DISCUSSION PAPER SERIES

IZA DP No. 8733

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December 2014

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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Discussion Paper No. 8733
December 2014

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IZA Discussion Paper No. 8733
December 2014

ABSTRACT

Efficacy vs. Equity: What Happens When States Tinker with College Admissions in a Race-Blind Era?[1]

College admissions officers face a rapidly changing policy environment where court decisions have limited the use of affirmative action. At the same time, there is mounting evidence that commonly used signals of college readiness, such as the SAT/ACTs, are subject to race and socioeconomic bias. Our study investigates the efficacy and equity of college admissions criteria by estimating the effect of multiple measures of college readiness on freshman college grade point average and four-year graduation. Importantly, we take advantage of a unique institutional feature of the Texas higher education system to control for selection into admissions and enrollment. We find that SAT/ACT scores, high school exit exams, and advanced coursework are predictors of student success in college. However, when we simulate changes in college enrollment and college outcomes with additional admissions criteria, we find that adding SAT/ACT or high school exit exam criteria to a rank-based admissions policy significantly decreases enrollment among minorities and other groups, with the most negative effects generated by the SAT/ACT, while inducing only minimal gains in college GPA and four-year graduation rates.

JEL Classification: I21, I23, I24, J15, J18

Keywords: college readiness, college admissions, affirmative action, Texas Top 10% Plan, alternative college admission, college graduation

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[1] The authors are grateful to the Texas Workforce Data Quality Initiative at The University of Texas at Austin's Ray Marshall Center, funded by the U.S. Department of Labor. The research presented here utilizes confidential data from the State of Texas supplied by the Texas Education Research Center (ERC) at the University of Texas at Austin. The authors gratefully acknowledge the use of these data. The views expressed are those of the authors and should not be attributed to the ERC or any of the funders or supporting organizations mentioned herein, including the University of Texas, the State of Texas, or the study's sponsor. Any errors are attributable to the authors. The authors thank Alan Blanch, Jenna Cullinane, Matt Farber, Chester Polson, and Emily Weisburst who provided outstanding research assistance. Institutional support from the University of Texas at Austin, Texas A&M University, and Stanford's Center for Education Policy Analysis are also gratefully acknowledged.

1. Introduction

When it comes to achieving goals of equitable access to higher education, public universities face a challenging policy environment. Public universities are increasingly constrained by constitutional limits on the use of race in admissions. For over a decade, the Supreme Court has chipped away at affirmative action practices in public university admissions (Hopwood v. Texas, 1996; Gratz v. Bollinger, 2002; Grutter v. Bollinger, 2003). In some states, voters have outlawed affirmative action through ballot initiatives. At the same time, efforts to promote diversity are overshadowed by calls for greater efficiency in higher education, such as policies linking state funding to undergraduate graduation rates. Thus, public universities are simultaneously losing both the incentive and the tools to promote diversity goals.

Most recently, the Supreme Court upheld in Fisher v. University of Texas (2014) an appeals court ruling that public universities must demonstrate that there are no "workable solutions" not based on race before using race-based admissions strategies to promote diversity. Affirmative action policies empowered admissions staff to apply different standards to students from different racial and ethnic backgrounds, and the elimination of these strategies means that similar standards must be applied to all students. Long (forthcoming) demonstrates that suitable replacements for affirmative action are both complex to implement and unlikely to achieve the same level of diversity as race-conscious strategies. Instead, many states have transitioned from holistic admissions to objective standards that guarantee admissions to students who meet minimum criteria for measures of college readiness. As a first step to understanding the implications of these changes, this paper examines the relationship between common measures of college readiness and student performance in college. From there, we address the efficacy of

automatic admissions policies that apply the same standards for observable college readiness across race and ethnicity.

Estimating the relationship between college readiness and college performance is challenging because we only observe prior college outcomes for students who were admitted and ultimately enroll. Although past studies have identified a relationship between observable college readiness and college performance (Betts and Morell, 1999; Cohn et al., 2004; Long, Iatarola and Conger, 2009; Cyrenne and Chan, 2012; Bettinger, Evans, and Pope, 2014; Black, Lincove, Cullinane, and Veron, 2014), there is evidence that much of this relationship is related to high school and college sorting rather than underlying student ability (Rothstein, forthcoming). We address this challenge by exploiting Texas's automatic admission policy, which admits students based solely on graduating in the top 10% of their high school class. Using a large and diverse sample of college students from Texas, we estimate the relationship between observable college readiness measures and college outcomes. To control for selection into admissions, we limit our sample to those who were automatically admitted based on class rank alone. This subsample has the unique advantage of having both observable college outcomes at selective universities and college readiness measures (such as SAT/ACT scores) that are unrelated to college admissions. And due to the percent plan, these students also come from a more diverse set of high schools than typically observed among students at selective universities. To control for selection into college campuses, we instrument for campus choice using distance to college, which should be associated with enrollment choices but not student ability (Rothstein, 2004). Thus, we are able to overcome multiple levels of selection bias that have plagued prior studies.

This paper makes several contributions to the literature on the determinants of college success and college admissions policy. First, unlike prior studies, we are able to explicitly

control for multiple levels of selection into college while estimating the effects of college entrance exams (SAT/ACTs), high school exit exams, and advanced high school coursework on college performance. Second, we use a data set that is not limited to a single college campus and provides significantly more diversity in college readiness measures, individual demographics, and high school quality than many prior studies of college admissions criteria. Third, we compare the effects of multiple college readiness measures that are available to admissions officers. Finally, we exploit Texas's simple percent plan to simulate the effects of additional admissions criteria on both efficiency (average college outcomes) and equity (racial/ethnic and socioeconomic (SES) make-up of college students).

Our results suggest that both college entrance and high school exit exams are significant predictors of college performance for students in the top decile of high school graduates. We estimate that adding a minimum SAT/ACT or exit exam score to automatic admissions criteria could increase average freshman GPA by up to 6.3 percent and 4-year graduation rates by up to 5.9 points. However, adding these new admission criteria also severely reduces both minority and low-income representation in our analysis, eliminating automatic admissions eligibility for 69 percent of Hispanics, 73 percent of blacks, and 62 percent of low-SES students who were admitted based on class rank alone. At state flagship universities, we estimate average GPA could increase by up to 6.9 percent, but the graduation rate would increase only up to 3.5 points, with similar large, negative effects on access for minority and low-SES students.

2. Policy Context for Public University Admissions

Until the mid-1990s, the use of affirmative action was common in both public and private universities as a strategy to promote diversity. The U.S. Supreme Court ruled in Regents of University of California v. Bakke (1978) that states had a compelling interest to increase

diversity in higher education, which could be addressed through differential admissions standards for different races at public universities.[2] A typical affirmative action admission policy applied different standards for GPA, SAT, and course completion to historically underrepresented racial and ethnic groups relative to whites. This is partially based on the assumption that minorities have less access to high quality high schools; as a result, a minority student might appear less qualified than an equally qualified white student across any measures that are associated with high school quality.

Texas was one of many states that implemented race-based admission policies for its highly selective flagship state universities. However, in 1996, the University of Texas at Austin (UT Austin) Law School admissions policy was the subject of the landmark Supreme Court case Hopwood v. Texas (5th Circuit U.S. Appeals Court, 1996; 2000). At the time, UT Austin's Law School employed separate admissions processes and standards for minority and white applicants. The 5th Circuit U.S. Appeals Court ruled (1996), and the Supreme Court agreed (2000), that this admissions process was a violation of the 14th Amendment. While private universities maintain affirmative action in admissions, Hopwood v. Texas triggered many states to reform public university admissions policies, most commonly by integrating race as a single component of complex admissions decisions, rather than as an immediate trigger for lower standards across objective measures or a separate admissions process. In two subsequent decisions regarding admissions at the University of Michigan – Gratz v. Bollinger (2002) and Grutter v. Bollinger (2003) – the Supreme Court affirmed both that differential standards by race were

[2] Using the National Longitudinal Survey of Youths (NLSY), Arcidiacono (2005) finds evidence that elite universities in particular apply different admissions standards (lower minimum SAT scores, lower minimum GPAs, etc.) for black students, selecting the top part of the distribution within races. He further argues that affirmative action is an efficient way to select high ability students, given the unequal distribution of access to college preparation.

unconstitutional and that using race as a component in admissions decisions was allowable to promote the public interest in diversity.[3]

Hopwood v. Texas triggered a period of admissions policy reform, with states legislatures and public universities struggling to address diversity and college access within the new legal framework. A central concern was eliminating the perception that different standards were being applied to different students. One policy response was to replace subjective assessment of applicants with uniformly applied standards. Many states developed automatic policies where students who met predetermined criteria – for example minimum SAT scores, GPAs, or advanced coursework requirements – are guaranteed admissions to public universities. These policies add transparency to previously subjective admissions processes. However, to the extent that college readiness is associated with race, ethnicity, or SES through high school quality, automatic admissions policies may be particularly harmful to goals of equity and access. States that eliminated affirmative action saw rapid declines in minority enrollment at elite state universities (Card and Krueger, 2005).

To mitigate the effects of objective criteria on underrepresented minorities, Texas implemented automatic admission to all state universities (including the two flagship campuses at UT Austin and Texas A&M University at College Station) based on a single criterion – graduating in the top 10 percent of your high school class. By design, this strategy admits students across the full range of high school quality, producing a diverse pool of admitted students without overt consideration of race or ethnicity. The important trade-off is that high performing students in the lowest quality high schools may be ill prepared for success at an elite

[3] Subsequent threats to this status quo have come from the voters rather than the courts. Voters in California, Michigan, and Florida have passed initiatives banning the use of race in public universities admissions. The Supreme Court upheld the constitutionality of these bans in the 2014 case Schuette vs. Coalition to Defend Affirmative Action (2014). In these and other states, race is not considered at all in admissions, and minority enrollment in public universities has declined (Liptak, April 22, 2014).

public university. Thus the design of automatic admissions policies reflects a classic tension between equity and efficiency. While average student performance might be improved with additional criteria, each additional criterion might also limit college access among underrepresented students.

