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Efficacy Versus Equity: What Happens When States Tinker With College Admissions in a Race-Blind Era?

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We investigate the efficacy and equity of college admissions criteria by estimating the effect of multiple measures of college readiness on college performance in the context of race-blind automatic admissions policies. We take advantage of a unique institutional feature of the Texas higher education system to control for selection into admissions. We find that SAT/ACT scores, high school exit exams, and advanced coursework are all predictors of student success in college. However, when we simulate changes in college enrollment and outcomes with additional admissions criteria, we find that adding SAT/ACT or exit exam criteria to an existing rank-based admissions policy significantly decreases enrollment among minorities, low-income students, and students who attend low socioeconomic status high schools, with the most negative effects generated by the SAT/ACT, while inducing only minimal gains in college grade point average and 4-year graduation rates.

Keywords: *college readiness, college admissions, affirmative action, Texas top 10% plan, alternative college admission, college graduation*

Introduction

When it comes to achieving goals of equitable access to higher education, public universities face a challenging policy environment. Public universities are increasingly limited by constitutional constraints on the admissions process. For over a decade, the Supreme Court has chipped away at affirmative action practices in public university admissions (*Hopwood v. Texas*, 1996; U.S. Supreme Court Reports, 2002, 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. 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.[1] Long (2015) 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. As public universities are simultaneously losing both the incentive and the tools to promote diversity goals, many are turning from holistic race-based admissions to simple, objective criteria that trigger automatic admissions.

Texas was the first to replace affirmative action with automatic admissions and implement a simple percent-based plan, which admits students based solely on their rank within their high school graduating class. This strategy exploits racial segregation of high school campuses to admit minority students with the best high school grade point averages (GPAs) relative to their classmates. Other states have followed, but all automatic admissions plans except Texas' include additional admissions criteria such as minimum SAT scores, minimum GPAs, or advanced coursework.[2] Although the impacts of the admissions policy shift induced by the *Hopwood v. Texas* ruling are well documented (see, for example, Long, 2015; Long & Tienda, 2008, 2010; Tienda, Leicht, Sullivan, Maltese, & Lloyd, 2003), research on the most effective automatic admissions policies is scant. This study examines the efficacy of various criteria for automatic admissions as predictors of college performance, as well as their influence on the demographic makeup of entering freshman and average outcomes for those who enroll, to inform the design of automatic admissions policies that balance equity and efficiency.

Admissions criteria are essentially designed to select students based on their readiness for college. Estimating the relationship between college readiness and college performance is challenging for both admissions officers and researchers, 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 (Bettinger, Evans, & Pope, 2013; Betts & Morell, 1999; Cohn, Cohn, Balch, & Bradley, 2004; Cyrenne & Chan, 2012; Long, Iatarola, & Conger, 2009; Black, Lincove, Cullinane, & Veron, 2015), there is evidence that much of this relationship is related to high school and college sorting rather than underlying student ability (Rothstein, 2009). We address this challenge by exploiting Texas's automatic admission policy, commonly known as the Top 10% Plan, 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) that are unrelated to college admissions.[3] And due to the percent plan, these students also come from a more diverse set of high schools than typically observed among students at flagship state 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 address multiple levels of selection bias that have plagued prior studies.

This article 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, 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 makeup of college students).

There are several key findings from our analysis. 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 0.19 grade points (a 6% increase over current admissions policy) and 4-year graduation rates by up to 6 percentage points (a 12% increase over current admissions policy). However, adding these new admissions criteria also severely reduces both minority and low-income representation on campus. Under more restrictive admissions policies, our simulations reveal that we would eliminate automatic admissions eligibility for up to 69% of Hispanics, 73% of Blacks, and 62% of low socioeconomic status (SES) students who were previously admitted based on class rank alone. At state flagship universities, we estimate average GPA could increase by up to 0.20 grade points, but the graduation rate would increase only up to 3.5 percentage points, with similar large, negative effects on access for minority and low-SES students. Overall, these results suggest that states must carefully consider the costs of equity effects of policies designed to increase efficiency in higher education through stricter admissions criteria.

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. Texas was one of many states that implemented race-based admission policies for its highly competitive flagship state universities, as a strategy to promote diversity in enrollment and to overcome historic inequalities across racially segregated public high schools in the state.[4]

In 1996, the University of Texas at Austin (UT Austin) Law School admissions policy was the subject of the Supreme Court case *Hopwood v. Texas* (5th Circuit Court of Appeals, 1996, 2000). The 5th Circuit U.S. Appeals Court ruled (1996), and the Supreme Court agreed (2000), that race-based admissions process was a violation of the 14th Amendment. This landmark decision triggered a period of admissions policy reform, with state 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 option was to replace subjective assessment of applicants with uniformly applied standards that triggered automatic admissions to public universities. Automatic admissions could, in theory, be based on several predetermined criteria—for example, minimum SAT scores, GPAs, or advanced coursework requirements. These new policies add transparency and simplicity to previously subjective admissions practices. However, to the extent that selection criteria may be associated with race, ethnicity, or SES through high school quality, automatic admissions policies may be particularly harmful to goals of equity and access.

