not reported). Linear probability models for high school graduates from 2008 and 2009. Panel A dependent variable is equal to one if the student applied to any Texas four-year university or enrolled at any four-year university within one year of graduation. Panel B dependent variable is equal to one if the student applied to a Texas flagship public university (UT Austin or Texas A&M), enrolled in a Texas flagship public university, or enrolled within one year of graduation at an elite four-year university that is ranked higher than UT Austin by Barron's. Enrollment data are available for all U.S. universities through the National Student Clearinghouse.

[a] High school exit exam scores are a composite z-score of both English language arts and mathematics. Advanced Placement (AP) mathematics include the following subjects: Calculus, Computer Science, and Statistics. AP science includes the following subjects: Biology, Chemistry, and Physics.

[b] The distance variables are generated using longitude and latitude to compute the distance between all high schools and public universities in Texas. Panel A includes the distance to the nearest four-year public university. Panel B includes the distance to the nearest flagship university.

[c] Characteristics include logged enrollment, percent FRPL, percent black, percent Hispanic, lagged measures of percent of graduates entering four-year colleges, percent earning AP credit, percent SAT tested, and Flagship scholarship program.

* Statistical significance at $p < 0.05$ level.

indicators of typical college expectations (percent of graduates who enroll in four-year colleges, percent of students earning AP credit, and percent of students taking SATs, all lagged one year to reflect prior graduating classes), and geographical proximity to

the nearest public university.[15] Minority students may live farther from universities than white students; thus, the costs of attending college may be higher.[16] In addition, we also include an indicator variable for high schools whose students were eligible for the CS program. Column 3 presents the results when we include these controls. Controlling for college readiness, observable high school characteristics, and distance to college, we find once again that a black student is significantly more likely than a white student to apply to college, ceteris paribus. In contrast, Hispanic students are again significantly less likely to apply to college than similar white students, but Asian students are now significantly less likely to apply than similar white students.

In our final specification, we include high school fixed effects, thereby controlling for any school characteristics that are constant across this two-year time period (column 4). Here, we are comparing students with equal college preparedness who graduated from the same high school to see if there are racial and ethnic disparities in application behavior within high schools. With high school fixed effects, the positive coefficient for black students relative to white students and the negative coefficient for Hispanic students relative to white students (from column 3) are confirmed and have similar magnitudes. We estimate that within high schools, a black student is 13.8 percentage points more likely to apply to college than a similar white student, whereas a Hispanic student is 6.1 percentage points less likely to apply than a similar white student. For Asian students, the within-high-school difference in application behavior is statistically significant and negative, suggesting that Asian students are less likely to apply than white peers from the same high school by approximately 2 percentage points.[17]

Our results so far indicate that the large Hispanic minority in Texas is least likely to apply to college, while black students are more likely to apply than equally qualified white students with similar high school characteristics. Although racial and ethnic differences in application to public universities in general is important, work by Hoxby and Avery (2013) suggests that another important difference for long-run economic outcomes may be racial and ethnic differences in application to elite universities. Texas's automatic admissions policy is designed to increase minority admissions to these elite

15. The distance variables are generated using longitude and latitude to compute the distance between each high school and each public university campus. The program used in the computation of the distance variables is called "Distance and Bearing between Matched Features" (*distbyid.avx*) by Jenness (2004), which is an application for ArcView. The extension *distbyid.avx* calculates the distance and bearing between features with identical attribute values, allowing one to generate connecting lines and calculate data for specific sets of features. The output options in this extension include a results table containing various user-selected fields such as: distance and bearing between features, x/y coordinates, centroids versus closest edges, etc. Because we had all school addresses, we first generated x/y coordinates based on *longitude* and *latitude* of all of the Texas high schools. Then, using the option x/y coordinates, we compute a 2,412 distance matrix. Lastly, the function option in Stata Statistics/Data Analysis called $min(x_1, x_2, x_3, \ldots, x_k)$ is used to generate miles to the nearest public university and public flagship university. In the case of missing distance data, we used the average distance for non-missing observations within the same school district or county.
16. Although many Texas cities have large Hispanic populations, Hispanics are more likely than other groups to live in rural areas near the Texas–Mexico border.
17. To further support these results, we reestimated all regression specifications on a subset of colleges that excludes Texas's two Historically Black Colleges and Universities (HBCUs) to determine whether our results on black application rates could be driven by these colleges. These regression results are shown in appendix table A.2 of this paper. Without HBCUs included, we predict a smaller, but still statistically significant, gap with black students more likely to apply than white students.

college campuses, but the effects on minority application are unclear (M. Long 2004a; Card and Krueger 2005; Niu, Tienda, and Cortes 2006).

Panel B of table 4 replicates the four specifications above for the outcome of applying to a flagship university or another campus ranked higher than the Texas flagships by U.S. News & World Report.[18] Across all four specifications, black and Hispanic students are significantly less likely than white students to apply to a flagship university. Asian students are significantly more likely to apply than white students, but a large portion of this effect is explained by differences in college readiness and high school quality. The point estimates for all races and ethnicities are larger in the parsimonious specification in column 5, suggesting that some, but not all, racial and ethnic differences are explained by differential levels of college preparation and high school quality.

5. HETEROGENEITY

So far, our analysis has assumed that our point estimates are estimating constant effects of race and ethnicity across both student and high school characteristics. It is possible, however, that racial and ethnic differences in the decision to apply vary depending on the characteristics of the high school a student attended. Minorities attending a high school where more graduates take AP exams or enroll in college might be more likely to consider college options than those attending a high school where graduates rarely attend college.[19] Application patterns could also vary depending on the characteristics of the student, and in particular on the student's level of college readiness. For example, less college-ready minorities may behave differently than minorities who are more prepared for college. We next examine whether we observe differential college application patterns based on high school and student characteristics.

High School Characteristics

Minority students may have different college application behaviors when they attend a high school with greater postsecondary expectations or with differential treatment of minorities relative to college expectations. Table 5 presents results when we examine whether gaps in application behavior are different at schools with a high fraction of Hispanic students versus a low fraction of Hispanic students, and schools with high college enrollment rates for graduates versus low rates. In each case, a high school is characterized as "high" for a given characteristic if it is in the top 20 percent of all high schools statewide and "low" if it is in the bottom 20 percent.[20] Each specification includes controls for gender, age, race and ethnicity, demographics, college readiness, graduation year, and high school fixed effects.

The findings that black students are more likely to apply to college than white students, and that Hispanic students are less likely to apply to college than white students,

18. For estimation of the probability of applying to a flagship university, the "distance to college" variable is replaced with the distance to the nearest of the two flagship campuses.
19. For example, Hoxby and Avery (2013) find that low-income, high-achieving students who are in schools with other high-achieving students are more likely to apply to elite institutions, whereas those who are more isolated are not.
20. These cutoff values are 0.12, 0.30, and 0.67 for percentage Hispanic (bottom 20 percent, median, and top 20 percent, respectively), and 0.09, 0.22, and 0.37 for percentage of graduates from the high school who enrolled in a four-year college (bottom 20 percent, median, and top 20 percent, respectively).