Table 1 lists the states that currently offer automatic admissions to flagship campuses both with and without percent plans and any additional criteria. There are 12 states total with automatic admissions at flagships, and six of these include percent plans. Texas is the only state in the nation to admit on percent alone. Other states add factors that could limit college access among lower-resourced students and those who attend lower quality high schools.

3. Related Literature

This study contributes to two main strands of literature on student access and academic achievement in postsecondary education. First, given that our focus is on analyzing the efficacy and equity of several commonly cited measures of college readiness, our study adds to the growing literature on which specific student and high school attributes predict postsecondary success.[4] Second, we address the specific policy question of the efficiency and equity of the use of different criteria in college admissions, adding to the literature on the effects of college admissions policies.

Our empirical methodology draws on Rothstein (2004), which assesses the validity of the SAT as a predictor of student success using data from the University of California system. A key advantage of the Rothstein study relative to its predecessors is that it attempts to address issues

[4] The overall consensus from this literature is that college performance is positively related to student, family, and high school characteristics, such as students' SAT/ACTs, high school performance and curriculum (e.g., GPA, achievement tests, and AP/IB coursework), family SES (Betts and Morrell, 1998; Cohn et al., 2004; Long, Iatarola and Conger, 2009; Cyrenne and Chan, 2012; Bettinger, Evans, and Pope, 2014), high school quality, such as resource rich schools (Light and Strayer, 2000; Deming et al., forthcoming; Black et al., 2014), and group peer effects, such as high school classmates in college (Fletcher and Tienda, 2009).

of endogenous admissions and enrollment. To account for selection into admissions, Rothstein exploits the UC System's automatic admission policy that guarantees admission based on a combination of SAT scores and high school grades, thus eliminating unobservable factors used in holistic admissions (such as leadership or motivation). To control for differential selection into college campuses within the system, he uses distance to each UC campus to instrument for the college campus attended, arguing that students are more likely to attend campuses closer to home, and these choices are orthogonal to other characteristics about the student that may affect student performance in college. Rothstein finds that a substantial portion of the predictive power of the SAT is due to its correlation with high school demographic characteristics, and the components of SAT that are orthogonal to these demographic characteristics have limited predictive power on their own.[5]

Our work builds on this by taking advantage of the Texas percent plan to consider the efficacy of other observable college readiness measures. Texas's Top 10% Plan varies notably from California's percent plan in ways that are advantageous to overcoming selection bias. California students are not automatically admitted to all UC campuses, and more selective campuses can apply additional criteria, including SATs. Texas's top 10% students can enroll at the public university of their choice, and the Texas percent plan is based solely on high school class rank. Automatically admitted students are required to take the SAT or ACT, but the scores do not influence admissions. As a result, we need only control for high school rank to control for selection into admission.[6]

[5] In a follow-up study, Rothstein (forthcoming) further extends his analysis to include characteristics of the student's high school such as demographic characteristics and mean SAT and GPA of the high school. He finds that the exclusion of school-level variables from validity models leads to a substantial overstatement of the effect of SAT scores. Moreover, he also finds that within-school differences in SAT scores have much less predictive power than do across-school differences.

[6] Betts and Morell (1999) use student-level administrative data from a large public California university to model college GPA as a function of student, high school, and family attributes. The authors find that student attributes,

Also closely related to our study is work by Bettinger, Evans, and Pope (2014) who use data from Ohio to investigate whether all ACT subtests (English, mathematics, science, and reading) provide equally useful information about future college performance. The authors find that only the English and mathematics subtests of the ACT are highly predictive of positive college outcomes, and they recommend omitting science and reading ACT scores from admissions criteria as a strategy to improve the match between students and colleges. While the authors were unable to control for selection into college, they did examine the predictive ability of ACT scores for college GPA on a much broader sample of students than single-university studies. Our study extends this line of research along a number of dimensions. We compare the efficacy of multiple measures of college readiness, selecting measures from different sources rather than different components of a single test. We also include efforts to control for selection into college, and we consider the compositional effects of changes in admissions criteria, as well as student outcomes.[7]

family background, and characteristics of the high school neighborhood are all significantly linked to college GPA. They also find that teacher experience has a significant and positive relationship with college GPA; however, other high school characteristics such as pupil-teacher ratio and level of teacher education are not associated with college performance. A limitation of this study is that the authors are not able to fully address the non-random selection of students who are admitted and ultimately enroll in the university. Controlling for observed characteristics is unlikely to sufficiently account for this non-random selection of students. It is therefore difficult to draw inference from their results. Our study attempts to tackle these key empirical issues by taking advantage of Texas's automatic admissions policy to better control for multiple levels of selection in college admissions.

[7] Our study also adds to the literature concerning changes in college admission policies and the potential distributional effects on student body composition of postsecondary institutions. The majority of the research conducted thus far has been on analyzing the elimination of race-based admissions policies (Bowen and Bok, 1998; Arcidiacono, 2005; Card and Krueger, 2005; Dickson, 2006; Howell, 2010) and the implementation of rank-based policies (e.g., *top x%* from each graduating high school class) on enrollment and college performance for minority students (Tienda et al., 2003; Niu, Tienda, and Cortes 2006; Cortes, 2010; Long 2004a, 2004b), and to a lesser extent, policies that replace race-based admissions with family-income based policies (Cancian, 1998) or other observables (Long, forthcoming). No prior studies have analyzed how using various measures of college readiness in admission policies can potentially have problematic distributional consequences on class composition at U.S. colleges and universities.

4. Empirical Strategy

A university admissions office wants to select students to maximize the probability of college success. To do so, admissions officers often use the observable characteristics of current students to predict the success of future students. We approximate this by estimating the following regression specification:

$$(1)\ y_{icm} = \beta \cdot Z_i + \gamma_c + \delta_m + \epsilon_{icm}$$

where y_{icm} measures college outcomes for student *i* in college *c* in major *m*. Z_i is a vector of observable indicators of college readiness (such as a standardized test scores). ϵ_{icm} is unexplained variation in y_{icm}. We also include college campus (γ_c) and major (δ_m) fixed effects to control for variation in academic rigor and expectations.[8]

Given that public universities are concerned with equity as well as efficiency, any admissions process based on past observations of relationships between college readiness and y_{icm} will have equity consequences if college readiness is unequally distributed by race and ethnicity. This is likely to be true, for example, when Z_i includes measures of high school quality. In that case, students with access to better public high schools in wealthier school districts will have greater access to college than students from lower SES districts. This may also be true if college readiness indicators measure individual achievement in a way that is associated with race or SES, for example if SAT scores are higher for students who can pay for SAT prep courses. Finally, Z_i could explicitly include race and SES characteristics, as it does in admissions through affirmative action.

In this study, we seek to compare the efficacy and distributional consequences of different measures of Z_i that are available for practical and legal use by public universities and

[8] All specifications include robust standard errors for clustering within high school attended.

reflect different perspectives on college preparation. The first is college admissions exams (SAT and ACT), which measure mastery of concepts related to college success. The second is high school exit exam scores, which measure mastery of core high school curricula. The third is Advanced Placement (AP) and International Baccalaureate (IB) coursework completed, which measures the rigor of prior academic work and exposure to college material. For each measure, we estimate equation (1) using one short-term and one long-term college outcome: first-semester GPA and four-year college graduation.

A limitation of any study of college performance is that we only observe outcomes for students who were admitted and then enrolled at a selective public university – a potentially select group of the pool of applicants. To the extent that selection is not based entirely on observable characteristics, and there remains a residual relationship between college admission, college enrollment, and campus chosen, and unobserved student characteristics, estimates of the relationship between college readiness in high school and college performance are likely to be biased. Importantly, the sign of the bias could go in either direction (See Black et al., 2014 for further discussion).

Our empirical strategy addresses two forms of selection – college admission and campus enrolled. In the case of admission, we take advantage of the automatic admissions policy in Texas and limit our analytical sample to students who were admitted based on observable high school class rank and no additional criteria. Most importantly for our analysis, the Texas percent plan is designed so high school quality will be uncorrelated with admissions, as all public schools have top 10 percent eligible students. By analyzing only students from the top 10 percent of their graduating class, we are able to perfectly control for selection into admission to all public

universities that are included in the study, and our college readiness measures, Z_i, are conditionally independent at this level of selection.[9]

Conditional on admission, there is still selection on enrolling in college and, in the case of admission to multiple campuses, campus selection (Niu, Tienda, and Cortes, 2006; Berkowitz and Hoekstra, 2011).[10] In our sample of top 10% students, almost all select into some form of college, but not all students choose to enroll at flagship universities. Top 10% students may enroll at the public university of their choice, and these choices are likely to be endogenous to both observed college readiness measures and unobserved ability. To address this, we apply Rothstein's (2004) empirical strategy of instrumenting for college campus attended with the geographic distance from a student's high school to each four-year public university in Texas. While the decision to enroll in a particular campus is likely endogenous to unobserved student ability, students may be marginally more likely to attend a campus closer to home. As long as geographic distance to a campus is not related to unobserved ability, our instrument will provide exogenous variation in campus attendance.[11]

A key assumption implicit in equation (1) is that the effects of college readiness measures are constant across both student and high school characteristics. With respect to race, this assumption is equivalent to race-blind admissions policies. For example, race-blind admissions policies assume that SAT/ACT scores are similarly predictive of college success for minority

[9] Students in the 11th percentile, for example, must have characteristics that warrant a discretionary admittance; given our inability to observe these admission criteria, we do not focus on students below the top 10%. This limits the generalizability of our results to students who are high-performing in high school compared to their peers. Further, we include only students from public universities subject to the Top 10% Plan. Texas also has several open-enrollment 4-year universities whose students are not included in this study.

