THE IMPACT OF LEGAL CHALLENGES TO AFFIRMATIVE ACTION ON EDUCATIONAL CHOICE

by

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TABLE OF CONTENTS

LIST OF FIGURES

Figure

LIST OF TABLES

Table

CHAPTER I

Introduction

My dissertation examines the impact of legal challenges to Affirmative Action in higher education and the subsequent policy responses on the various aspects of educational behavior. The first chapter examines the impact of the Supreme Court's 2003 decisions in *Gratz v. Bollinger* and *Grutter v. Bollinger* on applications and admissions at the University of Michigan, an elite public institution. The second chapter investigates the effects of Texas's Top Ten Percent rule and targeted recruitment and financial aid programs on the score report sending behavior of SAT takers in Texas. The third chapter examines how the implementation of Texas's Top Ten Percent Rule (TTTPR) affected the rate at which graduates from Texas's high schools attempt admissions examinations; the taking of an admissions examination signifies that a student is interested in applying to more selective institutions.

The modern Affirmative Action debate is not about general access to post-secondary education; rather, it is about the use of race and ethnicity in determining access to elite colleges and universities. As such, this dissertation is provides credible information for researchers and policy makers as they consider this contentious issue.

The first chapter is entitled "The Impact of Legal Challenges to Affirmative Action on Applications and Admissions at an Elite Public University". In the summer of 2003, the United States Supreme Court handed down decisions in *Gratz v. Bollinger* and *Grutter v. Bollinger*. Taken together the decisions accomplished two things: 1. The decision in

Gratz v. Bollinger proscribed any system that mechanically assigns a fixed point value to applicants for being a member of a particular racial/ethnic group. 2. The decision in *Grutter v. Bollinger* reaffirmed Justice Powell's opinion in *Regents of the University of California v. Bakke*; that is, securing the benefits that flow from diversity is a sufficient reason to allow for the use of narrowly-tailored policies designed to acquire the benefits.

The University of Michigan was a named defendant in the cases and the office of undergraduate admissions was forced to change its admissions system. Using two data sets provided the University, I estimate the impact of the changes on the pool of applicants, the pool of admitted students, and the probability of admissions.

I find that the applicant pool changed after the Supreme Court decisions. The size of the applicant pool declined. The proportion of whites and blacks in the applicant pool declined. The academic quality of the applicant pool, as measured by average SAT scores and ACT scores, increased. The average SAT scores and average ACT scores of black applicants increased by the greatest amount. The average SAT scores and ACT scores of admitted students increased; however, the increase in both measures was less than the increase observed in the applicant pool.

Using a version of the selection index as a basis for comparing applicants and admits from the periods before and after the Supreme Court's decisions, I find that the conditional probability of admissions did not decline appreciably for black applicants. I also find that the advantage in the probability of admission that white applicants with relatively low selection index scores enjoyed over Asian applicants with similar scores in the period before the Supreme Court's decisions declined.

The second chapter is entitled "Estimating the Responsiveness of College Applications to the Likelihood of acceptance and Financial Assistance: Evidence from Texas". The *Hopwood v. Texas* decision in 1996 proscribed the use of race in both the admissions decision and the decision to provide financial aid. Minority enrollment dropped precipitously at the University of Texas at Austin and Texas A&M-College Station. The Top

Ten Percent rule was signed into law in the Spring of 1997 to address the drops in minority enrollment. The Top Ten Percent Rule guarantees admissions to any public college or university in Texas for graduates from Texas high school graduates who finish in top decile of their graduating class and submit a completed application to a college within two years of graduation. The University of Texas at Austin and Texas A&M-College Station also established programs that targeted poor high schools that hadn't had many graduates matriculate at the respective institutions and offered some of the graduates from these high schools financial aid other support.

Since class rank plays such a important role in determining admissions, this paper examines the impact of switching from admissions regimes where rank mattered somewhat to a system where rank explicitly determines admission and this information is available to all interested parties. This paper also examines the impact of the targeted recruitment plans on the score report sending behavior of the targeted high schools. This paper is not the first to consider these programs; however, I use methods to account for the bias that results from non-random selection into treatment. Previous work examining these programs did not account for the bias. I combine two data sources to obtain my estimates, the student descriptive questionnaire data from all SAT test takers in Texas from 1996–2004 and information on public high schools in Texas from its Academic Excellence Indicator System.

I find evidence that the score report sending behavior of students of different rank changed compared to identically ranked students who applied under admissions regimes where class rank wasn't as important a determinant of college admission. I find evidence that the students in schools that are eligible for the Longhorn Opportunity Scholarship Program were more likely to send a score report to the University of Texas at Austin, especially for students in the top decile, when compared to students from similar schools. I find that the Century Scholars program was not as effective in inducing students to submit score reports to Texas A&M-College Station.

The third chapter is entitled “The Impact of Colorblind Admissions on the Educational Expectations of Texas High School Graduates”. This chapter considers the impact of Texas’s Top Ten Percent Rule on the test-taking behavior of Texas’s high school graduates. Initiated in response to the decision of *Hopwood v. Texas*, TTTPR guarantees admission into **any** public college or university in Texas provided the student finishes in the top decile of her class and submits a completed application to the college. I investigate the impact of the policy on the percentage of graduates from different types of high schools who attempt an admissions examination. The taking of an admissions examination is interpreted as being the intent to apply to a more selective post-secondary institution. I find a considerable decrease in the overall percentage of graduates who attempt an admissions examination and that the decrease is larger at schools that are poor and have student bodies that with relatively large percentages of Hispanic students.

CHAPTER II

The Impact of Legal Challenges to Affirmative Action on Applications and Admissions of Disadvantaged Groups at an Elite Public University

2.1 Introduction

Prior to the decisions handed down by the U.S. Supreme Court on June 23, 2003 in *Gratz v. Bollinger*[1] and *Grutter v. Bollinger*[2], the University of Michigan used a selection index to score applications. The selection index awarded a specific number of points for certain characteristics—e.g., GPA and standardized test scores. The selection index was proscribed because it mechanically awarded twenty points of the one hundred points needed to guarantee admission to all under-represented minority groups.[3]

The University of Michigan was forced by the Court to change its undergraduate application and admission processes in order to meet the new legal standards. The University now uses a holistic review—in which the use of race in the admissions process conforms to "strict scrutiny"[4] —to make admissions decisions.

The University of Michigan is a selective public institution. The number of applicants it receives each year far exceeds the number of available slots for freshmen. In order to craft an incoming cohort, the admissions office must employ a method of ordering applications, a way of determining which applicants are suitable for admission. I address the following question: How does switching from the selection index to a "properly devised" admissions

[1] *Gratz v. Bollinger, 539 U.S. 244 (2003)*

[2] *Grutter v. Bollinger 539 U.S. 306 (2003)*

[3] Under-represented minority groups include African-Americans, Hispanics, and Native Americans applicants.

[4] Strict Scrutiny requires that two conditions are met: 1) The existence of a compelling interest to warrant treating individuals differently. 2) The program used to further this interest must be "narrowly tailored" to accomplish its purpose.

program affect the pool of applicants, the pool of admits, and admissions at an elite public university?

The use of race in the admissions process remains a contentious issue. A ballot initiative amending the State of Michigan's constitution, Proposition 2, was placed on the November 2006 ballot and was approved by voters. It became law on December 22, 2006. With the passing of Proposition 2, Michigan joins California, with its Proposition 209, and Washington State, with its Initiative 200, as states that have banned public entities—for example, public universities, school districts, and local governments—from granting preferential treatment to groups or individuals based on race, gender, color, ethnicity, or national origin. Nevertheless, there are many other states where the public institutions of higher education still practice some form of affirmative action in the admissions process that conform to *Gratz v. Bollinger* and *Grutter v. Bollinger*. In this paper, I focus on the period prior to the ratification of Proposition Two, when the University of Michigan was still able to use race in making admissions decisions.

This question has interesting policy implications. The relationship between post-secondary education and wages has grown over time. Lemieux (2006) documents that the returns to post-secondary education have nearly doubled between 1973 and 2005. There is evidence that minority students benefit from attending a high quality postsecondary institution (Dale and Krueger, 2002). The University of Michigan is one of a handful of elite public institutions. As such, it is under a great deal more scrutiny than a comparable private institution with respect to its admission policies.

2.2 Background

2.2.1 *Gratz v. Bollinger*

Jennifer Gratz and Patrick Hamacher, both of whom are natives of Michigan and Caucasian, applied to the University of Michigan's College of Literature, Science, and the Arts in 1995 and 1997, respectively. Upon being denied admission, they filed a class action suit in the fall of 1997 that claimed that the University of Michigan's use of race in the admissions process violated the Equal Protection Clause of the Fourteenth Amendment, Title VI of the Civil Rights Act of 1964, and 42 U.S.C. §1981. The petitioners sought compensatory and punitive damages for past violations, declaratory relief finding that the respondents violated their rights to nondiscriminatory treatment, an injunction prohibiting respondents from continuing to discriminate on the basis of race, and an order requiring the University of Michigan's College of Literature, Science, and the Arts to offer Patrick Hamacher admission as a transfer student.[5]

The admissions guidelines used by the University of Michigan's Office of Undergraduate Admissions (OUA) changed several times during the litigation in this case. The District Court determined that the admissions guidelines used by OUA from 1995 − 1998 was functionally equivalent to a quota. This is in violation of Justice Powell's principal opinion in *Regents of the University of California v. Bakke*, 438 *U.S.* 265, 317. The District Court granted the petitioners summary judgement in regards to the University of Michigan's undergraduate admissions programs for those years. The OUA began using the selection index in 1998. The decisions in *Gratz v. Bollinger* addresses the legitimacy of the selection index.

The Supreme Court found that the selection index is not narrowly tailored to achieve the goal of securing the educational benefits that flow from having a diverse student body. In effect, the twenty points allotted to every under-represented minority makes race a decisive factor for virtually every minimally qualified under-represented minority applicant. The selection index is not consistent with the principles espoused by Justice Powell whereby the race of a particular applicant could be considered as one of many factors in the admissions process without being decisive.

However, the Supreme Court in *Grutter v. Bollinger*, the case brought against the law school, held that a narrowly tailored use of race in a properly devised admissions system designed to obtain the educational benefits that flow from a diverse student body is not

[5] *Gratz v. Bollinger*, 539 *U.S.* 244, 251 − 252 (2003)

prohibited by the Equal Protection Clause of the Fourteenth Amendment, Title VI, or 42 U.S.C. §1981.[6]

2.2.2 *Grutter v. Bollinger*

Barbara Grutter, a white Michigan resident, had earned a 3.8 grade point average and scored 161 on the Law School Admissions Test. After being denied admission to the University of Michigan's Law School (Law School), she filed suit, alleging that the University of Michigan had discriminated against her on the basis of race in violation of the Fourteenth Amendment, Title VI of the Civil Rights Act of 1964, and 42 U.S.C. §1981.

The District Court decided that the Law School's use of race as a factor in the admissions process was unlawful. The Sixth Circuit Court of Appeals reversed the decision of the District Court. The Sixth Circuit Court of Appeals held that Justice Powell's opinion in *California Board of Regents v. Bakke* was binding precedent that established diversity as a compelling state interest and that the Law School's program was sufficiently narrowly tailored as it mirrored the Harvard admissions program that Justice Powell put forth as an appropriate model.

The Law School used a holistic review that evaluates each individual candidate based on all of the information available in the file. The information that is considered includes letters of recommendation, transcripts, a personal statement, and an essay that describes how the candidate will contribute to both life at the Law School and diversity. The law School's review process required officials to look beyond grades and test scores and to consider "soft-variables"—for example, the enthusiasm of the student's recommenders, the quality of the undergraduate institution, and the difficulty of the undergraduate curriculum. The Law School did not classify diversity purely with respect to racial or ethnic characteristics and it did not restrict the types of contributions to diversity that are eligible to receive consideration in the admissions process.[7]

In deciding *Grutter v. Bollinger*, the United States Supreme Court held in a 5 − 4

[6] See *Grutter v. Bollinger*, 539 *U.S.* 306, 306 − 307 (2003)
[7] *Grutter v. Bollinger* 539 *U.S.* 306, 315 − 316 (2003)

decision that the pursuit of the benefits that flow from diversity comprises a compelling state interest and that the Law School's admissions program was sufficiently narrowly tailored. Taken together, these two decisions mean that states have the choice of using race as a means of furthering diversity provided that the specific admissions procedures minimize the damage to groups who are treated less favorably.

The next three sections discuss the decision to apply to the University of Michigan, the University's role in the admissions decision, and the data that will be used in the analysis, respectively. This is followed by a discussion of the results and the conclusion.

2.3 The Application Decision

Consider the following decision rule.

$$Apply = \begin{cases} Yes \quad If \; P_{UM}\{\prod_{j=0}^{J(\sim UM)} \pi_j \max[0 \;,\; U_{UM} \;-\; U_j]\} - \; C_{UM} \;>\; 0 \\ \\ No \quad Otherwise \end{cases}$$

$J(\sim UM)$ is the number of schools in a student's optimal choice set sans the University of Michigan. Let P_{UM} be the student's subjective estimate of her own probability of admission to the University of Michigan. The term π_j represents the probability that school j is the best school that admits the applicant. U_{UM} is the utility she receives from being admitted to the University of Michigan. U_j represents the utility the student receives from attending school j. C_{UM} is the total cost of applying to the University of Michigan; this includes both pecuniary and non-pecuniary costs.

Card and Krueger (2004) derive this rule to characterize the set of schools that are included in a student's final choice set. I apply the decision rule to highlight the various channels through which the changes at the University of Michigan impact the decision to apply.

The decision rule is straightforward. The student applies if and only if the expected gain in being to admitted to the University of Michigan, the term in braces, multiplied by her estimate of her probability of admission, P_{UM}, exceeds the cost of applying to the University of Michigan.

The Supreme Court decisions and the University of Michigan's subsequent response affect the components of the decision rule. An examination of how P_{UM}, U_{UM}, and C_{UM} are impacted by the changes yield insight into how the applicant pool under the holistic review will be changed relative to the applicant pool under the point system regime.

Suppose there are two under-represented minority applicants who are alike in every respect except that one applies for admission in 2003, while the other applies for admission in 2004. How will P_{UM} vary across the two regimes? Under the point system, an under-represented applicant receives twenty points towards the one hundred points required for admission. It is unclear how race factors into the computation of P_{UM} for the applicant who applies for admission in 2004. Given that the point system was struck down, perhaps the applicant who applies in 2004 estimates that ethnic status has decreased in importance. This would lead to a decrease in P_{UM} relative to the 2003 estimate. Under the holistic review, the contribution of ethnic status towards admission varies from applicant to applicant. Perhaps ethnic status matters more for applicants with low socioeconomic status. This is not possible under the point system, because the contribution of race is fixed. It is possible that our applicant concludes that race matters more than it would have in 2003. If so, then the estimate of P_{UM} by the 2004 applicant has increased relative to the estimate of P_{UM} by his 2003 analogue.

How is U_{UM} impacted relative to the level that an applicant would have received prior to 2004? The utility that students receive from attending the University of Michigan is affected by the composition of the student body. Suppose there is a positive relationship between campus diversity and U_{UM}. If the student expects a decrease in diversity, then the utility from matriculating at the University of Michigan has declined. Conversely, an increase in diversity will increase U_{UM} relative to the 2003 level ceteris paribus. The relationships reverse themselves if there is a negative relationship between diversity and U_{UM}.

U_{UM} can be impacted by the changes at the University of Michigan even if the applicant is indifferent to the level of campus diversity. The debate concerning affirmative action heightens the tension on campus. If a student prefers a tranquil campus, then the tension associated with the affirmative action debate lowers U_{UM}. On the other hand, a student may be indifferent with respect to the changes at the University of Michigan, but enjoys being on a campus that actively engages in social discourse. If so, then U_{UM} increases relative to the level that a identical applicant would have expected prior to 2004. U_{UM} is also affected by the cost of attendance. If under-represented minority students thin that the changes at the University will reduce the amount of funding that they receive, then the attractiveness of the University declines.

C_{UM}, the cost of applying to the University of Michigan, increases. Prior to 2003 the University of Michigan required one 500 word essay and a counselor recommendation. The application process now requires two 250 word essays, one 500 word essay, and recommendations from both a counselor and a teacher. This raises the cost to students in terms of the amount of time required to complete an application. However, the increase in C_{UM} is not uniform across all students. Potential applicants vary with respect to how onerous they perceive the essays to be.

The model highlights what segments of the pool of potential applicants is likely to be impacted by the changes. Marginal applicants, academically weaker students with low P_{UM}, are likely to be impacted by the changes. In particular, under-represented minority applicants who are marginal are likely to be affected.

The additional costs of applying reduce the expected benefit for marginal students, and, thus, we might expect the number of weaker students to decline. Exceptionally strong students are also likely to be affected. Applicants with a set of schools that have expected utilities that are comparable to the University of Michigan might reduce the rate at which they apply. For such an applicant, the University of Michigan doesn't yield a sufficient expected gain relative to his other options to offset the increased cost of application.

The aggregate impact of the changes at the University of Michigan on the pool of applicants is theoretically ambiguous. It must be determined empirically.

2.4 The University

Bowen and Bok (1998) state that the fundamental goal of admissions at a selective institution is to ensure that all admitted applicants are above a high academic threshold. Despite the high academic requirements, selective institutions still have many more applicants than there are available slots in an entering cohort. Bowen and Bok (1998) identify four reasonable considerations that admissions officers typically give weight in making admissions decisions after imposing the academic quality constraint. The considerations are:

- The first consideration is to admit an ample number of students who show promise in excelling in their studies.
- The second consideration is to assemble a class of students with a wide diversity of backgrounds, experiences, and talents.
- The third consideration is to attract students who seem especially likely to use their education to make significant contributions to their chosen vocation or to the welfare of society.
- The fourth consideration is to respect the importance of long-term institutional loyalties and traditions—for example, legacy admissions.

The four admissions considerations in conjunction with the high academic threshold characterize the University of Michigan's goal in making admissions decisions: to select a set of students that are best suited to maximize both the educational and social experiences that comprise an undergraduate education at the University of Michigan.

The University of Michigan was forced to change the method it used to rank applicants. This does not imply that it has changed its conception of the characteristics that an optimal set of admitted students must possess. That is, I assume the University has stable preferences with respect to the set of students that it deems worthy of admission. The University has provided prima facie evidence that it is committed to its conception of what constitutes an optimal class. The University of Michigan argued the case before the Supreme Court; it spent a total of $10,637,976$ dollars in defending its affirmative action practices.[8]

2.4.1 Admissions Model

The Supreme Court cases addressed the process that the University used to determine admissions and not the outcomes. The University was committed to the selection index. They employed the system until forced to change. I infer from these facts that the University would adopt a system that was holistic in nature, but would produce admission decisions that are very similar to the outcomes that would have emerged had the selection index not been proscribed.

To fix ideas, consider a stringent point system with a clearly defined score that guaranteed admission. Let S^* be the required score. If an applicant has a selection index score, S_i, that is greater than or equal to S^*, then the probability of admission conditional on S_i is equal to one. The probability of admission given a selection index score that is less than S^* is zero. Under these assumptions, the graph of the probability of admission as a function of the selection index score is a step function.

The selection index employed by the University was not a strict system. Under the University's selection index system, S^* is equal to one hundred points. However, for selection index scores less than one hundred points, the probability of admission is not zero. Rather, the probability of admission conditional on an applicant's selection index score is an increasing function of the score. The graph of the probability of admission

[8]This figure was obtained from Lynette Kosky, senior department administrator and senior department paralegal for the University of Michigan's Office of the Vice-President and General Counsel.

conditional on the selection index score as a function of the selection index score has an S-shape.

I assume that the University's holistic review produces a new admission rule is a noisier version of the selection index score. That is, I assume they now use $T_i = S_i + \epsilon$, where, for convenience, I assume that ϵ has a mean of zero and finite variance equal to σ^2. The probability of admission under the new rule is the probability that that T_i exceeds a certain threshold. This simple model yields predictions about how the mapping from the selection index score to the conditional probability of admission will change.

Assume that the applicant pool does not change. Under the new admissions regime, the S-shaped graph of the conditional probability of admission as a function of the selection index score will be flatter than the curve that would have emerged under the system that the University used to practice. The intuition is as follows. For applicants with high selection index scores—who would have gotten in automatically—the holistic review can only hurt them. The probability of admission weakly declines for those students. For applicants with low selection index scores, the holistic review can only help them. The probability of admission weakly increases for such students. The combination of the two changes, yields a conditional probability of admission schedule that is flatter.

Suppose the applicant pool declines in size and it is applicants with selection index scores less than some value, S^o, who stop applying.The University of Michigan must admit a certain number of students in order to function. If the reduction in the applicant pool is sufficiently, then the University of Michigan will have to admit students that from the weaker end of the distribution. The graph of the probability of admissions as a function of the selection index score will have higher values for selection index scores less than S^o relative to the curve that would have emerged had there been no changes at the University of Michigan and coincide with the "no changes" curve for selection index score values greater than S^o. If different segments of the potential pool of applicants are disparately impacted by the changes at the University, then the shape of the changes in the probability of admission curves for the various segments will be different. For example, the decline in applications may start at different values for blacks and whites. If the declines are sufficiently large, then the probability of admissions schedules for blacks and whites will change at different points. This theoretical outline provides a means of interpreting the changes we observe in the conditional probability of admissions function.

2.5 Data

The data used in this analysis will come from two sources. The first data set—the applicant data set—is a subset of a ninety percent random sample of all first-year freshman applicants to the University of Michigan for the fall cohorts for the years 2000 – 2006. The second data set—the admit data set—is a subset of a ninety percent random sample of the first- year freshman applicants who were granted admission to the University of Michigan for the fall cohorts for the years 2000 – 2006.

The applicant data set includes domestic applicants with a valid standardized test and a non-zero high school grade point average.[9,10] One of the goals of this paper is to analyze the impact of the University of Michigan being forced to discontinue the use of the selection index to determine admissions. The inclusion criteria I use guarantee that the applicants were evaluated using the selection index or would have been evaluated using the selection index had they applied during the period of time when it was in use.

The applicant data set includes a total of 106,004 applicants. The data set includes standardized test scores, recalculated high school grade point average[11], the applicant's gender, the applicant's state of residence, self-reported race or ethnicity, the year the applicant applied, the applicant's legacy status[12] as well as high school level information

[9]Theodore Spencer, Associate Vice-Provost and Executive Director of the Office of Undergraduate Admissions, in an email message sent on August 11, 2006, states that: "international students are given a Grade Point Average in a different way than the domestic students." There were students who were granted admission with recorded Grade Point Averages of zero. I was informed that the majority of admitted students with zero grade point averages are international students. The process used to evaluate international students was not made available to me. However, the process for domestic students is clearly defined.

[10]An email message from Diane Walton, an official with the University of Michigan's Office of Undergraduate Admissions, stated that an application must have a valid standardized test score to be considered for review. This email was received on August 1, 2006

[11]Recalculated GPA is calculated from tenth and eleventh grade academic courses.

[12]Legacy status consists of having a parent, step-parent, grandparent, sibling, or spouse who attended the University of Michigan as a degree seeking student.

from both the Educational Testing Service and ACT.

The admit data set contains information on students who were offered admission to the University of Michigan and, for comparability, meet the inclusion restrictions that I placed on the applicant data set. The admit data set contains the records of $63,155$ admitted students. The admit data set has the same measures as the applicant data set as well as some additional information. The additional measures include the following: the admitted student's enrollment decision, financial aid information for students who decided to enroll, a by-term measure of overall grade point average for enrolled students, the student's grade point average for a particular term for enrolled students, a by-term measure of the student's academic plan(student's major and/or minor) for enrolled students, as well as information on the attendance patterns of students who decided to accept admission to the University of Michigan.

The confidentiality agreement does not allow me to match individuals across the two data sets. However, I am allowed to make use of both data sets if the level of aggregation is sufficient to mask the identity of individuals.

2.6 Methodology

2.6.1 Describing the Applicant Pool

In a previous section, I outlined a simple model that describes how the decision to apply to the University of Michigan is affected by the changes in the admissions regime and the events surrounding the changes. I do not observe sufficient information to empirically model the application decision; I only observe the set of applicants who applied. However, the model does offer some insight into how to interpret changes in the applicant pool.

I exploit the timing of the the decisions in *Gratz v. Bollinger* and *Grutter v. Bollinger* to discern the impact on the applicant pool by comparing applicants who applied before the Supreme Court Decisions with Applicants who applied afterwards. The comparisons are useful if the following assumption hold: The applicant pool prior to the Supreme Court cases serves as a counterfactual for how the applicant pool would have looked had the changes never occurred.

2.6.2 Describing the Admit Pool

The University of Michigan used a holistic review system to make admissions decisions after the decisions in *Gratz v. Bollinger* and *Grutter v. Bollinger*. I compare the distribution of characteristics of students admitted under the selection index with the distribution of characteristics of the pool of students admitted under the holistic review. The analysis will describe how the pool of admitted students changed after the Supreme Court Decisions relative to the pool of students who were admitted under the selection index regime.

The pool of admits is the result of series of complicated decisions and is directly dependent on the pool of applicants. As such, one must be careful in drawing conclusions from the descriptive analysis. Still, it is important to document the differences in the pool of students who will shape the undergraduate educational experience. Examining the differences in the admit pool will offer some insight in the University of Michigan's admissions process, as the University strives to select the set of students to both maximize the educational experience offered by the University of Michigan and fulfill the social obligations that the University faces as a public university. The simple model of admissions that I outlined previously will aid in interpreting the changes in the pool of admitted students.

2.6.3 Admission Probabilities

The University of Michigan's selection index has a maximum value of 150 points where 100 points usually guaranteed admissions. The selection index assigns a fixed number of points for certain characteristics. For example, a SAT score greater than or equal to 1360 would earn an applicant 12 points; a recalculated high school grade point average of 2.0 would earn an applicant 40 points.[13] The selection index is constructed as follows:

$$\text{Selection Index Score} = S = \sum_{c \in \mathcal{C}} \beta_c I_c$$

[13] A detailed description of how the selection score index is calculated is available from the author upon request.

$\mathcal{C}$ is the set of characteristics that the University considers in the admissions process. I_c is an indicator variable that assumes a value of one if an applicant possesses characteristic c; it assumes a value of zero otherwise. β_c is the fixed point value that the University assigns to characteristic c.

I am interested in discerning if switching from a mechanical point system to a system that meets the guidelines of *Gratz v. Bollinger* and *Grutter v. Bollinger* affects the probability of admission.

The conventional way of empirically determining the changes would be to use a regression framework with the outcome being a dummy variable that indicated whether or not an applicant was admitted. With an appropriate set of covariates one could estimate the impact of various characteristics—such as race and the admissions regime under which an applicant applied—on the probability of admission. I do not have a data set that has both the covariates and the outcome. In order to investigate the changes in the probability of admission, I must use another method. In the paragraphs that follow, I describe the method.

Suppose I generated a selection index score for each applicant and admit from the periods before and after the change in the admissions regime sans the twenty points which are allotted for being an under-represented minority. For a given selection index score and a full census of each data set, the conditional probability of admission is equal to the following:

$$\mathcal{P}(A_i = 1|S) = \frac{\mathcal{P}(S|A_i = 1)P(A_i = 1)}{\mathcal{P}(S)} \tag{2.1}$$

The result in (2.1) follows from Bayes' rule, where $\mathcal{P}(S|A_i = 1)$ is the probability mass at selection index score S in the data set of admitted students, $\mathcal{P}(A_i = 1)$ is the unconditional probability of a randomly drawn applicant being admitted, and $\mathcal{P}(S)$ is the probability mass at selection index score S in the data set of applicants. With the true data sets, the conditional probability of admission is a number; no estimation is required.

The sample analogue of (2.1) is:

$$\mathcal{P}(\widehat{A_i = 1}|S) = \frac{\mathcal{P}(S = \widehat{|A_i} = 1)\mathcal{P}(\widehat{A_i = 1})}{\widehat{\mathcal{P}(S)}} \tag{2.2}$$

If $\mathcal{P}(\widehat{S|A_i} = 1)$, $\mathcal{P}(\widehat{A_i = 1})$, and $\widehat{mathcal P}(S)$ are consistent estimates of each of their full sample analogues on the right hand side of equation 2.1, then $\mathcal{P}(A_i \widehat{= 1|} S =)$ approaches $\mathcal{P}(A_i = 1|S =)$ in probability; that is, $P(\widehat{A_i = 1}|S)$ is a consistent estimator of $\mathcal{P}(A_i = 1|S)$. The sample analogue of $\mathcal{P}(S|A_i = 1)$ is estimated from the data set of admitted students. The sample analogue of $\mathcal{P}(A_i = 1)$ comes from both data sets, it is merely the number of admits divided by the number of applicants. For the subgroups, it is the number of the members of the subgroup in the admit data set divided by the number of members of the subgroup in the applicant data set. The sample analogue of $\mathcal{P}(S)$ is estimated from the applications data set.This approach can be readily modified to yield estimates of the conditional probability of admission for a number of subgroups.[14]

I do not observe the full set of characteristics that are considered in constructing the selection index. However, the quasi-selection index that I construct includes the following characteristics: GPA, Standardized test score, Michigan residency, whether an applicant is from an under-represented state, a limited measure for school strength, and alumni relationships. These characteristics are weighted according to the schedule formerly used by the University of Michigan.

The selection index employed by the University of Michigan had a maximum value of 150 points. My version of the selection index has a maximum value of 108 points. The version of the selection index that I use does not include the following: points for the strength of a students' curriculum, points for the strength of an applicant's high school, points for the essay, points for personal achievement, points for leadership, and points for the miscellaneous category. I do not include the points allotted to under-represented

[14]My estimate of the conditional probability of admissions depends on my estimate of $\mathcal{P}(S|A_i = 1)$ and $\mathcal{P}(S)$. I use Stata's kdensity function to generate the estimates. The estimates depend on the bandwidth selection. I use Stata's default which is to select the bandwidth that minimizes the mean integrated squared error as if the data were gaussian and a gaussian kernel were being used.

minorities, because I want to examine how under-represented minority status truly impacts the probability of admission.

I categorize each applicant and admit by my version of the selection index score, race, and period. I compute consistent estimates of the conditional probability of admissions for a given selection index score, period, and race/ethnic category. For a given race and selection index score combination, comparing the conditional probability of admissions for applicants from before and after the Supreme Court decisions answers the following question: What is the change in the probability of admission that can be attributed to the new admissions regime and the changes at the University of Michigan given that the applicants are, on average, observationally equivalent relevant to the metric that was used to determine admissions from $2000 - 2003$?

2.6.4 Computing Confidence Intervals for the Conditional Probability of Admissions

I compute bootstrap-t confidence intervals (Efron and Tibshirani, 1993) for my estimates of the conditional probability of admission. I use a non-standard estimator. The bootstrap-t methodology allows me to generate a "t" table that is suited to this particular sample and estimator without making a normality assumption.

I employ an algorithm that is described in Horowitz (2001). The algorithm is as follows:

1. Sample the data set with replacement.

2. Estimate the conditional probabilities of admission and compute $\tau^* = \frac{\mathcal{P}^*(\widehat{A_i=1}|S)-\mathcal{P}^0(\widehat{A_i=1}|S)}{se(\mathcal{P}^*(\widehat{A_i=1}|S))}$ where $\mathcal{P}^*(\widehat{A_i = 1}|S)$ is the conditional probability of admissions for a randomly drawn applicant with selection index score S from the bootstrapped sample, $\mathcal{P}^0(\widehat{A_i = 1}|S =)$ is the conditional probability of admissions for a randomly drawn applicant with selection index score S from the original sample, $se(\mathcal{P}^*(\widehat{A_i = 1}|S))$ is an estimate of the standard error of the conditional probability of admissions for a randomly drawn applicant with selection index score S_o from the bootstrapped sample.