Table 5. Ordinary Least Squares Regression Results for Applying to College by High School Characteristics

	Panel A: Any Four-Year University				Panel B: Flagship University or Better			
	% Hispanic		College Entrance Rate		% Hispanic		College Entrance Rate	
	Top 20%	Bottom 20%	Top 20%	Bottom 20%	Top 20%	Bottom 20%	Top 20%	Bottom 20%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Race and ethnicity								
Black	0.157*	0.114*	0.113*	0.049*	0.125*	0.084*	0.075*	0.038*
	(0.016)	(0.012)	(0.008)	(0.009)	(0.015)	(0.012)	(0.007)	(0.008)
Hispanic	−0.026*	−0.049*	−0.072*	−0.017*	−0.022*	−0.049*	−0.068*	−0.015*
	(0.009)	(0.009)	(0.006)	(0.005)	(0.009)	(0.009)	(0.006)	(0.005)
Asian	0.017	−0.040*	−0.022*	0.007	0.017	−0.038*	−0.022*	0.007
	(0.023)	(0.010)	(0.006)	(0.018)	(0.022)	(0.011)	(0.007)	(0.018)
Other demographics								
Free or reduced-price lunch (FRPL) eligible	−0.040*	−0.062*	−0.072*	−0.008*	−0.039*	−0.053*	−0.066*	−0.007*
	(0.004)	(0.006)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)
Limited English proficient (LEP)	−0.117*	−0.159*	−0.170*	−0.021*	−0.116*	−0.164*	−0.162*	−0.022*
	(0.009)	(0.021)	(0.011)	(0.009)	(0.009)	(0.022)	(0.011)	(0.009)
High school coursework (college readiness)								
No. of AP and IB semesters	0.021*	0.005*	0.007*	0.028*	0.022*	0.006*	0.007*	0.027*
	(0.002)	(0.002)	(0.001)	(0.005)	(0.002)	(0.002)	(0.001)	(0.005)
Took AP English language arts	0.115*	0.144*	0.123*	0.015	0.113*	0.135*	0.123*	0.010
	(0.009)	(0.013)	(0.007)	(0.018)	(0.009)	(0.013)	(0.007)	(0.018)
Took AP mathematics	0.062*	0.115*	0.095*	0.121*	0.062*	0.126*	0.102*	0.124*
	(0.010)	(0.010)	(0.006)	(0.032)	(0.010)	(0.011)	(0.006)	(0.033)
Took AP science	0.040*	0.056*	0.037*	0.024	0.041*	0.053*	0.038*	0.019
	(0.010)	(0.013)	(0.006)	(0.031)	(0.011)	(0.012)	(0.006)	(0.031)
Total semesters failed	−0.015*	−0.028*	−0.032*	−0.002*	−0.015*	−0.024*	−0.029*	−0.002*
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.002)	(0.001)	(0.000)
High school exit exam (z-score)[a]	0.056*	0.078*	0.067*	0.015*	0.055*	0.073*	0.066*	0.014*
	(0.002)	(0.004)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Number of observations	94,289	55,795	132,050	19,938	94,289	55,795	132,050	19,938
Other controls								
High school fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors (shown in parentheses) are clustered at the high school level. Regressions also control for graduation year, gender, and age. Linear probability model regressions for high school graduates from 2008 and 2009. Panel A dependent variable is equal to one if the student applied to any Texas four-year university or enrolled at any four-year university within one year of graduation. Panel B dependent variable is equal to one if the student applied to a Texas flagship public university (UT Austin or Texas A&M), enrolled in a Texas flagship public university, or enrolled within one year of graduation at an elite four-year university that is ranked higher than UT Austin by Barron's. Enrollment data are available for all U.S. universities through the National Student Clearinghouse. Regression subsamples are based on characteristics of high school attended compared to statewide quintiles. Quintile cutoff values are 0.115 and 0.669 for percentage Hispanic (bottom 20% and top 20%, respectively); 0.086 and 0.366 for percentage of graduates from the high school who enrolled in a four-year college (bottom 20% and top 20%, respectively).

[a] High school exit exam scores are a composite z-score of both English language arts and mathematics. Advanced Placement (AP) mathematics include the following subjects: Calculus, Computer Science, and Statistics. AP science includes the following subjects: Biology, Chemistry, and Physics.

* Statistical significance at $p < 0.05$ level.

are remarkably consistent across high school types. The estimated racial and ethnic differences are smallest in high schools with low college entrance rates (column 4 of panel A). Interestingly, the estimated coefficient for Hispanic students relative to white students was negative even in high schools with the highest college entrance rates (column 3) and percent Hispanic students (column 1). Other high school characteristics

were also tested (results not displayed) with consistent results for black and Hispanic students.[21]

In panel B of table 5, we examine whether racial differences in application to selective universities vary by high school type. Some minorities should be more likely to apply from high schools where minorities are more likely to be represented in the top 10 percent—for example, a high school with more than 90 percent minority students. The results in panel B also control for gender, age, demographics, college readiness, graduation year, and high school fixed effects. Again, we observe that Hispanic students are less likely to apply to elite flagship universities compared with their white student counterparts, and their lower application rate is remarkably consistent across all high school types. The results for black and Asian students vary by high school type. Most notably, black students are significantly more likely than white students to apply at schools with high college enrollment.

College Readiness

We next examine whether racial and ethnic differences are constant across the distribution of student preparation for college. Students should be more likely to apply to college when their high school outcomes signal the potential for college success, and racial/ethnic gaps might diminish for minority students who are highly qualified for postsecondary education. To examine this, we divide high school graduates by their observed high school preparation in comparison to what is typical for Texas public universities. This comparison proxies for information students might know about their own college readiness through observation of peers. First, we measured average levels of college readiness based on AP courses completed and high school exit exams for freshman entering all non-open enrollment public universities in Texas in the year prior to the student's graduation. We then selected three institutions from across the distribution of average freshman college readiness—the top-ranked campus (UT Austin), the median campus (UT San Antonio), and the bottom-ranked campus (UT El Paso)—among campuses that are not open enrollment. Next, from among the sample of high school graduates, we identified students whose exit exams and AP courses exceeded that of the average entering freshman at those three institutions during the student's senior year in high school. Thus, a "highly qualified student" is above average compared to an entering freshman at the top-ranked public university, a "somewhat-qualified student" is above average for a median public university but not the top-ranked, and a "less-qualified student" is above average for a bottom-ranked public university but not the median university. Students who are below average for the bottom-ranked campus are excluded from this analysis. High school students who are similar to students who successfully gain admissions and enroll should view themselves as college-ready, and should receive encouragement to apply from teachers and counselors. In addition, a student's college readiness should partially overcome the information problem regarding the probability of admissions.

21. Specifically, we tested specifications by the high school's percent FRPL-eligible students, percent SAT-tested, and percent earning AP credit, along with specifications by the high school's rate of Hispanic SAT testing, Hispanic AP credit, and Hispanic college entry, with similar results. Even in schools with high rates of Hispanic college readiness indicators and high rates of Hispanic college entry, Hispanic students were significantly less likely to apply to college than white students with similar college readiness.