To mitigate the effects of objective criteria on underrepresented minorities, Texas implemented automatic admission to all state universities (including the two flagship campuses) based on a single criterion—graduating in the top 10% 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, particularly given the high degree of racial segregation across Texas high schools. The important trade-off is that high-performing students in the lowest quality high schools may be ill prepared for success at an elite public university.[5] Thus, the design of automatic admissions policies reflects a classic tension between equity and efficiency. Although 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 in total with automatic admissions at flagships, and six of these include percent plans. Texas is the only state in the nation to admit to flagship universities based on percent alone.[6] Other states add factors that could limit access among lower resourced students and those who attend lower quality high schools. For example, California's automatic admissions policy for campuses in the University of California (UC) System is based on both class rank and achieving

TABLE 1
Automatic Admissions Policies at State Flagship Institutions

State	Percent-plan threshold	Additional criteria
Panel A: States with percent plans		
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, writing and math proficiency
Nebraska	Top 50%	Minimum SAT/ACT and completed coursework
Texas	Top 7%–10%	None[a]
Panel B: States without percent plans		
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

Note. GPA = grade point average.
[a]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.

a minimum SAT score. Other states add minimum GPA and coursework completion requirements as well. In this study, we examine the potential effects of these types of criteria on equity and college outcomes using the Texas student population as a basis for estimating the effects of criteria applied in other states.

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.[7] Second, we address the specific policy question of the efficiency and equity of the use of different criteria in automatic 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 UC system. A key advantage of the Rothstein study relative to its predecessors is that it attempts to address issues 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.[8]

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 SAT thresholds. During the period studied here, Texas's top 10% students could enroll at the public university of their choice, and the Texas percent plan was based solely on high school class rank. Automatically admitted students were required to take the SAT or ACT, but the scores did not influence admissions. As a result, we only need to control for high school class rank to address selection into admissions.[9]

Also closely related to our study is work by Bettinger, Evans, and Pope (2013) 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. Although 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 most importantly, we consider the compositional effects of changes in admissions criteria, as well as student outcomes.

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 examined the elimination of race-based admissions policies (Arcidiacono, 2005; Blume & Long, 2014; Bowen & Bok, 1998; Card & 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 (Cortes, 2010; Long, 2004a, 2004b; Niu, Tienda, & Cortes, 2006; Tienda et al., 2003), and to a lesser extent, policies that replace race-based admissions with family-income-based policies (Cancian, 1998). More recently, Long (2015) investigates alternative strategies for race-based admissions by predicting a student's race based on other observable variables that are allowed under current law (such as parent income). He then simulates outcomes of admissions based on predicted versus actual race, finding that explicit race-conscious policies are more equitable than those based on predicted race. In general, this prior research compares race-conscious admissions policies to either race-blind admissions or percent plans. No prior studies have analyzed how variations in percent plans, such as the use of additional measures of college readiness, can potentially have problematic distributional consequences on class composition at U.S. colleges and universities.

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:

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

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 score). ε_{icm} is the 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.[10]

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 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 4-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, Lincove, et al., 2015, 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% eligible students. By analyzing only students from the top 10% 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.[11]

Conditional on admission, there is still selection on enrolling in college and, in the case of admission to multiple campuses, campus selection (Berkowitz & Hoekstra, 2011; Niu et al., 2006).[12] 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 4-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.[13,14]

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 and nonminority 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. Public universities can use race as a factor in admissions, but cannot explicitly set different standards, for example, different minimum acceptable SAT scores, for students by race or ethnicity (Long, 2015). Our estimation 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.

Data Sources, College Readiness Measures, and Descriptive Statistics

Data Sources

The data sources for this study were collected by the Texas Workforce Data Quality Initiative (WDQI), funded by the U.S. Department of Labor. The WDQI database contains administrative data sets from Texas's PK–12 public education system, public university systems, and workforce commission. For our purposes, the data set 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 2 years, enrolled in a Texas selective 4-year public university directly after high school, and attempted a full-time course load in their first fall semester.[15] This includes approximately 22,000 students selected from approximately 500,000 total graduates.

Our data provide several improvements over samples used in prior studies on automatic admissions. First, the majority of studies on the elimination of affirmative action in Texas and the implementation of automatic admissions rely on data restricted to applicants and students at the University of Texas at Austin and only six other top 10% campuses (see, for example, Cortes, 2010; Long & Tienda, 2008, 2010; Niu et al., 2006). Whereas, the WDQI database includes students at all Texas public university campuses covered by the Top 10% Plan, allowing us to simulate differential effects for elite flagship and less selective public universities (i.e., other top 10% campuses). This is particularly important for national policy relevance, as many states with automatic admissions do not extend the policy to their flagship campuses. Second, the Texas population provides greater minority representation than studies using national survey samples such as National Longitudinal Survey of Youth (NLSY). The diversity of Texas allows us to disaggregate effects for Black and Hispanic students, while many prior studies group these populations together in a homogeneous category of "underrepresented minorities" (Card & Krueger, 2005; Long, 2004a, 2004b). Finally, the 2008 and 2009 cohorts provide a more up-to-date sample of Texas high school students, reflective of rapid demographic changes in the United States, most notably, the growth of Hispanics as a share of first generation college students.

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.[16] We include students who enrolled at any campus that is obligated by the Top 10% Plan.[17] Data on demographics, family background, and family income were obtained from high school enrollment records, college applications, and financial aid forms (Free Application for Federal Student Aid [FAFSA]) that were available in the WDQI database.