3. Repeat steps one and two 1000 times.

4. For a given selection index score, order the 1000 estimates of τ^* and select the twenty-fifth and nine hundred seventy-fifth largest values. The ninety-five percent confidence interval for the estimate of the conditional probability of admission for a given selection index score is :

$$(\mathcal{P}(\widehat{A_i = 1}|S) - \tau^{*(1-\frac{\alpha}{2})} * se(\mathcal{P}^*(\widehat{A_i = 1}|S)), \mathcal{P}(\widehat{A_i = 1}|S) - \tau^{*(\frac{\alpha}{2})} * se(\mathcal{P}^*(\widehat{A_i = 1}|S)))$$

I employ the delta method to generate my estimate of $se(\mathcal{P}^*(\widehat{A_i = 1}|S)$. Recall (2.1) and assume that $\mathcal{P}(A_i = 1)$ is fixed. A first order approximation of the variance of $\mathcal{P}^*(\widehat{A_i = 1}|S)$ takes the following form:

$$\begin{bmatrix} \frac{\partial \mathcal{P}(\widehat{A_i=1|S})}{\partial \mathcal{P}(\widehat{S|A_i=1})} \\ \frac{\partial \mathcal{P}(\widehat{A_i=1|S})}{\partial \widehat{\mathcal{P}(S)}} \end{bmatrix}^T \begin{bmatrix} Var(\mathcal{P}(\widehat{S|A_i = 1})) & Cov(\mathcal{P}(\widehat{S|A_i = 1}), \widehat{\mathcal{P}(S)}) \\ Cov(\mathcal{P}(\widehat{S|A_i = 1}), \widehat{\mathcal{P}(S)}) & Var(\widehat{\mathcal{P}(S)}) \end{bmatrix} \begin{bmatrix} \frac{\partial \mathcal{P}(\widehat{A_i=1|S})}{\partial \mathcal{P}(\widehat{S|A_i=1})} \\ \frac{\partial \mathcal{P}(\widehat{A_i=1|S})}{\partial \widehat{\mathcal{P}(S)}} \end{bmatrix} \quad (2.3)$$

The terms $Var(\mathcal{P}(\widehat{S|A_i = 1}))$, $Cov(\mathcal{P}(\widehat{S|A_i = 1}), \widehat{\mathcal{P}(S)})$, and $Var(\widehat{\mathcal{P}(S)})$ are the approximate variances of the probability of the selection score conditional on being admitted, the covariance between the probability of the selection index taking on a particular value, S, conditional on being admitted and the probability of observing selection index score S in the applications data set, and the variance of the estimate of the probability mass of observing selection index score S in the applications data set. In the remainder of the subsection, I detail how I estimate the components of the variance-covariance matrix of the conditional probability of admission that I require to produce the confidence intervals.

I apply the following formula from Silverman (1986, pg. 40) to generate estimates of the variances of $\mathcal{P}(\widehat{S|A = 1})$ and $\widehat{\mathcal{P}(S)}$).

$$Var(\widehat{\mathcal{P}(S)}) \approx n^{-1}h^{-1}\widehat{\mathcal{P}(S)} \int (K(t))^2 \, dt \quad (2.4)$$

In this application, $K(t)$ is the Epanechnikov kernel, n is the number of applicants or admits with the particular selection index score, and h is the window width. I use the following result:

$$\int (K(t))^2 \, dt = \int_{-\sqrt{5}}^{\sqrt{5}} (\frac{3}{4\sqrt{5}}(1-\frac{t^2}{5}))^2 dt \;=\; \frac{3}{5\sqrt{5}} \tag{2.5}$$

I also require an estimate of $Cov(\mathcal{P}(\widehat{S|A_i=1}), \widehat{\mathcal{P}(S)})$ to estimate $se(\mathcal{P}^*\widehat{(A_i=1}|S))$. $Cov(\mathcal{P}(\widehat{S|A_i=1}), \widehat{\mathcal{P}(S)})$ measures the extent to which the fraction of students of a given selection score in the complete applicant data set covaries with the fraction of students with the same selection score in the admit data set. The random sampling and the law of total probability indicates that $Cov(\mathcal{P}(\widehat{S|A_i=1}), \widehat{\mathcal{P}(S)})$is equal to the following expression.[15]

$$\widehat{\mathcal{P}(S)} = .9\mathcal{P}(\widehat{S|A=1})\mathcal{P}\widehat{(A=1})+.9\mathcal{P}(\widehat{S|A=0})\mathcal{P}\widehat{(A=0})\tag{2.6}$$

Recall that $\widehat{\mathcal{P}(S)}$ is the estimate of the probability of observing a particular selection index score, S, in the applications data set. Equation (2.6) reflects the fact that the applications data set consists of applicants who will be admitted and applicants who will be denied admission.

By substituting the right hand side equation (2.6) for $\widehat{\mathcal{P}(S)}$ in $Cov(\mathcal{P}(\widehat{S|A_i=1}), \widehat{\mathcal{P}(S)})$ and applying the bilinearity property of the covariance, $Cov(\mathcal{P}(\widehat{S|A_i=1}), \widehat{\mathcal{P}(S)})$can be shown to equal the following expression:

$$(.9)^2\mathcal{P}\widehat{(A=1})Var(\mathcal{P}(\widehat{S|A=1})) \;+\; (.9)^2\mathcal{P}\widehat{(A=0})Cov(\mathcal{P}(\widehat{S|A=0}), \mathcal{P}(\widehat{S|A=0})) \tag{2.7}$$

$Cov(\mathcal{P}(\widehat{S|A_i=1}), \widehat{\mathcal{P}(S)})$ measures the extent to which the fraction of students of a given selection score in the complete applicant data set covaries with the fraction of students with the same selection score in the admit data set. It does not appear that the sign of $Cov(\mathcal{P}(\widehat{S|A_i=1}), \widehat{\mathcal{P}(S)})$ is knowable, in general. The reason for the uncertainty about the sign comes from the term $Cov(\mathcal{P}(\widehat{S|A=1}), \mathcal{P}(\widehat{S|A=0}))$. Determining the sign of $Cov(\mathcal{P}(\widehat{S|A=1}), \mathcal{P}(\widehat{S|A=0}))$ requires knowledge of the set of students who are rejected, a set of students who I don't observe.

[15] In deriving the analytic expressions, I elide the distinction between whether the data set is the full population or a single instantiation from a superpopulation.

I assume that $Cov(\mathcal{P}(\widehat{S|A_i} = 1), \widehat{\mathcal{P}(S)})$ is zero. This is true in the case where I have a full census of the data sets. In this case, the probabilities are the true values of $\mathcal{P}(S)$ and $\mathcal{P}(S|A = 1)$ which are fixed numbers; the covariance is zero by definition. However, for most "realistic" cases I have been able to study $Cov(\mathcal{P}(\widehat{S|A_i} = 1), \widehat{\mathcal{P}(S)})$ appears to be positive.

2.7 Implications of Sampling

The random sampling is the sole reason that I have to estimate the probabilities. The data sets that I have are the results of two independent random samples. This implies that the following configurations are possible: 1. Observations that appear in both data sets. 2. Observations that appear in the applications data set but not in the admissions data set. 3. Observations that do not appear in the applications data set but appear in the admit data set. 4. Observations that don't appear in either data set.

To see how the sampling affects the estimates of the conditional probabilities and confidence intervals, consider the following extreme example. Suppose that applicants with a particular selection index score, S_0 didn't appear in either data set. How would the conditional probability for a different score S_1 be affected? The estimate of the conditional probability of admission depends on the likelihood of observing S_1 in the applicant data set in the denominator and the likelihood of observing S_1 in the admit data set in the numerator. Not observing S_0 implies that the estimates of the probabilities of observing S_1 in both data sets are biased and, therefore, the estimate of the conditional probability of admission given a score of S_1 is biased. The estimate of the standard error also depends on the estimated probabilities of observing S_1 in both data sets; the omission of S_0 also produces biased estimates of the components of the standard errors.

Given that I have a single random sample of applicants and admits, my estimates, therefore, are sensitive to the vagaries of my particular samples. The severity of the problem would be greatly reduced if I had at my disposal a number of random samples to analyze.

2.8 Discussion

2.8.1 Changes in the Applicant Pool

Figure 2.1 is a graph of the total number of applicants by race/ethnicity for each year in the data set. The time series of the level of applicants across the four race/ethnicity categories were increasing at a modest rate in the years prior to the Supreme Court decisions in 2003. However, there are sharp declines in the total number of applications for whites, blacks, and Hispanics in 2004, the first cohort that applied under the University of Michigan's holistic review.

The scale of Figure 2.1 makes it difficult to detect changes in the numbers of applicants. To alleviate this problem, Figure 2.2 graphs the percent change in admissions by race/ethnicity for each year relative to the level of applications received in the year 2000, the first year in the data set. Applications from Hispanic and Asian students were increasing in the period prior to the *Gratz v. Bollinger* and *Grutter v. Bollinger* decisions; whereas, the applications from whites and blacks remained close to their 2000 levels. In 2004, each of the racial/ethnic categories had applications decline by at least 19 percentage points relative to the 2003 levels. Application levels increased increased in 2005. As of 2005, the application levels for the four racial/ethnic categories applicants remain below the levels obtained prior to 2003.

Table 2.1 demonstrates that the academic quality of applicants—as measured by average standardized test scores and average GPA— were increasing at a modest rate in the period prior to the Supreme Court's decisions. Table 1 shows that the changes are relatively smooth and that the applicants in each of the cohorts prior to the Supreme Court's decisions are fairly similar to one another.

The timing of the changes in the level of applications is consistent with the idea that the Supreme Court's decisions and the subsequent changes at the University of Michigan affect the applicant pool. The Supreme Court Decisions and the events that followed likely impacted the average academic quality—as measured by standardized test scores and grade point averages—of students who now decide to apply to the University of Michigan.

Table 2.2 contains descriptive statistics from the sample of applicants. The average SAT score rose by 20.16 points in the period following the Supreme Court Decisions. This is roughly 14 percent of the standard deviation of the average SAT score for the applicants in the period prior to the Supreme Court Decisions. The average ACT score increased by .6 points which is 15 percent of the standard deviation of the average ACT score in the period prior to the Supreme Court Decisions. There is little difference in the average grade point average, gender composition, and the percentage of applicants that are in-state across the two periods.

The proportion of the applicant pool that is black declined fell from .070 to .058, a 17 percent decline relative to the proportion of the applicant pool that was black in the period prior to the Supreme Court changes. The proportion of the applicant pool that is Hispanic increased by .003, from .035 to .038, a 8.6 percent increase relative to the proportion of the applicant pool that is Hispanic in the period prior to the Supreme Court decisions. The proportion of the applicant pool that identifies as being of Asian decent increased by .004 or 2 percent of the proportion of the pool of applicants that was Asian prior to the Supreme Court Decisions. Interestingly, the proportion of the applicant pool that identifies as being white declined by .018 or 1.8 percentage points..

Table 2.3 examines the means and differences of standardized test scores and grade point averages of applicants by race/ethnicity for the periods before and after the Supreme Court decisions. The average SAT score and average ACT score of white applicants increased by 16.76 points, 13 percent of the standard deviation of the before-decisions white SAT score, and .430 points, 13 percent of the standard deviation of the before-decisions white ACT score, respectively. In the after-decisions period, the average SAT score and average ACT score of black applicants increased by 27.74 points, 16 percent of the standard deviation of the before-decisions black SAT score, and .982 points, 24 percent of the standard deviation of the before-decisions black ACT scores, respectively. The average SAT score and average ACT score of Hispanic applicants increased by 17.83 points, 12 percent of the standard deviation of the before-decisions Hispanic SAT score, and .577 points, 15 percent of the standard deviation of the before-decisions Hispanic ACT score, respectively.The average SAT score and average ACT score of Asian applicants increased by 24.14 points, 18 percent of the standard deviation of the before-decisions Asian SAT score, and .612 points, 17 percent of the standard deviation of the before-decisions Asian ACT score, respectively.

The changes in the average GPA was small for all race/ethnic categories. I focus on the changes in standardized test scores. The quality of the applicant pool, as measured by the mean of standardized test scores, has increased across the four race/ethnic categories. However, the mean and standard deviation offer limited information about the underlying distribution. I graph the distributions of SAT scores and ACT scores for the four race/ethnic categories from the periods before and after the Supreme Court decisions.

The results are striking. Figure 2.3 shows the distributions of SAT scores for black applicants from before and after the Supreme Court decisions.The distribution of scores for the period after the Supreme Court decisions shows a drastic decrease in the mass of applicants who score less than 1000 on the SAT relative to the distribution of scores for the period prior to the Supreme Court decisions. In fact, the likelihood of observing a black applicant with a SAT score of less than 1000 declines by 6.4 percentage points from 25.3 percent to 18.9 percent.

Figure 2.4, Figure 2.5, and Figure 2.6 show the before-decisions and after-decisions distributions of SAT scores of white applicants, Hispanic applicants, and Asian applicants, respectively. There are slight differences in the distributions. For example, the distribution of Asian applicants for the period after the decisions shows more mass in the right tail, and there are differences in the SAT distributions for Hispanic applicants near the modal values. The overall shape of the distributions for white applicants and Asian applicants is remarkably stable. The distributions of SAT scores for the under-represented minority groups, blacks and Hispanics, appear to change more than the distributions of both white and Asian Applicants.

Figure 2.1 and Figure 2.2 show that the application levels declined for the four race/ethnic categories. The stability of the distributions for white applicants, Hispanic applicants, and Asian applicants indicate that, on average, for these groups the reduction in applicants was uniform across the distribution of SAT scores. However, for black applicants the reduction was relatively large with respect to the level of applicants with SAT scores less than a 1000. I infer from these changes that blacks with relatively low SAT scores are less likely to apply.

Figure 2.7 displays the distribution of ACT scores for black applicants for the periods before and after the Supreme Court decisions. The distributions have similar shapes; however, the distribution of ACT scores for black applicants in the period following the decisions in *Gratz v. Bollinger* and *Grutter v. Bollinger* is clearly to the right of the distribution of ACT scores for black applicants from the period prior to the Supreme Court decisions. This pattern—where the distributions of ACT scores for the period following the decisions have shapes that are similar to the distributions in the period prior to the Supreme Court decisions but are shifted to the right—manifests for each race/ethnic category I consider. Figure 2.8, Figure 2.9, and Figure 2.10 graph the distributions for white applicants, Hispanic applicants, and Asian applicants, respectively. The shapes of the distribution of ACT scores for black and Hispanic applicants do not change as much between periods as do the shapes of the analogous SAT distributions.

The University of Michigan is a public university; its primary mission is to educate the residents of the state of Michigan. State of residence is an important consideration. Table 2.4 contains the means and differences of standardized test scores and grade point averages by race/ethnicicty, Michigan residency, and cohort membership for the periods before and after the Supreme Court Decisions.

Table 2.4 reveals some interesting patterns. With respect to standardized test scores, out-of-state students score higher than their in-state counterparts regardless of the period. The standardized test score averages of applicants from the period following the Supreme Court decisions are higher than averages for students from the period prior to the decisions. These facts hold for all race/ethnic categories.

The residency differences in average SAT score and Average ACT score are largest for black and white applicants. Black and Asian applicants show the largest between cohort differences with respect to SAT scores. In-state black applicants and in-state Asian applicants show the largest between-cohort difference in the average ACT score.

Taking the between-cohort difference in the residency differences measures how the gap between in-state and out-of-state students has changed across the periods. For example, the gap in average SAT scores between in-state white applicants and out-of-state white applicants has grown by 11.67 points. For black applicants, the gap decreased by 3.18 points, a very small change. The gap in average ACT scores between in-state black applicants and out-of-state black applicants decreased by .78 points or 18 percent of the standard deviation of black applicants in the period prior to the Supreme Court decision.

Average GPA is the one category in which in-state students actually perform better than out-of-state students. Moreover, this gap increased between cohorts. However, the changes are very small.

The applicant pool changed after the Supreme Court decisions. In particular, the distribution of black applicants changed. The arguments for the use of race in the admissions process focused on the "points" that under-represented minorities the point received for admissions. This is especially true for black applicants. If black applicants perceived that the events at the University of Michigan would negatively affect the probability of admission or reduce the benefit of the educational experience, then they may have responded by not applying.

However, the applicant pool, in both periods, consists of strong students. With respect to ACT scores, for example, the average ACT score of each race/ethnic category bests the national average for the same race/ethnic category by at least six points, which is approximately 1.2 times the standard deviation of all ACT test takers (see Table 8). The descriptive analysis suggests that the quality of the applicant pool as measured by standardized test scores has increased.

Application levels dropped across the four race/ethnicity categories that I consider. One explanation for this decline is the increase cost of application. The increase in the cost of applying matters more for students for applicants who are marginal with respect to the probability of admissions. As blacks have the lowest academic scores, a larger percentage of blacks are both likely to be marginal and to respond by not applying. The decline in the number of applicants across race/ethnicity categories implies that the cost of acquiring information pertinent to admissions under the new regime is not borne solely by one group.

2.8.2 Changes in the Admit Pool

Figure 2.11 is a graph of the total number of admits by race/ethnicity for each year in the data set. The number of black admits declined steadily in the period prior to the decisions in *Gratz v. Bollinger* and *Grutter v. Bollinger*. The number of white admits declined from 2000 to 2002 and rose in 2003, the year before the change in the admissions regime. The number of white admits remained close to the 2003 level in the period following the Supreme Court Decisions. The number of Asian admits declined from 2000 to 2002, rose in 2003, and remained close to the level obtained in 2003. The number of Hispanic admits appeared to be relatively stable across periods.

The scale of Figure 2.11 makes it difficult to detect the magnitude of the changes in the level of domestic admits. Figure 2.12 graphs the percent change in the number of admits relative to the year 2000. The downward trend in the level of black admits is evident. In the period prior to the Supreme Court decisions the number of black admits declined by more than ten percent relative to the number of black applicants admitted in the year 2000. The number of black admits declined by more than fifteen percentage points in 2004, the first year of the holistic review. White admits declined from 2000 to 2002, rose in 2003, and maintained levels comparable to the levels admitted in 2003. The level of white admits remained above the levels obtained in 2000. Asian admits followed a temporal pattern similar to that of white admits. As of 2005, Asian admits exceeded the level obtained in 2003. Hispanic admits experienced a sharp increase in 2002, a decline in 2003, and an even steeper decline in 2004, returning to the level of Hispanics applicants admitted in the year 2000. The number of applicants admitted declined for all race/ethnic categories in 2004, with blacks and Hispanics experiencing the largest percentage point declines. The number of admits rose for the four race/ethnic categories I consider; however, blacks are the only group with the level of admitted applicants below the level obtained in the year 2000.

Table 2.5 contains descriptive statistics from the sample of admits. The average SAT score of admitted students rose by 17.67 points, 13.5 percent of the standard deviation of average SAT scores for students admitted in the period prior to the decisions in *Gratz v. Bollinger* and *Grutter v. Bollinger*. The average ACT score rose by .44 points, 12.3 percent of the standard deviation of the average ACT scores for students admitted in the period prior to the Supreme Court decisions.

The composition of the pool of admitted students changed substantially. The percentage of the admitted applicants that is male increased by .02 percentage points. The percentage of Michigan residents in the admit pool declined by 2.6 percentage points. The proportion of the pool of admitted students that is white decreased from .687 to .648, a 5.7 percent increase. The proportion of the pool of admitted applicants that is black decreased from .089 to .055 , a 38.2 percent decline. The proportion of the pool of admitted applicants that is Hispanic increased from .034 to .065 , a 91.2 percent increase relative to the value obtained in the period prior to the change in the admissions regime. The proportion of the pool of admitted applicants that is Asian increased from .102 to .127 percent, a 24.5 percent increase.

The primary goal of admissions is to admit a class with sufficient academic potential. Table 2.6 contains the within-period means and between-period differences by race/ethnic category of the SAT, the ACT, and GPA, the variables used by admissions officers to gauge academic potential. Examining Table 2.6 allows me to look for differences in the academic quality of the admitted students.

Table 2.6 reveals significant heterogeneity in standardized test scores and GPA across both time and race/ethnic categorization. For example, the average SAT scores of black, Hispanic, and Asian admitted applicants declined by 11.01 points, 69.55 points, and 7.00 points, respectively, while the scores of white admitted applicants increased by 31.70 points. The average ACT scores of black, Hispanic, and Asian admitted applicants increased by .76 points, .65 points, and .56 points, respectively, while the average ACT score of white admitted applicants fell by a statistically insignificant and small .04 points. The average GPA increased by .02 points, .03 points, and .06 points for white, black, and Hispanic admitted applicants, respectively, while the average GPA of admitted Asian applicants increased by .06 points. Although the increases in average GPA are statistically significant, they are substantively small.

Comparing Table 2.6 with Table 2.3 reveals some interesting facts. Average SAT scores increased for the four racial/ethnic groupings. However, the average SAT scores for black and Hispanic admits declined. The average ACT score of white applicants increased, while the average ACT score of white admits remain virtually unchanged.

Table 2.6 presented the means and differences across both time and race/ethnic categorization. The mean is only one aspect of the distribution. Figure 2.13 - Figure 2.20 present the entire distribution of SAT and ACT scores across both time and race/ethnic categorization.

Figure 2.13 contains the distributions of SAT scores for blacks that were granted admission for the periods before and after the Supreme Court decisions. The distributions are quite different. The distribution of SAT scores of black admits for the period after the Supreme Court decision has relatively more mass for SAT scores below 1000 points and for SAT scores above 1500 points. Figure 2.14 presents the distribution of SAT scores for white admits. The distribution of scores for whites admitted after the Supreme Court decisions has relatively more mass for scores greater than 1400 points.

Figure 2.15 presents the distribution of SAT scores for Hispanic admits from the periods before and after the Supreme Court decisions. There are drastic changes in the distributions over time. There is the appearance of a huge spike at approximately 1100 points in the distribution of SAT scores for Hispanic applicants admitted after the decisions.[16] The distribution of SAT scores for Hispanic admits in the after-decisions period has relatively more of its mass in the tails of the distribution. Figure 2.16 contains the distributions of SAT scores for Asian admits. Both distributions contain relatively large spikes; however, for the distribution of scores after the Supreme Court decisions, the spike is to the left of 1400 points; it is to the right of 1400 points for the distribution of SAT scores from the period before the Supreme Court decisions.

Figure 2.17 contains estimates of the density of ACT scores for blacks admitted before and after the Supreme Court's decisions. The distribution of ACT scores for admitted blacks after the Supreme Court decisions has relatively more mass for scores greater than 19 points. Figure 2.18 contains the graphs of ACT scores white admits. The shapes of the distributions are remarkably similar. The distribution of ACT scores for white admits is nearly a mean preserving compression of the distribution of ACT scores for whites who were admitted in the period prior to the the Supreme Court decisions.

Figure 2.19 contains the distribution of ACT scores for Hispanic admits. The distribution of ACT scores for Hispanics who were granted admission after the Supreme Court decisions has relatively more mass for scores greater than 25 points. For extremely high scores in excess of 34 points, the distribution of ACT scores for Hispanics who were admitted prior to the decisions has slightly more mass. Figure 2.20 displays the distributions of ACT scores for Asian applicants who were granted admission. The change in the distribu-

[16]There is a discrepancy in the admit data for out-of-state Hispanic students. The data set has 933 out-of-state Hispanic students admitted in 2005. This far exceeds the numbers reported by the the University of Michigan's Office of Undergraduate Admissions. As out-of-state students are more likely to take the ACT, this explains the strange result for the distribution of SAT scores for Hispanic students after the Supreme Court's decisions. This anomaly precludes me from doing analyzing the admissions probabilities of Hispanic students.

tions is similar to the changes in the distribution for blacks and Hispanics. The distribution for the period following the Supreme Court's decision has relatively more mass on higher ACT scores.

The University of Michigan is a public institution. As such, the University of Michigan gives special consideration to applicants from Michigan.[17] Table 2.7 contains the means and differences of standardized test scores and grade point averages by race/ethnicicty, Michigan residency, and cohort membership for the periods before and after the Supreme Court's decisions.

Out-of-state admits have higher standardized test scores relative to their in-state counterparts; the difference in standardized test-scores between out-of-state admits and in-state admits holds for all race/ethnic and cohort categories with the exception of Hispanics who were admitted after the Supreme Court's decisions. This occurrence should be discounted, however, given the discrepancy in the data.

Although out-of-state students have higher standardized across the board, there were striking changes in the relative standing of in-state students relative to out-of-state students for the periods before and after the Supreme Court's decisions. The average SAT score of in-state white admits rose by nearly 3 points, from approximately 1297 points to 1300 points. The average SAT score for out-of-state white admits rose by more than 43 points, from 1318.14 points to 1351.83. The difference in the between-cohort differences between the average SAT score out-of-state white admits and the average SAT score of in-state white admits increased by more than 40 points. The gap in the average SAT score between in-state white admits and out-of-state white admits nearly tripled in magnitude.

For black admits, the inter-temporal pattern reverses relative to white admits. For in-state black admits, the average SAT score rose by more than 34 points, from 1092.95 points to 1127.02 points. For out-of-state admits, the average SAT score fell by nearly 36 points, from 1231.65 to 1195.73. The difference in the between-cohort differences between

[17] In testimony to the Senate Subcommittee on Higher Education Appropriations on April 29, 2005, Mary Sue Coleman, President of the University of Michigan, states, " students who hail from Michigan get far greater access to admission than the sheer number of applications would indicate."

the average SAT score out-of-state black admits and the average SAT score of in-state black admits increased by nearly 70 points, which is more than half of the gap in average SAT scores between in-state black admits and out-of-state black admits in the period prior to the Supreme Court's decision.

The average SAT scores of Asian admits followed an inter-temporal pattern that is similar to black admits. For in-state Asian admits, the average SAT score rose by 17.30 points, while the average SAT score out-of-state Asian admits fell by nearly 23 points. The difference in the between-cohort differences between the average SAT score of out-of-state Asian admits and the average SAT score of in-state Asian admits decreased by more than 40 points.

The average ACT scores of in-state white admits rose by .12 points, while the average ACT score of out-of-state white admits fell by a quarter of a point. The difference in the between-cohort differences between the average ACT score of out-of-state white admits and the average ACT score of in-state white admits fell by more than a third of a point, a change that is statistically significant but substantively small.

For black admits, however, the changes in average ACT scores was far larger relative to white admits. The average ACT score for in-state black admits increased by .87 points. The average ACT score for out-of-state black admits declined by .11 points. The difference in between-cohort differences declined by .97 points, which is nearly fifty percent of the 2.10 point difference in the average ACT scores between in-state black admits and out-of-state black admits.

The average ACT scores of in-state Asian admits and out-of-state Asian admits increased by .61 points and .26 points, respectively. The increase in out-of-state ACT scores wasn't statistically significant. The difference in the between-cohort differences between in-state Asian admits and out-of-state Asian admits declined by .35 points; the decline is statistically indistinguishable from zero.

The average GPAs of white admits, both in-state and out-of-state, are statistically significant and substantively small. For black admits, however, this is not the case. The average GPA for in-state black admits increased by .04 points, while the average GPA for out-of-state black admits declined by .15 points. Black admits were the only race/ethnic category in which the out-of-state students initially had a higher average GPA, 3.47 for out-of-state black admits versus 3.42 for in-state black admits. After the Supreme Court's decisions, the in-state black admits average GPA was higher than their out-of-state counterparts.

The average GPA of in-state Asian admits increased by a marginally significant and substantively small .02 points, while the average GPA of out-of-state Asian admits declined by .08 points. The difference in the between-cohort differences between the average GPA of out-of-state Asian admits and in-state Asian admits declined by a tenth of a point. The difference between the average GPA of in-state Asian admits and out-of-state Asian admits in the period after the Supreme Court's decisions more than doubled the difference in average GPA between in-state Asian admits and out-of-state Asian admits in the period prior to the Supreme Court's decisions.

The pool of admitted students changed after the decisions in *Gratz v. Bollinger* and *Grutter v. Bollinger*. The relative strength of the University of Michigan's admitted class, however, did not change. Table 2.8 contains the yearly averages of the SAT and ACT for whites, blacks, and Asians.[18] A comparison of the values in Table 2.8 with the values in Table 2.5 supports this assertion. With respect to standardized test scores, the applicants that are granted admission to the University of Michigan outscore the national averages by more than 200 points on the SAT and by more than 5 points on the ACT. These differences hold for every race/ethnic category in each time period under consideration. Although Michigan's admitted class remained relatively strong in comparison to the national average, the between cohort changes in Michigan's admitted classes deserves consideration.

The changes in the averages for black admits are intriguing. Table 2.7 reveals that in-

[18]The SAT information was obtained from Kobrin et al. (2006). The ACT information was obtained from the following ACT sponsored universal resource locator: **http://www.act.org/news/data.html**.

state black admits possessed a higher average SAT score, average ACT score, and average GPA relative to the averages of in-state black admits from the period prior to the Supreme Court's decisions. Conversely, out-of-state black admits after the Supreme Court's decisions have lower averages relative to the out-of-state black admits from the period prior to the Supreme Court's decisions with respect to SAT score, ACT score and GPA. Table 2.4 shows that the average SAT score and ACT score for both in-state and out-of-state black applicants increased, while the average GPA of in-state black applicants increased and the average GPA of out-of-state black applicants remained stable across periods. Is there a cogent explanation that is consistent with these facts?

The University of Michigan's primary mission is to admit a sufficient **number** of academically talented students. This is a binding constraint. In addition, the University of Michigan desires to admit a sufficient number of minority students to reach critical mass, a sufficient **number** of minorities to yield the benefits of diversity. Suppose that the University has a minimum threshold for standardized test performance that is non-binding in the sense that there are sufficient numbers of black applicants that meet the criterion. After the Supreme Court's decisions, the number of black applicants decreased, while the average SAT score, average ACT score, and average GPA increased. In attempting to reach a critical mass, it is possible that average scores of the admit pool declines even as the average score of the pool of applicants increases, because both the lower scoring out-of-state black applicants are less likely to apply and critical mass depends on the **number** of under-represented minority applicants available to be admitted.

The above explanation of the outcomes with respect to the changes in the set of black admits, while plausible, is both illustrative and unwieldy. It is illustrative in that it highlights that any attempt to explain the changes in the admit data set requires one to speculate about the changes in the mapping from applicants to admits. The explanation is unwieldy in the sense that too many factors—for example, race/ethncity, time, standardized test scores, and Michigan residency—are in play simultaneously; there is no ceteris paribus condition. Further, one has to speculate on the importance of a certain factor in the admissions decision. I employ a version of the selection index to weigh certain factors in a manner similar to the method that the University of Michigan employed in determining undergraduate admissions prior to *Gratz v. Bollinger*, this allows me to reduce the number of factors under consideration. Examining the changes in the mapping from applicant to admit will aid in interpreting the observed changes in the pool of admitted applicants.

2.8.3 Admissions

Figure 2.21, Figure 2.22, and Figure 2.23 show the distributions of the quasi-selection index score for white applicants, black applicants, and Asian applicants, respectively, for the periods before and after the Supreme Court's decisions.[19] The distributions are remarkably similar across time periods; that is, for each race/ethnic category, the distributions of the selection index have basically the same shape.

White applicants, on average, have the highest selection index scores, 87.6 points in the period prior to the Supreme Court's decisions and 87.7 points in the period after the decisions. Asian applicants have the second highest average selection index scores, 83.3 points in the period prior to the decisions and 82.7 points in the period after the decision. Blacks have the lowest average selection index scores, 78.1 points in period prior to decisions and 79.1 points in the period after the decision.

Figure 2.24, Figure 2.25, and Figure 2.26 show the distributions of the selection index for white admits, black admits, and Asian admits, respectively, for the periods before and after the Supreme Court's decisions. There is far more inter-temporal variation in the distributions of selection index scores for a given race/ethnic category. In particular, the distribution of selection index scores for black admits changed. There is a huge spike at the modal value of 83 points for black admits for the period prior to the decisions. The distribution of selection index scores for blacks is much smoother in the period following the Supreme Court decisions.

[19]From this point on, the term selection index will refer to the quasi-selection index; unless, I explicitly indicate otherwise

White admits have the highest average selection index scores, 91.9 points in the period prior to the Supreme Court's decisions and 92.8 points in the period following the decisions. Asian admits have the second highest average selection index scores, 91.9 points in the period before the decision and 89.7 points in the period afterwards. Black admits have the lowest selection index scores, 84.7 points in the period before the decisions and 85.4 points in the period after the decisions.

Figures 2.21 – 2.26 allow me to determine the regions of "common support" for the race/ethnic groups. I evaluate and compare the conditional probabilities of admission for selection index scores between 74 and 104 points. This range of selection index scores provides sufficient support so that my numerical estimation procedure can produce both estimates of the conditional probability of admissions for a given selection index score and the accompanying confidence interval for the estimate. For example, in the period prior to the Supreme Court decisions, there were 11 black applicants with selection index scores that exceed 104 points, 5 applicants with 105 points, 3 applicants with 106 points, 2 applicants with 107 points, and 1 applicant with 108 points. In the period following the Supreme Court's decisions, there was a total of 4 black applicants with selection index scores in excess of 104 points, 2 applicants with 105 points, 1 applicant with 106 points, and 1 applicant with 107 points. The combination of such a small number of black applicants with the given selection score and the random sampling prevents my numerical technique from consistently generating estimates of the standard errors and confidence intervals for these values. Similar reasoning applies to white applicants and Asian applicants for scores lower than 74 points.