Table 6 displays regression results by college-readiness level for specifications that include both student college readiness measures and high school fixed effects. Thus, we are estimating within-school racial and ethnic differences for each qualification group. We again present our results for our two main outcomes of interest: application to any four-year university (panel A) and application to a flagship university (panel B), as defined earlier. For either outcome, the results for Hispanic students are remarkably similar to prior point estimates. At all college-readiness levels, a Hispanic student is less likely to apply to college than a similarly prepared white student within the same high school. These effects are statistically significant for all groups except highly qualified applicants to a flagship university. A highly qualified Hispanic student is 3.2 percentage points less likely to apply to any college than a white student, and a less-qualified Hispanic student is 6.1 percentage points less likely to apply to any college than a white student.

The results for black students in table 6 provide new insight into the positive effects previously reported. Black students from the medium- and less-qualified groups are significantly more likely to apply to college than similarly qualified white students, but black students from the highly qualified group are less likely to apply to college than highly qualified white students, although this difference is not statistically significant. Thus, the college application rate for black students is high because of a higher propensity to apply among students who are more marginal for college admissions. In addition, a highly qualified black student is 5 percentage points more likely to apply to a flagship university than a similar white student from the same high school.

Interestingly, these results suggest that Hispanic students are less likely to apply to any college at most levels of college readiness relative to white students, but that less-prepared black students are more likely to apply to college than white students, and better-prepared black students are more likely to apply to flagships than white students. Asian students are more likely to apply to flagship universities than white students. Put differently, among highly qualified graduates, Hispanic students are significantly more likely to "undermatch" (i.e., apply to campuses for which they are overqualified) relative to white students, but Asian students are more likely to "overmatch" (i.e., apply to campuses for which they are underqualified) relative to white students.[22]

6. CHOICE AMONG COLLEGES CONDITIONAL ON APPLICATION

So far, we have examined the decision of whether to apply to college and have shown that Hispanic students are less likely to apply to four-year postsecondary education relative to white students, black students are more likely to apply than white students, and Asian students are more likely to apply to elite universities in comparison to white students. Next, we examine how *college characteristics* influence the decision of where to apply by race and ethnicity. Why do students choose to apply to one university over another?

22. In other work (Black, Cortes, and Lincove 2015), we estimated interactions between college qualifications, as defined above, and the propensity to apply to elite flagship public universities by race and ethnicity. Here, we find that Hispanic students in the top 11–25 percent who were highly qualified for flagships were less likely to apply to flagships than similar white students. In addition, we find that black undermatch occurs among top 10 percent graduates who choose not to take advantage of automatic admissions to flagships (but do apply to less competitive campuses), whereas the Hispanic undermatch occurs among highly qualified students who miss the cut for automatic admissions and must compete in a holistic process.

Table 6. Ordinary Least Squares Regression by College-Readiness Levels for Applying to College

	College Readiness Based on High School Exit Exam and Advanced Placement Coursework[a]					
	Panel A: Any Four-Year University			Panel B: Flagship University or Better		
	Highly Qualified	Somewhat Qualified	Less Qualified	Highly Qualified	Somewhat Qualified	Less Qualified
	(1)	(2)	(3)	(4)	(5)	(6)
Race and ethnicity						
Black	−0.021	0.073*	0.136*	0.050*	−0.000	−0.012
	(0.017)	(0.008)	(0.011)	(0.023)	(0.010)	(0.010)
Hispanic	−0.032*	−0.032*	−0.061*	−0.022	−0.027*	−0.040*
	(0.010)	(0.006)	(0.009)	(0.015)	(0.006)	(0.007)
Asian	−0.004	−0.004	0.004	0.073*	0.042*	0.002
	(0.008)	(0.007)	(0.013)	(0.012)	(0.009)	(0.013)
Other demographics						
Free or reduced-price lunch (FRPL) eligible	−0.043*	−0.059*	−0.064*	−0.074*	−0.068*	−0.041*
	(0.010)	(0.006)	(0.007)	(0.016)	(0.006)	(0.006)
Limited English proficient (LEP)	−0.119	−0.280*	−0.257*	−0.130	−0.166*	−0.076*
	(0.105)	(0.038)	(0.040)	(0.111)	(0.032)	(0.027)
High school coursework (college readiness)						
Number of AP and IB semesters	−0.001	0.008*	0.013*	0.006*	0.016*	0.014*
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Took AP English language arts	−0.000	0.024*	0.033*	−0.018	0.038*	0.032*
	(0.017)	(0.006)	(0.008)	(0.026)	(0.007)	(0.007)
Took AP mathematics	0.030*	0.059*	0.067*	0.175*	0.110*	0.093*
	(0.012)	(0.004)	(0.006)	(0.017)	(0.006)	(0.007)
Took AP science	0.010	0.018*	0.040*	0.041*	0.054*	0.053*
	(0.007)	(0.004)	(0.007)	(0.012)	(0.005)	(0.007)
Total semesters failed	−0.034*	−0.039*	−0.040*	−0.059*	−0.041*	−0.025*
	(0.005)	(0.002)	(0.002)	(0.006)	(0.002)	(0.001)
High school exit exam (z-score)[b]	−0.004	0.032*	0.061*	0.044*	0.088*	0.093*
	(0.006)	(0.004)	(0.006)	(0.009)	(0.004)	(0.007)
Constant	1.035*	0.475*	0.190	0.298	−0.091	−0.144
	(0.155)	(0.095)	(0.145)	(0.217)	(0.110)	(0.127)
Number of observations	13,037	53,412	30,521	13,037	53,412	30,521
Dependent variable mean	0.889	0.815	0.698	0.653	0.404	0.218
Other controls						
High school fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors (shown in parentheses) are clustered at the high school level. All regressions control for graduation year, gender, and age. Linear probability model regressions for high school graduates from 2008 and 2009. Panel A dependent variable is equal to one if the student applied to any Texas four-year university or enrolled at any four-year university within one year of graduation. Panel B dependent variable is equal to one if the student applied to a Texas flagship public university (UT Austin or TAMU), enrolled in a Texas flagship public university, or enrolled within one year of graduation at an elite four-year university that is ranked higher than UT Austin by Barron's. Enrollment data are available for all U.S. universities through the National Student Clearinghouse. IB = International Baccalaureate.

[a] College qualification levels are based on the average performance of entering freshmen on high school exit exams and Advanced Placement (AP) coursework completion at Texas state universities of varying levels of selectivity. "Highly qualified" is greater than the average entering freshman at the UT Austin (most selective state university). "Somewhat qualified" is less than average for UT Austin, but greater than average for the University of Texas at San Antonio (mid-range state university). "Less qualified" is less than average for UT San Antonio, but greater than average for UT El Paso (less selective state university).

[b] High school exit exam scores are a composite z-score of both English language arts and mathematics. AP mathematics include the following subjects: Calculus, Computer Science, and Statistics. AP science includes the following subjects: Biology, Chemistry, and Physics.

* Statistical significance at $p < 0.05$ level.

Are there particular institutional characteristics more appealing to students of different races and ethnicities?