The data set identifies students who were eligible for automatic admissions through information reported by each campus to the Texas Higher Education Coordinating Board (THECB). Class rank is based on GPA calculation that takes place at the school-district level, and specific calculation strategies vary across districts. The data set does not include individual GPAs or class ranks, but college applications include a designation for whether the student is eligible for the Top 10% Plan automatic admissions policy.

As an important caveat to our efforts to control for selection into college admissions, we are able to observe college outcomes for all top 10% students who both applied to and enrolled in a Texas public university, but there is still unobserved selection. First, not all of the top 10% applied to public universities. Based on the total size of the high school graduation cohorts (approximately 490,000 graduates), compared with the number of students identified through public universities applications as top 10%, approximately 70% of the full top 10% sample completed an application. It is likely that many in this sample are high-performing students with high college readiness who enrolled at elite universities; however, the group might also include students with high class rank but low college readiness who did not apply to college at all (Black, Cortes, & Lincove, 2015). We are unable to examine outcomes for these students because we cannot identify top 10% eligibility without a public university application.

Second, our analysis of college outcomes is restricted to top 10% students who took advantage of automatic admissions and enrolled at a Texas public university. Although we do control for campus selection by estimating a two-stage least squares model, where we use distance to each college campus to instrument for campus attended, many of these students had the (unobserved) option to attend private or out-of-state universities as well. A total of 72% of those observed as being in the top 10% enrolled at a Texas public university and are included in our analysis—43% who enrolled at flagships and 29% at other top 10% campuses. These two groups have observed college outcomes and are included in our analytic sample. Among the remaining 28% of the observed top 10% sample, half enrolled in private or out-of-state 4-year universities, and half either enrolled at community colleges or did not enroll anywhere. Thus, the bias due to the omission of performance outcomes for these students appears to be equally split between those who enrolled at 4-year colleges with holistic admissions (i.e., likely to have high college readiness) and those who did not enroll at 4-year colleges (i.e., likely to have low college readiness). Thus, our results are only generalizable to similar student populations to those who have full data—highly ranked high school graduates who apply to and enroll at public universities.

College Readiness Measures

We focus on three commonly available college readiness indicators that reflect different theoretical perspectives on college preparation. Our selected measures are easily observable, available for use in college admissions, and related to similar criteria applied in other states. Our first indicator is the college entrance exam, which is specifically designed to measure preparation for college. Over 98% of students in the 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. The exit exam is an important measure of college readiness in Texas policy, although it is not used in college admissions. At the school level, exit exam pass rates are included in measures of high school quality. At the student level, sufficiently high exit exam scores exempt entering college students from remedial coursework. For our measure, we first summed the students' scale scores in English and math and then converted the sum to standardized *z*-scores within all tested students.[18]

Our third indicator is the number of AP or 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 with 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. Also, it is important to note that some Texas school districts calculate GPAs with extra weight for AP courses. This can create some endogeneity between AP coursework and college admissions. We cannot observe which students were eligible for the top 10% because of AP/IB coursework. Therefore, we recommend extra caution in interpreting regression results for this variable, because it is immeasurably linked to admissions for part of the sample.

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).[19] 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 4-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. As seen in column 1, the average high school graduate attended a high school where 44% of students received free/reduced lunch (FRL) and 30% of graduates enrolled at a 4-year university immediately after graduation.

Compared with 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% Hispanic, 5% Black, 12% Asian, and 27% from families with income below US$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% of students on FRL, and where 33% of graduates enrolled in a 4-year college within 1 year of graduation.[20] There is also a very large range in high school characteristics, with FRL rates ranging from 0% to 100%, and college enrollment rates from 0% to 89%.

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 1,170, which is 0.73 standard deviations above the state mean of all test takers, and the average exit exam is 1.17 standard deviations above the state mean of all test takers. 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 way 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 with all those who enrolled in top 10% campuses.[21] 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 4-year graduation, which reflects the ultimate objective of college attendance. The 4-year graduation rate for all college enrollees in the cohort is only 26.9%, with only 61.4% 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% persisted to the fourth year, and 46.4% graduated by August of their fourth year in college. The national Baccalaureate and Beyond Study reports a similar 4-year graduation rate of 44% for the 2009 graduation cohort (U.S. Department of Education, National Center for Education Statistics, 2011).

Results

Basic Models

We first estimate a parsimonious ordinary least squares (OLS) specification, predicting college outcomes with controls for 22 campuses attended and nine majors.[22,23] Table 3 reports

TABLE 2
Descriptive Statistics

	Panel A: All high school graduates	Panel B: All high school graduates who enrolled at top 10% campuses	Panel C: Top 10% graduates who enrolled at top 10% campuses
	(1)	(2)	(3)
Student characteristics			
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			
Low-income (less than US$40,000)	0.262	0.317	0.271
Middle income (between US$40,000 and US$80,000)	0.128	0.253	0.267
High income (more than US$80,000)	0.107	0.362	0.445
Missing income information	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	US$1,169	US$1,379	US$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	1,029	1,071	1,170
	(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