[10] We are unable to control for selection into enrolling (vs. not enrolling) explicitly. However, we do not think this is likely a problem, as 94 percent of top 10% students identified in this data set enroll in college. Enrollment for any students who are automatically admitted is likely due to factors unrelated to admissions policies.

[11] This strategy may be even more appropriate in Texas than California. California students are not automatically admitted to all campuses, so campus selection is also systematically related to college readiness measures. Texas students can select into any campus they choose, and therefore campus selection is only related to student preferences and unrelated to admissions.

and non-minority students. Our basic model also assumes that the estimated effects of SAT/ACTs on college outcomes are equivalent for all students. In later analysis, we relax this assumption by examining interactions of college readiness measures and students' race/ethnicity, family income, and high school characteristics – a strategy that reflects a race-conscious approach to admissions that is no longer allowed at public universities. This provides insight into whether objective application of admissions criteria will have different implications for students from different backgrounds. Following the regression analysis, we directly estimate the effects of imposing objective admissions criteria by simulating changes in enrollment patterns, graduation, and GPA if additional criteria for automatic admissions were applied in Texas, as they are in other states.

5. Data Sources, College Readiness Measures, and Descriptive Statistics

5.A. Data Sources

The data sources for this study were collected by the Texas Workforce Data Quality Initiative (WDQI), funded by the United States Department of Labor. The dataset includes high school enrollment and performance measures for all Texas public school students, and data on college application, enrollment, financial aid, grades, and graduation for all those who applied to and enrolled in Texas public colleges and universities. Coverage includes all students who graduated from Texas public high schools in 2008 and 2009. Our analytic sample includes students who graduated in the top 10% of their high school classes during these two years, enrolled in a Texas selective four-year public university directly after high school, and attempted

a full-time course load in their first fall semester.[12] This includes approximately 22,000 students selected from approximately 500,000 total graduates.[13]

High school measures of college readiness and eligibility for automatic admissions were obtained from high school academic records and college applications. From college enrollment records, we obtained information on campus attended, credits attempted, grades, college major, and graduation.[14] We include students who enrolled at any campus that is obligated by the Top 10% Plan.[15] Data on demographics, family background, and family income were obtained from high school enrollment records, college applications, and financial aid forms (FAFSA) that were available in the WDQI dataset.

5.B. College Readiness Measures

We focus on three commonly available college readiness indicators that reflect different perspectives on college preparation. Our first indicator is the college entrance exam, which is specifically designed to measure preparation for college. Over 98 percent of students in the

[12] We expect college readiness measures observed during high school to have a stronger relationship with college performance for students who enroll directly after high school. This restriction has minimal impact on our sample; of the 490,000 high school students in our sample, only 6,000 appear at a 4-year college in the second year but not the first year following high school graduation, and among those, fewer than 200 are top 10% students.

[13] The dataset identifies students who were eligible for automatic admissions through information reported by each campus to the Texas Higher Education Coordinating Board (THECB). We do not observe top 10% status for students who did not apply to at least one Texas university or community college. Based on the size of the graduation cohorts, approximately 70 percent of the full top 10% completed the application. Of these, 43 percent enrolled at one of the two flagship state universities (UT-Austin or Texas A&M University) and 29 percent at another selective Texas four-year public university. These two groups have observed college outcomes and are included in our analytic sample. Among the full top 10%, 13 percent enrolled at a non-selective, open enrollment Texas public community college or university, 8 percent at a Texas private university, and 6 percent at an out-of-state university. Finally, 6 percent of students identified as eligible did not enroll in any college.

[14] Students were not required to immediately declare a major, and majors can change during undergraduate years. We use the student's declared major at the time of enrollment as proxy for the difficulty of coursework taken during the first semester. Subsequent majors are only available conditioned on continued enrollment, so we also use initial declared major in estimations of college graduation. We include "undeclared" and eight other departmental majors.

[15] Top 10% students are automatically admitted to the state's two flagship public universities (The University of Texas at Austin and Texas A&M University) and 20 additional 4-year campuses in the University of Texas System, Texas A&M System, Texas State System, University of Houston, and Texas Tech University. Students not in the top 10% must compete for admissions to these campuses through a holistic admissions process that includes a larger pool of out-of-state applicants, international students, and students attending private high schools in Texas.

subsample had an SAT or ACT composite (verbal and mathematics) score reported on their college application. We converted all ACT scores to equivalent SAT scores using the College Board's crosswalk, and standardized the composite scores around the statewide mean for Texas.

Our second measure is performance on the Texas high school exit exam, which is designed to measure mastery of the high school curriculum. All students in our graduation cohorts were required to pass the standardized Texas Assessment of Knowledge and Skills (TAKS) in four subject areas (English, mathematics, science, and social studies). To facilitate comparison with the SAT/ACT composite scores, we created a similar composite score of exit exam scores. We first summed the students' scale scores in English and math, and then converted the sum to standardized z-scores within all tested students.

Our third indicator is the number of Advanced Placement or International Baccalaureate (AP/IB) courses completed in high school, which reflects experience with college-level coursework. We measure AP/IB coursework as the total number of high school semesters completed. Completed AP/IB coursework could reflect college readiness in several ways. First, selection into AP/IB courses could reflect a teacher's assessment that a student is capable of mastering college-level material. Second, enrollment could reflect a student's own belief that she will likely attend college after high school. Completion of AP/IB coursework should reflect the ability to master college-level material. However, compared to individual test performance, AP/IB coursework is likely to be more highly correlated with high school quality, as it depends on course offerings and teacher quality. A lack of AP/IB coursework might reflect either voluntary selection into less challenging coursework or limited offerings at the high school.

5.C. Descriptive Statistics

Table 2 reports the descriptive statistics for all high school graduates from the two student cohorts (column (1)), all graduates who enrolled at Texas selective public universities (column (2)), and top 10% graduates who enrolled at selective public universities (column (3)).[16] Our analytic sample includes 21,679 students who graduated in the top 10% from a Texas public high school in 2008 or 2009, immediately enrolled in a selective four-year public university in Texas, and have complete data. Overall, Texas high school graduates are quite diverse with a large Hispanic population and no racial majority. The average high school graduate attended a high school where 44 percent of students received free/reduced lunch (FRL) and 30 percent of graduates enrolled at a four-year university immediately after graduation.

Compared to the full population of high school graduates in Texas, top 10% students are higher on SES indicators and have less racial and ethnic diversity. However, because of the Top 10% Plan, our sample offers a more diverse student body than most prior studies of college readiness. Our sample is 26 percent Hispanic, 6 percent black, 11 percent Asian, and 27 percent from families with income below $40,000. Also, in accordance with goals of the Top 10% Plan, high school quality variables are remarkably similar for the average graduate and the top 10% subgroup. Students in the analytic sample attended high schools with an average of 42 percent of students on free/reduced lunch, and where 33 percent of graduates enrolled in a four-year college within one year of graduation.[17] There is also a very large range in high school characteristics, with FRL rates ranging from zero to 100 percent, and college enrollment rates from zero to 89 percent.

[16] Approximately 500 of 22,095 observations of top 10% students who enrolled at selective public university are not included in the analytic data set due to missing data. The analytic data set is statistically similar across all values reported in Table 1 of column (3).

[17] The four-year college enrollment rate is lagged one year to reflect whether the student attended a high school with a college-going culture.

Table 2 also displays mean values of the three college readiness indicators that are the focus of this study. As expected, students in the analytic sample exceed state averages in college readiness. The average SAT/ACT score is 1170, which is 0.73 standard deviations above the state mean, and the average exit exam is 1.17 standard deviations above the state mean. Although these students were all eligible for automatic admissions based on their high school class rank, they vary significantly on measures of college readiness, creating a unique opportunity to investigate whether these additional measures are associated with college outcomes in a ways that could provide valuable information to admission officers.

Also shown in Table 2 are mean values of the college performance variables for students in the analytic sample, compared to all those who enrolled at selective public universities.[18] The average first-semester GPA for top 10% graduates is 3.07 (out of 4.0), with a large standard error of 0.81 points. Our second outcome of interest is four-year graduation, which reflects the ultimate objective of college attendance. The four-year graduation rate for all college enrollees in the cohort is only 26.9 percent, with only 61.4 percent persisting to the fourth year. The rate is higher for top 10% students who have demonstrated the ability to perform very well in high school. In our analytic sample, 81.6 percent persisted to the fourth year, and 46.4 percent graduated by August of their fourth year in college. The national Baccalaureate and Beyond Study reports a similar 4-year graduation rate of 44 percent for the 2009 graduation cohort (U.S. Department of Education, 2011).

[18] We calculated a GPA for all students who attempted full-time enrollment of at least 12 credit hours in the first semester of college (this GPA could be calculated for 94 percent of top 10% students who enrolled).

6. Results

6.A. Basic Models

We first estimate a parsimonious Ordinary Least Squares (OLS) specification, predicting college outcomes with controls for 22 campuses attended and nine majors.[19] Table 3 reports these results for the continuous outcome of first-semester GPA (columns (1)-(3)) and the dichotomous outcome of four-year graduation (columns (4)-(6)) estimated as a function of SAT/ACT composite z-scores, exit exam composite z-scores, and number of AP/IB courses completed, respectively.[20] All three measures are positively and significantly associated with both outcomes. We estimate that an additional standard deviation in SAT/ACT performance is associated with 0.451 additional grade points, and a 10.6 percentage point increase in the probability of graduation. An additional standard deviation in exit exam performance is associated with 0.377 additional grade points, and a 7.9 percentage point increase in the probability of graduation. One additional AP/IB semester is associated with smaller increases of 0.030 grade points, and a one-point increase in the probability of graduation. To assess how well each measure predicts college outcomes, we consider the goodness-of-fit test statistic (R^2) for the continuous dependent variable freshman year GPA. The R^2 for the SAT/ACT specification is the highest at 0.223, followed by 0.143 for the high school exit exam, and 0.073 for AP/IB courses. These results suggest that admissions might perhaps lead to better college outcomes with any or all of these additional criteria. It is possible that SAT/ACTs, exit exams, and advanced coursework are redundant measures of college readiness that provide the same information.