A number of papers have estimated college choice behavior. We build on work by Bridget Long (2004), which first examined college enrollment choices using McFadden's (1973) choice model. This strategy exploits the variation across college characteristics in a student's choice set to estimate the influence on enrollment of observable characteristics (such as tuition, distance from home, and college inputs). Hoxby and Avery (2013) applied the same approach to college application decisions to examine the application behavior of high-achieving, low-income high school students to explain the phenomenon of "undermatch," where highly qualified students opt for less-competitive universities, despite a high probability of admissions and financial support at elite universities.[23] Here, we expand on Hoxby and Avery (2013) to better understand racial and ethnic differences in application choices. This strategy provides insight into how the characteristics of public universities may contribute to racial gaps in applications.

We also expand on prior models of college choice by examining academic, social, and informational influences on student choices. Prior studies primarily test how students are influenced by campus academics by estimating the effects of similarities or differences between the student's SAT scores and campus average, with controls for geographic and financial accessibility. To better understand racial and ethnic differences in application, we also consider characteristics describing the social setting of the college campus. Minority students may be reluctant to enroll in campuses with few students from the same racial or ethnic group. We also include measures of the feeder patterns between the student's high school and the college campus. Students may have better information about campuses attended by prior graduates from their own high school and may be more willing to attend a campus if their older peers are currently attending that campus.

A key advantage of applying this methodology is, by looking at the pool of applicants and examining how individual and school characteristics affect these decisions, we are able to incorporate information on eligibility for automatic admissions through class rank. As noted earlier, we only observe information on eligibility for top 10 percent admissions for students who choose to apply to college, and, as a result, we cannot use this information when analyzing the decision to apply to college at all.

Following B. Long (2004) and Hoxby and Avery (2013), we model the college application decision as a conditional logit:

$$\Pr(y_i = j) = \frac{e^{Z_{ij}\cdot\beta}}{\sum_j e^{Z_{ij}\cdot\beta}}, \tag{2}$$

$$Z_{ij}\cdot\beta = \beta_1\cdot C_j + \beta_2\cdot Distance_{ij} + \beta_3\cdot Academic_{ij} + \beta_4\cdot Demog_j + \beta_5\cdot Feeder_{ij} + \varepsilon_{ij}, \tag{3}$$

where $\Pr(y_i = j)$ is an indicator if student i applied to university j, C_j represents in-state tuition cost at institution j, $Distance_{ij}$ is the distance from student i's high school address

23. Bettinger and Long (2004) use the same empirical strategy to investigate the effects of a specific college input and academic remediation on college outcomes.

to institution j, $Academic_{ij}$ is a vector of indicator variables representing student *i's* academic readiness compared to mean readiness on campus j (i.e., the distance between the student's SAT scores and the institution mean), $Demog_j$ is a vector of campus racial and ethnic demographics based on prior year's freshman class at institution j (i.e., % Black, % Hispanic, and % Asian enrolled on campus), $Feeder_{ij}$ is a vector of variables indicating feeder patterns of student *i's* high school to each institution j (i.e., number enrolled from the same high school in prior year, number of college graduates from the same high school in prior year, number enrolled of the same race/ethnicity from the same high school, and number of college graduates of the same race/ethnicity from the same high school—all lagged one year prior to the student's high school graduation), and lastly, ε_{ij} is independent and identically distributed with the extreme value distribution.[24]

In the estimation, a student appears in one observation for *each* four-year public university in Texas, reflecting the full choice set of public universities.[25] The outcome variable is coded as one if the student applied to that campus and zero otherwise, and multiple positive outcomes occur for students who applied to more than one university. The conditional logit requires that individuals must have at least one positive outcome across the choice set, so this analysis is limited to students who applied to at least one university. Six universities that received fewer than five total applications are also omitted, creating a choice set of thirty-one public universities.[26] The conditional logit is estimated with student fixed effects, controlling for all fixed student characteristics. All independent variables must vary across college campuses within a student's choice set. Our estimations include robust standard errors for clustering within high schools.

Table 7 presents our regression results on what specific institutional attributes are appealing to students. We estimate the conditional logit model for all college applicants (panel A) and top 10 percent college applicants (panel B) across racial and ethnic groups.[27] The conditional logit results are displayed as odds ratios of the change in the

24. A key underlying assumption of the conditional logit specification is the Independence of Irrelevant Alternatives (IIA) assumption. In this model, the ratio of the probabilities of any two choices is unrelated to any of the other choices or their characteristics. A change in the characteristics of any of the other choices should not affect this ratio. (See Hoffman and Duncan 1988 for more discussion.) This is a particularly strong assumption (despite being commonly made in the literature), and so results should be interpreted with caution. We have also estimated the models as Linear Probability Models, where the dependent variable is whether or not an individual applied to a college with a specific attribute (based on characteristics such as school quality, geographic proximity, and racial composition). The conclusions are invariant to this specification choice.

25. Niu and Tienda (2008) highlight the sensitivity of conditional logit estimations to the selection of the choice set of the individual, with no attention to differences in application behavior by race and ethnicity. They examine how college choice sets differ if left unconstrained to include all postsecondary institutions relative to choice sets that are constrained by students' academic achievement and the high school attended. They find that constraining the criteria used to define choice sets produces quite different institutional profiles. In addition, when one uses data from Texas to estimate a conditional logit of the influence of college characteristics on students' top institutional preference, the choice set constrained by type of high school attended gives very different estimates from the unconstrained choice set (while the choice set delimited only by class rank produces essentially similar results.) We are using all public colleges in our choice set and not constraining choices based on individual characteristics or institutional quality.

26. The omitted campuses offer highly specified programs, primarily for graduate students.

27. Based on numbers of high school graduates and college applicants in our data with top 10 percent status, approximately 72 percent of the population of top 10 percent graduates applied to a Texas public university. The remaining 28 percent might have applied only to out-of-state or private institutions, or they might have not applied to college all. Because we cannot assess why top 10 percent students do not appear in our application data,

Table 7. Factors Associated with Applying to College by Race and Ethnicity—Results of a Conditional Logit Estimation (Expressed in Odds Ratios)