Figure 2.27 contains both the estimates of the conditional probability of admission and the associated ninety-five percent confidence interval for a given selection index score for the entire sample sans the Hispanic applicants and Hispanic admits. Both graphs have the S-shape as predicted by the model. The estimated probability of admission for applicants with a selection index score of 74 points is 15.0 percent for applicants from before the decision and 13.7 percent for applicants who applied after the decision. The difference is not statistically significant. For selection index scores that are greater than or equal to 75 points and less than or equal to 81 points, applicants from the period prior to the Supreme Court's decisions have higher probabilities of admission and these differences are statistically significant. Applicants from before the decisions with scores in this range had probabilities of admission that were, on average, less than twenty percent. The probabilities of admission for selection index scores in the 75–81 point range for applicants from the period prior to the Supreme Court's decisions—which range from 25.9 percent to 37.6 percent—are at least 10 percentage points higher than the estimated probabilities of admission for applicants with identical selection index scores from the period after the decisions. The differences are statistically significant.

There is considerable noise in the 83–95 point range, especially for the estimates from the period after the Supreme Court's decisions. Applicants from the period after the decisions with selection index scores of 83 points, 84 points, and 85 points have estimated probabilities of admission equal to 75.4 percent , 86.7 percent, and 89.9 percent, respectively. Applicants from the period before the decisions with selection index scores of 83 points, 84 points, and 85 points have estimated probabilities of admission equal to 53.6 percent , 71.4 percent, and 71.1 percent, respectively. The differences are statistically significant. Applicants from the period before the decisions with selection index scores of 86 points and 87 points who applied before the decisions, 63.2 percent and 60.2 percent versus 53.2 percent and 50.7 percent, respectively.

Applicants from the 2004, 2005 period with selection index scores between 89 points and 99 points generally have higher estimated probabilities of admission, with the exception of selection index score values of 92 points and 93 points. Applicants from the 2004, 2005 period have a higher probability of admission for the selection index score value of 94 points, 74.9 percent versus 69.0 percent. However, the difference in the estimated probabilities is not statistically significant. For selection index scores between 100 and 104 points, however, the estimated conditional probabilities of admission for applicants from the period before and after the Supreme Court's decisions—which are in excess of ninety percent—are statistically and substantively not different.

Some general patterns emerge upon examining Figure 2.27. First, for a given period, as you increase the selection index score, the probabilities form a S shape. Second, the probabilities are noisier for the period after the Supreme Court's decisions.

Figure 2.28 contains the estimates of the conditional probability of admissions for white applicants for the periods before and after the Supreme Court's decisions. The pattern is very similar to Figure 2.27. This is expected, as whites comprise the majority of both the applications and admits. For selection index scores between 75 points and 81 points, whites who applied in the period prior to the Supreme Court's decisions have higher estimated probabilities of admission. Whites who applied before the Supreme Court's decisions have higher probabilities of admission in this range relative to the overall pool of applicants with similar scores. Whites who applied after the Supreme Court's decisions have lower estimated probabilities of admission relative to the overall pool of applicants with scores in this range. For selection index scores between 82 points and 100 points, white applicants from the period after the Supreme Court's decisions generally have higher estimated probabilities of admission relative to white applicants from the period before the change in the admissions regime, with the exception of the following selection index scores: 87 points, 88 points, 93 points, and 94 points. Whites with selection index scores in excess of 100 points who applied after the decision also have slightly higher estimated probabilities of admission relative to whites who applied before the Supreme Court's decisions; however, the differences aren't statistically significant.

Figure 2.29 contains the estimates of the conditional probability of admissions for black applicants for the periods before and after the Supreme Court's decisions. The estimated probabilities of black applicants from before and after the Supreme Court applicants with scores at the lower end of the selection index are much greater than the estimated probabilities for both the overall pool of applicants and white applicants with similar scores regardless of the period under consideration. For example, a white applicant with a selection index score of 75 who applied before the decisions had an estimated probability of admission of 31.2 percent; a black applicant who applied during this period had an estimated probability of admission of 55.5 percent, a difference of 24.3 percentage points. Except for selection index score values between 79 points and 87 points, black applicants from the period following the Supreme Court's decisions have higher estimated probabilities of admissions for a given selection index score. In the range between 79 points and 87 points, the estimated probabilities of admissions are exceptionally high, with some values far in excess of one. Comparing Figure 22 and Figure 25 yields one possible explanation for this occurrence. The estimates of the conditional probability of admission for a given selection index score for a particular group is the ratio of the probability mass for a given selection index score for that particular group from the admit data set to analogous probability mass from the applicant data set multiplied by the probability of admission for that particular group. For black admits in the period prior to the Supreme Court decisions there is a spike in this range of scores. Even with this ratio being deflated by the probability of admission for blacks, the estimated conditional probability of admission exceeds one. Mechanically, this explains the occurrence. Also, I can't dismiss the possibility that admissions was especially generous towards black applicants in this range prior to the Supreme Court's decisions. Still, the estimated probabilities of admission for black applicants with selection scores in 79–87 point range from the period following the decision are all in excess of eighty percent with some estimates exceeding one. I conclude that black applicants continue to be admitted at relatively high rates.

Figure 2.30 contains the estimates of the conditional probability of admissions for Asian applicants for the periods before and after the Supreme Court's decisions. The estimated conditional probabilities of admissions for Asian applicants with relatively low selection index scores are low. For example, a black applicant with a selection index score of 74 points from the period before the Supreme Court's decision had an estimated probability of admission of 52.2 percent, while an Asian applicant from the same time period with an index score of 74 points had an estimated probability of admission of 2.7 percent. For selection index scores in the range of 74 points to 81 points, applicants from the period following the Supreme Court's decision have slightly higher estimated probabilities of admission ranging from 5.6 percent to 19.4 percent versus a range of 2.7 percent to 12.9 percent for Asian applicants who applied after the decisions. The differences in the estimated probabilities are not statistically significant. For selection index scores ranging from 82 points to 90 points, Asian applicants from the period following the decisions generally have higher estimated probabilities; however, the differences are larger, at least 10 percentage points, and statistically significant, with the exceptions of 86 points and 87 points. The values of the estimates far exceed one for Asian applicants after the Supreme Court's decisions with selection index scores of 88 points, 89 points, and 90 points. Asian applicants from the period prior to the Supreme Court's decisions with scores of 88 points, 89 points, and 90 points had estimated probabilities of admissions of 34.7 percent, 37.7 percent, and 40.5 percent, respectively. Asian applicants from the period before the Supreme Court's decisions with selection index scores in the 92 point to 98 point range have higher estimated probabilities of admission relative to Asian applicants with similar selection index scores. For values of the selection index in excess of 98 points, there are no statistically significant differences in the estimated probabilities of admission.

The following figures compare the estimated probabilities of admission of white, black, and Asian applicants. Figure 2.31 contains estimates of the conditional probability of admissions for black and white applicants from the period before the Supreme Court decision. Figure 2.32 contains estimates of the conditional probability of admissions for black and white applicants who applied under the admissions regime that came after the Supreme Court's decisions. Figure 2.33 and Figure 2.34 allow for comparison of the estimated probabilities of admission for white and Asian applicants for the periods before and after the Supreme Court's decisions.

Examining figure 2.31 reveals that black applicants have higher estimated conditional probabilities of admission for nearly the entire range of selection index scores. For example, black applicants with a selection index score of 74 had a 52.2 percent chance of being admitted, while a white applicant with the identical score had a 13.5 percent chance of being admitted, a difference of 38.7 percentage points. The gap between black and white applicants in the conditional probability of admission for selection index scores with values of 78 points to 88 points. Although the estimated conditional probabilities for black applicants over this range lie outside the unit interval, I conservatively interpret this as meaning that blacks were far more likely to be admitted relative to whites with selection index scores in this range. For selection index scores with values ranging from 90 points to 100 points, blacks had a considerable edge with respect to the probability of admissions. Over this range, the smallest difference occurred at 100 points. At values of the selection index that are greater than 100 points, the differences in the estimated probabilities of admission for black and white applicants, while high, are statistically indistinguishable from each other.

Figure 2.32 contains the estimated probabilities of admission for white and black applicants from the period following the Supreme Court's decisions. Black applicants, on average, have higher estimated probabilities of admission relative to their white counterparts. For example a black applicant with a selection index score of 74 points had a 68.9 percent probability of being admitted, while a white applicant with the identical selection index score had a 11.4 percent chance of being admitted, the probability of admission for blacks at this value of the selection index is slightly greater than six times the probability of admission for whites with the identical selection index score. In fact, for selection index scores with values less than 82 points, the gap in the conditional probability of admission between blacks and whites has widened, with black applicants gaining even more of an advantage. Blacks still maintain a relative advantage over whites in the range of scores from 83 points to 92 points. However, the gap is not nearly as large in magnitude as it was in the period prior to the Supreme Court's decisions. For scores in the range of 92 points to 95 points the difference in the estimated probabilities of admission increased. For selection index scores that are greater than 100 points, the conditional probabilities of admission for black applicants statistically different from white white applicants; however, as the estimates for black applicants exceed one and the estimates for white applicants are very close to one, I interpret this as meaning virtually all the applicants, black and white, with a selection index score this high were admitted.

Figure 2.33 contains estimates of the conditional probability of admissions for white and Asian applicants for the period prior to the Supreme Court's decisions in *Gratz v. Bollinger* and *Grutter v. Bollinger*. For each of the selection index scores in the interval that spans 74 points to 89 points, the estimated probability of admission for whites are more than double the estimated probability of admission for Asian applicants. For example, the estimated probabilities of admission of Asian applicants with selection index scores of 87 points, 88 points, and 89 points are 31.7 percent, 34.8 percent, and 37.8 percent, while the estimated probabilities of admission for white applicants with identical selection index scores are 64.8 percent, 79.1 percent and 79.3 percent, respectively. At a selection index score of 90 points, the estimated probability of admission for whites exceeds the estimated probability of admission for Asian applicants by more than twenty percentage points, 63.2 percent for whites versus 40.5 percent for Asians. For values of the selection index of 91 points to 95 points, the conditional probabilities of admissions are higher for Asian applicants. The difference in the estimated probability of admission between white applicants and Asian applicants with a selection index equal to 90 is 4 percentage points; this difference is not statistically significant. The difference in the estimated probability of admissions for Asian applicants with selection index score values of 92 to 95 points is substantially larger than the estimated probability of admissions for white applicants with selection index score values of 92 to 95 points; for example, the estimated probability of admissions for Asian applicants with a selection index score of 92 points is 86.2 percent, which is 25 percentage points larger than the estimated probability of admission for a white applicant from this period with the identical selection index score. Asian applicants have higher estimated probabilities of admission for selection index scores in excess of 95 points. The differences are small, on the order of a few percentage points, and statistically insignificant.

Figure 2.34 displays the conditional probabilities of admission for white and Asian applicants who applied during the period following the Supreme Court's decisions. The difference in the conditional probabilities of admission between white and Asian applicants with selection index scores less than 90 points who applied during the period prior to Supreme Court's decisions has decreased. A white applicant with a selection index score of 74 points who applied during the period after the decisions has an estimated probability of admission of 11.4 percent versus an estimated probability of admission of 5.6 percent for Asian applicants who applied during the same period. The difference is statistically significant, but the magnitude of the difference is significantly smaller than the difference between white and Asian applicants from the period prior to the decisions, 5.5 percentage points versus 9 percentage points. A similar pattern exists for scores in the range 75 points to 81 points. For selection index scores greater than 82 points and less than 86 points, the gap in the estimated probabilities of admission between white and Asian applicants increase. For example, the conditional probability of admission for a white applicant with a selection index score of 82 points is 54.7 percent versus 25.2 percent for a white applicant with an identical selection index score. In the range of scores from 88 points to 90 points, the estimated probabilities of admission for Asian applicants are very high, far outside of the unit interval. The probabilities for white applicants were also high in this range. For selection index scores greater than or equal to 91 points and less than or equal to 101 points, white applicants generally have higher estimated probabilities of admission. This is the reverse of the pattern of estimated probabilities between whites and Asians with scores in the range 91 points to 101 points during the period prior to the Supreme Court's decisions. For selection index scores greater than 101 points, the estimated probabilities of admission between white and Asian applicants, which are in excess of 90 percent, are statistically indistinguishable.

I have presented evidence that there were changes in the mapping from applicants to admits. The conditional probabilities of admission increased for black applicants with selection index scores less than 79 points and greater than 87 points. The increase in the probability of admission for applicants with relatively low selection index scores is consistent with the model outlined earlier. However, I also find that the conditional probability of admissions is higher for blacks with relatively high selection index scores who applied after the Supreme Court decisions.

The difference in the estimated probability of admission between white and black applicants with selection index scores less than 82 points increased in the period following the Supreme Court's decisions, with blacks gaining more of an advantage. The differences in the estimated probability of admission between white applicants and Asian applicants with selection index scores less than 90 points decreased over times. Black applicants still have a higher conditional probability of admissions after the Supreme Court decisions. This finding directly opposes the notion that the change in the admissions system will decrease the probability of admissions for blacks who choose to apply.

The difference in the probability of admissions between white and Asian applicants declined, especially for selection index scores less than 81 points. It isn't the case that the conditional probability of admissions increased for Asian applicants with selection index scores in this range. Rather, the conditional probability of admissions for white applicants with scores in this range declined.

2.9 Conclusion

Gratz v. Bollinger and *Grutter v. Bollinger* did two things. First, the decisions reaffirmed that obtaining the benefits of diversity is a sufficient reason to practice Affirmative

Action. Second, the decisions made clear that systems that mechanically assigned a fixed number of points to members of certain race/ethnic populations are proscribed.

The discussion about Affirmative Action, at least with respect to post-secondary education, is about access to highly selective institutions. Examining the University of Michigan offers the opportunity to examine how applications and admissions are impacted at a highly selective institution that has publicly demonstrated its commitment to using race in the admissions process.

I document how the Applicant pool changed at the University of Michigan. Both the composition and the size of the applicant pool changed. That is, the applicant pool after the Supreme Court's decisions have fewer students with higher standardized test scores. This applies especially to black applicants, the group with the largest percentage decline in application levels and also had the largest absolute gains with respect to both average ACT and average SAT scores.

I find that the pool of admitted students has changed drastically, and these changes vary with respect race/ethnic membership and the applicant's state of residence. In most cases, the in-state students drastically improved their standing with respect to standardized test scores.

I use a version of the University of Michigan's selection index to classify applicants and admits and compute consistent estimates of the conditional probability of admissions. Using this metric and comparing the estimates of the conditional probabilities of admission for applicants who applied in the period after the Supreme Court's decisions with the estimates of the conditional probabilities of applicants who applied before the decisions, I find that there are differences. White applicants with low selection index scores had lower probabilities of being admitted in the period following the Supreme Court decisions. Black applicants with relatively low selection index scores experienced an increase in the conditional probability of admission. The difference in the conditional probability of admissions between white and Asian applicants with relatively low selection index scores declined.

At a minimum, I conclude that the holistic review that the University of Michigan employed after the Supreme Court's decisions did not reduce the probability of admission for applicants. In particular, there is no evidence that the conditional probability of admission for black applicants declined. The benefits of diversity, however, depends on there being a critical mass of minorities. Hence, it is important that institutions that are interested in securing the benefits of diversity take steps to ensure that minority students know that there is a place for them. This is the greatest lesson to be learned from the events at the University of Michigan.

2.10 Tables

Table 2.1: **Academic Quality Variables**

		Quality Variables				
Period	**Year**	GPA	ACT	SAT	SAT-V	SAT-M
Pre	**2000**	3.52	27.06	1275.10	624	651
	2001	3.53	27.18	1283.22	628	655
	2002	3.55	27.12	1289.94	629	661
	2003	3.56	27.44	1293.62	633	661
Post	**2004**	3.60	27.79	1301.99	639	663
	2005	3.58	27.87	1309.17	642	667

Note: The averages are derived from the Applications data set.

Table 2.2: **Descriptive Statistics from the Applications Data Set**

Variables	2000-2003 Before Decisions	2004,2005 After Decisions	Difference
Average SAT Score	1285.62	1305.78	20.16***
	(144.00)	(142.25)	(1.12)
Average ACT Score	27.23	27.83	.60***
	(3.86)	(3.65)	(.03)
Average GPA	3.51	3.49	$-$.01***
	(.532)	(.689)	.004)
Proportion Male	.507	.501	$-$.006*
	(.500)	(.500)	(.003)
Proportion White	.661	.643	$-$.018***
	(.473)	(.479)	(.003)
Proportion Black	.070	.058	$-$.012***
	(.255)	(.235)	(.002)
Proportion Hispanic	.035	.038	.003**
	(.184)	(.191)	(.001)
Proportion Asian	.150	.154	.004*
	(.357)	(.361)	(.002)
Proportion In-state	.398	.404	.006**
	(.489)	(.491)	(.003)
N	73097	32907	–

Notes: Measures derived from 90 percent random sample of Applications from the 2000-2005 cohorts.
Sample includes applications with valid GPA and Standardized Test Score
In columns two and three, parentheses contain standard deviations.
In column four, parentheses contain standard errors.

Table 2.3: **Standardized Test Scores and GPAs of Applicants by Race/Ethnicity**

	2000-2003 Before Decisions	2004,2005 After Decisions	Difference
White			
Average SAT Score	1291.18	1307.84	16.76***
	(131.67)	(132.52)	(1.32)
Average ACT Score	27.81	28.23	.430***
	(3.36)	(3.30)	(.034)
High School GPA	3.57	3.55	−.012***
	(.463)	(.625)	(.004)
Black			
Average SAT Score	1107.98	1135.71	27.74***
	(174.01)	(167.74)	(5.92)
Average ACT Score	22.24	23.21	.984***
	(4.19)	(3.99)	(.127)
High School GPA	3.18	3.21	.019
	(.594)	(.718)	(.017)
Hispanic			
Average SAT Score	1221.12	1238.95	17.83***
	(148.05)	(148.76)	(5.96)
Average ACT Score	25.66	26.24	.577***
	(3.83)	(3.78)	(.171)
High School GPA	3.37	3.36	-.010
	(.554)	(.703)	(.021)
Asian			
Average SAT Score	1320.54	1344.68	24.14***
	(134.39)	(131.29)	(2.42)
Average ACT Score	27.79	28.40	.612***
	(3.62)	(3.71)	(.094)
High School GPA	3.44	3.39	−.042***
	(.672)	(.851)	(.012)

Notes: Significance Levels: * ⇒ 10%   ** ⇒ 5%   *** ⇒ 1%
In columns two and three, the parentheses contain standard deviations.
In column four, the parentheses contain standard errors.
Source of Data: See Notes for Table 1

Table 2.4: **Standardized Test Scores and GPAs of Applicants by Race/Ethnicity and Residency**

	SAT Scores			ACT Scores			GPA		
	2000-2003 Before Decision	2004,2005 After Decision	Between-Period Difference	2000-2003 Before Decision	2004,2005 After Decision	Between-Period Difference	2000-2003 Before Decision	2004,2005 After Decision	Between-Period Difference
White									
In-State	1263.98	1272.75	8.77***	27.55	27.89	.34***	3.66	3.66	.001
	(1.41)	(2.15)	(2.57)	(.02)	(.03)	(.04)	(.003)	(.005)	(.006)
Out-of-State	1301.84	1322.28	20.44***	28.24	28.84	.60***	3.50	3.47	−.03***
	(.82)	(1.27)	(1.51)	(.03)	(.05)	(.05)	(.003)	(.006)	(.007)
Residency Difference	37.86***	49.53***	11.67***	.69***	.95***	.26***	−.16***	−.19***	−.03***
	(1.64)	(2.49)	(2.98)	(.04)	(.06)	(.07)	(.004)	(.008)	(.009)
Black									
In-State	1067.67	1094.57	26.90***	21.70	22.86	1.16***	3.25	3.30	.05**
	(4.76)	(7.81)	(9.15)	(.08)	(.13)	(.15)	(.01)	(.02)	(.02)
Out-of-State	1140.48	1164.20	23.72***	23.54	23.97	.43**	3.09	3.09	.001
	(4.18)	(5.98)	(7.29)	(.12)	(.18)	(.22)	(.01)	(.02)	(.03)
Residency Difference	72.81***	69.63***	−3.18	1.84***	1.11***	−.73***	−.16***	−.21***	−.05
	(6.33)	(9.83)	(11.70)	(.14)	(.22)	(.23)	(.02)	(.03)	(.04)
Hispanic									
In-State	1206.07	1226.10	20.03	25.49	26.12	.63***	3.49	3.54	.05*
	(8.37)	(11.76)	(14.43)	(.14)	(.20)	(.24)	(.14)	(.20)	(.03)
Out-of-State	1224.32	1241.83	17.51***	25.83	26.34	.51**	3.32	3.28	−.04
	(3.73)	(5.38)	(6.55)	(.15)	(.19)	(.24)	(.01)	(.03)	(.03)
Residency Difference	18.25**	15.73	−2.52	.34**	.22	−.12	−.17***	−.26***	−.09**
	(9.16)	(12.92)	(15.85)	(.20)	(.28)	(.34)	(.02)	(.04)	(.05)
Asian									
In-State	1297.42	1321.03	23.61***	27.44	28.17	.73***	3.63	3.66	.03**
	(3.75)	(5.23)	(6.44)	(.08)	(.12)	(.14)	(.008)	(.014)	(.016)
Out-of-State	1325.71	1349.99	24.28***	28.12	28.62	.50***	3.38	3.31	−.07***
	(1.45)	(2.05)	(2.55)	(.07)	(.11)	(.13)	(.008)	(.015)	(.017)
Residency Difference	28.29***	28.96***	.67	.68***	.45***	−.23	−.25***	−.35***	−.10***
	(4.02)	(5.64)	(6.92)	(.11)	(.16)	(.19)	(.011)	(.020)	(.023)

Notes: Significance Levels: * ⇒ 10%   ** ⇒ 5%   *** ⇒ 1%
The parentheses contain standard errors.
Residency Difference = Out-of-State - In-State Between Cohort Difference = After Cohort - Before Cohort
ACT scores range from 1 to 36.
There are some discrepancies due to rounding
Source of Data: See Table 1 Footnote 1

Table 2.5: **Descriptive Statistics for Admitted Students**

Variables	2000-2003 Before Decisions	2004,2005 After Decisions	Difference
Average SAT Score	1310.52	1328.19	17.67***
	(131.00)	(140.10)	(1.32)
Average ACT Score	28.27	28.71	.44***
	(3.57)	(3.27)	(.03)
Average GPA	3.72	3.74	.02***
	(.359)	(.386)	(.003)
Proportion Male	.526	.547	.021***
	(.499)	(.498)	(.004)
Proportion White	.687	.648	−.039***
	(.464)	(.478)	(.004)
Proportion Black	.089	.055	−.034***
	(.285)	(.228)	(.002)
Proportion Hispanic	.034	.065	.031***
	(.180)	(.247)	(.002)
Proportion Asian	.102	.127	.025***
	(.303)	(.333)	(.003)
Proportion In-state	.456	.429	−.026***
	(.489)	(.495)	(.004)
N	40994	22161	−

Notes: Measures derived from 90 percent random sample of Admits from the 2000-2005 cohorts.
Sample includes applications with valid GPA and Standardized Test Score
In columns two and three, parentheses contain standard deviations.
In column four, parentheses contain standard errors.

Table 2.6: **Standardized Test Scores and GPAs of Admits by Race/Ethnicity**

	2000-2003 Before Decisions	2004,2005 After Decisions	Difference
White			
Average SAT Score	1311.60	1343.30	31.70***
	(119.605)	(134.48)	(1.56)
Average ACT Score	28.98	28.94	−.04
	(3.01)	(2.77)	(.035)
High School GPA	3.76	3.78	.02***
	(.463)	(.625)	(.003)
Black			
Average SAT Score	1166.99	1155.97	−11.01*
	(147.20)	(153.56)	(6.50)
Average ACT Score	23.14	23.90	.76***
	(3.70)	(3.60)	(.135)
High School GPA	3.44	3.41	.03**
	(.388)	(.445)	(.014)
Hispanic			
Average SAT Score	1235.20	1165.65	−69.55***
	(137.55)	(117.65)	(5.67)
Average ACT Score	26.10	26.75	.65***
	(3.60)	(3.34)	(.189)
High School GPA	3.50	3.56	.06***
	(.432)	(.326)	(.014)
Asian			
Average SAT Score	1376.72	1369.72	7.00**
	(117.52)	(103.15)	(2.82)
Average ACT Score	29.02	29.58	.56***
	(3.20)	(3.22)	(.121)
High School GPA	3.76	3.70	−.06***
	(.510)	(.599)	(.014)

Notes: Significance Levels: * ⇒ 10% ** ⇒ 5% *** ⇒ 1%
In columns two and three, the parentheses contain standard deviations.
In column four, the parentheses contain standard errors.
Source of Data: See Notes for Table 4

Table 2.7: **Means and Differences of standardized test scores and GPAs of Admits by Race/Ethnicity and Residency**

	SAT Scores			ACT Scores			GPA		
	2000-2003 Before Decision	2004,2005 After Decision	Between-Cohort Difference	2000-2003 Before Decision	2004,2005 After Decision	Between-Cohort Difference	2000-2003 Before Decision	2004,2005 After Decision	Between-Cohort Difference
White									
In-State	1297.31	1300.18	2.86	28.55	28.67	.12***	3.81	3.82	.002
	(1.56)	(2.29)	(2.78)	(.03)	(.04)	(.05)	(.002)	(.004)	(.004)
Out-of-State	1318.14	1361.83	43.69***	29.70	29.45	−.25***	3.71	3.75	.04***
	(.94)	(1.58)	(1.84)	(.03)	(.04)	(.05)	(.003)	(.004)	(.005)
Residency Difference	20.82***	61.64***	40.82***	1.15***	.78***	−.37***	−.10***	−.06***	.04***
	(1.83)	(2.78)	(3.33)	(.04)	(.05)	(.07)	(.003)	(.005)	(.006)
Black									
In-State	1092.95	1127.02	34.07***	22.80	23.67	.87***	3.42	3.46	.04**
	(4.76)	(7.70)	(9.05)	(.08)	(.13)	(.15)	(.01)	(.01)	(.02)
Out-of-State	1231.65	1195.73	−35.92***	24.91	24.80	−.11	3.47	3.31	−.16***
	(2.75)	(8.11)	(8.56)	(.12)	(.18)	(.22)	(.01)	(.01)	(.03)
Residency Difference	138.70***	68.72***	−69.98***	2.10***	1.13***	−.97***	.05***	−.15***	−.20***
	(5.50)	(11.18)	(12.46)	(.19)	(.27)	(.33)	(.01)	(.03)	(.03)
Hispanic									
In-State	1217.87	1230.76	12.90	25.80	26.60	.80***	3.57	3.62	.05**
	(8.67)	(11.14)	(14.12)	(.14)	(.19)	(.24)	(.14)	(.18)	(.02)
Out-of-State	1243.72	1156.07	−87.65***	26.79	27.02	.23	3.43	3.55	.12***
	(5.27)	(3.40)	(6.27)	(.14)	(.19)	(.24)	(.02)	(.01)	(.02)
Residency Difference	25.85**	−74.69***	−100.55***	.99***	.42	−.57	−.14***	−.07***	.07**
	(10.14)	(11.64)	(15.44)	(.24)	(.31)	(.40)	(.02)	(.02)	(.03)
Asian									
In-State	1336.24	1353.54	17.30**	28.76	29.37	.61***	3.80	3.82	.02*
	(4.02)	(5.68)	(6.96)	(.09)	(.12)	(.15)	(.007)	(.011)	(.013)
Out-of-State	1397.58	1374.69	−22.90***	29.73	29.99	.26	3.74	3.66	−.08***
	(1.95)	(2.03)	(2.81)	(.12)	(.15)	(.19)	(.012)	(.015)	(.019)
Residency Difference	61.34***	21.15***	−40.19***	.97***	.62***	−.35	−.06***	−.16***	−.10***
	(4.47)	(6.03)	(7.50)	(.15)	(.19)	(.25)	(.014)	(.018)	(.023)

Note: Significance Levels: * ⇒ 10% ** ⇒ 5% *** ⇒ 1%
Notes: The parentheses contain standard errors.
Residency Difference = Out-of-State - In-State
Between Cohort Difference = After Cohort - Before Cohort
ACT scores range from 1 to 36
GPA is calculated from high school transcripts by the Office of Undergraduate Admissions.
There are some discrepancies due to rounding
Source of Data: See Table 1 Footnote 1

Table 2.8: **National Average of SAT and ACT by Year**

	Year					
	2000	2001	2002	2003	2004	2005
White						
Average SAT	1058	1060	1060	1063	1055	1068
Average ACT	21.8	21.8	21.7	21.7	22.7	22.8
Black						
Average SAT	860	859	857	857	857	864
Average ACT	17	16.9	16.8	16.9	17.8	17.7
Asian						
Average SAT	1064	1067	1070	1083	1084	1091
Average ACT	21.8	21.8	21.7	21.7	22.7	22.5