Note. Standard deviations are shown in parentheses for continuous variables. FAFSA = Free Application for Federal Student Aid; AP/IB = Advanced Placement or International Baccalaureate; GPA = grade point average.
[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: 4-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	.223	.143	.073	.056	.041	.038

Note. Standard errors are shown in parentheses. Standard errors are robust to clustering within high school attended. Columns 1 to 6 include fixed effects for departmental major and university. OLS = ordinary least squares; GPA = grade point average; AP/IB = Advanced Placement or International Baccalaureate.
*Statistical significance at the 5% level. **Statistical significance at the 1% level.

these results for the continuous outcome of first-semester GPA (columns 1–3 in panel A) and the dichotomous outcome of 4-year graduation (columns 4–6 in panel B) estimated as a function of SAT/ACT composite *z*-scores, exit exam composite *z*-scores, and number of AP/IB courses completed, respectively.[24] 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 1-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. Similar to Bettinger et al. (2013), for each model, we also estimated a fourth specification including all three college 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 selection on campus attended we employ a two-stage least squares method, where we use distance to each college campus to instrument for campus attended.[25] 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 21 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

TABLE 4
Two-Stage Least Squares Estimates of the Effect of College Readiness on College Performance

	Panel A: First-semester GPA			Panel B: 4-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

Note. 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. Columns 1 to 6 include fixed effects for college major. GPA = grade point average; AP/IB = Advanced Placement or International Baccalaureate.
*Statistical significance at the 5% level. **Statistical significance at the 1% level.

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.[26] 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 percentage point increase in the probability of 4-year graduation. A one standard deviation increase in exit exams scores is associated with 0.315 additional grade points and a 6.2 percentage point increase in the probability of 4-year graduation. One additional AP/IB semester is associated with 0.021 additional grade points and a 0.7 percentage point increase in the probability of 4-year graduation. These results suggest that, controlling for selection into admissions and campus attended, college readiness measures do provide additional information about college performance. This information could be useful for improving efficiency in college admissions, but the effects on equity are unclear.

Interactions With Race, Ethnicity, and Socioeconomic Status

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/ethnicity 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 1,029 for Blacks and 1,061 for Hispanics to 1,218 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.

TABLE 5

Summary Statistics of College Readiness Measures by Student Characteristics

	By race/ethnicity			By family income			By high school SES[a]		By high school college enrollment rate[b]	
	Black	Hispanic	White	<US$40k	US$40k–US$80k	>US$80k	Low	High	Low	High
SAT/ACT score	1,029	1,061	1,218	1,082	1,145	1,238	1,013	1,255	1,071	1,231
	(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	3,763	9,039	129	9,846

Note. Standard deviations are shown in parentheses. SES = socioeconomic status; AP/IB = Advanced Placement or International Baccalaureate.

[a]Low SES schools are in bottom quartile among high schools statewide for free/reduced lunch rate, and high SES schools are in the top quartile.

[b]Low college enrollment schools are in bottom quartile among high schools statewide for rate of 4-year college enrollment of graduates, and high college enrollment schools are in the top quartile.

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 in panel A and columns 7–9 for graduation in panel B), and with interactions between race/ethnicity and college readiness measures (columns 4–6 for GPA in panel A and columns 10–12 for graduation in panel B).[27] 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 and ethnicity indicators are approximately 50% 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 with 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 with 0.461 grade points for a Black student. For college graduation, the exit exam has a stronger association with graduation for Black students, whereas 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 White and Hispanic students but different for Black students in ways that are problematic for race-neutral admissions processes. These results suggest that the differential admissions process

TABLE 6

Two-Stage Least Squares Estimates of the Effect of College Readiness on College Performance

	Panel A: First-semester GPA						Panel B: 4-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 × SAT/ACT				0.152**						0.027		
				(0.042)						(0.019)		
Hispanic × SAT/ACT				0.029						0.018		
				(0.023)						(0.012)		
Black × Exit exam					0.196**						0.041*	
					(0.061)						(0.021)	
Hispanic × Exit exam					0.041						0.018	
					(0.026)						(0.012)	
Black × AP/IB semesters						−0.004						−0.008*
						(0.009)						(0.003)
Hispanic × 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

Note. 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. Columns 1 to 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. GPA = grade point average; AP/IB = Advanced Placement or International Baccalaureate.
*Statistical significance at the 5% level. **Statistical significance at the 1% level.

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, whereas 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 US$40k to US$80k, "high income" reflects family income over US$80k, and the omitted comparison group has income under US$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.[28]

The significant interaction between college readiness measures and student demographics in the prediction of college outcomes suggests that, although 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.

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.