[19] The top 10% graduates in this study enrolled in 21 of the state's 22 selective public universities. Average freshman GPAs for students in the sample differ across these campuses, ranging from 2.94 to 3.60. Four-year graduation rates vary by campus from 29 percent to 62 percent. Different majors also have different norms for student performance. Average freshman GPAs in the sample vary by major from 3.06 for science and engineering majors to 3.31 for those with undeclared majors. Average graduation rates vary by major from 36 to 53 percent. Specifications without controls for major and college attended produce coefficients on college readiness indicators that are slightly lower. Results are available from authors upon request.

[20] In the case of four-year graduation, we are estimating linear probability models.

Similar to Bettinger, Evans, and Pope (2014), for each model, we also estimated a fourth specification including all three readiness measures. All three measures were statistically significant and F-tests of equivalence suggest that each measure provides unique information about college readiness.

The OLS model controls for admission by considering only students admitted through the Top 10% Plan, but we still face selection into college attendance and campus attended that is likely correlated with college readiness. To address campus attended we employ a two-stage least squares method, where we use distance to college campuses to instrument for campus attended. In the first-stage, we estimate the probability that each student will enroll at each top 10% campus with the distance from a student's high school to each of Texas's 36 public 4-year universities (both selective top 10% campuses and open-enrollment campuses). In practice, however, top 10% students only attended 22 of the possible 36 universities. Predicted probabilities of attending each top 10% campus are then used in the second-stage as instruments for campus attended. The F-tests and R^2 statistics for the first-stage estimations are reported in Appendix A for each college campus. We continue to control for college major directly in the second-stage of the instrumental variables regressions.

Results using the instrumental variables estimation strategy are shown in Table 4. The estimated effects of all college readiness measures are robust to campus selection with coefficients that are similar to the OLS estimation with campus fixed effects. In the instrumental variables specification, a one standard deviation increase in SAT/ACT scores is associated with 0.399 additional grade points and a 9.8-point increase in the probability of four-year graduation. A one standard deviation increase in exit exams scores is associated with 0.315 additional grade points and a 6.2-point increase in the probability of four-year graduation. One additional AP/IB

semester is associated with 0.021 additional grade points, and a 0.7-point increase in the probability of four-year graduation. These results suggest that, controlling for selection into admissions and campus attended, college readiness measures do provide additional information about the college performance. This information could be useful for improving efficiency in college admissions, but the effects on equity are unclear.

6.B. Interactions with Race, Ethnicity, and SES

College admissions strategies that are based on college readiness measures can influence equity in two distinct ways. First, these measures can be correlated with observable characteristics such as race or income, and, because of this correlation, admissions that include these criteria will favor one group over another. Table 5 displays summary statistics for the college readiness measures in our analytic sample by race and ethnicity, family income, and high school quality. Differences by group are quite large. For example, average SAT/ACTs range from 1029 for blacks and 1061 for Hispanics to 1218 for whites. All three college readiness indicators have a clear association with demographics and high school quality even within our sample of highly-ranked high school students, and it is likely that adding admissions criteria based on these indicators will exclude more minority and low-income students than white and high-income students from automatic admissions.

In addition to the different average levels, measures of college readiness may have different relationships with college performance for subgroups of the population. For example, SAT scores might have a weaker association with college performance for students who have access to preparation courses than those who do not. If access to SAT prep differs by race or family income, SAT scores will have a different association with performance across groups. These differences are accommodated in affirmative action programs where different standards

can be applied to different groups. It is unclear from the results above whether the predictive value of college readiness measures holds for underrepresented students.

We next examine whether college readiness measures have a similar predictive value for all students. Specifically, we control for race/ethnicity and family income and interact race/ethnicity and family income with the college readiness measures in our estimation of college outcomes. Table 6 reports results from the instrumental variables specification with indicators for race and ethnicity (columns (1)-(3) for GPA and columns (7)-(9) for graduation), and with interactions between race/ethnicity and college readiness measures (columns (4) to (6) for GPA and columns (10) to (12) for graduation).[21] In these estimates, race and income variables are included in both stages of the instrumental variables estimation. The estimates for all three college readiness measures are robust to the inclusion of race/ethnicity variables for both outcomes. Interestingly, the coefficients on race indicators are approximately 50 percent smaller in specifications that include SAT/ACT scores, relative to the other two measures, suggesting that college entrance exams are more correlated with race/ethnicity than other indicators. This finding reinforces prior evidence that the use of college entrance exams is problematic for an admissions process that strives to be race-neutral (see Jencks, 1998).

When interaction terms are added, we find significant and positive point estimates for the interactions between black and SAT/ACT and black and exit exams in the estimates for GPA. As seen in column (4) of Table 6, an additional standard deviation on the SAT/ACT is associated with 0.347 additional grade points for a white student compared to 0.499 points for a black student. An additional standard deviation on the exit exam is associated with 0.265 grade points for a white student compared to 0.461 grade points for a black student. For college graduation,

[21] The reference group in each regression specification is white social science major. Indicators are also included for Native American and Asian ethnicities (not tabled). There are no significant differences for these groups.

the exit exam has a stronger association with graduation for black students, while advanced coursework is a weaker predictor of graduation for black students than white students. Importantly, these associations may be related to school quality, rather than student ability, as black students may have lower access to test preparation and AP/IB coursework. Overall, our results suggest that the effects of college readiness measures are similar for whites and Hispanics but different for black students in ways that are problematic for race-neutral admissions processes. These results suggest that the differential admissions process used in affirmative action would enable a more accurate assessment of student potential for success than a process based on a single set of objective criteria applied across racial groups. For example, test scores appear to be more predictive of college success for blacks than white students, while advanced coursework is a better predictor for whites than black students.

Table 7 reports results by two family income brackets. “Middle income” reflects family income from $40-$80k, “high income” reflects family income over $80k, and the omitted comparison group has income under $40k. Similar to the race/ethnicity results from Table 6, specifications with income indicators show a stronger association between income and SAT/ACT than the other two readiness measures. Coefficients for SAT/ACT and exit exams are robust to the inclusion of income dummies. The only significant interaction terms for these two measures are negative, significant effects of the interaction between high-income and the exit exam on both freshman GPA and graduation. Thus, exit exams have a stronger association with

college outcomes for students from lower income brackets, while SAT/ACT and advanced coursework provide similar information across income groups.[22]

The significant interaction between college readiness measures and student demographics in the prediction of college outcomes suggests that while college readiness measures provide additional information, the information is not the same for all students. Admissions processes that apply a single criterion for all students are likely to have differential effects on students from different demographic groups. Thus the efficiency gained through use of these criteria will depend on the distribution of students. For example, a criterion based on SAT scores would have a smaller expected effect on college GPAs for a group of white students than a group of black students, because SAT scores are more predictive of GPA for black students. The implication for admissions policy is that adding objective criteria will influence both the demographics of admitted college students and the average relationship between college readiness and outcomes. Next, we test this expectation by simulating admissions under objective criteria in Texas.

7. Simulated Admissions with New Objective Criteria

The results above suggest that admissions criteria based on college readiness measures have the potential to improve college outcomes, but with potentially problematic effects on equity. Because our analytical sample was selected strictly on top 10% class rank, we can simulate the equity effects of automatic admissions with alternative admissions rules.

[22] The influence of college readiness measures on college performance may also vary across students based on the level of college preparation offered through their peer group and high school. We estimate these effects by considering differential effects for students from high schools with above median rates of free/reduced lunch status and differential effects for above median rate of college enrollment. We find that both SAT/ACT and exit exams have a stronger association with college performance for students from low SES high schools and, for exit exams only, students from high schools with low college-enrollment rates. We also examine whether these results apply to all university types by including an interaction term for college readiness and attendance at a state flagship university (versus lower-tier selective state universities). We find no significant interactions by university type, which suggests that the effect of college readiness measures is similar across university selectivity despite differences in average levels of student readiness at flagship campuses. These results are available upon request.

We begin with our full sample of 22,095 freshmen from the top 10% who enrolled at selective four-year public universities. For these students, we simulate new rules based on objective cut points for SAT/ACT scores, high school exit exams, and AP/IB courses completed. We then observe changes in average college outcomes and student demographics due to the exclusion of students who do not meet each criterion. We test several plausible admissions criteria that could be added to the Top 10% Plan. These additions would make Texas's policy similar to the other states listed in Table 1, where automatic admissions (with or without percent plans) also include other statewide criteria. Specifically, we test the effects of five new criteria requiring: (1) SAT/ACT composite scores above the statewide average; (2) SAT/ACT scores at least 0.5 standard deviations above the state average; (3) TAKS high school exit exam scores above the state average; (4) TAKS high school exit exams scores at least 0.5 standard deviations above the state average; and (5) completion of at least four AP/IB semesters.

The estimated changes in average college outcomes under each simulated rule change are shown in Table 8. We present results both for all selective four-year universities (panel A) and for the state flagship universities (panel B), UT Austin and Texas A&M University, where the majority of top 10% students chose to enroll. As seen in column (1), average first-semester GPA was 3.069 for the full sample, and 2.983 for the flagship universities. Statistics in columns (2) to (6) present the average GPA and graduation rates for the subgroup of students who remain eligible for automatic admissions following the imposition of each new criterion. All five alternative admissions policies raise GPAs, but the gains are relatively small. The largest increases in average GPA come through SAT/ACT-based admissions rules. Requiring above average SAT/ACT increases average GPA by 0.10 points (a 3.2% increase) overall, and by 0.098 points (3.3%) at flagships. The higher SAT/ACT cut-off increases average GPA by 0.194 point

(6.3%) overall, and by 0.207 (6.9%) at flagships. High school exit exam criteria trigger smaller increases in GPA, and AP/IB course requirements increase average GPA by less than two percent.