2.11 Figures

Figure 2.1: **Applicants by Race/Ethnicity**

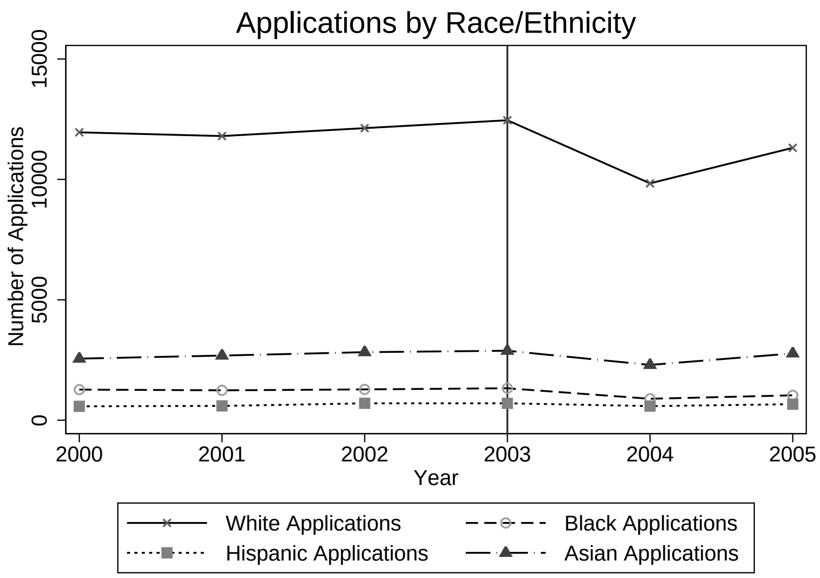


Figure 2.2: **Percent Change in Applications by Race/Ethnicity**

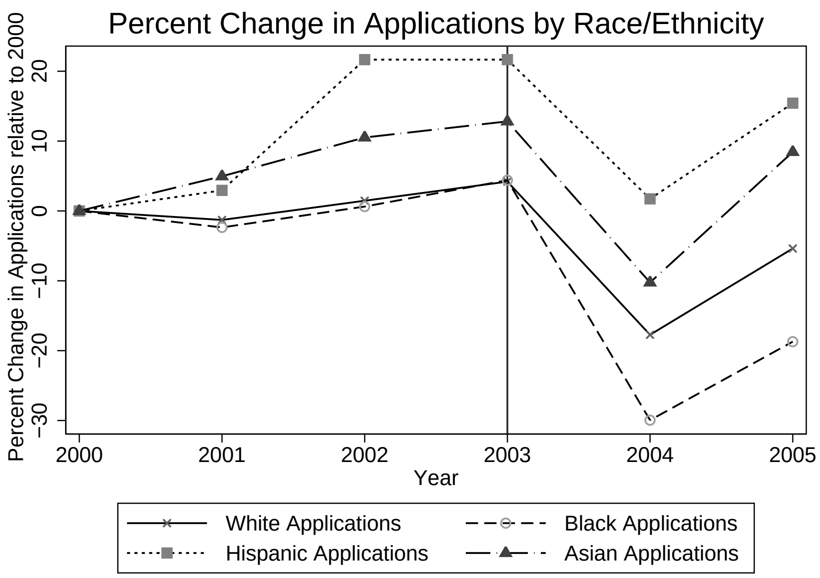


Figure 2.3: **SAT Score Distributions for Black Applicants**

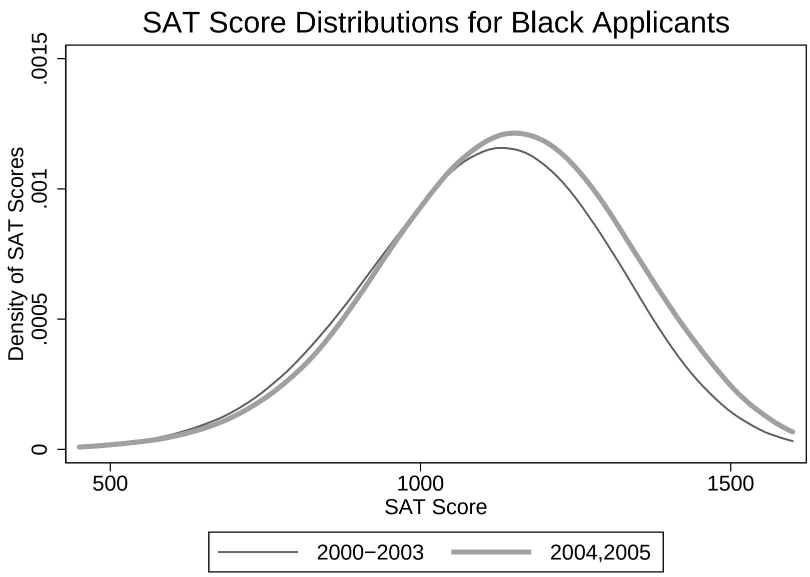


Figure 2.4: **SAT Score Distributions for White Applicants**

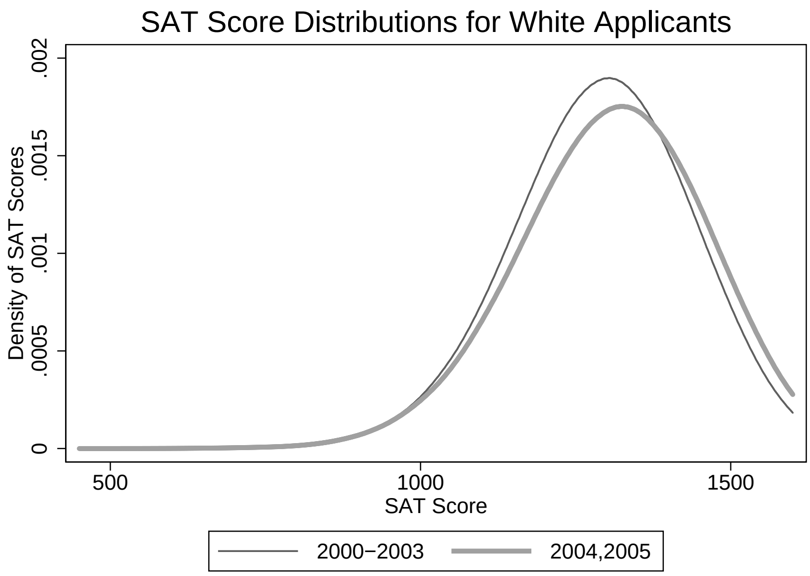


Figure 2.5: **SAT Score Distributions for Hispanic Applicants**

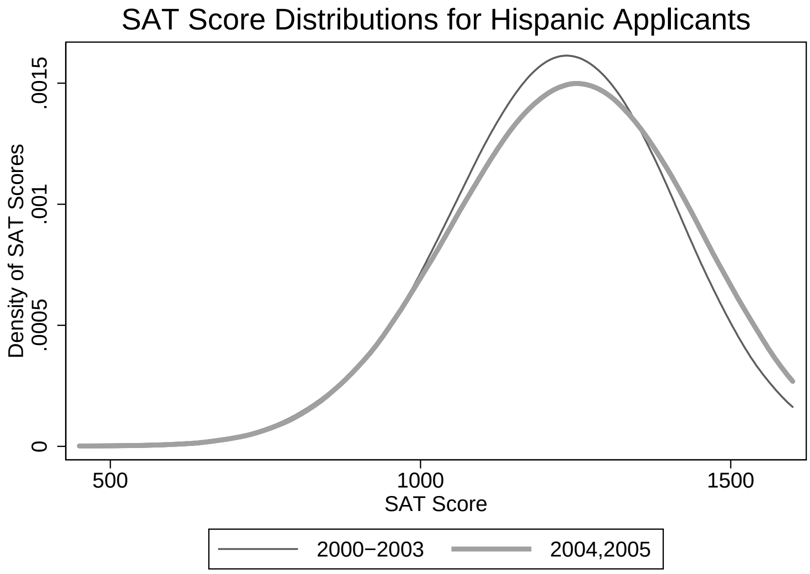


Figure 2.6: **SAT Score Distributions for Asian Applicants**

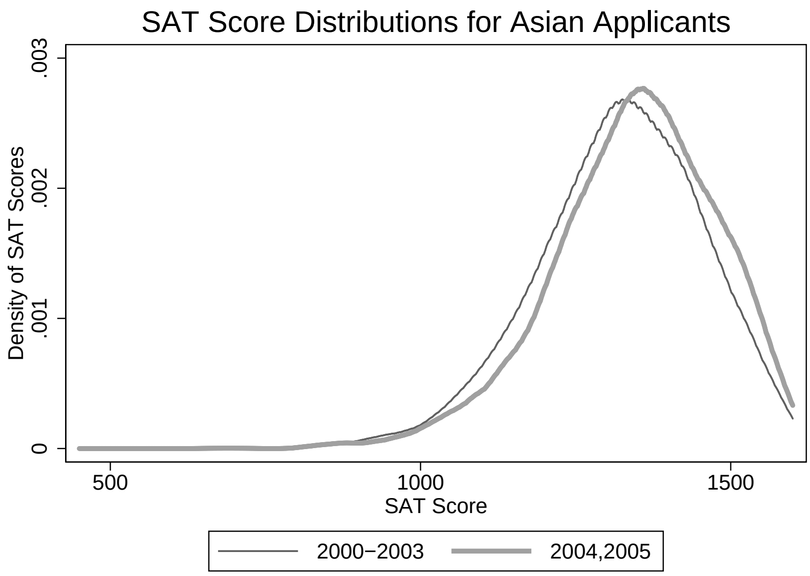


Figure 2.7: **ACT Score Distributions for Black Applicants**

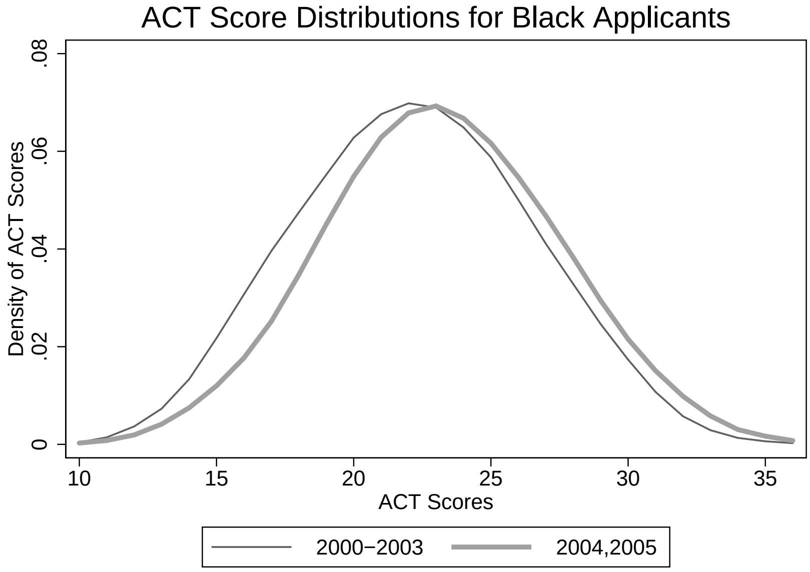


Figure 2.8: **ACT Score Distributions for White Applicants**

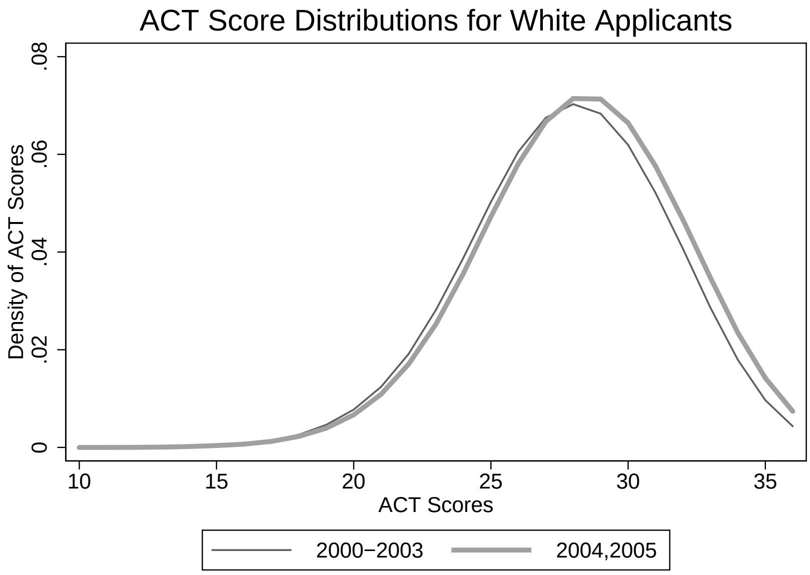


Figure 2.9: **ACT Score Distributions for Hispanic Applicants**

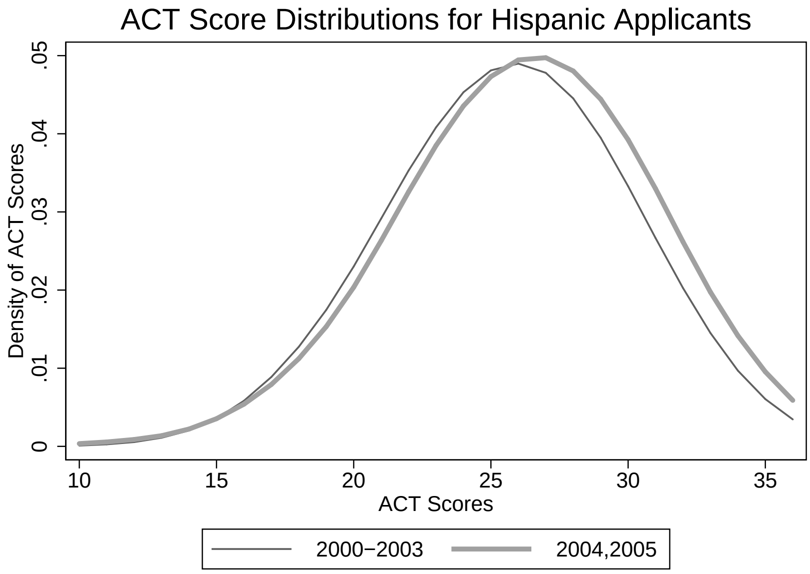


Figure 2.10: **ACT Score Distributions for Asian Applicants**

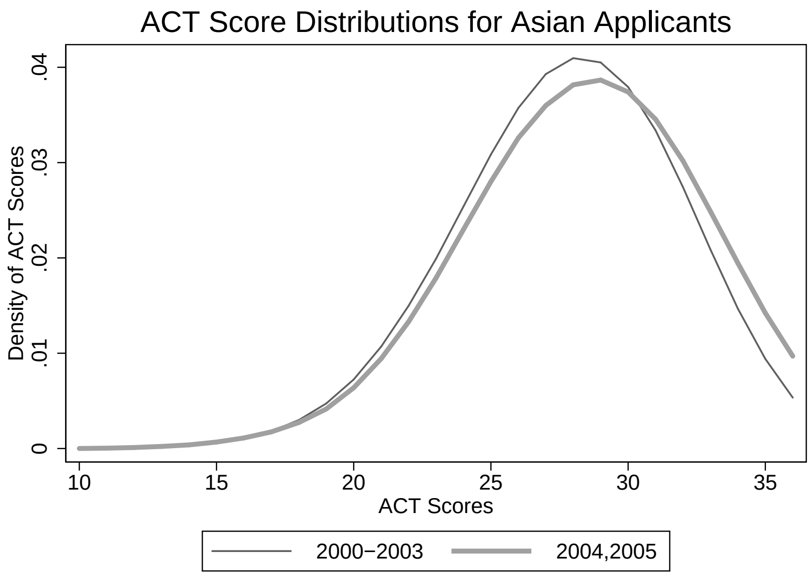


Figure 2.11: **Admits by Race/Ethnicity**

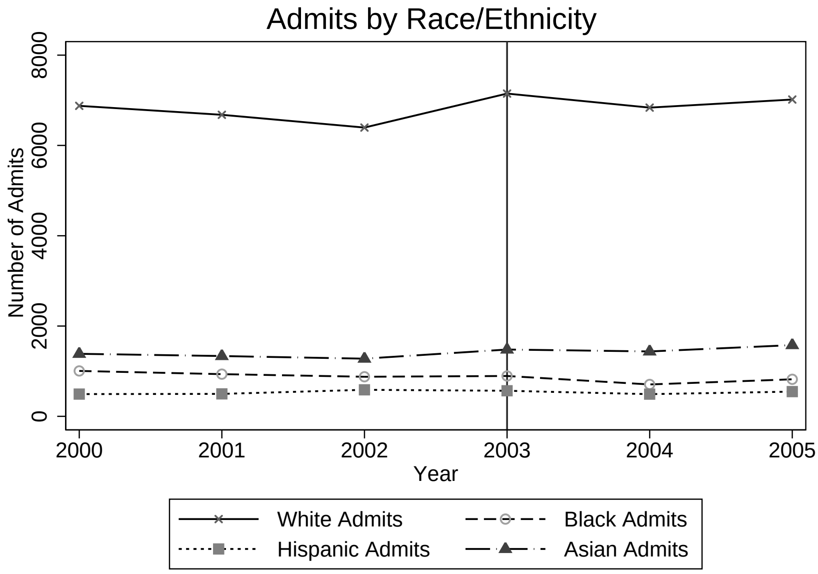


Figure 2.12: **Percent Change in Admits by Race/Ethnicity**

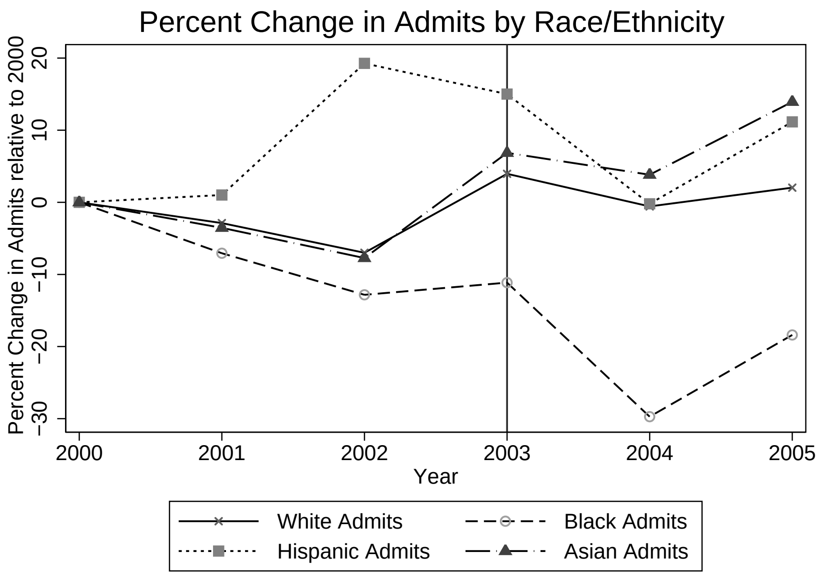


Figure 2.13: **SAT Score Distributions for Black Admits**

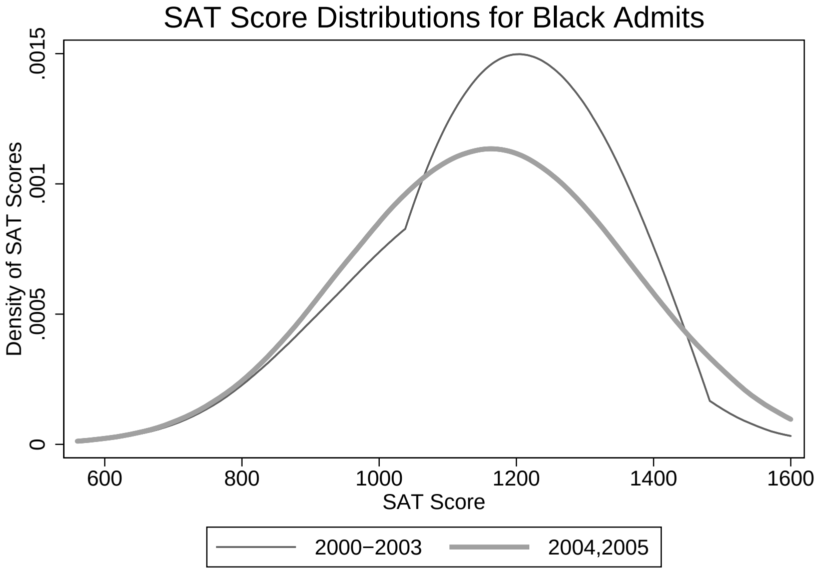


Figure 2.14: **SAT Score Distributions for White Admits**

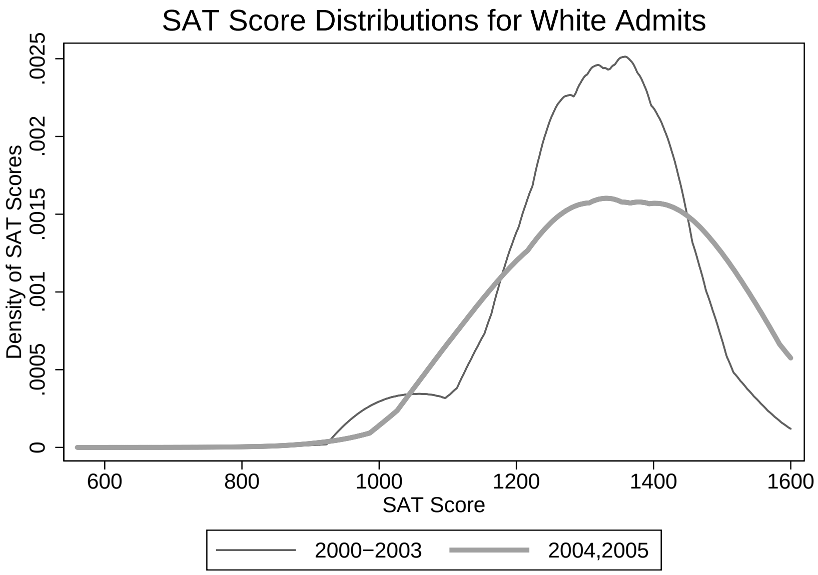


Figure 2.15: **SAT Score Distributions for Hispanic Admits**

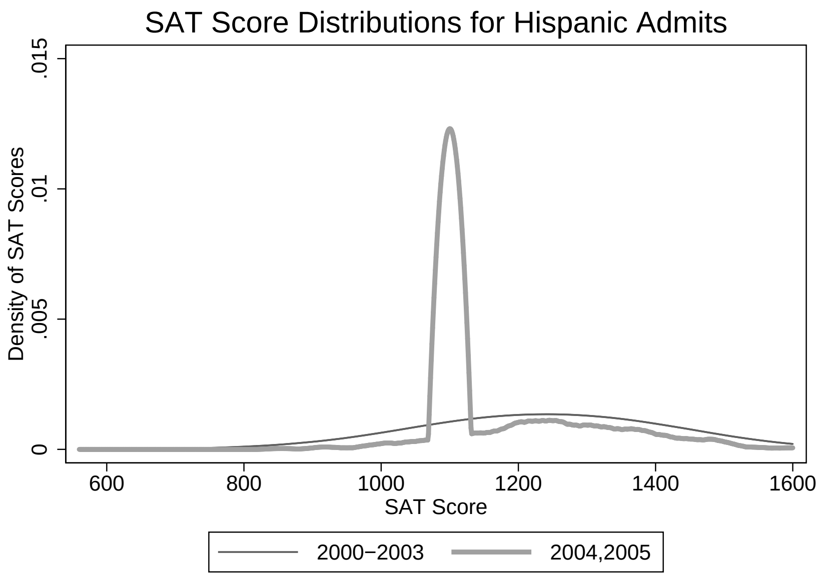


Figure 2.16: **SAT Score Distributions for Asian Admits**

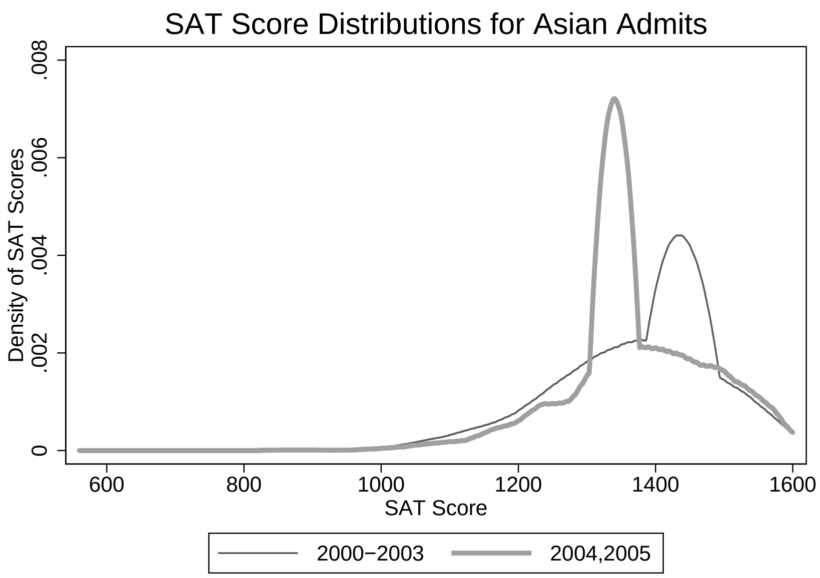


Figure 2.17: **ACT Score Distributions for Black Admits**

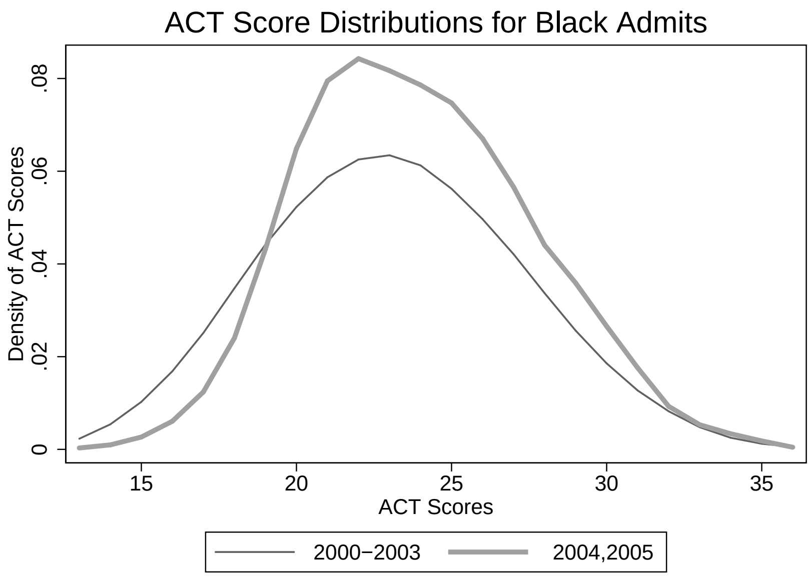


Figure 2.18: **ACT Score Distributions for White Admits**

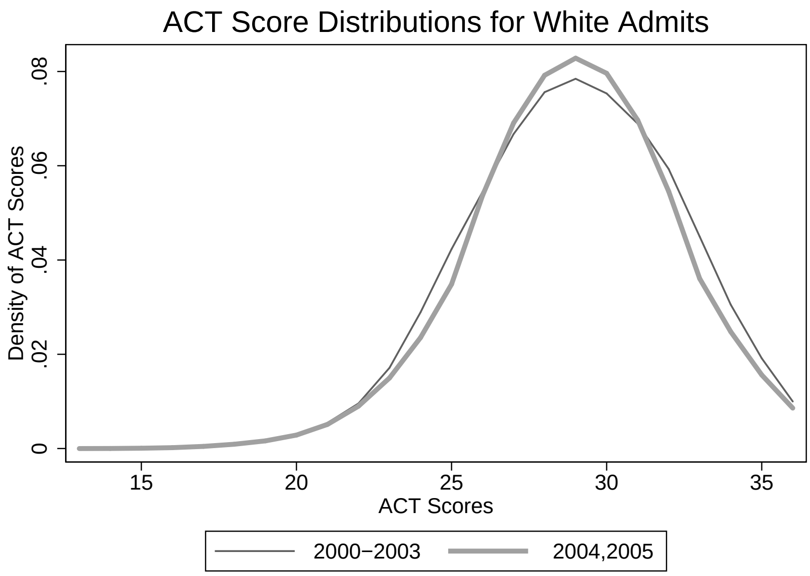


Figure 2.19: **ACT Score Distributions for Hispanic Admits**

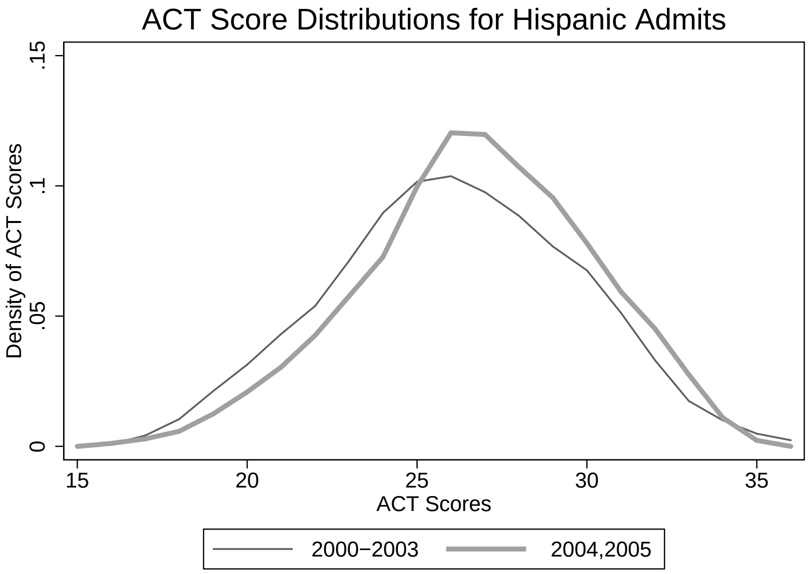


Figure 2.20: **ACT Score Distributions for Asian Admits**

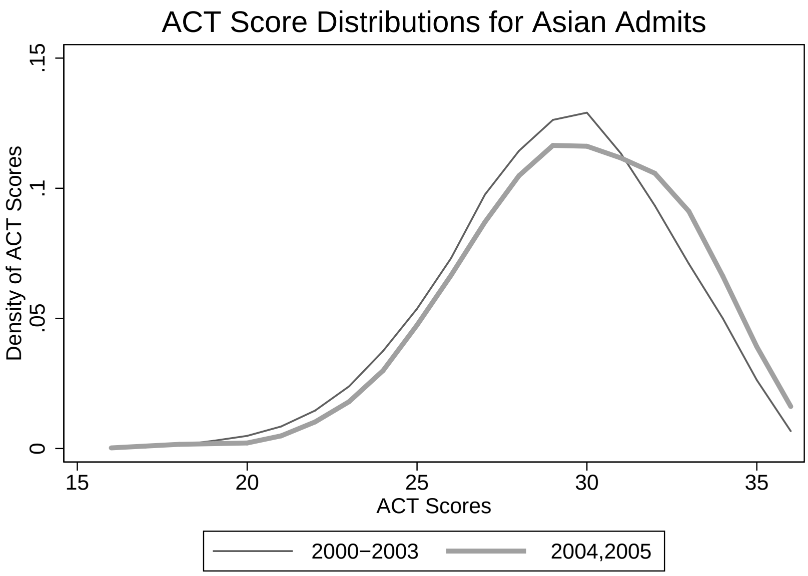


Figure 2.21: **Selection Index Distributions for White Applicants**

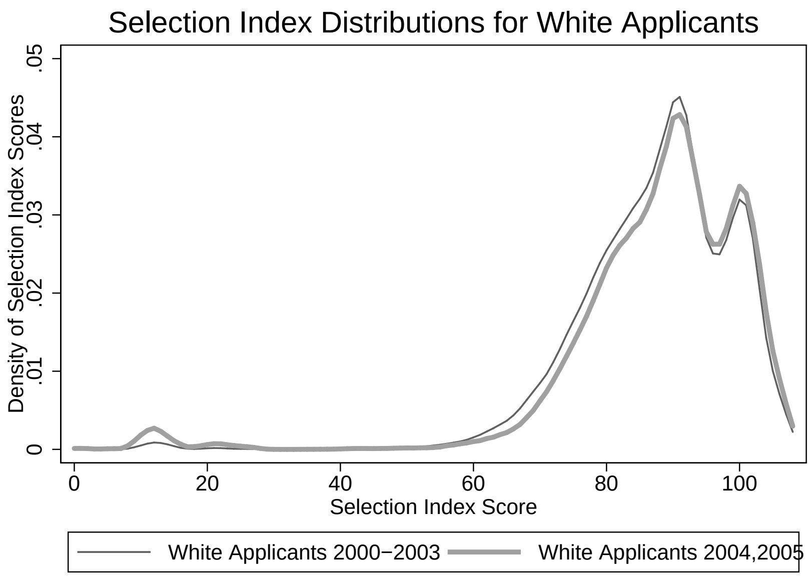


Figure 2.22: **Selection Index Distributions for Black Applicants**

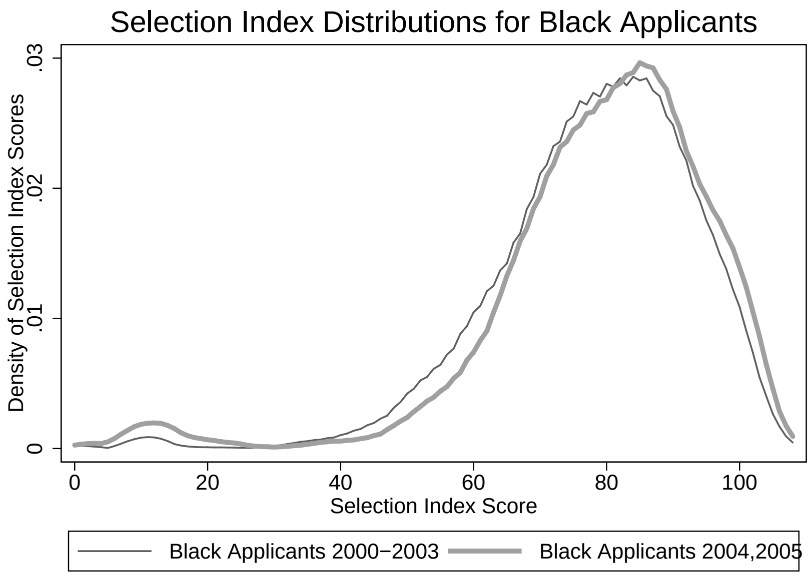


Figure 2.23: **Selection Index Distributions for Asian Applicants**

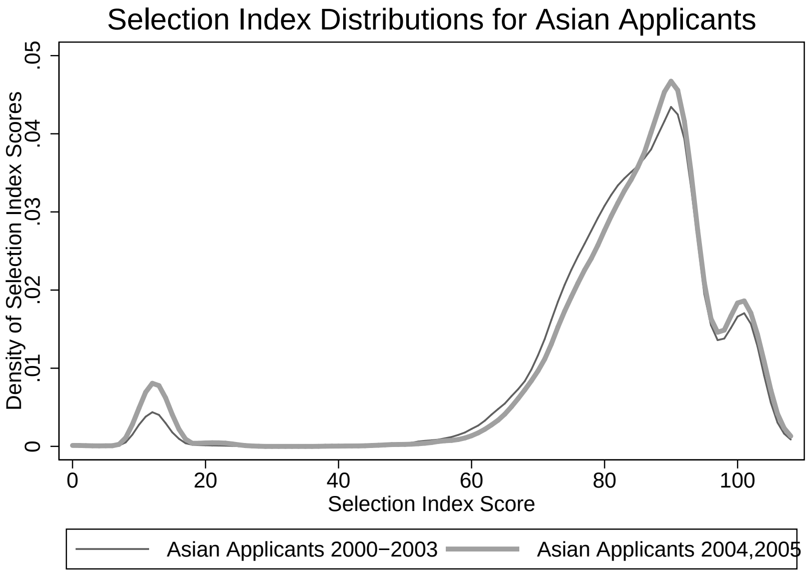


Figure 2.24: **Selection Index Distributions for White Admits**

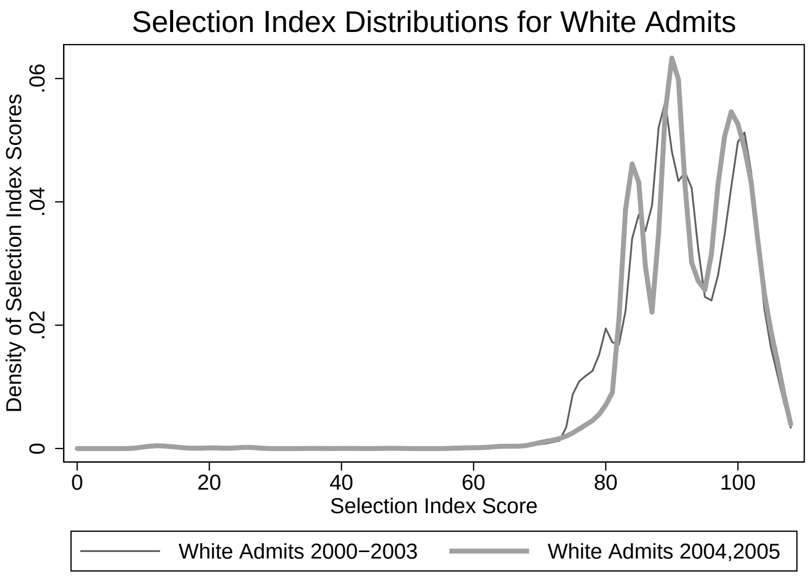


Figure 2.25: **Selection Index Distributions for Black Admits**

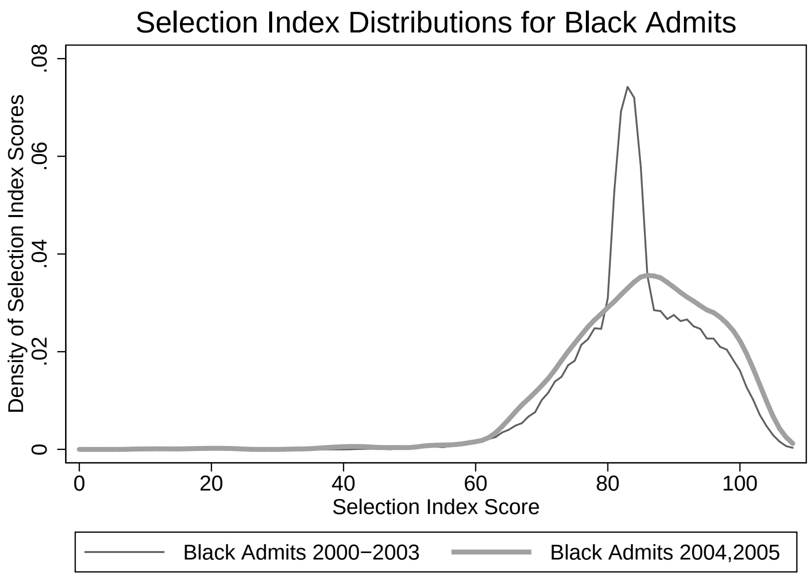


Figure 2.26: **Selection Index Distributions for Asian Admits**

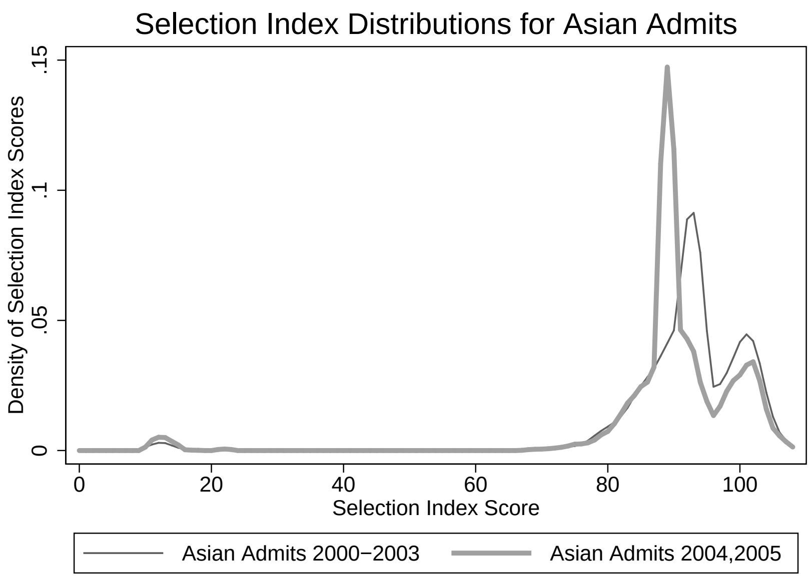


Figure 2.27: **Conditional Probability of Admissions**

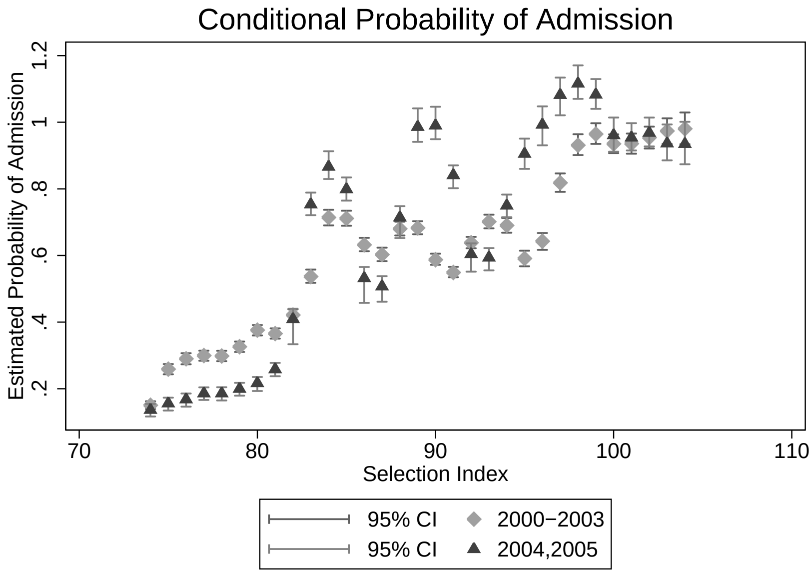


Figure 2.28: **Probability of Admission for Whites**

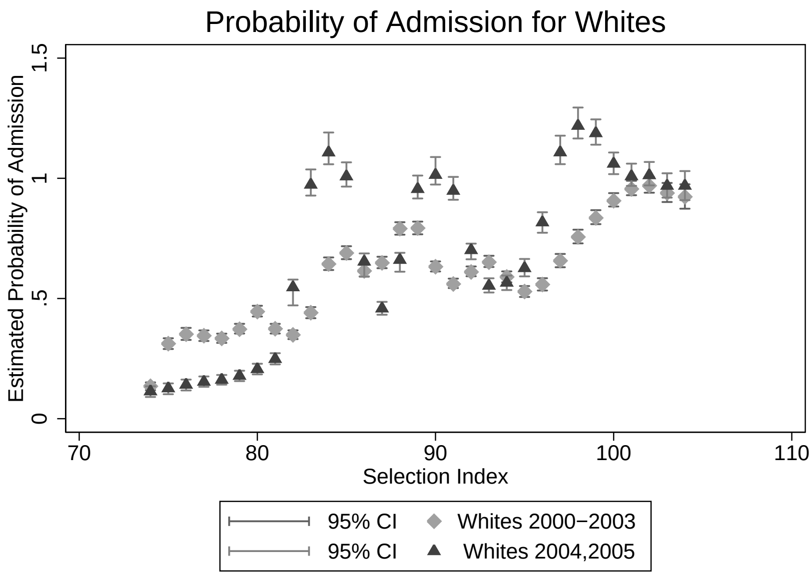


Figure 2.29: **Probability of Admission for Blacks**

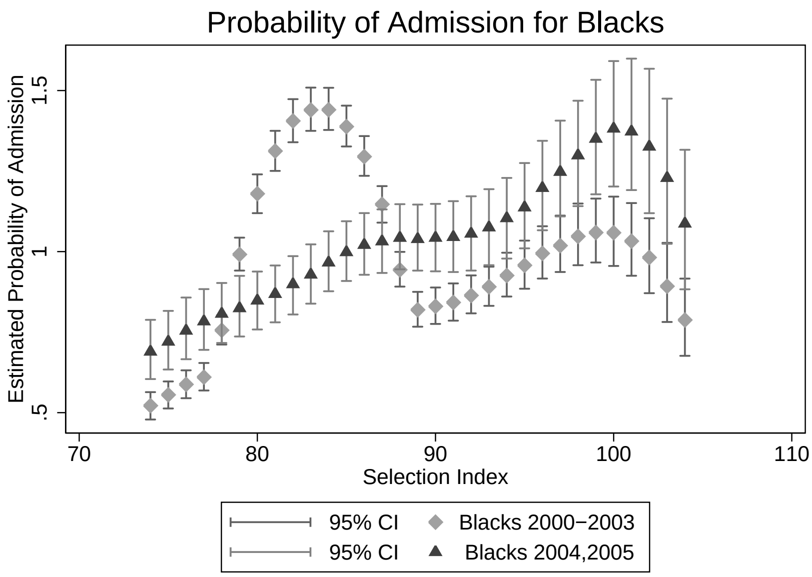


Figure 2.30: **Probability of Admission for Asians**

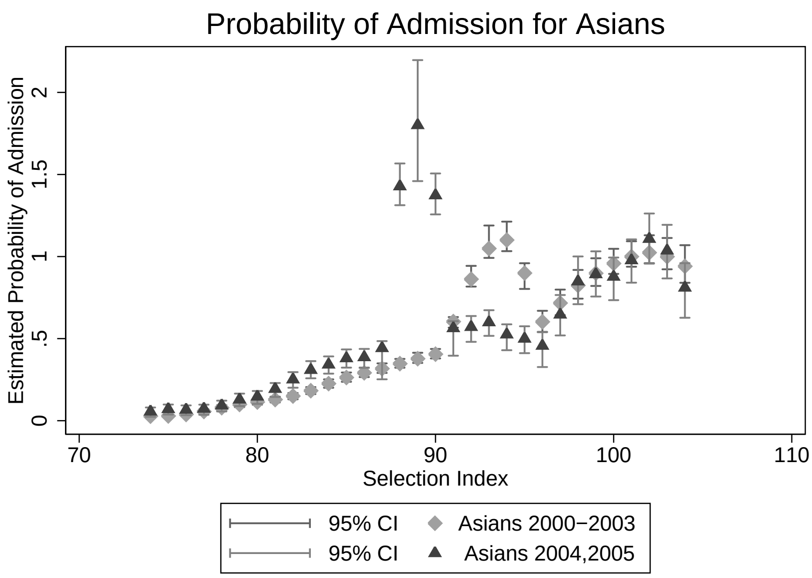


Figure 2.31: **White vs. Black Admission Probabilities-Pre**

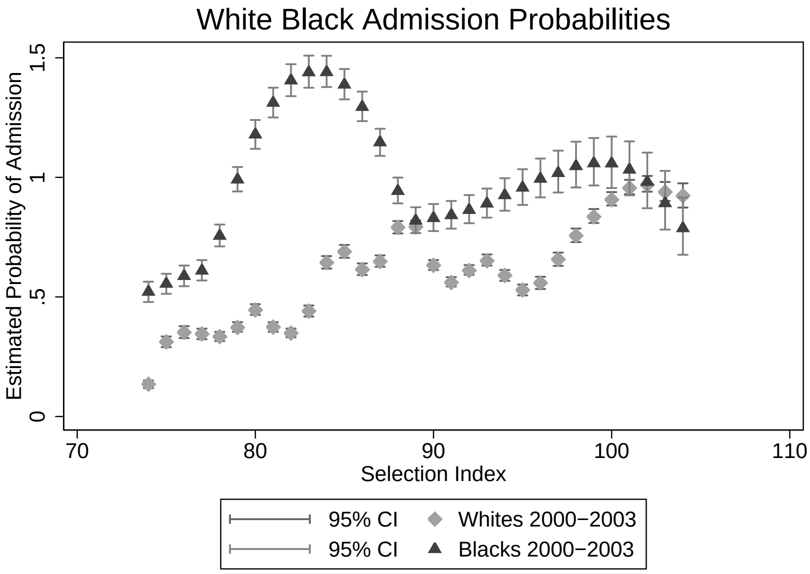


Figure 2.32: **White vs. Black Admission Probabilities-Post**

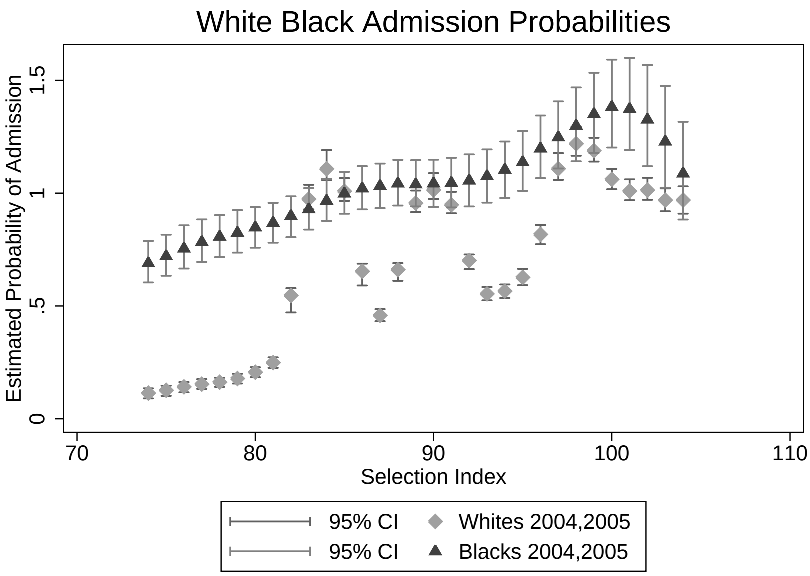


Figure 2.33: **White vs. Asian Admission Probabilities-Pre**

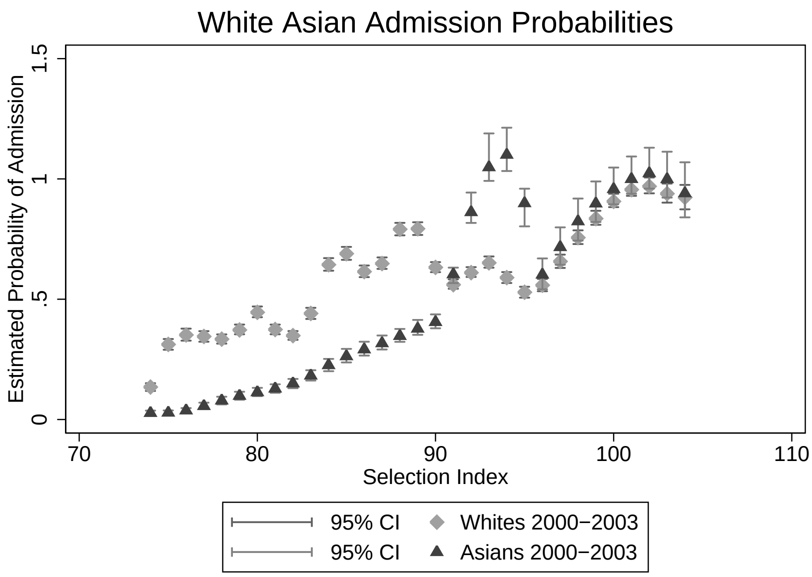
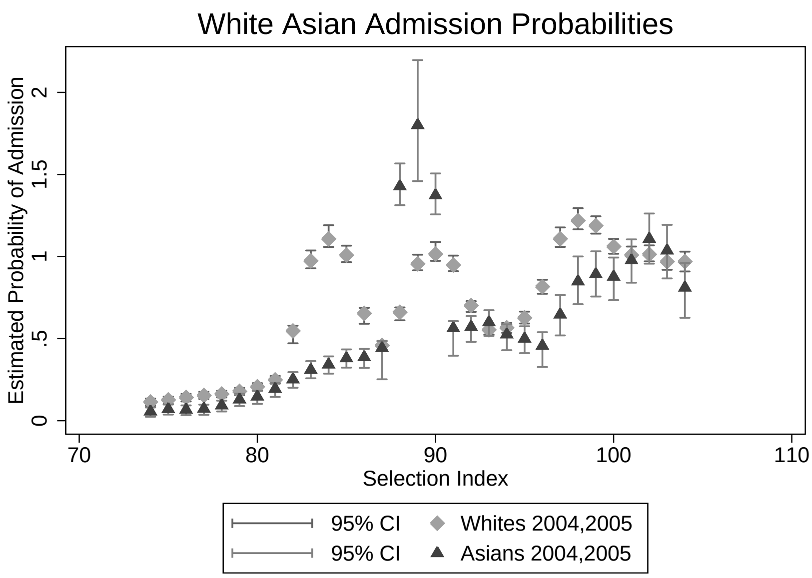


Figure 2.34: **White vs. Asian Admission Probabilities-Post**



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CHAPTER III

Estimating the responsiveness of college applications to the likelihood of acceptance and financial assistance: Evidence from Texas

3.1 Introduction

The end of affirmative action in Texas due to the 1996 *Hopwood v. Texas* decision led to precipitous drops in minority enrollment at the University of Texas at Austin and Texas A&M University-College Station. In order to reverse the decline in minority enrollment at Texas's elite public institutions, the Texas legislature passed *House Bill 588* or the Top Ten Percent Rule (TTPR) which was signed into law on May 20, 1997 by then governor George W. Bush. The Top Ten Percent Rule grants automatic admission to any public college or university in Texas for Texas high school graduates who both finish in the top decile of their graduating cohort and submit a completed application for admission to a qualifying postsecondary institution within two years of graduating.[1]

The Top Ten Percent Rule did not have a large enough effect on minority applicants to restore minority enrollment to the levels obtained prior to the *Hopwood v. Texas* decision. Texas's Attorney General interpreted the decision handed down in *Hopwood v. Texas* by the Fifth Circuit Court of Appeals to mean that race or ethnicity could factor into neither the decision to admit a student nor the decision to provide financial aid. Two selective institutions in Texas, The University of Texas at Austin and Texas A&M University-College Station, identified a set of high schools with student bodies that were,

[1] *House Bill 588* also allows each public college or university in Texas to annually determine if it will offer automatic admission to graduates in the top quartile and provides each institution with a list of eighteen factors that can be used in making admissions decisions if a student does not qualify for automatic admissions

on average, socioeconomically disadvantaged and had not had many students matriculate at the respective institutions.

The University of Texas at Austin identified 70 Texas high schools that were both poor and, which historically, had not had many students matriculate at the University of Texas at Austin. These schools, on average, consisted of student bodies that were more than ninety percent minority (Tienda and Niu, 2006). The most deserving graduates at these high schools were offered scholarships, smaller classes, and tutoring if they were admitted to the University of Texas at Austin. The funding is not exclusively for Top Ten Graduates. This program, which was introduced to selected Texas High schools in 1999, 2000, and 2001, is known as the Longhorn Opportunity Scholarship (LOS) Program.[2]

Texas A&M followed suit with its Century Scholars program which offers scholarships to the graduates of 40 high schools located in Houston, Dallas, and San Antonio. The Century Scholars (CS) Program began in the fall of 2000. The high schools were selected based on high poverty rates of their students and the low number of applications that these schools sent to Texas A&M University-College Station.[3]

The Top Ten Percent rule and the institution of the targeted financial aid and recruitment programs offer the opportunity to examine two questions:

1. What is the impact of both the increased emphasis and transparent use of class rank on the score-report sending behavior of Texas's High School Graduates? The sending of a score report to a college or university is our proxy for an application.

2. How does targeted financial aid and recruitment affect the application behavior of potential recipients?

The use of race in the admissions process remains a contentious issue across this country. California, Washington State, and, most recently, Michigan have passed bans that forbid

[2]The Longhorn Opportunity Scholarship information was obtained from Dr. Lawrence W. Burt, former associate vice president and director of student financial services at the University of Texas at Austin.

[3]The Century Scholar program information was obtained from correspondence with Myra Gonzalez, Associate Director Office of Honors Programs and Academic Scholarships at Texas A&M - College Station.

the use of race in both the admissions and financial aid processes. Knowledge of how prospective students respond to race neutral admissions regimes is vital to institutions of higher learning that are interested in maintaining a diverse student body.

Two of the selective institutions in Texas responded by both increasing recruitment efforts and offering financial aid to high schools that were likely to yield students who were members of under-represented minority groups. In addressing the second question, we explore the efficacy of such programs by asking: Do students from the targeted high schools increase the rate that they send score reports to the university that targeted the high school relative to the rate that would have prevailed had there been no intervention? By exploring the behavior of potential applicants and their responsiveness to targeted recruitment and financial aid, we will enhance our understanding of the determinants of student application behavior.

3.2 Previous Research

Card and Krueger (2004, 2005) examine the impact of ending affirmative action in California and Texas on the score report sending behavior of highly qualified minority applicants. Card and Krueger have information on all SAT takers in California and Texas from 1994–2001. Using the sending of a score report as a proxy for applying to a college, they find that highly qualified minorities—minorities with an A/A- grade point average or a score of at least 1150 on the SAT—did not substantially alter the set of institutions that they choose to send their score reports in response to the changes in admissions policies.

Long (2004), using a random sample of ten percent of all SAT I takers from 1996–2000, finds that the gap between minorities and non-minorities in the number of score reports sent to in-state public institutions widened. He simulates the effect of the change in state policies on the number of score reports of minority and non-minority students and compares the results of the simulation to the actual outcomes. The simulation predicts both a decrease in the number of score reports sent to top-tier public colleges by minorities and an increase in the number of score reports sent to top-tier colleges by non-minorities due to changes in the relative probability of admissions between minority and non-minority applicants.

Dickson (2006) analyzes the impact of the change in the admissions regime in Texas on the percent of graduates from Texas's public high schools who attempt an admissions examination, either the SAT or SAT. Using data from the Texas Education Agency's Academic Excellence Indicator System, Dickson constructs a balanced panel of high schools and estimates weighted fixed effects models which include high school level covariates—for example, the percentage of the high school that is black and the percentage of a the high school that receives free or reduced price meal. Dummies for the various admissions regimes as well as an indicator variable that assumes a value of one if the school is eligible for the Longhorn Opportunity Scholarship program are also included in the empirical specification. Dickson finds a significant decrease in the percentage of graduates taking admissions examinations after the implementation of the Top Ten Percent Rule. In addition, she finds that high schools that were selected as Longhorn Opportunity Scholarship schools experienced an increase in the percentage of graduates who attempted admissions examinations.

Niu, Tienda, and Cortes (2006) use a representative sample of Texas high school seniors in 2002 who were re-interviewed one year later to discern the effects of the Top Ten Percent Rule. First, they find that Texas seniors—and top decile graduates in particular—are sensitive to institutional selectivity. That is, Texas seniors prefer more selective institutions all else equal. Second, they find that graduates from affluent high schools are more likely than their counterparts from less-affluent high schools to apply to selective institutions. Third, they find that while there are disparities in the selectivity of colleges that blacks and Hispanics within the top decile apply to, these differences do not carry over into the actual matriculation decision.

Our paper builds on this existing literature in various ways. First, we are interested in evaluating the transition from an admissions regime where class rank was merely one factor that was used in differing degrees with respect to admissions to a regime where class rank is the primary factor in admissions. Moreover, this fact is known to all interested parties.[4] In contrast to Card and Krueger (2004, 2005), we do not limit our sample to highly qualified test-takers as measured by SAT performance or grade point average, as the Top Ten Percent rule likely impacts students who aren't highly qualified, especially those students who are from high schools with relatively low test scores.[5]