We begin with our full sample of 22,095 freshmen from the top 10% who enrolled at the 22 universities governed by the top 10% rule. For these students, we simulate five 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 of the five new criteria. 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 (a) SAT/ACT composite scores above the statewide average, (b) SAT/ACT scores at least 0.5 standard deviations above the state average, (c) TAKS high school exit exam scores above the state average, (d) TAKS high school exit exams scores at least 0.5 standard deviations above the state average, and (e) 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 22 top 10% campuses (panel A) and for just the state's two flagship universities (panel B), University of Texas at Austin and Texas A&M University at College Station, where the majority of top 10% students chose to enroll. Students who enroll at a flagship university also have higher average college readiness and reflect a greater geographic diversity than most other campuses. As seen in columns 1 and 7, average first-semester GPA was 3.069 for the full sample, and 2.983 for the flagship university sample. Statistics in columns 2 to 6 present the average GPA and graduation rates for the subgroup of students who remain eligible for

TABLE 7

Two-Stage Least Squares Estimates of the Effect of College Readiness on College Performance

	Panel A: First-semester GPA						Panel B: 4-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 (US$40k–US80k)	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 (>US$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 × SAT/ACT				−0.007						−0.012		
				(0.021)						(0.012)		
High income × SAT/ACT				−0.021						−0.019		
				(0.021)						(0.011)		
Middle income × Exit exam					−0.006						0.003	
					(0.030)						(0.014)	
High income × Exit exam					−0.067*						−0.028*	
					(0.027)						(0.011)	
Middle income × AP/IB semesters						0.003						0.003
						(0.003)						(0.002)
High income × 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

Note. 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. Columns 1 to 12 include fixed effects for college major. GPA = grade point average; AP/IB = Advanced Placement or International Baccalaureate.

*Statistical significance at the 5% level. **Statistical significance at the 1% level.

TABLE 8

College Performance at Top 10% Campuses Under the Top 10% Plan and Five Simulated New Admissions Rules

	Panel A: All top 10% campuses[a]					
	(1)	(2)	(3)	(4)	(5)	(6)
	Top 10% plan	SAT/ACT *z*-score > 0	SAT/ACT *z*-score > 0.5	Exit exam *z*-score > 0	Exit exam *z*-score > 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 4 years	0.464	0.495	0.523	0.470	0.486	0.481
	(0.499)	(0.500)	(0.500)	(0.499)	(0.500)	(0.500)
Total no. of automatically admitted students	22,095	17,909	13,241	21,334	18,809	17,089
	Panel B: Flagship campuses only[b]					
	(7)	(8)	(9)	(10)	(11)	(12)
	Top 10% plan	SAT/ACT *z*-score > 0	SAT/ACT *z*-score > 0.5	Exit exam *z*-score > 0	Exit exam *z*-score > 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 4 years	0.506	0.521	0.541	0.509	0.517	0.517
	(0.500)	(0.500)	(0.498)	(0.500)	(0.500)	(0.500)
Total no. of automatically admitted students	13,472	11,758	9,283	13,168	12,093	11,120

Note. AP/IB = Advanced Placement or International Baccalaureate; GPA = grade point average.
[a]Twenty-one 4-year campuses in the University of Texas System, Texas A&M System, Texas State System, University of Houston, and Texas Tech University automatically admitted students in the top 10%. We refer to these universities throughout the article as “top 10% campuses.”
[b]Flagship universities are the University of Texas at Austin and Texas A&M University at College Station.
Source. Author’s own calculations. Data used in calculations came from the Texas Workforce Data Quality Initiative Database, 2008 and 2009 student cohorts.

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 grade points (a 3.2% increase) across all top 10% campuses, and by 0.098 grade points (a 3.3% increase) at the state’s flagship universities. Moreover, higher SAT/ACT cutoffs induce larger increases in average GPA by 0.194 grade points (a 6.3% increase) across all top 10% campuses, and by 0.207 grade points (a 6.9% increase) at flagship universities. However, high school exit exam criteria trigger smaller increases in GPA, and AP/IB course requirements increase average GPA by less than 2%.

The effects on 4-year graduation rates across all top 10% campuses are similar. As seen in panel A, the 4-year graduation for all top 10%

students would increase from 46.4% to 49.5% with a requirement for above average SAT/ACT, and to 52.3% with the higher SAT/ACT cutoff. Overall graduation rates would increase only to 47.0% with a requirement for above average TAKS exit exams, and to 48.6% with the higher cutoff. 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 across all top 10% campuses. At the flagships, the most stringent new SAT/ACT-based admissions rule would increase 4-year graduation among automatically admitted students from 50.6% to 54.1%.

The improvements in student outcomes come with a significant trade-off in the number of students who would be automatically admitted under each new admission rule, as well as dramatic shifts in student demographics. The estimated changes in the enrollment size and demographic composition of automatically admitted freshmen are shown in Table 9 for all top 10% campuses. Requiring above average SAT/ACT scores would eliminate automatic admissions eligibility for 19% of students, and the higher SAT/ACT criteria would eliminate eligibility for 40% of the sample. In contrast, requiring above average exit exams would reduce the sample by only 3%, and the higher exit exam cutoff would reduce the sample by 15%. Requiring more than four AP/IB semesters would reduce the sample by 23%. The effects are somewhat smaller at the two elite flagship universities (results shown in Table 10, panel A) because students who attend the flagships 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 is 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.[29]

The disaggregated results shown in both Tables 9 (all top 10% campuses) and 10 (flagship campuses only) suggest that our five simulated admission rules have substantially different effects by race/ethnicity (panel B), family income (panel C), and high school quality (panels D and E). Compared with modest gains in freshman GPA and graduation rates, these simulated admission rules have dramatic effects on equity and access. For example, as observed in Panel B of Table 9, requiring above average SAT/ACT eliminates only 8% of White students, 10% of Asian students, and 7% of high-income students from eligibility, while eliminating 40% of Hispanics, 49% of Blacks, and 36% of low-income students. Requiring the higher SAT/ACT cutoff would increase 4-year graduation on all campuses by 5.9 percentage points, but would also eliminate 69% of Hispanics, 73% of Blacks, and 62% of low-income students from eligibility for automatic admissions. SAT/ACT-based criteria also dramatically reduce representation by students from low-quality high schools. As panel D shows, requiring above average SAT/ACT scores would eliminate only 5% of students from high SES high schools, but 53% 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 all top 10% campuses through automatic admissions in 2008 and 2009. Requiring above average SAT/ACT score would have eliminated 36% of these students (panel E), compared with only 10% of a much larger sample of students from high schools with high college-entry rates.