	Panel A: All College Applicants				Panel B: Top 10% College Applicants			
	Black	Hispanic	Asian	White	Black	Hispanic	Asian	White
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Geographic proximity[a]								
Can commute (distance ≤ 60 miles)	4.407*	15.335*	5.485*	5.323*	3.698*	13.207*	4.100*	4.710*
	(0.278)	(0.953)	(0.436)	(0.338)	(0.412)	(1.138)	(0.580)	(0.314)
Can visit home (distance between 61 and 250 miles)	2.929*	4.171*	2.905*	2.612*	3.121*	4.301*	3.909*	3.309*
	(0.112)	(0.176)	(0.146)	(0.072)	(0.244)	(0.220)	(0.379)	(0.158)
College preparedness: Measures of SAT Match[b]								
Own SAT 100–149 pts above campus mean	0.439*	0.506*	0.739*	0.653*	0.511*	0.526*	0.831*	0.772*
	(0.015)	(0.014)	(0.040)	(0.014)	(0.041)	(0.028)	(0.068)	(0.024)
Own SAT 150–199 pts above campus mean	0.246*	0.302*	0.579*	0.462*	0.311*	0.341*	0.667*	0.653*
	(0.010)	(0.012)	(0.048)	(0.015)	(0.031)	(0.023)	(0.066)	(0.027)
Own SAT greater than 200 pts above campus mean	0.053*	0.077*	0.203*	0.141*	0.082*	0.092*	0.340*	0.290*
	(0.004)	(0.006)	(0.026)	(0.007)	(0.012)	(0.010)	(0.048)	(0.018)
Own SAT 1–99 pts below campus mean	2.249*	1.913*	0.965	1.271*	1.957*	1.792*	0.833	1.075*
	(0.059)	(0.047)	(0.061)	(0.035)	(0.127)	(0.086)	(0.085)	(0.038)
Own SAT 100–149 pts below campus mean	3.259*	2.569*	0.794*	1.200*	2.788*	2.562*	0.793	1.146*
	(0.121)	(0.097)	(0.082)	(0.059)	(0.284)	(0.181)	(0.102)	(0.068)
Own SAT 150–199 pts below campus mean	3.804*	2.768*	0.659*	0.965	3.073*	3.230*	0.685*	0.905
	(0.158)	(0.135)	(0.090)	(0.060)	(0.353)	(0.282)	(0.111)	(0.070)
Own SAT 200 or more pts below campus mean	4.319*	2.501*	0.287*	0.507*	4.548*	3.570*	0.429*	0.731*
	(0.252)	(0.177)	(0.057)	(0.045)	(0.651)	(0.429)	(0.084)	(0.073)
Campus racial demographics (prior year's freshman class)								
% Black enrolled on campus	6.566*	0.306*	0.208*	0.067*	4.280*	0.416*	0.302*	0.108*
	(0.558)	(0.023)	(0.022)	(0.003)	(0.760)	(0.041)	(0.053)	(0.007)
% Hispanic enrolled on campus	0.442*	1.269*	0.799	0.129*	0.371*	1.187	0.943	0.129*
	(0.037)	(0.092)	(0.105)	(0.007)	(0.057)	(0.131)	(0.183)	(0.010)
% Asian enrolled on campus	0.676	0.458*	294.081*	0.013*	1.865	0.354*	103.599*	0.030*
	(0.140)	(0.081)	(102.809)	(0.003)	(0.664)	(0.088)	(49.354)	(0.008)
Feeder patterns of student's high school to college campus								
Number enrolled from same high school in prior year	1.029*	1.032*	1.031*	1.017*	1.016*	1.008	1.011*	1.007
	(0.004)	(0.006)	(0.006)	(0.004)	(0.005)	(0.007)	(0.005)	(0.004)
Number graduated from same high school in prior year	0.996	1.002	1.026*	1.019*	1.047*	1.071*	1.060*	1.062*
	(0.004)	(0.005)	(0.006)	(0.007)	(0.008)	(0.009)	(0.009)	(0.009)
Number enrolled of same race from same high school	1.004	0.989	1.016	1.017*	1.020	1.008	1.030	1.000
	(0.009)	(0.007)	(0.015)	(0.005)	(0.011)	(0.009)	(0.024)	(0.007)
Number graduated of same race from same high school	1.109*	1.048*	0.981	0.996	1.081*	0.987	1.025	1.010
	(0.017)	(0.012)	(0.012)	(0.009)	(0.028)	(0.016)	(0.020)	(0.013)
Number of observations	616,559	1,374,664	305,660	2,250,259	70,215	286,998	115,010	576,321

Notes: Conditional logit estimates are reported in odds ratios (with student fixed effects) of the probability of application to thirty-one state universities. Robust standard errors for clustering within high schools. Sample includes students who graduated from a Texas public high school in 2008 and 2009 and applied to at least one Texas public university for admission in the fall following high school graduation. A small number of students (<1%) are omitted who were missing distance to college or SAT scores.

[a] Distance is measured from the student's high school to each college campus.

[b] Dichotomous measures of SAT match (omitted group has SATs 0–99 points [pts] above campus mean). Specifications also control for in-state tuition. All college campus variables (i.e., enrollment, graduation, SAT, and tuition) are lagged one year to information the student would have as she entered her senior year of high school.

* Statistical significance at $p < 0.05$ level.

odds of applying to a campus based on marginal changes in a campus characteristic, ceteris paribus. Similar to prior work (B. Long 2004; Hoxby and Avery 2013), we control

this likely introduces some bias. Our results are only generalizable to similar populations of high-performing students who might apply to public institutions.

for tuition, college proximity, and academic match. Building on this model, our second set of covariates controls for *social match*, measured as the proportion of each minority race and ethnic group on the campus. Our third and final set of covariates controls for *high school feeder patterns* both for the whole high school and for students of the same race and ethnicity as the student.

As shown in panel A, students of all races and ethnicities are more likely to apply to universities that are closer to home (either within commuting or visiting distance), but Hispanic students are three times more likely than any other racial group to apply to a university that is easily commutable to their home (i.e., distance less than sixty miles). Specifically, controlling for academic match, Hispanic students are the most sensitive to distance, followed by Asian and white students, and black students are the least influenced by distance. In terms of academic campus match, all races and ethnicities are more likely to apply to campuses where their SATs are below the campus mean, and less likely to apply to campuses where their SATs are above the campus mean. However, Hispanic and black students are more likely to apply to campuses that are a far reach academically, with average SATs 200 or more points above their own score, whereas white students are significantly less likely to apply to a campus that is a far reach. With higher average SAT scores, white and Asian students have fewer "reach" campuses than black and Hispanic students, but the evidence does not suggest that a lack of close academic match campuses explains racial and ethnic differences in application behavior.

Regarding social match, measured through the racial demographic composition of the college campus, we observe that black, Hispanic, and Asian students are all more likely to apply to campuses with a higher concentration within their own racial and ethnic group. The effect is particularly large for Asian and black students. Interestingly, white students' application behavior is negatively associated with minority concentrations of all other racial and ethnic groups on campus.[28] Because differences in application behavior by race and ethnicity could mask associated differences in income levels across racial and ethnic groups, we further disaggregate students into two brackets of family income: below $40,000 and above $80,000. Those additional analyses are reported in Appendix table A.3.