Second, our data allows us to investigate in detail the set of schools a student chose to send their scores to. Thus, whereas Long (2004) is able to only observe classifications of the colleges that are designated to receive score reports, we observe the student's full choice set.

Third, only limited evidence has been gathered in the evaluation of targeted recruitment programs. The only other paper that considers such programs is Dickson (2006). The analysis in Dickson (2006) is conducted at the high-school level and focuses on the extensive margin of test taking, the percent of graduates that attempt an admissions examination. In addition, Dickson (2006) focuses only on the LOS program. Our data allows us to examine the impact of both the LOS program and the CS program on the actual score report sending behavior of individual students, conditional on a student having attempted the SAT I examination. We believe that this provides a more direct measure of the effectiveness of such programs. If the programs worked, then the probabilities that students from either a LOS school or students from a CS school sent score reports to the University of Texas at Austin and Texas A&M-College Station, respectively, should increase relative to the probabilities for similar students from non-Longhorn high school and non-Century Scholar schools.

In addition, our empirical method for evaluating the LOS differs considerably from

[4]For example, Bucks (2004) provides evidence that the University of Texas relied heavily on class rank prior to *House Bill 588*; however, this policy was not explicit.

[5]In our data set we identify $74,472$ students who self-identify as being in the top ten percent of their class and have SAT scores less than 1150, one of the benchmarks they used to identify highly qualified students.

that of Dickson (2006). In analyzing the Longhorn Opportunity Scholarship, Dickson (2006) draws inference from the dummy associated with Longhorn Opportunity Scholarship status. The fixed effects specification means that the variation used to identify the effect of the Longhorn Opportunity Scholarship comes from inter-temporal variation in Longhorn status. The counterfactual high schools are the set of Longhorn Schools prior to the schools obtaining Longhorn status and the set of high schools that never obtained Longhorn status. Later in the paper, we show that Longhorn Opportunity Scholarship Schools have a higher percentage of minority students, score lower on the SAT, and are less likely to to have graduates attempt a college admissions examination. Because the Longhorn Opportunity Scholarship schools are so different from other high schools in Texas, using the other high schools in Texas as a comparison group could lead to biased estimates of the impact of the Longhorn Opportunity Scholarship program.

We take a number of steps to reduce the bias in estimating the impact of the targeted recruitment and financial aid programs. We impose a common support condition to identify a set of non-treated schools that are "similar" to the Longhorn Opportunity Scholarship Schools. We compute the propensity score and use inverse probability weighting to identify the average effect of treatment on the treated for students who attend LOS high schools and CS high schools. Selection into treatment for these programs depended on the rate at which the high school's students sent score reports to either the University of Texas at Austin or Texas A&M and the socioeconomic status of the high school's students. We directly include measures of the first factor and proxies for the second in calculating the propensity scores. This is likely to provide better estimates of the true effects of the LOS program and CS program than estimation procedures that ignore the problem of non-random selection into treatment.

3.3 Theory

We adopt verbatim the theoretical model presented in Card and Krueger (2004). In this framework, a student needs to decide whether to apply to a particular college or not. Relevant factors are the utility of attending the school being considered, the chance of being admitted to that school, the cost of attending the school, the costs of applying, and the corresponding factors in the set of available alternative colleges.

3.3.1 The Model

A student assigns a net utility level $U_i(Q_i, C_i)$ to attending college i. Utility increases with the quality of the institution (Q_i) and decreases with the cost of attending the institution (C_i). The student estimates the probability of being admitted to school i with probability p_i, which is, for simplicity, assumed to be independent across schools. The cost of applying to any school is d and the utility of not attending college is U_0.

Optimizing behavior on the part of the student generates an application set C consisting of an ordered list of J schools with $U_1 \leq U_2 \leq \ldots \leq U_J$. A necessary condition for applying to a given school i is that $U_i > U_0$, and that the student's subjective estimate of the probability of admission is strictly positive. Let π_j represent the probability that school j is the best school in C that admits the student. Then

$$\pi_j = p_j \times \prod_{i=j+1}^{J} (1 - p_i) \tag{3.1}$$

Let $C(\sim k)$ denote the optimal choice set when school k is excluded, and $J(\sim k)$ represent the number of schools in this set. School k will be included in the final choice set if and only if

$$p_k\{ \prod_{j=0}^{J(\sim k)} \pi_j \; max[0, U_k - U_j]\} \; - \; d \; > \; 0 \tag{3.2}$$

The above equation defines the condition for including school k in the choice set. It states that college k will be included in the optimal application set if the expected return of attending college k exceeds the cost of applying.

3.4 Some predictions from the model

This simple framework is useful to clarify the effects we expect to identify empirically.[6] The introduction of the Top Ten Percent Rule changes the subjective estimation of the probability of admission conditional on rank and the type of institution under consideration. In particular, for students in the top decile, the probability of admission to any of Texas's public colleges or universities is one. For Texas high school graduates who aren't in the top decile, the impact of change in the admissions regime is not clear. Perhaps students not in the top decile perceive that their probability of admission, p_i, has declined at elite public institutions. If this is the case, then students in the lower rank classifications are more likely to submit scores to both less selective institutions within Texas and selective institutions outside of the state of Texas. The perceived change in the probability of admission will cause some colleges to be added and other colleges to be deleted relative to the optimal choice set that would have prevailed absent the change in the admissions regime. Conversely, students in the top decile should be more likely to submit score reports to more selective institutions in Texas and less likely to submit to less selective institutions.

The introduction of the Longhorn Opportunity Scholarship at UT Austin and the Century Scholars Program at Texas A&M, on the other hand, changed the expected costs of attending these two colleges for students at the eligible schools. This effectively increases the expected utility, U_i from attending one of these schools, which should increase the likelihood that the applicant places either the University of Texas at Austin or Texas A&M University in the optimal college choice set.

3.5 Data

The data we use for this paper was obtained from two sources. First, we downloaded Academic Excellence Indicator System (AEIS) data from the Texas Educational Agency (TEA). This is high school level data, available publicly on the internet, which provides

[6] A more complete discussion of the model and its implications is presented in the original paper by Card and Krueger (2004).

a wide range of information on the performance of students in each school and district in Texas for each academic year. Indicators include Texas Assessment of Academic Skills (TAAS) performance, attendance rates, dropout rates, completion rates, and SAT/ACT test results." [7]

Second, we used extremely rich student level data from the College Board. This data set contains the SAT verbal and math scores of every high school senior in the state of Texas who took the SAT exam, for the 1996–2004 cohorts. Student demographic information was also available including age, race, and gender.[8] We also utilized information on the number of test scores each student sent to colleges, as well as the name of the destination college.

Both data sets contained the name of the student's high school, enabling us to merge the two data sets and conduct analyses that include both high school and student level information. In addition, we used information provided on the SAT Questionnaire (formerly known as the Student Descriptive Questionnaire). Most students taking either the SAT Reasoning Test or any of the SAT Subject Tests also complete the optional SAT Questionnaire when they register to take the SAT Program tests, providing valuable contextual information to aid in interpreting and understanding individual and group scores. The questionnaire asks students about their family background, high school courses and performance, college aspirations, and most importantly for this study, a student's class rank. It should be stressed that the SAT Questionnaire, as well as any particular question, is voluntary. Moreover, the responses are all self-reported.

Table 3.1 provides some descriptive statistics of our data set. We include only students for whom we are able to merge these data sets. This excludes primarily students in private and charter high schools. In total, we have 916,348 remaining unique student observations

[7]The URL is "http://www.tea.state.tx.us/"

[8]We only have racial information for students from the 1999 cohort onwards

across all years combined, with a mean number of test takers of about 102,000 per year. [9] Of these, approximately 11 percent are Black, 17 percent are Hispanic and 46 percent are White, with a sizable proportion for whom we do not have racial information. Roughly 54.5 percent of takers are female, and the average performance of these Texas graduates is 458 points and 466 points on the verbal and mathematical component of the SAT, respectively.

3.6 Empirical Specifications

3.6.1 Score Report Sending

We use the inter-temporal variation in the importance of rank with respect to the probability of admissions to identify the impact of the change in the admissions regime on the score report sending behavior of Texas's public high school graduates. We estimate linear probability models of the following form:

$$Y_{ist} = \alpha_s + \varphi\alpha_t + \beta_1' X_{st} + \beta_2' X_{ist} + \pi P + \sum \Gamma^j R_{ist}^j + \sum \delta_P^j (R_{ist}^j \times P) + \varepsilon_{ist} \tag{3.3}$$

Y_{ist}, our outcome, is an indicator variable that assumes a value of one in the event that student i in high school s in year t engages in a particular behavior with respect to score report sending. Examples of the outcomes that Y_{ist} represent include the following: does a student send a score report to a selective institution in Texas, does the student send a score report to one of the schools that must abide by the Top Ten Percent rule, does the student send at least one score report to a less-selective institution in Texas, does the student send more than four score reports in total.[10]

We include both high-school fixed effects, α_s, and a linear time trend, α_t. We include year specific high school level variables, X_{st}. X_{ist} are individual level characteristics; we include the individual's verbal SAT score and the math SAT score. P is an indicator variable that assumes a value of one for cohorts that are under the Top Ten Percent

[9] The original sample size was 1,068,071 individuals.