Table 9 also reveals that simulated admissions rules based on the state exit exams (columns 4 and 5) have smaller equity effects than those based on SAT/ACT scores. Specifically, requiring above average exit exam scores reduces minority enrollment across all top 10% campuses more than Whites, but Hispanic enrollment is reduced by only 6% (compared with 40% for above average SAT/ACT),

TABLE 9

Enrollment at Top 10% Campuses Under the Top 10% Plan and Five Simulated New Admissions Rules

	(1)	(2)	(3)	(4)	(5)	(6)
	Top 10% plan	SAT/ACT *z*-score > 0	SAT/ACT *z*-score > 0.5	Exit exam *z*-score > 0	Exit exam *z*-score > 0.5	AP/IB semesters > 4
Panel A: Total no. of automatically admitted students	22,095	17,909	13,241	21,334	18,809	17,089
% change		−19%	−40%	−3%	−15%	−23%
Panel B: By race and ethnicity						
Black	1,200	614	322	1,049	734	822
% change		−49%	−73%	−13%	−39%	−31%
Hispanic	5,684	3,411	1,788	5,360	4,274	4,372
% change		−40%	−69%	−6%	−25%	−23%
Asian	2,569	2,302	1,883	2,527	2,361	2,359
% change		−10%	−27%	−2%	−8%	−8%
White	12,584	11,530	9,206	12,340	11,387	9,488
% change		−8%	−27%	−2%	−10%	−25%
Panel C: By family income						
Low income (<US$40,000)	5,978	3,837	2,268	5,579	4,521	4,388
% change		−36%	−62%	−7%	−24%	−27%
Middle income (US$40,000–US$80,000)	5,901	4,638	3,218	5,710	4,962	4,422
% change		−21%	−45%	−3%	−16%	−25%
High income (>US$80,000)	9,836	9,116	7,524	9,675	8,997	8,005
% change		−7%	−24%	−2%	−9%	−19%
Panel D: By high school free or reduced lunch rate						
Low SES (>75th percentile)	3,763	1,765	733	3,421	2,531	3,966
% change		−53%	−81%	−9%	−33%	5%
High SES (<25th percentile)	9,039	8,564	7,371	8,933	8,476	7,547
% change		−5%	−18%	−1%	−6%	−17%
Panel E: By high school college enrollment rate						
Low college enrollment (<25th percentile)	129	83	43	117	96	68
% change		−36%	−67%	−9%	−26%	−47%
High college enrollment (>75th percentile)	9,846	8,848	7,297	9,653	8,951	8,268
% change		−10%	−26%	−2%	−9%	−16%

Note. Twenty-one 4-year campuses in the University of Texas System, Texas A&M System, Texas State System, University of Houston, and Texas Tech University automatically admitted students in the top 10%. We refer to these universities throughout the article as "top 10% campuses." AP/IB = Advanced Placement or International Baccalaureate; SES = socioeconomic status.
Source. Author's own calculations. Data used in calculations came from the Texas Workforce Data Quality Initiative Database, 2008 and 2009 student cohorts.

Black enrollment by 13% (compared with 49%), and low-income enrollment by 7% (compared with 36%). 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.

TABLE 10

Enrollment at the Flagship Campuses Under the Top 10% Plan and Five Simulated New Admissions Rules

	(1)	(2)	(3)	(4)	(5)	(6)
	Top 10% plan	SAT/ACT *z*-score > 0	SAT/ACT *z*-score > 0.5	Exit exam *z*-score > 0	Exit exam *z*-score > 0.5	AP/IB semesters > 4
Panel A: Total no. of automatically admitted students	13,472	11,758	9,283	13,168	12,093	11,120
% change		−13%	−31%	−2%	−10%	−17%
Panel B: By race and ethnicity						
Black	600	355	214	543	421	472
% change		−41%	−64%	−10%	−30%	−21%
Hispanic	2,680	1,857	1,090	2,576	2,193	2,186
% change		−31%	−59%	−4%	−18%	−18%
Asian	1,792	1,672	1,432	1,773	1,684	1,712
% change		−7%	−20%	−1%	−6%	−4%
White	8,371	7,846	6,522	8,247	7,768	6,724
% change		−6%	−22%	−1%	−7%	−20%
Panel C: By family income						
Low income (<US$40,000)	2,756	1,972	1,256	2,621	2,238	2,204
% change		−28%	−54%	−5%	−19%	−20%
Middle income (US$40,000–US$80,000)	3,210	2,715	2,005	3,144	2,839	2,572
% change		−15%	−38%	−2%	−12%	−20%
High income (>US$80,000)	7,329	6,899	5,874	7,228	6,850	6,197
% change		−6%	−20%	−1%	−7%	−15%
Panel D: By high school free or reduced lunch rate						
Low SES (>75th percentile)	1,614	875	396	1,492	1,190	1,346
% change		−46%	−75%	−8%	−26%	−17%
High SES (<25th percentile)	6,558	6,317	5,593	6,503	6,254	5,717
% change		−4%	−15%	−1%	−5%	−13%
Panel E: By high school college enrollment rate						
Low college enrollment (<25th percentile)	52	34	18	50	40	32
% change		−35%	−65%	−4%	−23%	−38%
High college enrollment (>75th percentile)	6,813	6,471	5,634	6,733	6,431	6,012
% change		−5%	−17%	−1%	−6%	−12%