The effects on overall four-year graduation rates are similar. The four-year graduation for top 10% students would increase from 46.4 percent to 49.5 percent with a requirement for above average SAT/ACT, and to 52.3 percent with the higher SAT/ACT cut-off. Overall graduation rates would increase only to 47.0 with a requirement for above average TAKS exit exams, and to 48.6 percent with the higher cut-off. Requiring more than four AP/IB semesters would increase overall graduation by less than two percentage points. The effects on graduation rates at the flagship universities are smaller than the overall average. At the flagships, the most stringent new SAT/ACT-based admissions rule would increase four-year graduation among automatically admitted students from 50.6 percent to 54.1 percent.

These improvements in student outcomes come with a significant trade-off in the number of students who would be automatically admitted under the new admission rules, as well as dramatic shifts in student demographics. The estimated changes in the size and demographic composition of automatically admitted freshmen are shown in Table 9. Requiring above average SAT/ACT scores would eliminate automatic admissions eligibility for 19 percent of students, and the higher SAT/ACT criteria would eliminate eligibility for 40 percent of the sample. In contrast, requiring above average exit exams would reduce the sample by only 3 percent, and the higher exit exam cutoff would reduce the sample by 15 percent. Requiring more than four AP/IB semesters would reduce the sample by 23 percent. The effects are somewhat smaller at the two flagship universities (results shown in Table 10), because flagship students have higher average college readiness.

Of course, the reduction in the number of automatically admitted students could be advantageous for admissions by opening up slots for otherwise highly qualified students with lower class rank. In Texas and other states, slots not filled through automatic admissions are distributed through a more traditional, holistic admissions process. However, the majority of minority students on Texas flagship campuses enter through automatic admissions, rather than the traditional admissions process, and minorities have lower average college readiness measures. Added to new constitutional restrictions on race-based admissions, it unlikely that any new admissions process would be explicitly race-based. Therefore, the implications of automatic admissions rules for the demographic composition of the freshman class are quite important. Even though new slots will be open for the discretion of admissions counselors, they are unlikely to be disproportionately filled by minority students.[23]

The disaggregated results in Tables 9 and 10 suggest that our simulated admission rules have substantially different effects by race/ethnicity, family income, and high school quality. Compared to modest gains in freshman GPA and graduation rates, these simulated admission rules have dramatic effects on equity and access. For example, requiring above average SAT/ACT eliminates only 8 percent of white students, 10 percent of Asian students, and 7 percent of high-income students from eligibility, while eliminating 40 percent of Hispanics, 49 percent of blacks, and 36 percent of low-income students. Requiring the higher SAT/ACT cutoff would increase four-year graduation by 8 percentage points, but would also eliminate 69 percent of Hispanics, 73 percent of blacks, and 62 percent of low-income students from eligibility for automatic admissions. SAT/ACT-based criteria also dramatically reduce representation by

[23] The lack of a statistical advantage for minorities in UT Austin's holistic admissions process is documented in the U.S. Appeals Court decision in Fisher v. University of Texas (2014). Judge Higginbotham notes in his ruling that very few minorities were admitted outside the top 10%, despite the use of race as a component of decisions. The process was upheld as legal use of race in admissions because it maintains the university's capacity to admit minority students below the top 10%.

students from low-quality high schools. Requiring above average SAT/ACT scores would eliminate only five percent of students from high SES high schools, but 53 percent of students from low SES high schools. High schools in the lowest quartile statewide for college-entry rates of graduates sent only 129 students to Texas selective universities through automatic admissions in 2008 and 2009. Requiring above average SAT/ACT score would have eliminated 36 percent of these students, compared to only 10 percent of a much larger sample of students from high schools with high college-entry rates.

Simulated admissions rules based on the state exit exams have smaller equity effects than those based on SAT/ACT scores. Requiring above average exit exam scores reduces minority enrollment more than whites, but Hispanic enrollment is reduced by only 6 percent (compared to 40 percent for above average SAT/ACT), black enrollment by 13 percent (compared to 49 percent), and low-income enrollment by 7 percent (compared to 36 percent). Hence, using the state standardized tests for admissions instead of SAT/ACT scores is a remarkable improvement for equity and access, with only a marginal loss in college outcome gains. Admissions criteria based on high school exit exams also have a smaller negative effect on students from low SES and low college-entry high schools than criteria based on SAT/ACT scores.

Our simulated admissions rule based on AP/IB coursework has a larger effect on the number of eligible students than high school exit exams; however, the effect is more equitably distributed across race and ethnicity. Requiring AP/IB courses is the only admissions rule that would reduce white student enrollment equally with minorities. The AP/IB coursework requirement also has the most equitable effect across income groups. In relation to high school quality, however, students at high schools with low college enrollment are far more likely to exit

eligibility for automatic admission when AP/IB coursework is required than students from high schools with high college enrollment.

Sensitivity to equity in admissions policies is most salient at Texas flagship universities, which have been the subject of multiple court cases questioning the constitutionality of race-conscious admission. Table 10 illustrates the effects of simulated admissions rules at the two flagship campuses. The results are similar to all top 10% universities. Adding SAT/ACT requirements would severely reduce enrollment by black and Hispanic students through automatic admissions. The more stringent SAT/ACT criteria would eliminate 75 percent of students from low SES high schools, and 65 percent of students from low college-entry high schools. Admissions rules based on exit exams have a smaller effect, but also differentially harm low-income, black, and Hispanic students, and students from low-quality high schools.

8. Discussion and Policy Implications

National and state policy environments are increasingly unfriendly to race-conscious admissions policies. The Supreme Court has limited public universities to a narrow use of race as a component of admissions decisions, and voters have outlawed even this minimal application of race in several states. As a replacement, many states are seeking more objective admissions criteria. Objective criteria have the benefit of being more transparent than holistic admissions processes, reducing both the perception of racial preference and the complexity and cost of admissions. It is challenging to identify the effects of admissions criteria on college outcomes, because we only observe college outcomes for students who are granted admissions and enroll, which is clearly endogenous to the criteria set for admissions.

Texas's top 10% policy is remarkable both for its policy simplicity and because it generates a sample of college students who enroll in selective and elite flagship universities

without selection on criteria typically applied in selective admissions. With this sample, we are able to improve upon prior estimation of the relationship between college readiness measures and college outcomes. In addition, the fact that Texas top 10% students can select their campus allows us to better control for selection into campus attended. If class rank provided perfect information about college success, we would find no remaining relationship between college readiness measures and college outcomes among these students. Instead, we find that college entrance exams, high school exit exams, and college coursework are all associated with college success. For public universities, this suggests that additional admissions criteria other than class rank may lead to selection of a more successful group of incoming freshman.

However, turning to the question of equity, we also find that college readiness measures, and entrance exams in particular, are not equally predictive of college outcomes for black and white students. The potential racial bias of SAT/ACTs is well documented and suggests that average scores for minorities are lower due to factors that are not associated with college success (Rothstein, 2004). We find here that even among students in the top decile of high school performance, test-based measures are more strongly predictive of college performance for black students. It is likely that white students in Texas and beyond have better access to test preparation, which, by design, weakens the association between ability and performance by teaching students how to improve their scores with no meaningful gains in actual college readiness. Thus, the use of these criteria in race-blind admissions might inadvertently introduce inequity. Affirmative action admissions policies can accommodate different relationships between measures and outcomes across racial and ethnic groups by applying different standards. However, these accommodations, which are supported by the results here, are no longer legal in public university admissions.

This study informs admissions policy in two ways. First, we directly test the implications of the design of automatic admissions policies on diversity and student outcomes. We find that Texas's simple percent plan does improve over policies that add additional objective criteria. Although there is still a lingering relationship between college readiness and college outcomes, simulated policies with additional criteria have a profound negative effect on diversity and equitable access, with a smaller positive effect on average outcomes. Any criteria-based admissions standard will have the largest effect on the marginal student near the selected cut-point. With minorities scoring, on average, lower than whites, it is inevitable that minorities are more likely to be affected by cut-points than whites. We find that this also holds for low-SES students and students from lower quality high schools, based on measures of a high school's focus on college readiness. The magnitude of these effects varies with the criterion selected, with simulated SAT/ACT-based criteria triggering larger equity effects than those based on high school exit exams and AP/IB coursework. Although we simulate policy effects in a state with a percent plan based automatic admissions policies, the results have implications in other settings as well.

Importantly, the equity effects of Texas's Top 10% Plan are dependent on a highly segregated public school system (Fisher v. University of Texas, 2014). If minorities and low-SES students were equitably represented in high quality schools, they might have difficulty cracking the top 10% to obtain college admissions. Thus, the general effectiveness of percent plans will vary in states with greater racial and economic integration in public high schools. However, the results regarding test scores and coursework are likely to stand up across all contexts where minorities and low-SES students have less access to test preparation and advanced coursework, which is common across the country. Our results suggest that these measures can predict college

outcomes among students who achieve a high class rank, but with differential effects by race and ethnicity. Applying the same SAT/ACT score criteria to a black and a white student may be inappropriate given these differential effects. However, applying differential criteria is now illegal for state universities; making percent plans a more attractive solution. Our results suggest that the fewer "objective" criteria that are used in admissions, the less inequity will be introduced. In the case of Texas, efficiency gains from adding criteria come at a very high cost of dramatic reductions in equity. Admissions officers should use caution in applying minimum standards across the board when diversity continues to be a goal of admissions.

References

5th Circuit Court of Appeals. *Hopwood, Cheryl J., et al. v. State of Texas, et al.* No. 94-505699 (1996).