[10] The first four score reports are free. A student must pay a fee for each additional score report that he or she chooses to send.

regime. The R^j_{ist} are a series of six rank dummies. We include dummies that assume a value of one if student i in school s in year t identifies as being in one of the following categories: the first decile, the second decile, the second quintile, the fourth quintile, the fifth quintile, and non-reported rank . The excluded category consists of students who are in the third quintile. We cluster at the high school level to produce standard errors that are both robust to using variables that are at a higher level of aggregation than the micro-units (Moulton, 1990) and to allow for arbitrary temporal correlation of the ε_{ist}'s within a cluster (Bertrand et al., 2004).

The coefficients of interest are δ^j_P, the coefficients associated with the interaction terms, $R^j_{ist} \times P$. To flesh out the interpretation of the δ^j_P consider the following example. Let Y_{ist} represent the event that a student sends to a selective university in Texas and consider the coefficient associated with the interaction term between the indicator for the top decile and the indicator dummy for the Top Ten Percent Rule admissions regime. This coefficient can be interpreted as the difference in the probability that a student in the top decile sends a score report to a selective institution relative to the probability that she would have sent a score report to a selective university in Texas prior to the advent of the Top Ten Percent Rule. Similar interpretations apply to the coefficient estimates with respect to both different rank categorizations and different outcomes.

3.6.2 Targeted Recruitment and Financial Aid

We are interested in determining the average effect of the treatment on the treated with respect to both the Longhorn Opportunity Scholarship program and the Century Scholar program. If we naively compared schools that were chosen to receive the scholarships with the schools that were not selected, then we would likely obtain biased estimates of the impact of the Longhorn Opportunity Scholarship. The schools that are selected to receive the treatment are likely to be systematically different in important ways that affect the outcome of interest. Therefore, we need to select an appropriate set of non-treated high schools that are "similar" to the set of schools that were selected to receive either the

Longhorn Opportunity Scholarship program or the Century Scholar program.

The LOS program and the CS programs were designed to boost minority enrollment at the University of Texas at Austin and Texas A&M-College Station, respectively. As such, high schools where the student body was majority white were unlikely to be selected to receive either the LOS program or the CS program. We trimmed the sample of high schools with students bodies that had high concentrations of white students in the year 1996. For the LOS program, we trimmed high schools with a percentage of white students that exceeded 66 percent of the student body in 1996. For the CS program we trimmed the sample of high schools with a percentage of white students that exceeded 75 percent of the student body in 1996. The maximum value of the percentage of the student body that is white in 1996 for LOS schools and CS schools is 41.7 percent and 60.3 percent, respectively. In evaluating the LOS program, the trimming resulted in 886 high schools being dropped from consideration. In evaluating the CS program, the trimming resulted in 757 schools being dropped from consideration. The total number of high schools in our base sample is 1440.

Using the trimmed samples, we estimate the probabilities that these particular Texas high schools are selected to receive either the Longhorn Opportunity Scholarship or the Century Scholar Program, $\mathcal{P}(Longhorn|X)$ or $\mathcal{P}(Century|X)$. That is, we estimate the propensity score (Rosenbaum and Rubin, 1983) of treatment by either of the programs on the appropriate sample.[11] The common support condition means that we are interested in comparing treated and non-treated schools with similar values of $\mathcal{P}(\widehat{Longhorn}|X)$ or $\mathcal{P}(\widehat{Century}|X)$. The common support condition is implemented as follows:

$$\max(\min[\mathcal{P}(\widehat{T=1}|X), \mathcal{P}(\widehat{T=0}|X)]) \ , \ \min(\max[\mathcal{P}(\widehat{T=1}|X), \mathcal{P}(\widehat{T=0}|X)])$$

where T is either the Longhorn Opportunity Scholarship program or the Century Scholar program. The above condition establishes the set of schools that will be used in the anal-

[11] We use a probit specification that include as regressors high school level characteristics prior to the start of the Longhorn Opportunity Scholarship program and the Century Scholar Program for the years 1996 − 1998.

ysis. The common support condition for the Longhorn Opportunity Scholarship program includes high schools with estimated propensity scores in the interval .02 to .93 inclusive. The common support condition for the Century Scholar program includes high schools with estimated propensity scores in the interval .01 to .74 inclusive.

Histograms of the propensity scores for the LOS schools and CS schools are shown in Figure 3.1 and Figure 3.3, respectively. Figure 3.2 and Figure 3.4 are adjusted histograms of the propensity scores. Essentially, Figure 3.2 and Figure 3.4 remove the huge spikes near zero. This readjusts the scale of the graphs to better show the full distribution of the propensity scores.

Table 3.2*a* and Table 3.2*b* demonstrate the effects of the balancing. The LOS program and CS program schools are remarkably different from non-LOS schools and non-CS schools.

In Table 3.2*a*, Column I contains the average of a particular characteristic for non-LOS schools minus the average of the same characteristic for LOS schools. Examining the tables we see that LOS schools have student bodies with higher percentage of Hispanic students, black students, students on free or reduced price lunch, limited English proficient students and higher student-to-teacher ratios. The LOS and non-LOS schools are clearly different. Column II and Column III demonstrates how trimming and trimming in conjunction with inverse probability weighting using the propensity score, respectively, reduces the differences in the observables. Table 3.2*b* shows the effects of balancing with respect to the difference between CS and non-CS schools.[12]

We make a conditional independence assumption and employ inverse probability weighting (Horvitz and Thompson, 1952; DiNardo et al., 1996) to estimate models of the following form:

[12] We only show the balancing results for the year 1996. Similar results are obtained for the other years. This is expected as these measures are highly correlated over time.

$$Y_{ist} = \alpha_s + \varphi\alpha_t + \beta_1' X_{st} + \beta_2' X_{ist} + \rho D_T + \pi P + \sum \Gamma_j R_{ist}^j + \sum \delta_P^j (R_{ist}^j \times P) + \sum \delta_T^j (D_T \times R_{ist}^j) + \varepsilon_{ist} \tag{3.4}$$

Y_{ist} is an indicator variable that assumes a value of one if the student submits a score report to the University of Texas at Austin. The terms α_s, α_t, X_{st}, X_{ist}, P, R_{ist}^j, and $R_{ist}^j \times P$ are the same as the previous specification. D_T is an indicator variable that assumes a value of one the year a school becomes a Longhorn Opportunity Scholarship School when analyzing the LOS program. D_T is an indicator variable that assumes a value of one the year that a high school becomes a Century Scholar school when we analyze the CS program. $D_T \times R_{ist}^j$ is an interaction term. The coefficient associated with the interaction term, δ_T^j is the difference-in-differences estimate. However, in this case we limit the sample to students in schools that survive the trimming procedure.

We weight the students in the non-treated schools by $\frac{\mathcal{P}}{1-\mathcal{P}} \times \frac{1-\Pi}{\Pi}$ where $\mathcal{P}$ is equal to propensity score for either the LOS program or the CS program for the particular school that the student attends and Π is equal to the unconditional probability of being either a LOS school or a CS school. This weighting scheme re-weights students in non-treated schools so that, on average, they are similar to students in treated schools. With a defensible set of counterfactuals, we are able to reduce the bias in the estimates of the impact of the Longhorn Opportunity Scholarship program and the Century Scholar programs. We cluster at the level of the high school to deal with the aggregation issues raised by Moulton (1990) and the serial correlation issues raised by Bertrand et al. (2004).

3.7 Results and Discussion

Our analysis comprises of three sections. First, we summarize our data in terms of the outcome variables of interest. This provides a broad overview of trends and aggregates for high school seniors in Texas. Second, we estimate how student behavior changed in the TTPR period relative to the prior two years using multivariate regressions. We next investigate the effects of the LOS program and CS on score report sending behavior. For the TTPR the LOS program, and CS, we estimate standard OLS models as well as models that include school level fixed effects.

3.7.1 Summary Statistics

3.7.1.1 Score Sending

Table 3.3 presents the mean values of various score sending outcomes. We see that the mean number of scores sent for each SAT taker declined between 1996 and 2004, from 4.29 scores to 3.86 scores, an 11 percent decline. This is also reflected in the mean numbers sent to Texas based institutions. In terms of the selective schools we consider, the proportion of SAT takers sending to the University of Texas at Austin drops by 4 percentage points from 35.5 percent to 31.5 percent, the proportion to the University of Texas at Dallas grew by 2.7 percentage points from 3.1 percent to 5.8 percent, while the proportion sending to Texas A&M decreased by 7 percentage points from 31.2 percent to 23.3 percent. On average, the proportion sending to any of these three schools decreased by 7.1 percentage points, or about 14 percent relative to the 1996 level. Thus, we observe that both the number of scores sent, and the proportion sending to selective schools decreased markedly in the period of our study.

In Table 3.4a, we observe an increasing trend in the proportion who refuse to answer the entire Student Descriptive Questionnaire (SDQ), although this occurs largely in 2003 an 2004. At the same time, there is a gradual and persistent upward trend in the proportion who answer parts of the SDQ, but refuse to respond to the question on class rank. The increase is large, from 8651 in 1996 to 33829 in 2004, which is almost a quadrupling in absolute number. Indeed, by 2004, more than a third of takers do not respond to the class rank question. This is problematic for our analysis, as a significant portion of our analysis is related to the class rank variable. Thus, all results making reference to the class rank variable pertains only to those students who provided us with such information.

Table 3.4*b* captures the mean proportion taking the SAT by class rank. This was computed for each school by dividing the total number of SAT takers reporting a particular rank in a given school in a given year, by the number of twelfth graders in that particular rank in that same school in that same year. The number of twelfth graders was obtained from Texas's Academic Excellence Indicator System (AEIS) data set. The mean was calculated by averaging across schools within a year, where each school received equal weighting in the calculation. We observe that the mean proportion in the first decile exceeds one for 1996 and 1997. Therefore, there has to be some misreporting in the data, with students systematically overstating their rank. Within each rank, the proportion taking the SAT decreased, although this is possibly due to the increased non-response rate for the class rank question. Nevertheless, we do observe sustained downward trends in the proportions taking an SAT conditional on them answering the class rank question. There are also large differences in test taking across rank classifications, which is to be expected. In 2004, the ratio of students who reported being in the top decile relative to one tenth of the number of twelfth graders is 0.90, compared to an analogous ratio of 0.376 for the second quintile, and only 0.051 for students in the lowest quintile.

Tables 3.4*c* and 3.4*d* provide the mean performance on the SAT verbal and mathematics components respectively, in each rank category for each year. Somewhat reassuring is that the performances are monotonically decreasing in rank, amongst those who do report a rank. We also observe that 2002 seems to be an outlier year, in that performance on both the verbal and mathematics component of the SAT greatly exceed those in other years. These tables also indicate that the students for whom we have no class rank information are not likely to be randomly drawn from the population of SAT takers in terms of their scholastic abilities in the period from 2002 to 2004. Prior to 2002, these students were on average likely to be placed somewhere between the 2nd and 3rd quintiles, whereas there-after, their mean performance places them between the 2nd decile and the 2nd quintile. [13]

Tables 3.5*a* – 3.5*i* summarize the various dimensions of score sending behavior within each class rank category. This allows us to observe any heterogeneity in the trends that occur as a function of a student's relative rank within their high school cohort. The mean number of scores sent decreases for most categories, although this is largest for those in the first decile (Table 3.5*a*). The mean number of scores sent to colleges within Texas decreased as well, most markedly in the first and second deciles, but was stable in the fourth quintile and actually increased for those in the fifth quintile (Table 3.5*b*). Table 3.5*c* shows the mean number of scores sent to schools that are legally compelled to follow the Top Ten Percent rule. For all students who do report a valid class rank variable, this number remains fairly stable. The next table concerns score sending to Texas two year colleges. The mean numbers here are also relatively stable. [14]

Tables 3.5*e* – 3.5*g* summarize the proportion sending to each of the three selective schools we consider, namely UT Austin, UT Dallas and Texas A&M. Table 3.5*h* presents the mean number of scores sent to this set of selective schools on aggregate, and Table 3.5*i* contains the proportion of students who send to at least one of these selective schools. Students in the top decile in 2004 are 2.2 percentage points more likely to send to UT Austin than similar students in 1996, while students in the other reported ranks in 2004 are generally less likely to send to Austin than their 1996 counterparts. [15] Score sending to UT Dallas increases in every category, although this occurs off of a rather small initial base. In all reported class ranks we observe a clear decrease in the proportion sending to Texas A&M, with large decreases of about nine percentage points in the first two deciles

[13] We use deciles for the first and second deciles, and quintiles for the remainder, as this is how the question that asks a student to report her rank is structured.

[14] Two year colleges are not the primary focus of this paper. Moreover, the SAT is taken primarily for applications to selective colleges. Thus, we do not comment in depth on the application decision for two year colleges.

[15] An exception is students in the 5th quintile, although these students represent a very small percentage of the population of SAT takers in any year.

as well as the second quintile. Table 3.5*i* indicates that approximately seventy percent of students in the first decile send to at least one selective school, and that this remains stable during the period of analysis. However, students in the other reported class rank categories generally show marked declines in the probability of sending to a selective school. This is most pronounced for students in the 2nd quintile, where the proportion decreases by about 10 percentage points, or almost 20 percent of the 1996 base proportion. This is in line with the model provided above, as those far from the first decile will need to compete aggressively in order to gain admission into selective schools compelled to admit anyone in the top 10 percent of their cohort.

3.7.1.2 Longhorn and Century Scholars Programs

Tables 3.6*a* – 3.6*c* show the number of test takers, the proportion of twelfth graders taking an SAT, and the proportion of SAT takers who send a score to UT Austin respectively. Table 3.6*a* shows that regardless of the scholarship program being administered at a school, if any, the number of takers increased with time. We also observe that more than 10 percent of all public school SAT takers attend a school where the LOS was subsequently implemented. The proportion taking an SAT increases dramatically in the LOS schools, by more than 20 percent, actually decreases in the CS only schools, and increases by a few percentage points in the non-scholarship programs. Moreover, the large increases observed in the LOS schools coincides with the time period when the LOS was introduced. Further suggestive evidence that LOS caused these responses is seen in Table 3.6*c*. Whereas the proportion of score senders sending to UT Austin actually decreased with time by about 5 percentage points between 1996 and 2004, the proportion from LOS schools increased by about 3 percentage points. These patterns are observed in Table 3.7 as well, where we summarize the schools using a binary classification of LOS or non-LOS schools, ignoring the particular potential school's CS status.

3.7.2 Top Ten Percent Rule

3.7.2.1 Score Sending

Table 3.8 presents individual level regression results for score sending behavior. Of primary interest to us are the coefficients on the post and post interacted with class rank variables. The dependent variable in the second column is an indicator variable for whether the student sent more than four SAT score reports. In the post period, students in the 1st decile were 5.6 percentage points less likely to send out more than four scores. Those in the 2nd decile and second quintile were also significantly less likely to send out more than four reports, but the decrease is less than 2 percentage points. In the third column, we model the actual number of scores sent. All students send fewer scores on average in the post period. However, this again is most pronounced amongst students who are in the 1st decile, who send 0.356 [16] fewer scores out. This is as predicted by the theory, since these students are guaranteed admission to any of the top public colleges in Texas. In the fourth column, the dependent variable is an indicator variable that takes a value of one if a student sends a score to one of the non-selective four year colleges in Texas. In the post period, students in the 1st decile are significantly less likely to apply to a non-selective school. At the same time, those in the 4th and 5th quintiles who do take an SAT have a significantly increased probability of sending to a non-selective college. This suggests that students of all ranks are being forced by the law to pre-select themselves into a particular type of college more strongly than prior to the law. The estimates in the sixth column shows that students in the first decile have an increased probability of sending to UT Austin in the post-TTPR period, of 3.8 percentage points, while students in the 2nd and 3rd quintiles have similarly small, but significant reductions in this probability. Interestingly, students in the 5th quintile show a large increase in the probability of sending there, although we observed that this group is small and likely to be selected in terms of other unobservables. Very little changes for the probability of sending to a school in-state, or a school to which

[16] $-0.108 + -0.248$

the TTPR applies.

Table 3.9 presents models with the same dependent variables and same set of covariates, but includes school level fixed effects. Of note in comparison to Table 3.8 is that the coefficients are very similar, both in terms of magnitude and significance. By and large, the theoretical framework predictions of the impact of the law are substantiated by the empirical analysis.

3.7.3 Longhorn Opportunity Scholarship

This component of our analysis looks at the effects of the targeted recruitment and financial aid packages offered by the University of Texas at Austin under the LOS program. This program targeted high schools with both socioeconomically disadvantaged students and graduates who send standardized test scores to UT Austin at a rate below the average rate at which Texas high school graduates send score reports to UT Austin.

Table 3.10 presents difference-in-differences (DD) results for various score sending behaviors as a function of the LOS program. We further allow for these effects to differ depending on the class rank of the students. Interpreting the coefficients on the interaction terms, we observe that most of the effects manifest in the first decile of students. The probability that a student in the first decile at a Longhorn school sends to Austin increases by 9.2 percentage points in the DD model. In 1999, 20.0 percent of test takers from LOS schools sent at least one score report to the University of Texas at Austin. Relative to the 1999 level, the change in the first decile is a forty-five percent increase. The coefficients associated with the interaction of being LOS and self-identifying as being in the second decile increase the probability of increasing of sending to to the University of Texas at Austin by 3.2 percentage points. The coefficient is statistically significant at the one percent level.

The second dependent variable is the total number of score reports sent. The coefficients associated with the interaction terms are all small and statistically insignificant.

The third dependent variable is an indicator variable that assumes a value of one if a student sends a score report to a non-selective four year institution in Texas.[17] Surprisingly, the coefficient associated with the interaction term between being in a LOS school and a self-reported rank of being in the top decile is 5.1 percentage points and is statistically significant at the one percent level.

The fourth dependent variable is a set of selective schools in Texas.[18] The coefficient associated with the interaction term between LOS and a self-reported rank of the top decile is 7.7 percentage points and is statistically significant at the one percent level.

The fifth dependent variable is a dummy variable that assumes a value of one if the test-taker chooses to send at least one score report to the set of colleges in Texas that must abide by the Top Ten Percent Rule. The difference-in-differences estimate of the effect of the LOS program on the first decile is 5 percentage points, and it is statistically significant at the one percent level.

The sixth dependent variable is an indicator variable that assumes a value of one if a test-taker sends at least one score report to the a school in Texas. Students in the top decile at a LOS school are 1.2 percentage points more likely to send to an in-state college or university. This effect is relatively small as a large proportion of test takers send at least one score report to an in-state school.

The final dependent variable is an indicator variable that assumes a value of one if a test-taker chooses to indicate more that four colleges to receive score reports. SAT test takers in the first decile at LOS schools are three percentage points more likely to send more than four score reports. We find small and statistically insignificant effects of the LOS program on the probability of designating more than four colleges to receive score reports for the remaining interaction terms.

Table 3.11 presents the results from the difference-in-differences model with fixed effects. The results we obtain are similar. Test-takers who self-identify as being in the top decile at schools under the LOS program are 9.4 percentage points more likely to submit a score

[17] Colleges are classified as non-selective according to the system used by Barron's Guide to Colleges and Universities

[18] Selective schools include the University of Texas at Austin, Texas A&M-College Station, and the University of Texas at Dallas.

report to the University of Texas at Austin; the coefficient is significant at the one percent level. Students who self-identify as being in the second decile at LOS schools are 3.2 percentage points more likely to send a score report to the University of Texas at Austin; the coefficient is significant at the five percent level. Students who self-identify as being in the second quintile at LOS schools are 2.3 percentage points more likely to send a score report to the University of Texas at Austin.

The results with respect to the number of scores sent are similar to the estimates obtained without fixed effects. With respect to non-selective institutions, the difference-in-differences estimate of the impact of the LOS program on the probability of a test-taker in the top decile submitting to a non-selective dropped to 4 percentage points, roughly a 20.0 percent decline relative to the estimate from the model without fixed effects. Still, the estimate is statistically significant at the five percent level.

The fixed effects difference-in-differences estimate of the impact of the LOS program on the probability of a test taker in the top decile submitting to a selective institution in Texas is 8.2 percentage points an increase of .5 percentage points relative to the estimate from the model without school fixed effects; the estimate is statistically significant at the one percent level. The estimate of the difference-in-differences estimate of the impact of the LOS program on the probability of students in the top decile submitting to a TTPR school is 5 percentage points and is significant at the one percent level. The finding that students in the top decile at LOS schools are 1.1 percentage more likely to remain in state is significant at the five percent level.

The difference-in-differences estimates of the impact of the LOS program on the probability that a test-taker who self-identifies as being in the third decile sends more than four score reports is 3.3 percentage points and is significant at the five percent level. Although none of the other difference-in-differences estimates are significant, the coefficients show a pattern whereby the difference-in-differences estimates for the third, fourth, and fifth quintiles are larger than the difference-in-differences estimates for the first decile, second decile, and the third quintile. This pattern doesn't emerge in the differences-in-differences model that doesn't include school fixed effects.

Overall, this is a remarkable finding. The impact of the LOS is large and significant. It also has the largest impact on the best ranked students in these schools. Indeed, the effects on weaker students are small and often statistically indistinguishable from zero. This is consistent with the hypothesis that student application decisions from under-represented schools are subject to multiple constraints. These include both the likelihood of admission as well as funding and post-enrollment support.

3.7.4 Century Scholars Program

This part of the analysis will focus on the Century Scholars Program. Table 3.12 contains the results of the difference-in-differences models without school fixed effects.

The first dependent variable is an indicator variable that assumes a value of one if the student sends a score report to Texas A&M-College Station. In stark contrast to the estimates for the Longhorn Opportunity Scholarship program, none of the interaction terms are statistically significant and differ greatly in magnitude from the estimates of the Longhorn Opportunity Scholarship program. The difference-in-differences estimate of the impact of the Century Scholar program on the likelihood that a test-taker who self identifies as being in the first decile attempts sends a score report to Texas A&M College Station is 3.5 percentage points, which is far smaller than the analogous estimate for the LOS program.

The second dependent variable is the total number of scores sent. The difference-in-differences estimates of the impact of the CS program on number of score reports sent by the first and second decile are $-.322$ and $-.255$ score reports. The estimates are both significant at the one percent level.

The third dependent variable is an indicator variable that assumes a value of one if a test-taker sends to a non-selective school. For students who self-identify a class ranking in the third quintile and students who indicate that they are in the fourth quintile, the difference-in-differences estimates take on values of −5.7 percentage points, and −8.0 percentage points, respectively. The estimates are significant at the one percent level. The CS program seems to reduce the probability that lower ranked students send score reports to non-selective institutions.

The Century Scholar program increases the probability that a student who chooses not to indicate rank sends a score report to a selective institution by 3.5 percentage points. This estimate is significant at the one percent level. This result is not surprising given the positive impact of the CS program on the likelihood that a student who does not indicate rank applies to Texas A&M. Texas A&M is one of the selective schools. The difference in differences estimates for the impact of the CS program on the probability that a student who identifies as being in ranked in the top decile is 4.3 percentage points; the estimate is significant at the one percent level.

Students in the top decile at CS high schools are 3.5 percentage points more likely to apply to a school with admissions that are subject to the Top Ten Percent rule. The difference-in-differences estimates for the impact of the CS program on the likelihood that test-takers of various ranks send score reports to Texas are small and statistically insignificant.

The CS program does seem to impact the probability that students from in the top decile, second decile, and second quintile send more than four score reports. The difference-in-differences estimate for the test-takers who identify as being in the top decile is −5 percentage points and is significant at the one percent level. The estimate of the impact of the program on both the probability of sending more than four score reports for a student whose self-reported rank is the second decile is −5 percentage points; the estimate is statistically significant at the one percent level. The difference-in-differences estimate for the second quintile is −2.9 percentage points. The estimate is significant at the five percent level.

Table 3.13 contains the results for the difference-in-differences models that include high school level fixed effects. The estimate is not statistically significant. The difference-in-differences estimate of the impact of the program on students who self-identify as being ranked in the top decile is 3.7 percentage points, which is similar in magnitude to the estimate we obtained without fixed effects.

The estimates of the impact of the CS program on the number of score reports changes after the addition of the school fixed effects. The difference-in-differences estimates of the impact of the CS program on number of score reports sent by the first and second decile are $-.301$ and $-.228$ score reports. The estimates are both significant at the one percent level.

Except for the estimate of the impact of the CS program on students who self-identify as being in the first decile, which falls by a percentage point, the fixed effects augmented difference-in-difference estimates of the impact of the CS on the probability of test-takers sending score reports to non-selective institutions are similar in magnitude to the values obtained from the models without fixed effects. The difference-in-difference estimates for the test-takers in the third quintile and test-takers who identify as being in the fourth quintile remain remain statistically significant, with values of -4.2 percentage points and -5.9 percentage points, respectively.

Test-takers in CS schools who do not indicate rank or self-report being in the top decile are more likely to send score reports to selective institutions. The estimates are similar to the estimates obtained from the model without school fixed effects. The estimate for students who don't report rank is 3.6 percentage points and is statistically significant at the five percent level. The difference-in-differences estimate for students in the top decile is 4.8 percentage points; the estimate is significant at the one percent level. The other differences-in-differences estimates decrease in magnitude relative to the model with no fixed effects.

The estimate of the impact of the CS program on the likelihood that a test-taker who self-reports as being in the top decile sends a score report to a TTPR schools remains nearly the same across specifications. The estimate obtains a value of 3.5 percentage points and is significant at the one percent level. The addition of school fixed effects does not change appreciably change the estimates of impact of the CS program on the likelihood that test-takers send score reports to in-state schools. The estimates remain small and statistically insignificant.

Test takers in the top decile and the second decile at CS schools are less likely to send out more than four score reports, estimates for both ranks take on values of 5 percentage points and 4.6 percentage points; both estimates are statistically significant at the one percent level. The sign of the difference-in-differences estimate for the second quintile is of similar magnitude to the estimates without fixed effects.

The Century Scholar program does not appear to attract highly ranked students to Texas A&M as effectively as does the Longhorn Opportunity Scholarship program. This is in contrast to the Longhorn Opportunity Scholarship program which has it greatest impact on highly ranked students; that is, students who self-identify as being in the top two deciles. The magnitude of the impact of the LOS program on the likelihood that a student who self reports as being in the top decile at a LOS school sends a score report to the University of Texas at Austin is 162 percent larger than the estimate of the impact of the CS program on the likelihood that a student who self-reports as being in the top decile in a CS school sends to Texas A&M-College Station.

There is evidence that the CS program reduces the probability that both low ranked students and students who don't report rank send score reports to non-selective schools.We find evidence that the CS program increases the probability that both students who don't report rank and students who report being in the top decile send score reports to selective institutions. The CS program increases the probability that test-takers in the top decile send a score report to schools to colleges that must abide by the Top Ten Percent rule; however, the Longhorn Opportunity Scholarship Program has a larger impact on the probability that students in the top decile send score reports to Top Ten Percent colleges. The

CS program also appears to reduce the probability that highly ranked students send more than four score reports.

3.8 Conclusion

Our analysis and results highlighted some important and useful new insights. First, the theoretical framework we adopted was useful in understanding the changes that were observed in student college applications behavior. Second, as predicted, there exists significant heterogeneity in the effects of the law, depending on a student's class rank. Previous research has not investigated this.

Third, the targeted recruitment program implemented by UT Austin was extremely successful. However, this success was limited mostly to the best students in these schools. The targeted recruitment program implemented by the Century Scholar program was not nearly as effective at increasing the likelihood that students send score reports to Texas A&M.

Our evidence suggests that students from poor schools face multiple barriers to obtaining postsecondary schooling at selective colleges. Using the combination of the TTPR and the LOS program, we find strong evidence that it is possible for targeted recruitment programs to attract students from such schools. However, as the results from evaluating the Century Scholar program demonstrates, the success of all targeted recruitment programs is far from guaranteed.

3.9 Tables

Table 3.1: **Sample Size and composition**

Year	# of Obs	% Black	% Hisp	% Cauc.	% Female	Mean SAT-V	Mean SAT-M
1996	83,769	–	–	–	54.7	460	466
1997	87,750	–	–	–	54.73	459	467
1998	94,136	–	–	–	54.84	456	463
1999	98,730	11.45	16.54	51.95	54.73	453	459
2000	103,367	11.11	16.57	49.46	54.41	454	461
2001	105,015	11.22	16.73	47.87	54.57	452	459
2002	110,097	11.23	16.58	45.07	54.57	488	499
2003	115,260	10.84	16.37	40.48	54.02	452	460
2004	118,224	12.07	18.28	43.53	54.19	450	458

Table 3.2a: **Difference in Means between LOS and non-LOS schools: 1996**

	I		II		III	
	Full Sample		Trimmed on % White		Trimmed + IPW	
	Diff	Std. Error	Diff	Std. Error	Diff	Std. Error
SAT Verbal 1996	84.2	11.3	60.6	12.9	-76.0	41.0
SAT Math 1996	78.7	11.5	56.9	13.2	-76.6	42.5
% Male1996	0.03	0.02	0.02	0.02	0.07	0.07
% LEP 1996	-9.08	1.06	-5.46	1.45	-1.92	2.91
% Poor 1996	-21.61	2.47	-11.18	2.69	-4.55	6.26
% White 1996	56.14	3.32	31.38	2.54	-0.61	1.67
% Black 1996	-28.67	1.96	-24.30	2.67	-4.35	10.69
% Hispanic 1996	-27.49	3.47	-7.45	3.86	5.57	10.35
% Twelfth Grade 1996	1.29	0.82	1.78	0.85	-1.77	0.89
Teacher Exper. 1996	-1.52	0.30	-1.31	0.31	-0.85	0.73
Stud to Teach. ratio 1996	-3.49	0.40	-2.97	0.46	0.89	0.99
% Taking Exam 1996	9.45	2.30	6.95	2.45	-11.09	6.61
Sent to Austin 1996	0.06	0.02	0.09	0.02	-0.04	0.04
Sent to UTD 1996	-0.01	0.01	-0.01	0.01	-0.02	0.01
Sent to A&M 1996	0.14	0.02	0.13	0.02	0.10	0.10

Notes:
IPW is our acronym for Inverse Probability Weighting.

Table 3.2b: **Difference in Means between CS and non-CS schools: 1996**

	I		II		III	
	Full Sample		Trimmed on % White		Trimmed + IPW	
	Diff	Std. Error	Diff	Std. Error	Diff	Std. Error
SAT Verbal 1996	68.2	15.0	53.0	16.3	-07.0	27.7
SAT Math 1996	59.7	15.1	46.6	16.5	-14.2	28.0
% Male 1996	0.02	0.03	0.01	0.03	-0.01	0.02
% LEP 1996	-8.32	1.40	-5.86	1.72	-3.77	2.43
% Poor 1996	-8.94	3.32	-1.42	3.44	6.12	3.86
% White 1996	52.03	4.59	33.75	3.83	6.91	2.96
% Black 1996	-43.78	2.47	-39.99	3.00	-14.09	8.19
% Hispanic 1996	-6.46	4.64	7.79	4.89	8.45	6.96
% Twelfth Grade 1996	1.97	1.07	2.36	1.07	0.97	1.11
Teacher Exper. 1996	-1.79	0.40	-1.49	0.39	-0.88	0.66
Stud. to Teach. ratio 1996	-4.25	0.52	-3.82	0.56	-0.49	0.54
% Taking Exam 1996	7.14	2.96	5.65	3.04	-3.99	3.57
Sent to Austin 1996	0.06	0.03	0.08	0.03	0.13	0.04
Sent to UTD 1996	-0.02	0.01	-0.02	0.01	-0.02	0.01
Sent to A&M 1996	0.10	0.03	0.10	0.03	0.03	0.02

Notes:
IPW is our acronym for Inverse Probability Weighting.