Note. Flagship campuses are the University of Texas at Austin and Texas A&M University at College Station. AP/IB = Advanced Placement or International Baccalaureate; SES = socioeconomic status.
Source. Author's own calculations. Data used in calculations came from the Texas Workforce Data Quality Initiative Database, 2008 and 2009 student cohorts.

Our simulated admissions rule based on AP/IB coursework (column 6 of Table 9) 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 across all top 10% campuses equally with minorities. The AP/IB coursework requirement also has the most equitable effect across income groups. However, in relation to high school quality, 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 admissions. Table 10 illustrates the effects of our simulated admissions rules at the two flagship campuses. These results are similar to those for all top 10% universities from Table 9. Adding SAT/ACT requirements at flagships would severely reduce enrollment by Black and Hispanic students through automatic admissions. The more stringent SAT/ACT criteria (column 3) would eliminate 75% of students from low SES high schools, and 65% of students from low college-entry high schools. Again, admissions rules based on exit exams (columns 4 and 5) not only have a smaller effect at flagships, but also differentially harm low-income, Black, and Hispanic students, and students from low-quality high schools.

Discussion and Policy Implications

National and state policy environments are increasingly unfriendly to race-conscious admissions policies in postsecondary education. 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, 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 and ethnic 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 flagship and other state universities without selection on criteria typically applied in admissions. Thus, 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 freshmen.

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 may be 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, where race can be used as a factor to promote diversity in admissions but differential race-based criteria cannot.

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 upon automatic admissions 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 college 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 White students, it is inevitable that minorities are more likely to be affected by cut points than White students. 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 automatic admissions policies based on high school class, 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 gain college admissions. Thus, the general effectiveness of variations to 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 may have less access to test preparation and advanced coursework, which is common across the country. Our results suggest that our college readiness 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. Moreover, our results also suggest that the fewer "objective" criteria are used in college 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 and policymakers should use caution in applying minimum standards across the board when diversity continues to be a goal of admissions, and potential efficiency benefits of stricter criteria should be weighed against the social costs of limiting access for historically underrepresented groups.

Appendix A

First-Stage Regression Results for Campus Attended

Campus	Total number of students	Total number of automatically admitted students (%)	F statistic	R^2
Panel A: Flagship campuses				
University of Texas at Austin	7,743	35.72	51.96	.078
Texas A&M University at College Station	5,501	25.37	35.63	.055
Panel B: Other campuses with automatic admissions				
Texas Tech University	1,258	5.80	116.55	.159
University of North Texas	835	3.85	30.04	.046
University of Houston	819	3.78	69.09	.101
University of Texas at Arlington	744	3.43	107.81	.149
Texas State University	677	3.12	18.46	.029
University of Texas Pan American	618	2.85	467.64	.431
University of Texas at Dallas	538	2.48	36.23	.055

(continued)

Appendix A (continued)

Campus	Total number of students	Total number of automatically admitted students (%)	F statistic	R^2
University of Texas at San Antonio	514	2.37	50.39	.075
University of Texas at El Paso	497	2.29	883.86	.588
Sam Houston State University	349	1.61	18.57	.029
Stephen F. Austin State University	298	1.37	33.88	.052
West Texas A&M	284	1.31	224.86	.267
Texas A&M International University	215	0.99	526.34	.460
Texas A&M University–Corpus Christi	215	0.99	55.85	.083
Texas A&M University–Kingsville	155	0.71	95.37	.134
University of Texas at Tyler	148	0.68	54.16	.081
Texas A&M University–Commerce	134	0.62	82.73	.118
University of Texas at the Permian Basin	91	0.42	137.55	.182
University of Texas at Brownsville	46	0.21	82.50	.118

Note. 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-one 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 21 probabilities estimated in the first stage are included as instruments for campus attended in the second stage in the prediction of college outcomes.
Source. Texas Workforce Data Quality Initiative Database, 2008 and 2009 student cohorts.

Appendix B

Alternative Two-Stage Least Squares Estimates (With Student Controls) 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)

(continued)

Appendix B (continued)

	Panel A: First-semester GPA			Panel B: Four-year graduation		
	(1)	(2)	(3)	(4)	(5)	(6)
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

Note. 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.
*Statistical significance at the 5% level. **Statistical significance at the 1% level.