Our final set of covariates, high school feeder patterns, controls for the information and familiarity students would gain about a campus by attending a high school that frequently sends graduates from their own school to that particular college campus. Our measures include the number of students from one's own high school who enrolled at the college in the previous year, as well as the number of students from one's own high school who successfully graduated from that college in the previous year. We calculate

28. We also ran models where we added in separately the three sets of covariates (college preparedness, campus racial demographics, and feeder patterns of student's high school) to see how the coefficients might change with the inclusion of each set of covariates. Those results are very similar to those reported in panel A of table 7 and are available from the authors upon request. A notable difference, however, is for Asian students, where the coefficients for academic match variables are influenced by the addition of campus racial demographic variables. Specifically, controlling for the percent Asian on campus, Asian students are most likely to enroll on a campus where their SAT scores are within 100 points of the campus mean. This suggests that Asian students are most likely to apply to campuses with a concentrated population of other Asian students who have similar academic readiness. Hispanic and black students, in contrast, remain more likely to apply to reach schools, holding racial demographic composition of the university constant.

both of these measures for the high school overall, as well as for the student's own racial group. Hispanic and black students are more likely to apply to a campus that has recently enrolled any students from the same high school and recently graduated students from the same high school of the same race. Asian students are positively influenced by both recent enrollment and recent graduation from their high school, but the race of the enrollers and completers is not relevant. White students are influenced by enrollment and completion of any race, as well as by enrollment specifically by white students. It appears that all students learn something about a college campus through the feeder relationship of their high school peers, but for black and Hispanic students, information about successful completion by same race and ethnicity of older peers is also important.[29]

We also consider the role of information in college application behavior. Hoxby and Avery (2013) hypothesize that college undermatch is related to a lack of information about admissions and financial aid among low-income, high-achieving high school students. We exploit Texas's unique college admissions policy to test this hypothesis in relation to racial and ethnic application gaps in the state. Specifically, we examine whether racial and ethnic differences in college application behavior are similar between students in the top 10 percent, who have full information about their admission to the state's top universities, and students who face typical college admissions uncertainty.[30,31]

The results, reported in panel B of table 7, show very little effect of automatic admissions on the application choices of black, Asian, and white students. In comparison, Hispanic students in the top 10 percent are the only minority group not significantly influenced by same-race enrollment on campus. Similarly, Hispanics in the top 10 percent are not significantly influenced by the feeder history of same-race students from their high school to the campus, while Hispanic students subject to admissions uncertainty are more likely to apply to campuses where Hispanic students from their high school have recently completed a college degree. Also salient in this analysis is the effect of college proximity on college application, in particular for Hispanic students—top 10 percent Hispanic students are about three times more likely compared with other students to apply to a university if that institution is near their home. College proximity is not only an important predictor for college application for Hispanics students in general, but also for high-achieving top 10 percent Hispanic students.

Finally, in table 8 we analyze the portfolio of college choices among top 10 percent students relative to all other students who apply to colleges. Here, we estimate linear probability models (LPMs) predicting different types of application behavior (application flagships, application to open-enrollment campuses, etc.), conditioned on

29. Although we interpret this effect as students following the behavior of similar students from earlier cohorts, this could also reflect teacher or counselor behavior, such as encouraging students of a particular race to attend a specific institution. We are not able to distinguish this with our data.

30. We also ran regression models for students who were ranked in the top 11–25 percent and the bottom 75 percent. Those regression results are similar to those found in panel A of table 7. These results are available upon request from the authors.

31. Each student in the top 10 percent receives a letter informing her of her status and of the associated benefits, suggesting that individuals do in fact have information about their admission status. Note that we assume the only value of being classified as top 10 percent is the associated admissions certainty. However, the classification itself could change individual preferences; see work by Papay, Murnane, and Willett (2011) for more discussion.

Table 8. Ordinary Least Squares Regression Results of the Effects of Automatic Admissions Status on Application Behavior by Race and Ethnicity

	Black	Hispanic	Asian	White
	(1)	(2)	(3)	(4)
Applied to flagship	0.200*	0.214*	0.137*	0.193*
	(0.012)	(0.009)	(0.014)	(0.007)
Applied to open enrollment	−0.075*	−0.018*	−0.023*	−0.039*
	(0.011)	(0.004)	(0.006)	(0.004)
Applied *only* to flagship	0.159*	0.149*	0.346*	0.283*
	(0.011)	(0.009)	(0.015)	(0.007)
Applied *only* to open enrollment	−0.065*	−0.012*	−0.012*	−0.027*
	(0.010)	(0.002)	(0.003)	(0.003)
Applied to HBCU	−0.055*	−0.003*	−0.001	−0.001*
	(0.010)	(0.001)	(0.002)	(0.000)
Applied to multiple campuses	−0.040*	0.015	−0.209*	−0.111*
	(0.014)	(0.009)	(0.023)	(0.006)
Applied to a high SAT campus	0.150*	0.187*	0.091*	0.158*
	(0.013)	(0.009)	(0.014)	(0.006)
Applied to a low SAT campus	−0.093*	−0.033*	−0.031*	−0.040*
	(0.013)	(0.007)	(0.008)	(0.003)
Number of observations	22,405	48,384	9,945	75,934
Other controls				
Student characteristics	Yes	Yes	Yes	Yes
High school fixed effects	Yes	Yes	Yes	Yes

Notes: Each cell from table 8 is from a separate regression and only reports on the estimated regression coefficients on the indicator of top 10 percent student by race. Samples include only students who applied to college. Students in the top 10 percent are automatically admitted to all types of campuses contingent on application. All regression specifications control for student demographics (e.g., female; age; free or reduced-price lunch eligible; and limited English proficient status), college readiness measures (e.g., number of Advanced Placement [AP] and International Baccalaureate semesters; took AP English language arts, mathematics, and/or science; total semesters failed; and high school exit exam), and high school fixed effects. HBCU = historically black colleges and universities.

*Statistical significance at $p < 0.05$ level.

application to at least one Texas public university. Each cell reported in table 8 comes from a separate LPM regression model estimated by race/ethnicity, and we report the estimated regression coefficients on the indicator of a top 10 percent student relative to a same-race/same-ethnicity student who is not in the top 10 percent but is otherwise similar in observable college readiness (and including high school fixed effects).[32] As previously mentioned, students in the top 10 percent of their graduating high school class are automatically admitted to all types of campuses contingent on application. So, in theory, top 10 percent students may choose from a wide array of in-state four-year public colleges.

We observed interesting application patterns among minority and nonminority top 10 percent students. We find that across all racial groups, top 10 percent students are more likely to apply to *only* a flagship campus, but the magnitudes of those coefficients differ substantially by race and ethnicity. Black and Hispanic top 10 percent students

32. Specifically, all regression specifications control for student demographics (e.g., female; age; FRPL eligible; and LEP status), college readiness measures (e.g., number of AP and IB semesters; took AP English language arts, mathematics, and/or science; total semesters failed; and high school exit exam), and high school fixed effects.

are 15.9 and 14.9 percentage points, respectively, more likely to apply only to a flagship campus. In contrast, both Asian and white top 10 percent students are substantially more likely to apply only to a flagship campus by 34.6 and 28.3 percentage points, respectively. We also observed that black top 10 percent students are 5.5 percentage points less likely to apply to HBCUs, perhaps opting to apply to more selective institutions. In fact, the influence of top 10 percent status on application rates to high-SAT campuses are about the same for both black and white students (roughly 15 percentage points). Lastly, across all groups, top 10 percent students are less likely to apply to an open enrollment campus.

7. CONCLUSION

Minority access to higher education is a growing concern across the nation. Obstacles to higher education for minorities will limit growth in human capital and competitiveness for the United States in the very near future. In this study, we identify the college application decision as a pivotal first step in college access that precedes the processes of admissions and enrollment. Our study benefits from the use of a statewide student dataset that includes the full range of student ability and college readiness existing within two high school graduation cohorts, and a single college application procedure that is common to most four-year universities in the state. We are also able to provide further insight into the decision process by analyzing campus preferences of applicants in a state where highly qualified students are automatically admitted to the top public universities.