Table 3.3: **Score Report Sending Behavior**

	Mean Number of Scores Sent:				Proportion of Scores Sent:			
Year	In Total	In State	To TTPR schools	To TX 2yr college	To UT Austin	To UT Dallas	To Texas A&M	To selective TX college
1996	4.29	3.11	1.75	0.34	0.355	0.031	0.312	0.514
1997	4.27	3.10	1.74	0.35	0.343	0.034	0.296	0.498
1998	4.08	2.97	1.67	0.34	0.334	0.034	0.281	0.480
1999	3.98	2.91	1.64	0.33	0.330	0.034	0.278	0.475
2000	4.05	2.97	1.70	0.34	0.352	0.043	0.288	0.499
2001	4.06	2.95	1.69	0.33	0.337	0.046	0.281	0.484
2002	4.02	2.95	1.70	0.32	0.328	0.053	0.265	0.470
2003	3.97	2.93	1.72	0.31	0.332	0.056	0.253	0.466
2004	3.86	2.88	1.69	0.31	0.315	0.058	0.233	0.443

Table 3.4a: **Number of Taker within class rank**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans	Total
1996	8,651	15,678	16,286	21,162	16,553	3,064	604	1,771	83,769
1997	9,528	16,182	17,093	21,674	16,983	3,308	630	2,352	87,750
1998	11,019	16,838	17,582	23,204	18,727	3,569	695	2,502	94,136
1999	13,229	17,311	18,483	23,776	19,133	3,730	773	2,295	98,730
2000	16,677	17,912	19,051	23,192	19,232	3,797	823	2,683	103,367
2001	22,258	18,202	18,623	21,438	17,792	3,495	729	2,478	105,015
2002	31,548	17,817	18,218	19,310	16,724	3,381	763	2,336	110,097
2003	27,176	17,693	17,510	17,567	15,338	3,098	704	16,174	115,260
2004	33,829	18,933	18,846	17,622	15,858	3,406	807	8,923	118,224

Note the increasing proportion that do not provide rank

Table 3.4b: **Proportion Taking conditional on rank reported**

year	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint
1996	1.02	0.93	0.52	0.43	0.13	0.06
1997	1.01	0.93	0.52	0.42	0.12	0.06
1998	0.98	0.90	0.51	0.43	0.13	0.06
1999	0.95	0.91	0.50	0.42	0.12	0.05
2000	0.97	0.89	0.50	0.42	0.13	0.07
2001	0.96	0.89	0.46	0.40	0.12	0.05
2002	0.92	0.87	0.43	0.37	0.13	0.06
2003	0.90	0.81	0.38	0.34	0.10	0.05
2004	0.90	0.83	0.38	0.34	0.11	0.05

Table 3.4c: **Mean of SAT Verbal by class Rank**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans	Overall
1996	412.59	560.67	491.05	451.29	400.73	354.39	323.00	404.24	460.04
1997	409.32	558.26	489.88	451.78	401.79	359.40	312.10	408.78	458.91
1998	414.18	557.35	489.49	450.18	396.57	351.26	309.63	398.29	455.64
1999	420.49	558.94	486.29	445.38	395.49	345.47	304.42	371.25	453.35
2000	424.51	556.36	486.25	446.74	396.64	347.87	303.03	377.37	453.53
2001	430.66	555.35	482.66	441.31	393.78	342.59	312.73	363.80	452.09
2002	483.85	567.01	503.02	468.48	433.83	403.11	391.88	426.55	487.75
2003	432.26	553.92	478.71	431.74	382.32	331.86	297.32	463.76	452.16
2004	426.76	552.46	480.72	430.55	385.40	336.66	304.36	464.98	449.96

Table 3.4d: **Mean of SAT Math by class Rank**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans.	Overall
1996	409.78	579.89	501.58	455.39	399.39	354.20	323.39	410.01	466.28
1997	409.55	578.17	501.47	458.20	402.92	358.52	318.43	411.77	466.77
1998	413.80	576.98	500.83	456.63	397.77	350.07	313.60	406.12	463.25
1999	420.04	575.89	496.49	449.57	394.06	343.22	301.51	376.52	458.92
2000	426.37	575.69	498.25	453.16	397.10	343.45	303.78	383.75	460.93
2001	432.98	574.87	494.29	447.49	393.59	339.02	309.14	370.52	459.27
2002	490.49	588.62	518.06	479.01	436.91	405.01	400.19	437.22	498.54
2003	435.62	573.47	491.72	437.26	383.36	331.02	296.58	472.41	460.10
2004	429.93	568.76	492.44	437.97	386.93	335.48	308.20	478.64	457.68

Table 3.5a: **Number of Scores Sent**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans	Overall
1996	3.36	5.39	4.63	4.24	3.83	3.43	3.26	2.80	4.29
1997	3.39	5.39	4.55	4.25	3.81	3.51	3.22	2.77	4.27
1998	3.22	5.24	4.43	4.05	3.61	3.26	3.08	2.75	4.08
1999	3.21	5.06	4.3	3.98	3.59	3.24	3.12	2.53	3.98
2000	3.32	5.06	4.41	4.11	3.71	3.39	3.16	2.51	4.05
2001	3.32	5.09	4.45	4.14	3.77	3.49	3.33	2.63	4.06
2002	3.43	5.00	4.41	4.17	3.81	3.53	3.35	2.74	4.02
2003	3.50	4.94	4.36	4.12	3.80	3.57	3.34	3.380	3.97
2004	3.29	4.77	4.22	3.98	3.67	3.41	3.39	3.73	3.86

Table 3.5b: **Number of Scores Sent within Texas**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans	Overall
1996	2.58	3.38	3.33	3.21	3.00	2.72	2.58	2.15	3.11
1997	2.59	3.40	3.30	3.22	2.98	2.74	2.47	2.15	3.10
1998	2.45	3.34	3.21	3.07	2.81	2.56	2.46	2.15	2.97
1999	2.41	3.19	3.14	3.03	2.81	2.56	2.41	1.97	2.91
2000	2.53	3.22	3.22	3.11	2.91	2.67	2.47	1.99	2.97
2001	2.52	3.17	3.23	3.11	2.93	2.71	2.69	2.05	2.95
2002	2.58	3.16	3.26	3.19	2.98	2.81	2.67	2.15	2.95
2003	2.68	3.16	3.24	3.16	2.98	2.81	2.62	2.52	2.93
2004	2.54	3.11	3.17	3.13	2.92	2.72	2.71	2.61	2.88

Table 3.5c: **Number of Scores Sent to TTPR schools**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans	Overall
1996	1.42	1.82	1.90	1.88	1.70	1.41	1.26	1.16	1.75
1997	1.41	1.83	1.90	1.87	1.68	1.43	1.16	1.17	1.74
1998	1.32	1.80	1.85	1.80	1.59	1.32	1.19	1.14	1.67
1999	1.34	1.75	1.81	1.76	1.60	1.36	1.19	1.02	1.64
2000	1.43	1.80	1.88	1.83	1.66	1.43	1.23	1.07	1.70
2001	1.44	1.78	1.90	1.83	1.67	1.46	1.40	1.14	1.69
2002	1.49	1.80	1.94	1.87	1.68	1.50	1.31	1.15	1.70
2003	1.56	1.83	1.95	1.90	1.70	1.50	1.24	1.53	1.72
2004	1.47	1.82	1.93	1.86	1.68	1.46	1.31	1.57	1.69

Table 3.5d: **Number of Scores Sent to TX 2yr colleges**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans	Overall
1996	0.39	0.17	0.28	0.35	0.48	0.62	0.67	0.36	0.34
1997	0.41	0.17	0.29	0.37	0.48	0.61	0.68	0.37	0.35
1998	0.38	0.18	0.27	0.35	0.44	0.58	0.63	0.40	0.34
1999	0.36	0.16	0.27	0.35	0.44	0.54	0.56	0.39	0.33
2000	0.36	0.16	0.28	0.36	0.47	0.59	0.62	0.40	0.34
2001	0.33	0.15	0.27	0.35	0.46	0.55	0.64	0.43	0.33
2002	0.29	0.14	0.27	0.36	0.46	0.59	0.68	0.49	0.32
2003	0.32	0.14	0.28	0.37	0.48	0.62	0.70	0.25	0.31
2004	0.32	0.14	0.26	0.37	0.47	0.59	0.69	0.24	0.31

Table 3.5e: **Number of Scores Sent to UT Austin**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans	Overall
1996	0.25	0.51	0.42	0.36	0.25	0.17	0.12	0.22	0.35
1997	0.24	0.49	0.40	0.35	0.25	0.18	0.12	0.20	0.342
1998	0.24	0.49	0.41	0.33	0.24	0.16	0.12	0.20	0.33
1999	0.26	0.49	0.40	0.32	0.24	0.17	0.14	0.18	0.33
2000	0.29	0.51	0.42	0.35	0.26	0.18	0.15	0.18	0.35
2001	0.27	0.52	0.41	0.33	0.23	0.17	0.17	0.17	0.34
2002	0.28	0.53	0.40	0.30	0.21	0.16	0.14	0.16	0.33
2003	0.27	0.54	0.40	0.31	0.21	0.15	0.13	0.31	0.33
2004	0.24	0.53	0.39	0.28	0.20	0.13	0.15	0.34	0.32

Table 3.5f: **Number of Scores Sent to UT Dallas**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans	Overall
1996	0.03	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.03
1997	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.01	0.03
1998	0.03	0.04	0.04	0.03	0.0	0.03	0.04	0.01	0.03
1999	0.03	0.04	0.04	0.04	0.03	0.03	0.03	0.01	0.03
2000	0.04	0.04	0.05	0.05	0.04	0.04	0.04	0.02	0.04
2001	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.02	0.05
2002	0.05	0.05	0.06	0.06	0.05	0.05	0.06	0.04	0.05
2003	0.05	0.06	0.06	0.06	0.05	0.04	0.04	0.05	0.06
2004	0.05	0.07	0.07	0.06	0.06	0.05	0.04	0.06	0.06

Table 3.5g: **Number of Scores Sent to Texas A&M**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans	Overall
1996	0.21	0.45	0.38	0.31	0.21	0.13	0.12	0.18	0.31
1997	0.20	0.43	0.37	0.30	0.20	0.13	0.10	0.16	0.30
1998	0.19	0.41	0.36	0.28	0.19	0.13	0.10	0.18	0.28
1999	0.20	0.41	0.35	0.28	0.19	0.12	0.11	0.15	0.28
2000	0.22	0.42	0.36	0.29	0.20	0.13	0.12	0.15	0.29
2001	0.22	0.42	0.36	0.28	0.20	0.13	0.12	0.13	0.28
2002	0.23	0.40	0.34	0.26	0.17	0.12	0.07	0.12	0.27
2003	0.20	0.39	0.33	0.24	0.16	0.116	0.07	0.24	0.25
2004	0.18	0.36	0.30	0.22	0.15	0.10	0.10	0.26	0.23

Table 3.5h: **Number of Scores Sent to a selective school**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans	Overall
1996	0.49	0.99	0.83	0.71	0.49	0.33	0.27	0.41	0.70
1997	0.47	0.96	0.81	0.69	0.48	0.34	0.26	0.38	0.67
1998	0.45	0.95	0.80	0.65	0.46	0.32	0.26	0.40	0.65
1999	0.48	0.94	0.78	0.64	0.46	0.32	0.28	0.34	0.64
2000	0.55	0.98	0.82	0.69	0.51	0.34	0.31	0.35	0.68
2001	0.53	0.99	0.82	0.66	0.47	0.35	0.33	0.32	0.66
2002	0.56	0.99	0.81	0.63	0.43	0.32	0.28	0.32	0.65
2003	0.53	0.99	0.79	0.61	0.43	0.30	0.25	0.60	0.64
2004	0.47	0.96	0.76	0.57	0.41	0.28	0.29	0.66	0.61

Table 3.5i: **Proportion who send to at least one selective school**

year	Q not ans	top decile	2nd decile	2nd quintile	3rd quint	4th quint	5th quint	SDQ not ans	Overall
1996	0.38	0.71	0.60	0.52	0.38	0.27	0.23	0.31	0.51
1997	0.36	0.69	0.59	0.51	0.37	0.28	0.21	0.29	0.50
1998	0.35	0.68	0.58	0.48	0.35	0.26	0.22	0.30	0.48
1999	0.37	0.68	0.57	0.47	0.36	0.26	0.22	0.27	0.48
2000	0.41	0.70	0.59	0.50	0.39	0.27	0.26	0.27	0.50
2001	0.39	0.71	0.58	0.48	0.36	0.27	0.27	0.26	0.48
2002	0.40	0.70	0.57	0.46	0.34	0.26	0.23	0.24	0.47
2003	0.39	0.70	0.56	0.45	0.33	0.25	0.20	0.43	0.47
2004	0.35	0.68	0.54	0.42	0.32	0.23	0.23	0.47	0.44

Table 3.6a: **Number of Takers by LOS x CS schools**

	LOS=0 CS=0	LOS=1 CS=0	LOS=0 CS=1	LOS=1 CS=1
1996	73574	5369	1802	3024
1997	77113	5704	1845	3088
1998	82870	6221	1829	3216
1999	86909	6612	1774	3435
2000	91058	6981	1796	3532
2001	92824	6898	1774	3519
2002	97596	7242	1663	3596
2003	102307	7425	1880	3648
2004	104945	7746	1909	3624

Table 3.6b: **Proportion of 12th Graders taking an SAT by LOS x CS schools**

	LOS=0 CS=0	LOS=1 CS=0	LOS=0 CS=1	LOS=1 CS=1
1996	0.47	0.45	0.47	0.47
1997	0.47	0.44	0.47	0.45
1998	0.48	0.46	0.45	0.46
1999	0.48	0.48	0.45	0.50
2000	0.49	0.51	0.45	0.51
2001	0.49	0.53	0.44	0.52
2002	0.50	0.54	0.42	0.55
2003	0.49	0.53	0.43	0.54
2004	0.49	0.56	0.42	0.54

Table 3.6c: **Proportion of SAT Takers sending to UT Austin by LOS x CS Schools**

year	LOS=0 CS=0	LOS=1 CS=0	LOS=0 CS=1	LOS=1 CS=1
1996	0.36	0.23	0.31	0.20
1997	0.35	0.21	0.30	0.18
1998	0.34	0.22	0.27	0.17
1999	0.34	0.21	0.29	0.18
2000	0.36	0.24	0.28	0.20
2001	0.34	0.26	0.30	0.20
2002	0.33	0.26	0.29	0.21
2003	0.32	0.26	0.27	0.22
2004	0.31	0.27	0.27	0.23

Table 3.7: **Proportion Taking SAT and Sending to UT Austin**

	Prop. SAT		Prop. Austin—SAT	
Year	LOS=0	LOS=1	LOS=0	LOS=1
1996	0.39	0.44	0.24	0.23
1997	0.42	0.43	0.22	0.21
1998	0.37	0.47	0.20	0.20
1999	0.33	0.49	0.22	0.20
2000	0.45	0.52	0.23	0.24
2001	0.45	0.53	0.18	0.26
2002	0.42	0.55	0.19	0.25
2003	0.40	0.53	0.24	0.25
2004	0.41	0.57	0.24	0.26

Table 3.8: **Individual level regressions for score-report sending w/o fixed effects**

	Dependent Variables						
	> 4 scores	# scores	non-select	selective	Austin	TTPR	In-state
Trend	0.001	-0.01	0.008	-0.004	-0.003	0.001	0
	[0.001]	[0.004]**	[0.001]**	[0.001]**	[0.001]**	[0.000]	[0.000]
No Rank	-0.089	-0.499	-0.071	-0.009	-0.007	-0.031	-0.008
	[0.004]**	[0.024]**	[0.006]**	[0.005]*	[0.004]	[0.005]**	[0.002]**
1st decile	0.186	0.984	-0.109	0.201	0.157	-0.006	0.003
	[0.005]**	[0.027]**	[0.006]**	[0.006]**	[0.005]**	[0.004]	[0.002]
2nd decile	0.084	0.442	-0.043	0.152	0.111	0.012	0.004
	[0.004]**	[0.019]**	[0.005]**	[0.004]**	[0.004]**	[0.003]**	[0.002]**
2nd quintile	0.052	0.241	-0.008	0.097	0.073	0.016	0.004
	[0.003]**	[0.018]**	[0.004]	[0.004]**	[0.004]**	[0.003]**	[0.001]**
4th quintile	-0.035	-0.208	-0.024	-0.071	-0.045	-0.042	-0.008
	[0.005]**	[0.032]**	[0.007]**	[0.007]**	[0.006]**	[0.007]**	[0.003]*
5th quintile	-0.049	-0.343	-0.08	-0.095	-0.076	-0.074	-0.017
	[0.011]**	[0.063]**	[0.015]**	[0.014]**	[0.010]**	[0.014]**	[0.007]*
Post	0.001	-0.108	-0.024	-0.003	-0.01	-0.002	-0.001
	[0.004]	[0.022]**	[0.005]**	[0.004]	[0.003]**	[0.003]	[0.001]
Post×No Rank	0.036	0.014	-0.004	0.007	0.017	0.006	0.002
	[0.004]**	[0.026]	[0.006]	[0.005]	[0.004]**	[0.005]	[0.002]
Post×1st decile	-0.056	-0.248	-0.02	0.019	0.038	0.005	0
	[0.004]**	[0.026]**	[0.005]**	[0.005]**	[0.004]**	[0.004]	[0.002]
Post×2nd decile	-0.019	-0.093	-0.003	-0.001	0.012	0.002	0
	[0.004]**	[0.021]**	[0.005]	[0.004]	[0.004]**	[0.003]	[0.002]
Post×2nd quintile	-0.016	-0.038	-0.002	-0.016	-0.01	-0.005	-0.002
	[0.004]**	[0.020]	[0.004]	[0.004]**	[0.004]*	[0.003]	[0.002]
Post×4th quintile	0.005	0.054	0.016	0.013	0.007	0.016	0.004
	[0.006]	[0.035]	[0.007]*	[0.007]	[0.006]	[0.007]*	[0.004]
Post×5th quintile	0.008	0.123	0.031	0.044	0.046	0.022	0.015
	[0.012]	[0.069]	[0.016]*	[0.014]**	[0.011]**	[0.015]	[0.008]
Constant	0.314	3.853	0.795	0.359	0.435	0.598	0.97
	[0.072]**	[0.442]**	[0.121]**	[0.057]**	[0.066]**	[0.053]**	[0.019]**
Observations	865490	865490	865490	865490	865490	751339	751339
R^2	0.1	0.1	0.08	0.13	0.11	0.01	0

Notes:
1. Robust standard errors in brackets
2. * significant at 5%; ** significant at 1%
3. Omitted coefficients include SAT math and verbal scores, racial composition of the school, % poor, numbers in 12th grade, student-to-teacher ratio, teacher experience, ,whether the school subsequently gets LOS or CS, the post dummy, and interactions between the post dummy and rank categories.
4. All dependent variables are 0 - 1 indicators, except for Col 2 which is a count variable

Table 3.9: **Individual level regressions for score-report sending with fixed effects**

	Dependent Variables						
	> 4 scores	# scores	non-select	selective	Austin	TTPR	In-state
Trend	0.003	0.007	0.012	-0.004	-0.002	0	0
	[0.001]**	[0.005]	[0.001]**	[0.001]**	[0.001]**	[0.000]	[0.000]
No Rank	-0.09	-0.506	-0.071	-0.004	-0.003	-0.026	-0.008
	[0.004]**	[0.023]**	[0.005]**	[0.004]	[0.004]	[0.004]**	[0.002]**
1st decile	0.213	1.104	-0.113	0.214	0.176	-0.007	0
	[0.004]**	[0.025]**	[0.006]**	[0.005]**	[0.004]**	[0.003]*	[0.002]
2nd decile	0.1	0.515	-0.044	0.158	0.122	0.012	0.002
	[0.004]**	[0.019]**	[0.005]**	[0.004]**	[0.004]**	[0.003]**	[0.002]
2nd quintile	0.06	0.279	-0.008	0.099	0.077	0.016	0.002
	[0.003]**	[0.018]**	[0.004]*	[0.004]**	[0.004]**	[0.003]**	[0.001]
4th quintile	-0.046	-0.268	-0.021	-0.072	-0.049	-0.04	-0.006
	[0.005]**	[0.032]**	[0.007]**	[0.007]**	[0.006]**	[0.006]**	[0.003]
5th quintile	-0.067	-0.439	-0.074	-0.092	-0.073	-0.069	-0.013
	[0.011]**	[0.062]**	[0.014]**	[0.014]**	[0.011]**	[0.013]**	[0.007]
Post	0.002	-0.113	-0.03	-0.003	-0.009	-0.003	-0.002
	[0.003]	[0.021]**	[0.004]**	[0.003]	[0.003]**	[0.003]	[0.001]
Post×No Rank	0.036	0.017	0.001	0.002	0.011	0.004	0.002
	[0.004]**	[0.024]	[0.006]	[0.005]	[0.004]*	[0.004]	[0.002]
Post×1st decile	-0.059	-0.261	-0.018	0.018	0.036	0.007	0
	[0.004]**	[0.026]**	[0.005]**	[0.004]**	[0.004]**	[0.003]	[0.002]
Post×2nd decile	-0.021	-0.1	-0.001	-0.002	0.01	0.003	0
	[0.004]**	[0.022]**	[0.004]	[0.004]	[0.004]**	[0.003]	[0.002]
Post×2nd quintile	-0.017	-0.044	-0.003	-0.016	-0.01	-0.004	-0.002
	[0.004]**	[0.021]*	[0.004]	[0.004]**	[0.004]**	[0.003]	[0.002]
Post×4th quintile	0.007	0.061	0.012	0.011	0.005	0.015	0.004
	[0.005]	[0.034]	[0.007]	[0.007]	[0.006]	[0.007]*	[0.004]
Post×5th quintile	0.013	0.144	0.023	0.038	0.039	0.016	0.014
	[0.012]	[0.069]*	[0.015]	[0.014]**	[0.011]**	[0.015]	[0.008]
Constant	0.028	1.863	0.453	-0.034	-0.089	0.777	0.933
	[0.066]	[0.569]**	[0.069]**	[0.103]	[0.105]	[0.074]**	[0.020]**
Observations	865490	865490	865490	865490	865490	751339	751339
R^2	0.12	0.12	0.15	0.15	0.14	0.04	0.02

Notes:
1. Robust standard errors in brackets
2. * significant at 5%; ** significant at 1%
3. Omitted coefficients include SAT math and verbal scores, racial composition of the school, % poor, numbers in 12th grade, teacher student ratio, teacher experience and whether the school subsequently gets LOS or CS.
4. All dependent variables are 0 - 1 indicators, except for Col 2 which is a count variable
5. Estimates of high school level fixed effects have been suppressed.

Table 3.10: **Difference-in-Differences estimates for LOS program w/o fixed effects**

	Dependent Variables						
	Austin	# scores	non-select	selective	TTPR	In-State	> 4 scores
Trend	0.005	-0.02	0.011	0.003	0.007	0.001	-0.003
	[0.002]**	[0.013]	[0.003]**	[0.002]	[0.002]**	[0.001]	[0.002]
No Rank	0.021	-0.566	-0.055	0.003	-0.035	-0.002	-0.123
	[0.017]	[0.078]**	[0.022]*	[0.016]	[0.025]	[0.012]	[0.019]**
1st decile	0.185	1.075	-0.1	0.192	0	0.008	0.231
	[0.019]**	[0.086]**	[0.016]**	[0.035]**	[0.025]	[0.008]	[0.016]**
2nd decile	0.127	0.543	-0.031	0.133	0.011	-0.002	0.115
	[0.025]**	[0.071]**	[0.019]	[0.018]**	[0.016]	[0.011]	[0.012]**
2nd quintile	0.056	0.342	-0.01	0.057	0.001	0.001	0.076
	[0.011]**	[0.092]**	[0.024]	[0.016]**	[0.028]	[0.008]	[0.011]**
4th quintile	0.015	-0.239	-0.05	-0.008	-0.026	0.012	-0.06
	[0.037]	[0.080]**	[0.025]*	[0.028]	[0.018]	[0.008]	[0.015]**
5th quintile	-0.005	-0.496	-0.123	-0.07	-0.077	-0.044	-0.076
	[0.073]	[0.197]*	[0.031]**	[0.056]	[0.058]	[0.026]	[0.036]*
LOS×No Rank	-0.011	-0.026	-0.01	-0.002	-0.008	0.003	0.007
	[0.014]	[0.093]	[0.014]	[0.013]	[0.016]	[0.004]	[0.013]
LOS×1st decile	0.092	0.081	0.051	0.077	0.05	0.012	0.03
	[0.012]**	[0.082]	[0.017]**	[0.012]**	[0.012]**	[0.004]**	[0.014]*
LOS×2nd decile	0.032	0.097	0.015	0.016	0.017	0.005	0.024
	[0.012]**	[0.077]	[0.013]	[0.015]	[0.009]	[0.004]	[0.013]
LOS×2nd quintile	0.022	0.088	0.012	0.033	0.002	0.008	0.016
	[0.009]*	[0.090]	[0.019]	[0.014]*	[0.011]	[0.005]	[0.016]
LOS×3rd quintile	0	0.146	0.007	-0.006	0.007	0	0.026
	[0.011]	[0.096]	[0.018]	[0.013]	[0.010]	[0.004]	[0.017]
LOS×4th quintile	0	0.052	0.018	0.019	0.002	0.007	-0.003
	[0.014]	[0.117]	[0.021]	[0.015]	[0.018]	[0.007]	[0.017]
LOS×5th quintile	-0.027	0.067	0.075	-0.012	-0.016	-0.016	-0.01
	[0.025]	[0.177]	[0.038]*	[0.023]	[0.035]	[0.012]	[0.031]
LOS School	-0.032	-0.068	-0.002	-0.034	-0.015	-0.008	-0.005
	[0.013]*	[0.096]	[0.028]	[0.015]*	[0.014]	[0.004]	[0.018]
Constant	-9.597	40.47	-21.051	-5.365	-12.465	-0.426	5.503
	[3.376]**	[26.636]	[6.488]**	[3.675]	[3.375]**	[1.216]	[3.870]
Observations	189354	189354	189354	189354	167646	167646	189354
R^2	0.09	0.1	0.01	0.1	0.02	0	0.11

Notes:
1. Robust standard errors in brackets
2. * significant at 5%; ** significant at 1%
3. Omitted coefficients include SAT math and verbal scores, racial composition of the school, % poor, numbers in 12th grade, student-to-teacher ratio, teacher experience, ,whether the school subsequently gets LOS or CS, the post dummy, and interactions between the post dummy and rank categories.
4. All dependent variables are 0 - 1 indicators, except for Col 2 which is a count variable.
5. Estimates of high school level fixed effects have been suppressed.
6. The common support condition has been imposed.

Table 3.11: **Difference-in-Differences estimates for LOS program with fixed effects**

	Dependent Variables						
	Austin	# scores	non-select	selective	TTPR	In-State	> 4 scores
Trend	0.007	0.006	0.014	0.004	0.006	0.001	0.002
	[0.002]**	[0.015]	[0.002]**	[0.002]*	[0.002]**	[0.001]*	[0.002]
No Rank	0.023	-0.564	-0.049	0.003	-0.025	-0.002	-0.127
	[0.016]	[0.070]**	[0.020]*	[0.016]	[0.027]	[0.012]	[0.019]**
1st decile	0.185	1.096	-0.08	0.184	-0.001	0.007	0.241
	[0.020]**	[0.084]**	[0.017]**	[0.036]**	[0.026]	[0.007]	[0.015]**
2nd decile	0.128	0.548	-0.017	0.128	0.01	-0.002	0.118
	[0.023]**	[0.072]**	[0.017]	[0.017]**	[0.016]	[0.011]	[0.011]**
2nd quintile	0.057	0.346	-0.006	0.055	0.003	0.001	0.078
	[0.011]**	[0.092]**	[0.023]	[0.016]**	[0.029]	[0.008]	[0.011]**
4th quintile	0.016	-0.245	-0.05	-0.005	-0.026	0.01	-0.059
	[0.037]	[0.073]**	[0.024]*	[0.028]	[0.018]	[0.008]	[0.015]**
5th quintile	-0.004	-0.53	-0.119	-0.07	-0.083	-0.046	-0.086
	[0.073]	[0.194]**	[0.031]**	[0.058]	[0.059]	[0.026]	[0.035]*
LOS×No Rank	-0.008	-0.019	-0.017	0.003	-0.005	0.003	0.008
	[0.013]	[0.082]	[0.012]	[0.012]	[0.011]	[0.004]	[0.011]
LOS×1st decile	0.094	0.024	0.04	0.082	0.05	0.011	0.02
	[0.012]**	[0.071]	[0.016]*	[0.012]**	[0.013]**	[0.004]**	[0.014]
LOS×2nd decile	0.032	0.061	0.004	0.02	0.014	0.004	0.018
	[0.011]**	[0.067]	[0.010]	[0.015]	[0.009]	[0.004]	[0.012]
LOS×2nd quintile	0.023	0.07	0.005	0.036	0	0.007	0.014
	[0.009]**	[0.078]	[0.016]	[0.013]**	[0.008]	[0.005]	[0.013]
LOS×3rd quintile	0.003	0.177	-0.002	0.002	0.003	0	0.033
	[0.010]	[0.083]*	[0.016]	[0.012]	[0.009]	[0.004]	[0.014]*
LOS×4th quintile	0.005	0.118	0.013	0.031	0	0.007	0.011
	[0.013]	[0.104]	[0.015]	[0.014]*	[0.014]	[0.006]	[0.015]
LOS×5th quintile	-0.02	0.184	0.051	0.007	-0.023	-0.014	0.01
	[0.024]	[0.177]	[0.030]	[0.024]	[0.034]	[0.012]	[0.031]
Constant	-14.065	-9.156	-26.75	-7.974	-9.849	-1.643	-4.504
	[3.936]**	[30.492]	[4.994]**	[4.045]	[3.311]**	[1.289]	[4.289]
Observations	189354	189354	189354	189354	167646	167646	189354
R^2	0.1	0.13	0.06	0.11	0.04	0.02	0.13

Notes:
1. Robust standard errors in brackets
2. * significant at 5%; ** significant at 1%
3. Omitted coefficients include SAT math and verbal scores, racial composition of the school, % poor, numbers in 12th grade, student-to-teacher ratio, teacher experience, ,whether the school subsequently gets LOS or CS, the post dummy, and interactions between the post dummy and rank categories.
4. All dependent variables are 0 - 1 indicators, except for Col 2 which is a count variable
5. Estimates of high school level fixed effects have been suppressed.
6. The common support condition has been imposed.

Table 3.12: **Difference-in-Differences estimates for CS program w/o fixed effects**

	Dependent Variables						
	A&M	# scores	non-select	selective	TTPR	In-State	> 4 scores
Trend	-0.006	0.012	0.003	0.001	0.001	-0.001	0.005
	[0.002]**	[0.014]	[0.004]	[0.002]	[0.002]	[0.001]	[0.002]**
No Rank	-0.017	-0.606	-0.083	-0.011	-0.034	-0.005	-0.118
	[0.013]	[0.089]**	[0.022]**	[0.020]	[0.016]*	[0.008]	[0.018]**
1st decile	0.149	0.989	-0.088	0.215	0.031	0.014	0.194
	[0.018]**	[0.119]**	[0.027]**	[0.022]**	[0.017]	[0.008]	[0.019]**
2nd decile	0.086	0.479	-0.027	0.115	0.011	0.006	0.109
	[0.016]**	[0.086]**	[0.023]	[0.019]**	[0.014]	[0.008]	[0.017]**
2nd quintile	0.057	0.226	0.006	0.075	0.026	0.005	0.06
	[0.014]**	[0.082]**	[0.015]	[0.017]**	[0.013]*	[0.008]	[0.013]**
4th quintile	-0.061	-0.346	-0.064	-0.092	-0.083	-0.028	-0.068
	[0.025]*	[0.138]*	[0.024]**	[0.033]**	[0.030]**	[0.019]	[0.023]**
5th quintile	-0.086	-0.357	-0.114	-0.168	-0.139	-0.071	-0.037
	[0.031]**	[0.198]	[0.059]	[0.044]**	[0.076]	[0.069]	[0.038]
CS×No Rank	0.023	-0.217	-0.043	0.035	0.004	0.003	-0.021
	[0.014]	[0.111]	[0.025]	[0.013]**	[0.012]	[0.005]	[0.017]
CS×1st decile	0.035	-0.322	0.014	0.043	0.035	0.005	-0.05
	[0.019]	[0.088]**	[0.022]	[0.015]**	[0.016]*	[0.006]	[0.014]**
CS×2nd decile	0.014	-0.255	-0.017	0.001	-0.008	0.005	-0.05
	[0.014]	[0.093]**	[0.016]	[0.015]	[0.011]	[0.005]	[0.017]**
CS×2nd quintile	0.014	-0.148	-0.025	0.023	-0.009	0.007	-0.029
	[0.013]	[0.092]	[0.018]	[0.014]	[0.013]	[0.005]	[0.014]*
CS×3rd quintile	0.02	-0.113	-0.057	0.014	-0.01	-0.003	-0.016
	[0.011]	[0.094]	[0.022]**	[0.015]	[0.014]	[0.008]	[0.015]
CS×4th quintile	0.015	-0.038	-0.08	0.024	-0.058	0.008	-0.026
	[0.018]	[0.148]	[0.029]**	[0.027]	[0.030]	[0.011]	[0.018]
CS×5th quintile	0.02	-0.316	-0.082	0.061	-0.004	0.013	-0.056
	[0.032]	[0.245]	[0.043]	[0.039]	[0.045]	[0.010]	[0.051]
CS School	0.001	-0.146	-0.01	-0.035	-0.053	-0.004	-0.02
	[0.013]	[0.089]	[0.034]	[0.014]*	[0.014]**	[0.004]	[0.015]
Constant	11.944	-19.36	-4.947	-2.037	-1.9	2.36	-9.546
	[3.272]**	[27.667]	[7.067]	[3.751]	[3.552]	[1.083]*	[3.535]**
Observations	265849	265849	265849	265849	233562	233562	265849
R^2	0.07	0.1	0.04	0.13	0.03	0.01	0.11

Notes:
1. Robust standard errors in brackets
2. * significant at 5%; ** significant at 1%
3. Omitted coefficients include SAT math and verbal scores, racial composition of the school, % poor, numbers in 12th grade, student-to-teacher ratio, teacher experience, ,whether the school subsequently gets LOS or CS, the post dummy, and interactions between the post dummy and rank categories.
4. All dependent variables are 0 - 1 indicators, except for Col 2 which is a count variable.
5. Estimates of high school level fixed effects have been suppressed.
6. The common support condition has been imposed.