Authors' Note

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Notes

1. *Fisher v. Texas* will be heard again by the Supreme Court in the 2015–2016 session.
2. See Horn and Flores (2003) for an early history of post-Hopwood automatic admissions policies. Texas A&M University, for example, does offer some automatic admissions related to SAT scores for students in the top 11% to 25%, but all top 10% students are admitted regardless of SATs.
3. Throughout this article, the usage of "selective" universities refers to 4-year public universities that automatically admitted students in the top 10%. Thus, we also refer to these universities as "top 10% campuses."

4. The flagship campuses of the University of Texas at Austin and Texas A&M University at College Station are ranked 53rd and 68th, respectively, in the *US News & World Report* national rankings.

5. The issue of matching student ability to average student on a campus is addressed in a growing literature on student–campus "mismatch" (e.g., Dillon & Smith, in press; Hoxby & Avery, 2013; Smith, Pender, & Howell, 2013).

6. Two major changes occurred in 2013 that influence who qualifies for the percent plan in Texas; however, for the period under study (2008 and 2009 student cohorts), our analysis is based on students who faced a pure percent plan. 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.

7. 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., grade point average [GPA], achievement tests, and Advanced Placement or International Baccalaureate [AP/IB] coursework), family SES (Bettinger et al., 2013; Betts & Morell, 1999; Cohn et al., 2004; Cyrenne & Chan, 2012; Long et al., 2009), high school quality, such as resource rich schools (Deming, Hastings, Kane, & Staigler, 2014; Light & Strayer, 2000; Black, Lincove, et al., 2015), and group peer effects, such as high school classmates in college (Fletcher & Tienda, 2009).

8. In a follow-up study, Rothstein (2009) 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.

9. 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, 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 nonrandom selection of students who are admitted and ultimately enroll in the university. Controlling for observed characteristics is unlikely to sufficiently account for this nonrandom selection of students. Similar to Black, Lincove, et al. (2015), we use automatic admissions policies to perfectly control for the component of selection associated with admissions decisions. This study finds that high school characteristics significantly influence college GPA and enrollment persistence when controlling for selection into college admission.

10. All specifications include robust standard errors for clustering by high school attended.

11. 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 with their peers. Furthermore, 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.

12. 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% 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.

13. Studies such as Cameron and Taber (2004) point out that living near a college may be associated with unobserved ability. However, this is less relevant in our case than other studies. Cameron and Taber, for example, use the presence of a college nearby to proxy for the costs of attendance in a study of where cost of attendance is the primary independent variable of interest. In our case, we use distance only to proxy for selection in enrollment on a particular campus and not for our independent variable of interest, which is observed measure of college readiness.

14. 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.

15. 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.

16. 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 major categories commonly used by the Texas Higher Education Coordinating Board: social science and service, liberal arts, fine arts/architecture, agriculture, science and math, engineering, technology, health, education, and business.

17. 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 at College Station) 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. We refer to these universities throughout the article as "top 10% campuses." Students not in the top 10% must compete for admissions to flagships and other top 10% 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. Barron's rankings of selectivity on these campuses range from "highly competitive" to "less competitive." Texas also has several state universities with fully open enrollment where admission is not dependent on class rank. These campuses are not included in our analysis.

18. Standardizing with all Texas test takers creates a different distribution for SAT/ACTs, which are taken only by students with college plans, and Texas Assessment of Knowledge and Skills (TAKS), which is taken by all high school students. Interpretation of regression coefficients should consider that the variation in exit exams score is greater due to the inclusion of a wider distribution of student ability.

19. 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.

20. The 4-year college enrollment rate is lagged 1 year to reflect whether the student attended a high school with a college-going culture.

21. 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% of top 10% students who enrolled).

22. The 22 included campuses are relatively diverse in student populations and admissions. They include the two state flagships at the University of Texas at Austin and Texas A&M University at College Station, and also many regional campuses in the University of Texas, Texas A&M, Texas State, and University of Houston systems that cater to more local or specialized student populations. We do not include nine Texas public universities that are open enrollment and therefore do not employ selective admissions.

23. 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% to 62%. 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%. 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.

24. In the case of 4-year graduation, we are estimating linear probability models.

25. The distance variables are generated using longitude and latitude to compute the distance between each high school and each public university campus. The program used in the computation of the distance variables is called "Distance and Bearing Between Matched Features" (distbyid.avx) by Jenness (2004), which is an application for ArcView. The extension distbyid.avx calculates the distance and bearing between features with identical attribute values, allowing one to generate connecting lines and calculate data for specific sets of features. The output options in this extension include a results table containing various user-selected fields such as distance and bearing between features, *X*/*Y* coordinates, centroids versus closest edges, and so forth. As we have all school addresses, we first generate *X*/*Y* coordinates based on *longitude* and *latitude* of all of the Texas high schools. Then, using the option *X*/*Y* coordinates, we compute a 2,412 distance matrix. Finally, the function option in Stata Statistics/Data Analysis called $min(x_1, x_2, x_3, \ldots, x_k)$ is used to generate miles to each public university and public flagship university. In the case of missing distance data, we used the average distance for nonmissing observations within the same school district or county.

26. Appendix B of this article shows an alternative estimation of Table 4 where we also control for student demographics, family income, and other financial

variables. Those results are similar to those discussed here.

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

28. 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 (FRL) 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 (vs. 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.

29. The lack of a statistical advantage for minorities in the University of Texas 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%. The constitutionality of this decision will be addressed by the Supreme Court in 2015–2016.

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