From a standpoint of population size, the growing Hispanic minority (soon to be a majority in Texas) is of great concern in Texas and across the nation. We consistently find that Hispanic students are least likely of all ethnic groups to apply to college overall and to elite flagship universities in particular. This finding is robust to controls for college readiness, high school quality, and high school fixed effects. The gap between Hispanic and white students in college application is consistent across levels of observable college readiness and high school quality. Even when Hispanic students attend high schools where a majority of students move on to college or where Hispanic students are statistically highly likely to achieve automatic admissions, Hispanic students are significantly less likely to apply to college than white students.

We find a more nuanced type of inequality in the college application behavior of black high school graduates, an issue not previously identified in studies that aggregate black and Hispanic students as a single group. On average, black students are actually more likely to apply to college than white and Hispanic students with similar levels of college readiness and high school quality. However, this is driven mostly by high application rates among less-prepared black students. Among the most qualified students, black students have similar overall application rates to white students but are more likely to apply to flagship universities.

We also find that college application decisions for minorities are responsive to more than just the average academic performance of students on a campus. Black, Hispanic, and Asian students are more sensitive than white students to distance to college; and black, Hispanic, and Asian students are all influenced by the presence of same-race students on campus. Black and Hispanic students are also influenced by the historical

feeder pattern of their high school to a campus, including past successful degree completion of same-race students from their high school. These social and informational effects are mitigated only among high-income Hispanics and Hispanic students who are guaranteed admission. Thus, minority application rates respond not only to student college readiness, but also the enrollment and outcomes of minority students on a campus. Automatic admissions might expand the application choices of Hispanic students to include campuses with fewer Hispanic students, but black students are highly responsive to the racial composition of a campus even when they are guaranteed admissions to any campus.

Finally, we find that admissions policy interacts with race and ethnicity, potentially altering the application behavior of minority students. Andrews, Imberman, and Lovenheim (2016) find evidence that intensive recruitment and support programs increased minority enrollment at Texas flagship universities. Adding to this finding, we show that state application policy also shapes how minority students select to which colleges they apply. Most notably, black and Hispanic students who are eligible for automatic admissions are 20 percentage points more likely to apply to a flagship campus than same-race/same-ethnicity peers who are not eligible, and also less likely to apply only to lower-tiered, open-enrollment campuses. Combined with prior evidence on racial differences in responses to the Top Ten Percent Plan (Black, Cortes, and Lincove 2015), our results suggest that statewide, race-neutral admissions policy can also improve access and quality for qualified minority students.

Although our results provide significant insight into the racial and ethnic disparities in college application behavior, we can offer little insight into the source of these inequalities. Our findings of race and ethnicity effects are robust to the inclusion of high school fixed effects, and the significant effect of high school characteristics on minority students suggests that high schools are an important source of information regarding college application. Overall, these potential frictions are not offset by the prospect of guaranteed admissions policies in higher education.

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APPENDIX

Table A.1. Summary Statistics by College Application Behavior

	Submitted ApplyTexas	Submitted ApplyTexas or Enrolled at a Four-Year University	Applied to a Flagship University	All Graduates
College application				
Submitted ApplyTexas	1.000	0.874	1.000	0.331
Submitted ApplyTexas or enrolled at a 4-year university	1.000	1.000	1.000	0.379
Applied to a flagship university	0.306	0.267	1.000	0.101
Student demographics				
Female	0.547	0.545	0.529	0.502
Age, years	17.03 (0.346)	17.03 (0.350)	17.02 (0.330)	17.12 (0.486)
White (non-Hispanic)	0.478	0.497	0.608	0.435
Black	0.145	0.147	0.068	0.137
Hispanic	0.311	0.293	0.206	0.385
Asian	0.063	0.059	0.116	0.040
Free or reduced-price lunch (FRPL) eligible	0.293	0.280	0.155	0.379
Limited English proficient (LEP)	0.008	0.008	0.002	0.036
High school coursework				
Number of AP/IB courses completed (semesters)[a]	4.82 (5.36)	4.86 (5.41)	8.45 (5.96)	2.50 (4.34)
Took AP English language arts	0.447	0.448	0.677	0.241
Took AP mathematics	0.299	0.301	0.586	0.145
Took AP science	0.235	0.235	0.442	0.117
Total semesters failed	1.14 (2.53)	1.13 (2.52)	0.32 (1.04)	2.97 (4.54)
High school exit exam (z-score)[b]	0.435 (0.877)	0.444 (0.886)	0.966 (0.805)	0.009 (0.990)
High school characteristics				
Campus size	1,992.44 (943.93)	1,991.08 (945.22)	2,167.56 (890.66)	1,836.93 (1012.26)
% FRPL eligible	0.415 (0.263)	0.403 (0.259)	0.325 (0.236)	0.439 (0.249)
% Black	0.134 (0.167)	0.135 (0.165)	0.123 (0.134)	0.141 (0.163)
% Hispanic	0.410 (0.303)	0.395 (0.297)	0.332 (0.258)	0.414 (0.292)
% Earning AP credit	0.131 (0.130)	0.136 (0.133)	0.178 (0.149)	0.109 (0.125)
% SAT tested	0.728 (0.177)	0.730 (0.178)	0.764 (0.172)	0.667 (0.211)
Average SAT score	987.59 (98.08)	991.76 (97.83)	1022.09 (92.52)	976.00 (96.18)
Number of observations	162,271	185,742	49,580	490,561

Notes: Summary statistics for all graduates of Texas public high schools from 2008 and 2009. Standard errors are in parentheses for continuous variables.

[a]Total number of Advanced Placement (AP) and International Baccalaureate (IB) courses completed (semesters).

[b]High school exit exam scores are a composite z-score of both English language arts and mathematics.

Sources: Authors' calculations from Texas Workforce Data Quality Initiative Database, graduating student cohorts from spring 2008 and 2009. National Student Clearinghouse data from the 2008–09 and 2009–10 academic years.

Table A.2. Ordinary Least Squares Regression Results for Applying to College, Excluding from the Analysis Historically Black Colleges and Universities

	Dependent Variable: Any Four-Year University				
	(1)	(2)	(3)	(4)	(5)
Race and ethnicity					
Black	−0.012	0.092*	0.106*	0.109*	0.106*
	(0.007)	(0.006)	(0.004)	(0.004)	(0.004)
Hispanic	−0.077*	−0.003	−0.061*	−0.060*	−0.061*
	(0.009)	(0.007)	(0.003)	(0.003)	(0.003)
Asian	0.177*	0.017*	−0.004	−0.019*	−0.004
	(0.009)	(0.009)	(0.007)	(0.006)	(0.007)
Other demographics					
Free or reduced-price lunch (FRPL) eligible	−0.114*	−0.047*	−0.052*	−0.053*	−0.052*
	(0.006)	(0.005)	(0.002)	(0.002)	(0.002)
Limited English proficient (LEP)	−0.203*	−0.095*	−0.096*	−0.096*	−0.096*
	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)
High school coursework (college readiness)					
Number of AP and IB semesters		0.014*	0.011*	0.013*	0.011*
		(0.001)	(0.001)	(0.001)	(0.001)
Took AP English language arts		0.132*	0.130*	0.138*	0.130*
		(0.007)	(0.006)	(0.004)	(0.005)
Took AP mathematics		0.122*	0.123*	0.117*	0.123*
		(0.005)	(0.004)	(0.004)	(0.004)
Took AP science		0.051*	0.047*	0.048*	0.048*
		(0.006)	(0.005)	(0.004)	(0.005)
Total semesters failed		−0.019*	−0.018*	−0.020*	−0.018*
		(0.001)	(0.000)	(0.000)	(0.000)
High school exit exam (z-score)[a]		0.079*	0.071*	0.067*	0.071*
		(0.002)	(0.001)	(0.001)	(0.001)
Geographic proximity[b]					
Distance to nearest university (100 miles)					−0.049
					(0.031)
Distance squared					0.018
					(0.028)
Number of observations	427,300	427,300	427,300	427,300	427,300
Other controls					
High school characteristics[c]			Yes		Yes
High school fixed effects				Yes	