5th Circuit Court of Appeals. *Hopwood, Cheryl J., et al. v. State of Texas, et al.* No. 94-505699 (2000).

5th Circuit Court of Appeals. *Fisher, Abigail Noel, v. University of Texas at Austin, et al.* No. 09-50822 (2014).

Arcidiacono, Peter. (2005). "Affirmative Action in Higher Education: How Do Admission and Financial Aid Rules Affect Future Earnings?" *Econometrica* 73(5): 1477-1524.

Berkowitz, D. and Hoekstra, M. (2011). "Does High School Quality Matter? Evidence from Admissions Data." *Economics of Education Review* 30: 280-288.

Bettinger, E.P., Evans, B.J., and Pope, D.J. (2014). "Improving College Performance and Retention the Easy Way: Unpacking the ACT Exam." *American Economic Journal*: *Economic Policy.*

Betts, J.R. and Morell, D. (1999). "The Determinants of Undergraduate Grade Point Average: The Relative Importance of Family Background, High School Resources, and Peer Group Effects." *The Journal of Human Resources* 34(2): 268-293.

Black, Sandra E., Lincove, Jane A., Cullinane, Jenna, and Veron, Rachel. (2014). "Can You Leave High School Behind?" IZA Discussion Paper No. 7899.

Bowen, W. G., and Bok, D. (1998). The Shape of the River: Long-term Consequences of Considering Race in College and University Admissions. Princeton, NJ: Princeton University Press.

Cancian, Maria (1998). "Race-based Versus Class-based Affirmative Action in College Admissions." *Journal of Policy Analysis and Management* 17(1): 94–105.

Card, David and Krueger, Alan B. (2005). "Would the Elimination of Affirmative Action Affect Highly Qualified Minority Applicants? Evidence from California and Texas." *Industrial and Labor Relations Review* 58(3): 416-434.

Cohn, E., Cohn, S., Balch, D.C., and Bradley, J. (2004). "Determinants of undergraduate GPAs: SAT scores, high school GPA and high-school rank." *Economics of Education Review* 23(6): 577-586.

Cortes, Kalena E. (2010). "Do Bans on Affirmative Action Hurt Minority Students? Evidence from the Texas Top 10% Plan." *Economics of Education Review* 29(6): 1110–1124.

Cyrenne, P. and Chan, A. (2012). "High School Grades and University Performance: A Case Study." *Economics of Education Review* 31: 524-542.

Deming, J.D., Hastings, J.S., Kane, T.J. and Staigler, D.O. (Forthcoming). "School Choice, School Quality and Postsecondary Attainment." *American Economic Review*.

Dickson, L. M. (2006). "Does ending affirmative action in college admissions lower the percent of minority students applying to college?" *Economics of Education Review* 25(1): 109–119.

Fletcher, J. and Tienda, M. (2009). "High School Classmates and College Success." *Sociology of Education* 82(4): 287-31

Howell, Jessica. (2010). "Assessing the Impact of Eliminating Affirmative Action in Higher Education." *Journal of Labor Economics* 28(1): 113-166.

Jencks, Christopher. (1998). "Racial Bias in Testing." In *The Black-White Test Score Gap*, editors, Christophe Jencks and Meredith Phillips. Brookings.

Light, Audrey and Strayer, Wayne. (2000). "Determinants of College Completion: School Quality or Student Ability." *The Journal of Human Resources* 35(2): 299-332.

Liptak, Adam (2014, April 22). "Court Backs Michigan on Affirmative Action." *The New York Times.* www.nytimes.com.

Long, Mark. (2004). "Race and College Admissions: An Alternative to Affirmative Action." *The Review of Economics and Statistics* 86(4): 1020-1033.

Long, Mark. (2004). "College Applications and the Effect of Affirmative Action." *Journal of Econometrics* 212(2): 319-342.

Long, Mark (forthcoming). "Is There a Workable Race-Neutral Alternative to Affirmative Action?" *Journal of Policy Analysis and Management.*

Long, Mark, Iatarola, Patrice, and Conger, Dylan. (2009). "Explaining Gaps in Readiness for College-Level Math: The Role of High School Courses." *Education Finance and Policy* 4(1): 1-33.

Niu, S. X., Tienda, M. and Cortes, K. (2006). "College Selectivity and the Texas Top 10% Law." *Economics of Education Review* 25: 259 – 272.

Rothstein, Jesse. (2004). "College Performance Predictions and the SAT." *Journal of Econometrics* 121(1-2): 297-317.

Rothstein, Jesse M. (Forthcoming). "SAT scores, High schools, and Collegiate Performance Predictions." In *Rethinking Admissions for a New Millennium: Moving Past the SAT for Social Diversity and Academic Excellence*, ed. J. A. Soares. Teacher's College Press.

Texas Higher Education Coordinating Board (2014). *Closing the Gaps by 2015.* (Accessed on March 2, 2014: http://www.txhighereddata.org/interactive/Accountability/)

Tienda, Marta, Kevin. T. Leicht, Teresa Sullivan, Michael Maltese, and Kim Lloyd (2003). "Closing the Gap?: Admissions and Enrollments at the Texas Public Flagships Before And After Affirmative Action." Working Paper No. 2003-01. Office of Population Research, Princeton University, Princeton, NJ.

US Department of Education, National Center for Education Statistics. (2011). *2008–09 Baccalaureate and Beyond Longitudinal Study (B&B:08/09): A First Look at Recent College Graduates (NCES 2011-236), Table 3.*

US Supreme Court Reports. *Regents of University of California, The v. Bakke, Allan.* 438 U.S. 265. No. 76-811 (1978).

US Supreme Court Reports. *Grutter, Barbra v. Bollinger, Lee, et al.* 539 U.S. 306. No. 02-241 (2003).

US Supreme Court Reports. Gratz, et al. v. Bollinger, *et al.* 539 U.S. 244. No. 02-516 (2002).

US Supreme Court Reports. *Fisher, Abigail Noel, v. University of Texas at Austin, et al.* 570 U.S. No. 11-345 (2014).

US Supreme Court Reports. *Shuette, Attorney General of Michigan v. Coalition to Defend Affirmative Action, Integration and Immigration Rights and Fight for Equality by Any Means Necessary, (Bamn) et al.* 572 U.S. No. 12-682 (2014).

Table 1: Automatic Admissions Policies at State Flagship Institutions

Panel A: States with Percent Plans

State	Percent-plan threshold	Additional Criteria
Arizona	Top 25%	Completed coursework
California	Top 9%	Composite of GPA and SAT/ACT
Kansas	Top third	Minimum SAT or GPA
Montana	Top 50%	Minimum ACT or GPA, completed coursework, and writing and math proficiency
Nebraska	Top 50%	Minimum SAT/ACT and completed coursework
Texas	Top 7-10%	None[1]

Panel B: States without Percent Plans

State	Percent-plan threshold	Additional Criteria
Arkansas	None	Minimum GPA, ACT, and completed coursework
Iowa	None	Composite of class rank, GPA, SAT/ACT, completed coursework
Louisiana	None	Minimum GPA, SAT/ACT, and completed coursework
Mississippi	None	Minimum GPA or SAT/ACT, and completed coursework
Nevada	None	Minimum GPA or SAT/ACT and completed coursework
Wyoming	None	Minimum GPA, SAT, and completed coursework

Notes: [1]Two major changes occurred in 2013 that influence who qualifies for the percent plan in Texas. First, the University of Texas at Austin now only admits top 7% of students, but Texas A&M University still admits the full top 10% of students. Second, the Texas legislature passed House Bill 5 which now requires top 10% students to take additional coursework. All other states have holistic admissions to public flagship universities. Many states, including Texas, offer a secondary holistic admissions process for those not automatically admitted.

Source: Admissions websites for state flagships universities.

Table 2: Descriptive Statistics

	All High School Graduates	High School Graduates who Enrolled at Selective Public Universities	Top 10% Graduates who Enrolled at Selective Public Universities
Student characteristics:	(1)	(2)	(3)
Female	0.502	0.535	0.595
Age	18.1	18.0	18.0
	(0.486)	(0.337)	(0.314)
Mother attended college	0.246	0.607	0.666
Father attended college	0.226	0.592	0.675
Race and ethnicity:			
Asian	0.040	0.084	0.116
Black	0.137	0.098	0.054
Hispanic	0.385	0.298	0.257
White	0.435	0.517	0.570
Family income:			
Less than $40,000	0.262	0.317	0.271
$40,000 - $80,000	0.128	0.253	0.267
More than $80,000	0.107	0.362	0.445
Missing	0.502	0.068	0.017
High school quality:			
Free or reduced lunch rate	0.439	0.392	0.418
	(0.249)	(0.253)	(0.243)
Rate of college enrollment	0.302	0.366	0.329
	(0.147)	(0.144)	(0.132)
Financial need:			
Unmet financial need	$1,169	$1,379	$941
	(4,383)	(4,573)	(3,729)
Did not complete FAFSA	0.567	0.199	0.150
	(0.495)	(0.399)	(0.357)
College readiness:			
SAT/ACT composite score	1029	1071	1170
	(194)	(176)	(168)
SAT/ACT z-score	0.001	0.217	0.726
	(1.000)	(0.903)	(0.861)
Texas high school exit exam z-score[a]	0.009	0.621	1.172
	(0.990)	(0.819)	(0.738)
AP/IB course semesters completed	2.5	5.8	9.4
	(4.3)	(5.5)	(5.6)
College outcomes:			
First-semester GPA		2.617	3.069
		(0.986)	(0.813)
Persist to year 4		0.614	0.816
		(0.487)	(0.388)
Graduate by year 4		0.269	0.464
		(0.443)	(0.499)
Observations	490,707	90,580	22,095

Notes: Standard deviations are shown in parentheses for continuous variables. [a]Texas high school exit exam scores are a composite z-score of both reading and mathematics.

Source: Texas Workforce Data Quality Initiative Database, 2008 and 2009 student cohorts.

Table 3: OLS Estimates of the Effect of College Readiness on College Performance

	Panel A: First-Semester GPA			Panel B: Four-Year Graduation		
	(1)	(2)	(3)	(4)	(5)	(6)
College readiness measures:						
SAT/ACT z-score	0.451**			0.106**		
	(0.009)			(0.005)		
High school exit exam z-score		0.377**			0.079**	
		(0.012)			(0.005)	
AP/IB courses (semesters)			0.030**			0.010**
			(0.002)			(0.001)
Observations	21,679	21,679	21,679	21,679	21,679	21,679
R^2	0.223	0.143	0.073	0.056	0.041	0.038

Notes: Standard errors are shown in parentheses. Standard errors are robust to clustering within high school attended. Column's (1)-(6) include fixed effects for departmental major and university. **, * indicates statistical significance at the 1% and 5% level, respectively.

Table 4: Two-stage Least Squares Estimates of the Effect of College Readiness on College Performance

	Panel A: First-Semester GPA			Panel B: Four-Year Graduation		
	(1)	(2)	(3)	(4)	(5)	(6)
College readiness measures:						
SAT/ACT z-score	0.399**			0.098**		
	(0.025)			(0.011)		
High school exit exam z-score		0.315**			0.062**	
		(0.026)			(0.010)	
AP/IB courses (semesters)			0.021**			0.007**
			(0.005)			(0.002)
Observations	21,679	21,679	21,679	21,679	21,679	21,679

Notes: Standard errors are shown in parentheses. Standard errors are robust to clustering within high school attended. First-stage estimations predict university enrolled with the distance from the student's high school campus to 36 public 4-year universities. Column's (1)-(6) include fixed effects for college major. **, * indicates statistical significance at the 1% and 5% level, respectively.

Table 5: Summary Statistics of College Readiness Measures by Student Characteristics

	By race/ethnicity:			By family income:			By high school SES[1]:		By high school college enrollment rate[2]:	
	Black	Hispanic	White	< $40k	$40-80k	> $80k	Low	High	Low	High
SAT/ACT score	1029	1061	1218	1082	1145	1238	1013	1255	1071	1231
	(155)	(146)	(144)	(160)	(155)	(149)	(138)	(142)	(144)	(160)
SAT/ACT z-score	0.003	0.169	0.973	0.277	0.596	1.076	-0.078	1.166	0.220	1.040
	(0.799)	(0.752)	(0.741)	(0.826)	(0.798)	(0.766)	(0.714)	(0.731)	(0.740)	(0.823)
High school exit exam z-score	0.695	0.942	1.271	0.971	1.101	1.338	0.804	1.392	0.830	1.341
	(0.740)	(0.694)	(0.706)	(0.745)	(0.693)	(0.724)	(0.715)	(0.696)	(0.654)	(0.724)
AP/IB semesters	7.8	8.6	9.2	8.4	9.0	10.3	8.6	10.7	5.3	10.8
	(5.2)	(5.0)	(5.6)	(5.3)	(5.6)	(5.8)	(4.9)	(5.7)	(4.5)	(5.8)
Observations	1,200	5,684	12,584	5,978	5,901	9,836	3763	9039	129	9846

Notes: Standard deviations are shown in parentheses. [1]Low SES schools are in bottom quartile among high schools statewide for free/reduced lunch rate. High SES schools are in the top quartile. [2]Low college enrollment schools are in bottom quartile among high schools statewide for rate of 4-year college enrollment of graduates. High college enrollment schools are in the top quartile.

Table 6: Two-stage Least Squares Estimates of the Effect of College Readiness on College Performance

	Panel A: First-Semester GPA						Panel B: Four-Year Graduation					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
College readiness measures:												
SAT/ACT z-score	0.370**			0.347**			0.092**			0.074**		
	(0.023)			(0.023)			(0.011)			(0.012)		
High school exit exam z-score		0.291**			0.265**			0.056**			0.044**	
		(0.021)			(0.020)			(0.009)			(0.009)	
AP/IB semesters			0.020**			0.021**			0.007**			0.008**
			(0.004)			(0.005)			(0.002)			(0.002)
Race and ethnicity:												
Black	-0.284**	-0.498**	-0.570**	-0.310**	-0.650**	-0.534**	-0.059**	-0.119**	-0.118**	-0.079**	-0.156**	-0.056
	(0.057)	(0.067)	(0.080)	(0.059)	(0.095)	(0.128)	(0.022)	(0.025)	(0.026)	(0.023)	(0.033)	(0.041)
Hispanic	-0.149**	-0.312**	-0.334**	-0.174**	-0.360**	-0.307**	-0.043**	-0.087**	-0.083**	-0.062**	-0.108**	-0.063**
	(0.033)	(0.039)	(0.045)	(0.039)	(0.054)	(0.070)	(0.014)	(0.015)	(0.016)	(0.016)	(0.022)	(0.024)
Interactions:												
Black x SAT/ACT				0.152**						0.027		
				(0.042)						(0.019)		
Hispanic x SAT/ACT				0.029						0.018		
				(0.023)						(0.012)		
Black x exit exam					0.196**						0.041*	
					(0.061)						(0.021)	
Hispanic x exit exam					0.041						0.018	
					(0.026)						(0.012)	
Black x AP/IB semesters						-0.004						-0.008*
						(0.009)						(0.003)
Hispanic x AP/IB semesters						-0.003						-0.002
						(0.004)						(0.002)
Observations	21,679	21,679	21,679	21,679	21,679	21,679	21,679	21,679	21,679	21,679	21,679	21,679

Notes: Standard errors are shown in parentheses. Standard errors are robust to clustering within high school attended. First-stage estimations predict university enrolled with the distance from the student's high school campus to 36 public 4-year universities. Column's (1)-(12) include fixed effects for college major. All specifications also include controls for Asian and Native American races and their interactions with college readiness variables. **, * indicates statistical significance at the 1% and 5% level, respectively.

Table 7: Two-stage Least Squares Estimates of the Effect of College Readiness on College Performance

	Panel A: First-Semester GPA						Panel B: Four-Year Graduation					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
College readiness measures:												
SAT/ACT z-score	0.387**			0.397**			0.093**			0.103**		
	(0.021)			(0.024)			(0.010)			(0.011)		
High school exit exam z-score		0.312**			0.344**			0.061**			0.073**	
		(0.022)			(0.028)			(0.009)			(0.011)	
AP/IB semesters			0.021**			0.016**			0.007**			0.005*
			(0.005)			(0.005)			(0.002)			(0.002)
Family income:												
Middle income ($40-80k)	0.025	0.080**	0.084**	0.026	0.083*	0.057	0.020	0.034**	0.031**	0.024*	0.030	0.008
	(0.020)	(0.024)	(0.026)	(0.022)	(0.039)	(0.042)	(0.010)	(0.011)	(0.011)	(0.011)	(0.017)	(0.019)
High income (>$80k)	0.122**	0.263**	0.261**	0.137**	0.341**	0.172*	0.052**	0.087**	0.074**	0.065**	0.121**	0.041
	(0.037)	(0.049)	(0.054)	(0.045)	(0.062)	(0.085)	(0.016)	(0.020)	(0.019)	(0.019)	(0.024)	(0.029)
Interactions:												
Middle income x SAT/ACT				-0.007						-0.012		
				(0.021)						(0.012)		
High income x SAT/ACT				-0.021						-0.019		
				(0.021)						(0.011)		
Middle income x exit exam					-0.006						0.003	
					(0.030)						(0.014)	
High income x exit exam					-0.067*						-0.028*	
					(0.027)						(0.011)	
Middle income x AP/IB semester						0.003						0.003
						(0.003)						(0.002)
High income x AP/IB semesters						0.009						0.004
						(0.005)						(0.002)
Observations	21,679	21,679	21,679	21,679	21,679	21,679	21,679	21,679	21,679	21,679	21,679	21,679

Notes: Standard errors are shown in parentheses. Standard errors are robust to clustering within high school attended. First-stage estimations predict university enrolled with the distance from the student's high school campus to 36 public 4-year universities. Column's (1)-(12) include fixed effects for college major. **, * indicates statistical significance at the 1% and 5% level, respectively.

Table 8: College Performance at Texas Selective and Flagship Universities under the Top 10% Plan and Simulated New Admissions Rules

	Panel A: All Selective Four-Year Universities					
	(1)	(2)	(3)	(4)	(5)	(6)
	Top 10% Plan	SAT/ACT zscore>0	SAT/ACT zscore>0.5	Exit exam zscore>0	Exit Exam zscore>0.5	AP/IB semesters>4
First-semester GPA	3.069	3.169	3.263	3.090	3.144	3.108
	(0.813)	(0.760)	(0.716)	(0.799)	(0.774)	(0.800)
Persist to senior year	0.816	0.836	0.848	0.822	0.834	0.831
	(0.388)	(0.370)	(0.359)	(0.383)	(0.372)	(0.375)
Graduate in four year	0.464	0.495	0.523	0.470	0.486	0.481
	(0.499)	(0.500)	(0.500)	(0.499)	(0.500)	(0.500)
No. automatically admitted	22,095	17,909	13,241	21,334	18,809	17,089
	Panel B: Flagship Universities Only					
	(7)	(8)	(9)	(10)	(11)	(12)
	Top 10% Plan	SAT/ACT zscore>0	SAT/ACT zscore>0.5	Exit exam zscore>0	Exit Exam zscore>0.5	AP/IB semesters>4
First-semester GPA	2.983	3.081	3.190	3.000	3.051	3.035
	(0.834)	(0.784)	(0.738)	(0.824)	(0.800)	(0.819)
Persist to senior year	0.854	0.869	0.874	0.859	0.866	0.864
	(0.353)	(0.338)	(0.331)	(0.348)	(0.341)	(0.343)
Graduate in four year	0.506	0.521	0.541	0.509	0.517	0.517
	(0.500)	(0.500)	(0.498)	(0.500)	(0.500)	(0.500)
No. automatically admitted	13,472	11,758	9,283	13,168	12,093	11,120

Notes: Texas flagship universities are the University of Texas at Austin and Texas A&M University at College Station.