Notes: Robust standard errors (shown in parentheses) are clustered at the high school level. Regressions also control for graduation year, gender, and age. Linear probability models for high school graduates from 2008 and 2009. Dependent variable is equal to one if the student applied to any Texas four-year university or enrolled at any four-year university within one year of graduation. Enrollment data are available for all U.S. universities through the National Student Clearinghouse. AP = Advanced Placement; IB = International Baccalaureate.

[a]High school exit exam scores are a composite z-score of both English language arts and mathematics.

[b]The distance variables are generated using longitude and latitude to compute the distance between all high schools and the flagship public institutions in Texas.

[c]Characteristics include logged enrollment, percent Free/reduced-price lunch eligible, percent black, percent Hispanic, lagged measures of percent of graduates entering four-year colleges, percent earning AP credit, percent SAT tested, and Flagship scholarship program.

*Statistical significance at $p < 0.05$ level.

Table A.3. Factors Associated with Applying to College by Family Income and Race/Ethnicity—Results of a Conditional Logit Estimation (Expressed in Odds Ratios)

	Panel A: Low Income (<$40k)				Panel B: High Income (>$80k)			
	Black (1)	Hispanic (2)	Asian (3)	White (4)	Black (5)	Hispanic (6)	Asian (7)	White (8)
Geographic proximity[a]								
Can commute (distance ≤ 60 miles)	5.458* (0.395)	19.365* (1.327)	8.378* (0.858)	11.779* (0.785)	2.761* (0.256)	6.581* (0.518)	3.888* (0.455)	3.491* (0.226)
Can visit home (distance between 61 and 250 miles)	3.246* (0.155)	4.688* (0.253)	3.319* (0.262)	3.469* (0.139)	2.352* (0.128)	3.036* (0.141)	2.928* (0.218)	2.283* (0.065)
College preparedness: Measures of SAT Match[b]								
Own SAT 100–149 pts above campus mean	0.441* (0.021)	0.495* (0.021)	0.535* (0.048)	0.613* (0.023)	0.450* (0.032)	0.579* (0.029)	0.897 (0.068)	0.675* (0.018)
Own SAT 150–199 pts above campus mean	0.255* (0.015)	0.308* (0.017)	0.350* (0.040)	0.388* (0.019)	0.269* (0.026)	0.375* (0.024)	0.926 (0.094)	0.515* (0.019)
Own SAT greater than 200 pts above campus mean	0.069* (0.007)	0.102* (0.009)	0.078* (0.012)	0.113* (0.008)	0.056* (0.008)	0.102* (0.011)	0.427* (0.057)	0.171* (0.010)
Own SAT 1–99 pts below campus mean	2.279* (0.074)	1.960* (0.059)	1.524* (0.109)	1.589* (0.054)	2.045* (0.119)	1.499* (0.073)	0.625* (0.056)	1.115* (0.036)
Own SAT 100–149 pts below campus mean	3.196* (0.132)	2.795* (0.123)	1.599* (0.185)	1.822* (0.099)	2.730* (0.224)	1.641* (0.130)	0.391* (0.054)	0.972 (0.057)
Own SAT 150–199 pts below campus mean	3.896* (0.176)	2.984* (0.163)	1.601* (0.230)	1.618* (0.106)	2.694* (0.280)	1.537* (0.142)	0.261* (0.051)	0.743* (0.056)
Own SAT 200 or more pts below campus mean	4.776* (0.275)	3.139* (0.231)	1.255 (0.238)	1.297* (0.111)	2.316* (0.308)	1.003 (0.127)	0.063* (0.017)	0.314* (0.033)
Campus racial demographics (prior year's freshman class)								
% Black enrolled on campus	7.646* (0.664)	0.350* (0.031)	0.402* (0.061)	0.079* (0.007)	3.790* (0.447)	0.169* (0.016)	0.142* (0.017)	0.068* (0.003)
% Hispanic enrolled on campus	0.396* (0.040)	1.333* (0.127)	1.669* (0.302)	0.190* (0.012)	0.441* (0.051)	0.721* (0.062)	0.550* (0.102)	0.101* (0.006)
% Asian enrolled on campus	0.693 (0.160)	0.752 (0.151)	257.298* (117.235)	0.003* (0.001)	1.325 (0.397)	0.316* (0.081)	291.763* (120.375)	0.031* (0.009)
Feeder patterns of student's high school to college campus								
Number enrolled from same high school in prior year	1.029* (0.005)	1.043* (0.005)	1.038* (0.006)	1.026* (0.005)	1.026* (0.004)	1.030* (0.006)	1.024* (0.006)	1.012* (0.005)
Number graduated from same high school in prior year	0.991 (0.005)	0.992 (0.005)	1.015* (0.006)	1.015* (0.008)	1.004 (0.004)	1.008 (0.005)	1.035* (0.007)	1.018* (0.007)
Number enrolled of same race from same high school	1.000 (0.009)	0.985* (0.007)	1.009 (0.016)	1.005 (0.007)	1.017 (0.011)	0.969* (0.007)	1.026* (0.013)	1.021* (0.006)
Number graduated of same race from same high school	1.105* (0.019)	1.050* (0.014)	0.990 (0.012)	0.993 (0.010)	1.128* (0.024)	1.079* (0.014)	0.972 (0.016)	0.999 (0.010)
Number of observations	323,857	711,202	99,417	388,678	87,451	187,364	106,640	1,191,392

Notes: Conditional logit estimates are reported in odds ratios (with student fixed effects) of the probability of application to thirty-one state universities. Robust standard errors for clustering within high schools. Sample includes students who graduated from a Texas public high school in 2008 and 2009 and applied to at least one Texas public university for admission in the fall following high school graduation, and provided income data on ApplyTexas. A small number of students (<1%) are omitted who were missing distance to college or SAT scores.

[a] Distance is measured from the student's high school to each college campus.

[b] Dichotomous measures of SAT match (omitted group has SATs 0–99 points [pts] above campus mean). Specifications also control for in-state tuition. All college campus variables (i.e., enrollment, graduation, SAT, and tuition) are lagged one year to information the student would have as she entered her senior year of high school.

* Statistical significance at $p < 0.05$ level.