Table 9: Enrollment at Texas Selective Universities
under the Top 10% Plan and Simulated New Admissions Rules

	(1) Top 10% Plan	(2) SAT/ACT zscore>0	(3) SAT/ACT zscore>0.5	(4) Exit exam zscore>0	(5) Exit exam zscore>0.5	(6) AP/IB semesters>4
Race and ethnicity:						
Black	1,200	614	322	1049	734	822
% change		*-49%*	*-73%*	*-13%*	*-39%*	*-31%*
Hispanic	5,684	3411	1788	5360	4274	4372
% change		*-40%*	*-69%*	*-6%*	*-25%*	*-23%*
Asian	2,569	2302	1883	2527	2361	2359
% change		*-10%*	*-27%*	*-2%*	*-8%*	*-8%*
White	12,584	11530	9206	12340	11387	9488
% change		*-8%*	*-27%*	*-2%*	*-10%*	*-25%*
Family income:						
< $40,000	5,978	3837	2268	5579	4521	4388
% change		*-36%*	*-62%*	*-7%*	*-24%*	*-27%*
$40,000-80,000	5,901	4638	3218	5710	4962	4422
% change		*-21%*	*-45%*	*-3%*	*-16%*	*-25%*
> $80,000	9,836	9116	7524	9675	8997	8005
% change		*-7%*	*-24%*	*-2%*	*-9%*	*-19%*
High school FRL rate:						
>75th percentile	3,763	1765	733	3421	2531	3966
% change		*-53%*	*-81%*	*-9%*	*-33%*	*5%*
< 25th percentile	9,039	8564	7371	8933	8476	7547
% change		*-5%*	*-18%*	*-1%*	*-6%*	*-17%*
High school college enrollment rate:						
< 25th percentile	129	83	43	117	96	68
% change		*-36%*	*-67%*	*-9%*	*-26%*	*-47%*
> 75th percentile	9,846	8848	7297	9653	8951	8268
% change		*-10%*	*-26%*	*-2%*	*-9%*	*-16%*
All students:	22,095	17,909	13,241	21,334	18,809	17,089
% change		*-19%*	*-40%*	*-3%*	*-15%*	*-23%*

Table 10: Enrollment at the Flagship Universities
under the Top 10% Plan and Simulated New Admissions Rules

	(1) Top 10% Plan	(2) SAT/ACT zscore>0	(3) SAT/ACT zscore>0.5	(4) Exit exam zscore>0	(5) Exit exam zscore>0.5	(6) AP/IB semesters>4
Race and ethnicity:						
Black	600	355	214	543	421	472
% change		*-41%*	*-64%*	*-10%*	*-30%*	*-21%*
Hispanic	2,680	1857	1090	2576	2193	2186
% change		*-31%*	*-59%*	*-4%*	*-18%*	*-18%*
Asian	1,792	1672	1432	1773	1684	1712
% change		*-7%*	*-20%*	*-1%*	*-6%*	*-4%*
White	8,371	7846	6522	8247	7768	6724
% change		*-6%*	*-22%*	*-1%*	*-7%*	*-20%*
Family income:						
< $40,000	2,756	1972	1256	2621	2238	2204
% change		*-28%*	*-54%*	*-5%*	*-19%*	*-20%*
$40,000-80,000	3,210	2715	2005	3144	2839	2572
% change		*-15%*	*-38%*	*-2%*	*-12%*	*-20%*
> $80,000	7,329	6899	5874	7228	6850	6197
% change		*-6%*	*-20%*	*-1%*	*-7%*	*-15%*
High school FRL rate:						
>75th percentile	1,614	875	396	1492	1190	1346
% change		*-46%*	*-75%*	*-8%*	*-26%*	*-17%*
< 25th percentile	6,558	6317	5593	6503	6254	5717
% change		*-4%*	*-15%*	*-1%*	*-5%*	*-13%*
High school college enrollment rate:						
< 25th percentile	52	34	18	50	40	32
% change		*-35%*	*-65%*	*-4%*	*-23%*	*-38%*
> 75th percentile	6,813	6471	5634	6733	6431	6012
% change		*-5%*	*-17%*	*-1%*	*-6%*	*-12%*
All students:	13,472	11,758	9,283	13,168	12,093	11,120
% change		*-13%*	*-31%*	*-2%*	*-10%*	*-17%*

Appendix Table A: First-stage Regression Results for Campus Attended

Campus	Number of students	Automatically Admitted Students (%)	F-statistic	R^2
Panel A: Flagship State Universities				
University of Texas at Austin	7,743	35.72%	51.96	0.078
Texas A&M University	5,501	25.37%	35.63	0.055
Panel B: Other Selective State Universities				
Texas Tech University	1,258	5.80%	116.55	0.159
University of North Texas	835	3.85%	30.04	0.046
University of Houston	819	3.78%	69.09	0.101
University of Texas at Arlington	744	3.43%	107.81	0.149
Texas State University	677	3.12%	18.46	0.029
University of Texas Pan American	618	2.85%	467.64	0.431
University of Texas at Dallas	538	2.48%	36.23	0.055
University of Texas at San Antonio	514	2.37%	50.39	0.075
University of Texas at El Paso	497	2.29%	883.86	0.588
Sam Houston State University	349	1.61%	18.57	0.029
Stephen F. Austin State University	298	1.37%	33.88	0.052
West Texas A&M	284	1.31%	224.86	0.267
Texas A&M International University	215	0.99%	526.34	0.460
Texas A&M University - Corpus Christi	215	0.99%	55.85	0.083
Texas A&M University - Kingsville	155	0.71%	95.37	0.134
University of Texas at Tyler	148	0.68%	54.16	0.081
Texas A&M University - Commerce	134	0.62%	82.73	0.118
University of Texas at the Permian Basin	91	0.42%	137.55	0.182
University of Texas at Brownsville	46	0.21%	82.50	0.118

Notes: The instrumental variable is the distance in miles from the student's high school to all top 10% campuses and 14 additional state universities that offer open enrollment to top 10% and other Texas high school graduates. Twenty-two linear probability regressions estimated the probability of attending each campus that automatically admits top 10% students. The first-stage also controls for student demographics shown in Table 2. The 22 probabilities estimated in the first-stage are included as instruments for campus attended in the second-stage in the prediction of college outcomes.

Appendix Table B: Two-stage Least Squares Estimates of the Effect of College Readiness on College Performance

	Panel A: First-Semester GPA			Panel B: Four-Year Graduation		
	(1)	(2)	(3)	(4)	(5)	(6)
College readiness measures:						
SAT/ACT z-score	0.368**			0.095**		
	(0.020)			(0.009)		
High school exit exam z-score		0.287**			0.058**	
		(0.019)			(0.008)	
AP/IB courses (semesters)			0.020**			0.007**
			(0.004)			(0.002)
Student characteristics:						
Female	0.126**	0.077**	0.066**	0.119**	0.105**	0.105**
	(0.012)	(0.013)	(0.015)	(0.007)	(0.008)	(0.008)
Age	0.079**	0.032	0.008	0.013	0.000	-0.007
	(0.020)	(0.021)	(0.022)	(0.011)	(0.011)	(0.011)
Mother attended college	0.044*	0.068**	0.088**	0.022*	0.029**	0.033**
	(0.018)	(0.021)	(0.025)	(0.010)	(0.010)	(0.010)
Father attended college	0.081**	0.124**	0.124**	0.033**	0.045**	0.042**
	(0.017)	(0.019)	(0.020)	(0.010)	(0.010)	(0.010)
Race and ethnicity:						
Native American	-0.141	-0.202	-0.170	-0.006	-0.019	-0.014
	(0.098)	(0.105)	(0.108)	(0.065)	(0.066)	(0.067)
Asian	0.070	0.021	0.059	0.043*	0.032	0.037
	(0.055)	(0.059)	(0.077)	(0.021)	(0.022)	(0.024)
Black	-0.257**	-0.440**	-0.513**	-0.049*	-0.104**	-0.107**
	(0.052)	(0.056)	(0.068)	(0.021)	(0.021)	(0.022)
Hispanic	-0.080*	-0.196**	-0.215**	-0.009	-0.041**	-0.042**
	(0.032)	(0.032)	(0.039)	(0.014)	(0.014)	(0.014)
Family income:						
$40,000-80,000	-0.014	0.008	0.006	0.007	0.013	0.011
	(0.018)	(0.020)	(0.021)	(0.010)	(0.010)	(0.011)
More than $80,000	0.044	0.114**	0.104*	0.021	0.040*	0.030
	(0.034)	(0.037)	(0.043)	(0.015)	(0.016)	(0.016)
Missing	0.072	0.174*	0.196*	0.034	0.064	0.067
	(0.064)	(0.071)	(0.081)	(0.035)	(0.036)	(0.038)
Other financial controls:						
Unmet financial need (log)	-0.012**	-0.017**	-0.014**	-0.004**	-0.006**	-0.005**
	(0.003)	(0.003)	(0.004)	(0.001)	(0.001)	(0.001)
No FAFSA completed	-0.019	-0.070	-0.049	0.032	0.017	0.020
	(0.071)	(0.081)	(0.104)	(0.027)	(0.029)	(0.032)
Observations	21,679	21,679	21,679	21,679	21,679	21,679

Notes: Standard errors are shown in parentheses. Standard errors are robust to clustering within high school attended. First-stage estimations predict university enrolled with the distance from the student's high school campus to 36 public 4-year universities. All specifications include fixed effects for college major. **, * indicates statistical significance at the 1% and 5% level, respectively.