Table 3.13: **Difference-in-Differences estimates for CS program with fixed effects**

	Dependent Variables						
	A&M	# scores	non-select	selective	TTPR	In-State	> 4 scores
Trend	-0.007	0.002	0.012	-0.004	0.003	0	0.003
	[0.002]**	[0.016]	[0.002]**	[0.002]*	[0.002]	[0.001]	[0.002]
No Rank	-0.017	-0.593	-0.073	0	-0.027	-0.004	-0.118
	[0.012]	[0.085]**	[0.020]**	[0.020]	[0.016]	[0.008]	[0.017]**
1st decile	0.154	1.028	-0.078	0.218	0.03	0.012	0.206
	[0.017]**	[0.116]**	[0.025]**	[0.021]**	[0.016]	[0.008]	[0.019]**
2nd decile	0.089	0.498	-0.02	0.114	0.014	0.006	0.115
	[0.016]**	[0.090]**	[0.021]	[0.018]**	[0.013]	[0.008]	[0.017]**
2nd quintile	0.057	0.239	0.011	0.074	0.03	0.004	0.064
	[0.014]**	[0.079]**	[0.014]	[0.017]**	[0.013]*	[0.008]	[0.013]**
4th quintile	-0.061	-0.361	-0.078	-0.09	-0.081	-0.027	-0.072
	[0.027]*	[0.144]*	[0.026]**	[0.035]*	[0.029]**	[0.019]	[0.024]**
5th quintile	-0.077	-0.405	-0.094	-0.177	-0.14	-0.07	-0.045
	[0.031]*	[0.192]*	[0.065]	[0.044]**	[0.074]	[0.069]	[0.038]
CS×No Rank	0.021	-0.126	-0.035	0.036	0.002	0.004	-0.011
	[0.012]	[0.100]	[0.020]	[0.012]**	[0.011]	[0.004]	[0.014]
CS×1st decile	0.037	-0.301	0.004	0.048	0.035	0.007	-0.05
	[0.019]	[0.083]**	[0.021]	[0.015]**	[0.013]**	[0.005]	[0.012]**
CS×2nd decile	0.016	-0.228	-0.019	0	-0.009	0.007	-0.048
	[0.014]	[0.084]**	[0.014]	[0.014]	[0.010]	[0.005]	[0.015]**
CS×2nd quintile	0.013	-0.109	-0.023	0.02	-0.008	0.008	-0.025
	[0.013]	[0.085]	[0.014]	[0.014]	[0.011]	[0.005]	[0.012]*
CS×3rd quintile	0.017	-0.079	-0.042	0.005	-0.01	-0.001	-0.012
	[0.011]	[0.085]	[0.018]*	[0.014]	[0.014]	[0.007]	[0.014]
CS×4th quintile	0.006	-0.013	-0.059	0.014	-0.055	0.01	-0.024
	[0.017]	[0.136]	[0.025]*	[0.025]	[0.031]	[0.011]	[0.016]
CS×5th quintile	0.004	-0.302	-0.09	0.06	0.012	0.011	-0.052
	[0.033]	[0.235]	[0.041]*	[0.038]	[0.043]	[0.010]	[0.050]
Constant	13.057	-1.85	-23.622	8.213	-4.524	0.718	-5.723
	[3.135]**	[31.248]	[4.899]**	[4.008]*	[3.417]	[1.516]	[3.893]
Observations	265849	265849	265849	265849	233562	233562	265849
R^2	0.08	0.13	0.1	0.14	0.05	0.01	0.13

Notes:
1. Robust standard errors in brackets
2. * significant at 5%; ** significant at 1%
3. Omitted coefficients include SAT math and verbal scores, racial composition of the school, % poor, numbers in 12th grade, student-to-teacher ratio, teacher experience, ,whether the school subsequently gets LOS or CS, the post dummy, and interactions between the post dummy and rank categories.
4. All dependent variables are 0 - 1 indicators, except for Col 2 which is a count variable
5. Estimates of high school level fixed effects have been suppressed.
6. The common support condition has been imposed.

3.10 Figures

Figure 3.1: **Propensity Score Histograms for LOS Schools**

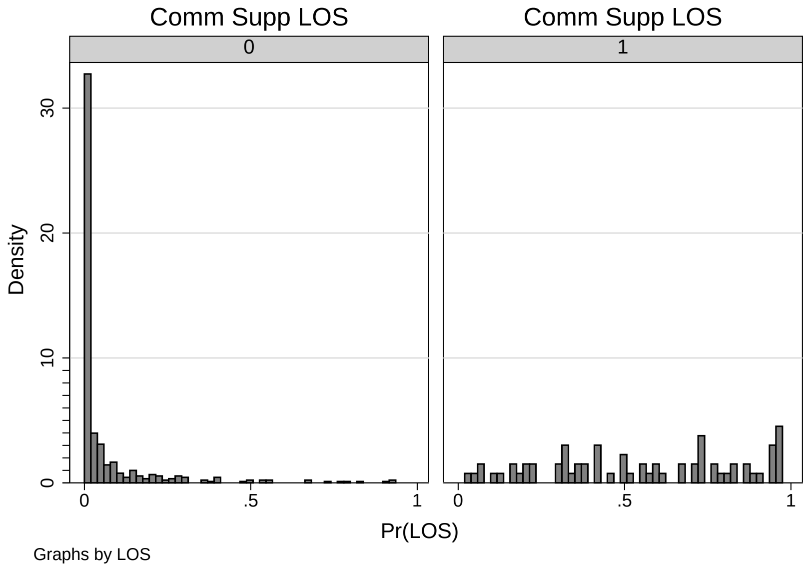


Figure 3.2: **Adjusted Propensity Score Histograms for LOS Schools**

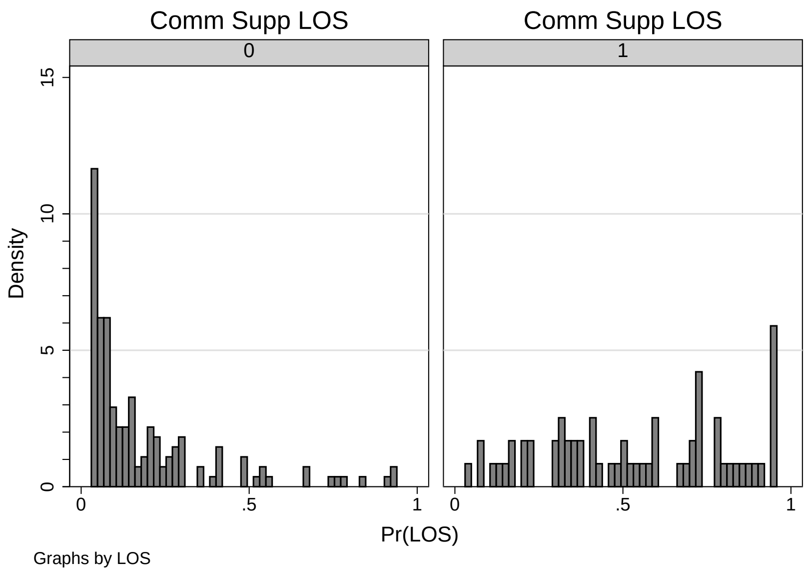


Figure 3.3: **Propensity Score Histograms for CS Schools**

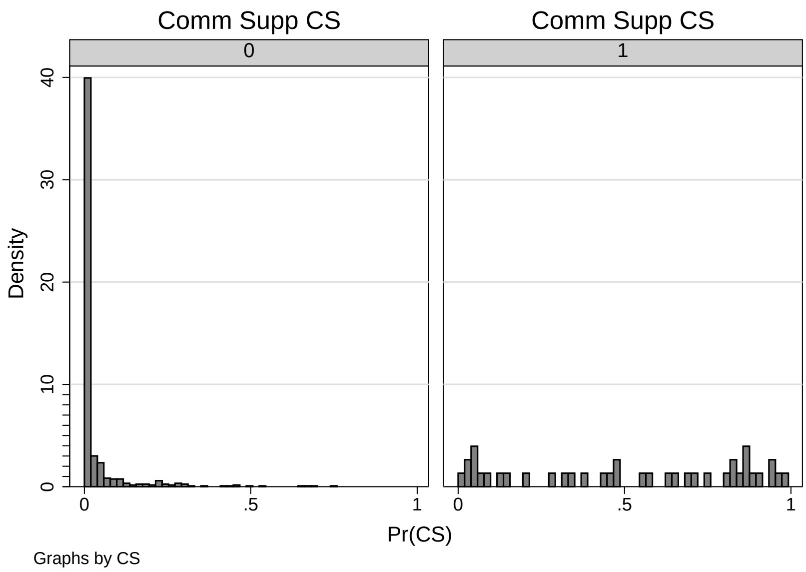
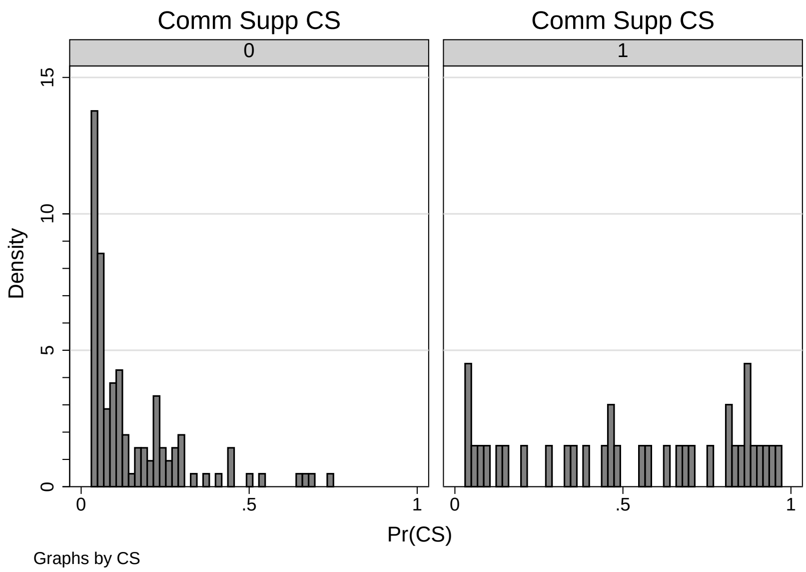


Figure 3.4: **Adjusted Propensity Score Histograms for CS Schools**



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CHAPTER IV

The Impact of Colorblind Admissions on the Educational Expectations of Texas High School Graduates

4.1 Introduction

On March 18, 1996 the United States Fifth Circuit court of appeals in *Hopwood v. Texas* ruled that the race of applicants could not be used for the purpose of creating a diverse student body. In July of 1996, the Supreme Court declined to review the ruling of the Fifth Circuit court of appeals. The ruling of the Fifth Circuit Court of Appeals coupled with the Supreme Court's subsequent refusal to review the case prompted the Attorney General of Texas to notify all public colleges and universities in Texas that it was illegal to consider race in decisions concerning either admissions or financial aid.

The Hopwood ruling was followed by precipitous drops in minority enrollment at Texas's most selective institutions of higher education. For example, in the three years following the Hopwood decision, the number of African-American and Hispanic graduates from Texas high schools enrolling in the state's two most selective public universities declined by 44 percent and 11.5 percent, respectively, relative to the three years that preceded the decision (Kain and O'Brien, 2003).

Texas's legislators sought a race-neutral solution to reverse the decline in minority enrollment that followed the *Hopwood v. Texas* decision. The legislators' policy response, *House Bill 588* or The Top Ten Percent Rule, was signed into law on May 20, 1997 by then governor George W. Bush. *House Bill 588* grants automatic admission to any Texas public college or university —for up to two years after graduation—for graduates of Texas's high schools provided that the student both finishes in the top decile of his/her high school class and submits a completed application. *Housebill 588* also grants Texas's public colleges and universities the option of admitting students who graduated in the top quartile of their class. The law also provides a list of characteristics that Texas's public colleges and universities may consider when making an admissions decision.[1]

Texas's race-neutral admissions regime has been the subject of many debates concerning the appropriateness of affirmative action. The merit based aspects of the regime, such as *House Bill 588's* use of class rank, makes it both more politically attractive and easier to defend legally than a criterion that explicitly depends on race as a means of prescription. The use of merit has made policies molded in the style of *House Bill 588* viable in states where there are existing or potential challenges to affirmative action policies.

Among academics, the efficacy of the regime has generated the lion's share of research. The initial impact of *House Bill 588* on minority enrollment at Texas's more selective public universities was small, but there were sizeable increases in minority enrollment during *House Bill 588's* second year (Kain and O'Brien, 2003). Bucks (2003) documents that students eligible for automatic admissions under *House Bill 588* comprise an increasing share of both applicants and enrolles at the University of Texas at Austin. However, Horn and Flores (2003) and Kain and O'Brien (2003) argue that that these increases can be attributed to to targeted financial aid and support programs, such as the University of Texas at Austin's Longhorn Opportunity Scholarship program.

Card and Krueger (2004) find that the elimination of affirmative action has no impact on the types of colleges that highly qualified blacks and Hispanics designate to receive SAT score results. Long (2004) finds that the gap between the number of SAT score reports sent by non-minority and minority students to in-state public colleges significantly widened. The share of minority students in Texas's high schools rose dramatically in the nineties. When viewed relative to the demographic changes, *Housebill 588's* performance

[1]A subset of the eighteen characteristics include the following:applicant's academic record,socioeconomic background,whether the applicant has bilingual proficiency,extracurricular activities,employment history,and personal interview.

as a means of diversification remains questionable.

Dickson (2006) analyzes the impact of the policies in Texas on the percentage of students from Texas's high schools who attempt an admissions examination. Dickson finds that the end of affirmative action both lowered the overall percentage of students taking an examination and ,in particular, it lowered the percent of black and Hispanic students who attempted an admissions examination.

I analyze a similar question with a different focus and estimation method. Horn and Flores (2003) state that percent plans work partly because the high schools are segregated. Using a difference-in-differences estimation strategy, I look at the impact of the admissions regime change on the test taking at relatively segregated Texas high schools. Dickson (2006) assumes that the impact of the changes in the admissions regime affects all high schools in the same manner after controlling for school demographics and including both school and time fixed effects. The method I employ relaxes this assumption. I account for the interaction of high school type and time in my empirical specifications.

The objective of this paper is to test the ability of Texas's post-affirmative action regime to influence the educational expectations of high school graduates as measured by their willingness to attempt an admissions examination. The decision to attempt an admissions examination reflects an individual's decision to join the potential pool of applicants to more selective colleges. The dependent variable is the percentage of a high school's graduates during a particular year that have chosen to attempt an admissions examination. The analysis focuses on individual outcomes aggregated to the high school level. The aggregation is appropriate, because eligibility for the automatic admissions granted by *House Bill 588* is determined relative to a student's graduating cohort at the high school where the student completed her studies.

To preview results, I find a decline in the percentage of students taking admissions examinations that is associated with the introduction of Texas's race-neutral admissions regime. I also find that the decline is worse for high schools classified as being Hispanic or

Poor. Schools that are classified as being black or minority did not experience declines of the same magnitude as high schools classified as being poor or Hispanic.

4.2 Impact of Admissions Regime Change

The policies that comprise the post-affirmative action regime are a response to the use of race being outlawed in the admissions process. Any direct advantage that race may have conferred upon a potential applicant is diminished. In principle, the loss of the potential advantage in admissions probability should impact the examination behavior of the individual minority student regardless of the characteristics of the school the student attends. However, this paper looks at outcomes aggregated to the high school level. I assume that such effects will have a greater impact on the schools with relatively high minority concentrations.

House Bill 588 makes use of a blunt instrument, class rank. It restricts Texas's public colleges and universities from considering other measures in the admissions decision for students who meet the class rank criterion. *House Bill 588* introduces a host of effects that depend upon interschool quality, test scores, and curriculum strength. The following model fleshes out these issues.

Let there be two types of schools, schools of higher quality (School type: H) and schools of lower quality (School Type: L). Each type of school produces two types of students, students who expect to qualify for automatic admissions by being in the top of their class (Student Type: Q) and students who do not expect to qualify for automatic admissions (Student Type: N). Assume that both the expectation and the realization of scores on admissions examinations are positively related to both the quality of a school and the rank of a student within a school. For example, a Q student from a L school, on average, expects and obtains a higher score than a N student from her school, but a Q student from a L school, on average, expects and obtains a lower admissions examination score than an identically ranked Q student from a H school.

Students who qualify for automatic admissions by graduating in the top decile are exempt from having both the quality of their high school and their standardized test scores factor in the admission decision for Texas's public colleges and universities. Texas's public colleges and universities can not deny admission to students who qualify via *House Bill 588*.

The post-affirmative action admissions regime is unlikely to impact the educational expectations of a Q student from a H school and hence the test taking behavior of such students. Q students from L schools are likely to have their expectation of attending a more selective institution increase relative to the periods prior to the change in the admissions regime. Being a Q student from a L school puts such students on par with Q students from H schools and grants them a significant advantage in admissions over lower ranked students from H type schools who obtained higher admissions examination scores relative to the periods prior to the post-affirmative action regime.

Texas's post-secondary institutions are not constrained when considering N students. High school quality, curriculum strength, and standardized test scores factor in the admissions decision for students not in the top decile. Students not in the top decile at schools of lower quality likely face a lower probability of admission to Texas's public colleges and universities relative to similarly ranked students in high schools of higher quality. If Texas's post-secondary institutions view some of the top ten students as being less than ideal, then one method of reducing the impact of the less qualified students on the average quality of incoming classes is to be more selective in admitting students not in the top decile. Hence, the educational expectations of N students from L schools may decrease. The above reasoning also applies to N students from H schools, but to a lesser extent. Relative to N students from L schools, N students from H schools are likely to benefit from higher test scores and higher levels of school quality.

For a N student from a L school, the expected value of attempting an admissions examination—as measured by the expectation of admission to a more selective institution—

has decreased. Given that the benefit of taking an admissions examination has declined, N students from L schools may respond by opting not to take a costly examination.

Furthermore, if the share of minorities in a high school is negatively related to school quality then the above mechanisms have a larger impact on the expectations of minorities relative to the period prior to affirmative action. A minority student of type N in a L school is subject to the mechanism outlined above and can not expect to benefit from the consideration of his/her race in the admissions process.

The above scenario considers the behavior of individual students. I do not have data that follows individual students. My research will investigate the aggregate response. Given that there are situations that both positively and negatively affect individual outcomes, my research will determine which effects have the largest magnitude.

I pose the followings questions: Did the admission regime change in Texas influence the graduates of high schools test taking propensity? If there is an effect, does it differ for schools of different"types"? I classify schools using the demographic characteristics of the high schools in my sample prior to the passing of *House Bill 588*. School quality and the demographic characteristics of high school are likely related. My estimates will reflect the impact of both school quality and compositional effects on the dependent variable.

The interaction of a student's ranking within a school, inter-school quality, and the socioeconomic characteristics of high school students makes the impact of the post-affirmative action on the educational expectations of Texas's high school graduates relative to the prior periods theoretically ambiguous a priori. The answers to these questions must be ascertained empirically.

The study of race neutral programs remains a topic worthy of investigation despite the United States Supreme Court's rulings[2] in the cases brought against the University of Michigan. The end result of these rulings is that the use of race is allowable but the means of applying race in the admissions process remains vague. Texas A&M, one of

[2] *Grutter v. Bollinger* established that diversity is a compelling government interest that allows for the use of race when its usage is governed by a narrowly tailored program. *Gratz v. Bollinger* proscribes any admissions policy that makes race a decisive factor.

Texas's flagship institutions, has opted to forego the consideration of race in its admissions process. One of the attractive features of race neutral policies is that they circumvent the legal constraints that race conscious policies must confront. This paper seeks to determine if the post-affirmative action regime consists of policies sufficient to combat the impact on minority students of disallowing the use of race in the admissions process.

Various factions are calling for Texas's Top Ten Percent Rule to be struck down or modified. It would be prudent to fully understand the ramifications of *House Bill 588* in its present incarnation before implementing some change in the policy. The two sections that follow describe both the data and the methods that I will use to determine the impact of race neutral admissions on the educational expectations of Texas high school graduates.

4.3 Data

The data used in this analysis are drawn from the Academic Excellence Indicator System (AEIS). Through the Public Education Information Management System (PEIMS) the Texas Education Agency (TEA) annually collects a broad range of information from Texas's high schools. Testing contractors provide the TEA with scores on standardized tests which are administered statewide.[3] The data are used to construct a panel consisting of high schools that meet four criteria:

i. No missing values for the variables of interest.

ii. The high school possesses a campus population of at least one hundred students.

iii. The high school cannot be an alternative school.

iv. The school appears at least once in both the pre and post periods.

The sample contains $9,875$ campus-year observations; $1,148$ individual high schools were followed over a period of nine academic years. Schools in the sample appeared a minimum of two times with the average number of appearances in the sample being 8.6

[3] Data available for the following standardized tests: ACT, SAT, Advanced Placement examinations, International Baccalaureate examinations

times. The data used in the analysis consist of high school demographics and institutional characteristics, such as student to teacher ratio per school, the number of students in the school and per pupil instructional costs in constant 2001 dollars.

4.4 Methodology

The use of race as a factor in determining admissions and financial aid was banned in Texas on August 21,1996, the beginning of the $1996-1997$ academic year. *House Bill 588* was signed into law on May 20, 1997. The first cohort exposed to the regime under which *House Bill 588* determined admissions graduated from high school during the $1997-1998$ academic year. The $1996-1997$ academic year operated under neither affirmative action nor the Texas Top Ten Percent rule. The post-affirmative action regime is designated as beginning during the $1997-1998$ academic year.

I propose estimating the following model to determine if the post-affirmative action regime is associated with differential test taking propensity relative to the affirmative action regime.

$$Entrance_{it} = \alpha_i + \beta' X_{it} + \gamma Trend + \delta Post_t + \varepsilon_{it} \tag{4.1}$$

The dependent variable is the percentage of a high school's graduates in year t that have taken a college entrance examination at some point in their high school career. The α_i are school specific fixed effects. With these initial estimates, I merely cluster at the school level. Later in the paper when I estimate models with variables that do not vary within group, I take measures to deal with this issue. X_{it} consists of school level characteristics— for example, the percentage of a campus that is black and the percentage of a campus that is Hispanic. The $Trend$ variable accounts for a linear trend that affects all schools in the same manner. $Post_t$ is a binary variable that indicates an observation comes from academic years following the $1996-1997$ academic year[4]

[4]I estimate models where I include *None*, a dummy variable to account for the no mandate year (1996-1997). The inclusion of the *None* and *Post* in the estimating accounts for the existence of three regimes in the data— affirmative action ($1993-94$ to $1995-96$), the no mandate year ($1996-97$), the Top Ten Percent Years ($1997-98$ to $2001-02$). The

The population of high school students experienced tremendous changes during the nineties. There was a marked increase in the number of graduates produced by Texas's high schools. The demographic composition of high schools changed as well. Minorities comprised an increasing share of the student population. I control for these changes by including in the specification the percentage of each school's population that is African American and Hispanic[5].

I have no prior prediction on the sign of the coefficient associated with the variable $Post_t$. Earlier in the paper, I posited several channels through which the admissions regime change can both positively and negatively affect the rate at which high school graduates attempt admissions examinations. The presence of these potentially countervailing effects accounts for the ambiguity associated with the impact of the post-affirmative action regime on the test taking propensity.

The second hypothesis consists of the following question: Did the post-affirmative action regime impact the percentage of Texas high school graduates who take admissions examinations differently for schools of varying "type"? In order to test this hypothesis, I devise a method of classifying schools. This classification scheme is based on the characteristics of the school prior to the admissions regime change in order to avoid the classification being contaminated by the effects of the regime change.

I use the demographics of the school to determine school type. Consider a characteristic of the schools in our sample, say the percentage of the school's students that is black. I compute the mean of this variable for each school in the sample from the period prior to the change in the admissions regime. I construct a binary variable that indicates if a school is in the top quintile of the distribution of mean percentages.[6] This indicator variable is

coefficient associated with this variable was small and statistically indistinguishable from zero. For the remainder of the paper, the no mandate year is treated as belonging to the period prior to the admissions regime and does not receive separate consideration.

[5]Models including the percentage of a high school's campus that is Asian or of Pacific Island descent were estimated. The data set has this measure beginning with the $1994-1995$ academic year. Prior to the $1994-1995$ academic year schools reported Black, Hispanic, and White as the primary categories. Other ethnic categories were lumped together. Models including the percentage of a high school campus that is Asian only use eight years of data. Including this covariate does not alter the conclusions.

[6]Let X_{it} be the percentage of students who are black for school i in year t. The measure under consideration is $\frac{1}{T}\sum_{t=1}^{t=T} X_{it}$ where T is the number of years school i is in the sample prior to the policy change.

called *Black* . This procedure is employed to designate schools of varying "types".

I assume that schools with relatively high minority concentrations are more likely to be impacted by Texas's prohibiting the use of race and the subsequent policy response, *House Bill 588.* The classification scheme that I employ provides a method of identifying such schools.

A difference-in-differences approach is employed to estimate the impact of the admissions regime changes on the propensity of the graduates of Texas's high schools to attempt entrance examinations. With this quasi-experimental design, high schools with relatively high concentrations of black students, Hispanic students, minority students, and poor students[7] in the period prior to the regime change are designated as schools likely to receive treatment from the changes in the admissions regime. Schools in the four remaining quintiles with respect to the time averaged measure of interest serve as the control group.

A reemergence of the "Moulton" problem (Moulton, 1990) has called into question a number of studies that have employed a difference-in-differences estimation strategy. Donald and Lang (2003), Wooldridge (2003), and Bertrand et al. (2004) point out the pitfalls in estimation and inference when the underlying group structure of the data is not addressed adequately.

Donald and Lang (2003) critique several papers that employ the difference-in-differences framework. They point out that asymptotic properties based on the assumption of an infinite number of groups lead to incorrect inference for the coefficients of variables that are constant within group. Bertrand et al. (2004) state that improperly accounting for serial correlation among outcomes and autocorrelation for "treatment" variables in the typical difference-in-differences estimation leads to the underestimation of the standard errors. The three papers describe the impact of variants of the "Moulton" critique on estimation and inference that apply when the number of groups is small.

To deal with these issues I use a two-step estimation procedure that accounts for the

[7]Minority is defined as being either black or Hispanic. A student is classified as poor if the student receives either free or reduced price meals

group structure of the data. The procedure is used to estimate variants of the following equation.

$$Ent_{igt} = \beta' X_{igt} + \gamma_0 Post_t + \gamma_1 Group_g + \delta Group_g * Post_t + \varepsilon_{igt} \tag{4.2}$$

The two-step estimation procedure is implemented as follows. In the first stage I estimate the following equation:

$$\hat{Z} = \overline{Ent}_{gt} - \hat{\beta}' \overline{X}_{gt} \tag{4.3}$$

$$for\ g\ \in (1,2)\ and\ for\ t\ \in (1, \ldots, 9)$$

$$where\ \overline{Ent}_{gt} = \frac{\sum_{i=1}^{N_{gt}} Ent_{igt}}{N_{gt}}\ and\ \overline{X}_{gt} = \frac{\sum_{i=1}^{N_{gt}} X_{igt}}{N_{gt}}\ for\ g\ \in (1,2)\ and\ for\ t\ \in (1, \ldots, 9)$$

The second step estimates the following:

$$\hat{Z} = \iota\ + \gamma_0 Post_t + \gamma_1 Group_g + \delta Group_g * Post_t + \varepsilon_{gt} \tag{4.4}$$

$\hat{Z}$ of equation three is a mean of the percentage of graduates who take admissions examinations that has been regression adjusted for the variables that vary within group, the X_{igt}. $Post_t$ retains the same definition. $Group_g$ is a dummy variable that indicates that a school is classified as being of a particular type; e.g., *Poor*. $Group_g * Post_t$ is an indicator variable that indicates that an observation is a school of type g in the post-affirmative action admissions regime. With two groups and nine years of data, a total of eighteen means are estimated. Equation four estimates how well the group level variables perform in estimating the variation in the means. The coefficient associated with Post gives the impact of the time period associated with the post-affirmative action regime on all schools. The coefficient associated with the indicator variable for group membership represents the difference in mean of test-taking propensity for the two groups—for example, the difference between Hispanic and Non-Hispanic schools. The coefficient δ is the difference-in-differences estimate. The size and magnitude of this coefficient on the post-affirmative action regime on schools in a particular group relative to schools in the same group in the period prior to Texas's colorblind admissions regime. The regressions in the second step are weighted by the inverse of the standard errors from the first step in order to correct for heteroscedasticity.

The $\hat{Z}$ are group-year means that have been regression adjusted for the variables that vary at the level of the high school. The two step procedure allows an econometrician to remove the effects of the characteristics that vary within group, while achieving proper aggregation in order to deal with the "Moulton" problem.

The next section offers describes the sample of high schools and discusses the results. The conclusion follows.

4.5 Discussion

The goal of this investigation is to determine the impact of the regime change on the admissions examination behavior of Texas's high school graduates. The rate at which graduates take these examinations is interpreted as a proxy for the intent to possibly apply to a more selective institution.

I avoid questions concerning the intensive aspect of taking entrance examinations. I define the intensive component of the admissions examination behavior as the exertion devoted to exam performance conditional upon taking an examination. Theoretical modeling of colorblind programs suggest that such programs result in a decrease in effort for some of the agents (Fryer and Loury, 2003). I avoid questions concerning effort because there isn't an adequate measure of effort at the school level. The dependent variable employed in this paper reflects the rate at which a Texas high school contributes to the potential pool of applicants to more selective institutions. Effort is an individual measure that would require extensive micro-level data beyond what is presently available.

4.5.1 Discussion of Summary Statistics

Inspection of Tables 4.1*a* and 4.1*b* reveal several interesting demographic trends. High schools have seen on average the percentage of Hispanic students comprising the campus population increase by 16 percent over the years for which the data are available. This is a direct reflection of the pattern of immigration that Texas experienced during the nineties. The percentage of students who are classified as poor[8] increased by an average of 16 percent from 33.99 percent to 39.34 percent between the academic years $1993 - 1994$ and $2001 - 2002$. The average number of students per high school also increased in our sample from 817 students to 891 students.

The dependent variable is high school graduates who have taken an admissions examination. This measure is consistently around 64 percent in the pre-period. The measure drops by four percent for those who graduated during the $1997 - 1998$ academic year. The timing is conspicuous. The cohort of those who graduated in 1998 is the first to be exposed to the admissions regime that began with the ratification of *House Bill 588*.

Table 4.2 summarizes the pre-period and post-period means for the schools in the sample. Table 4.2 shows that schools have increased in size and that instructional costs per student have risen over time. Minorities comprise a higher percentage of students in the period after the regime change. This growth can attributed to the increase in the number of Hispanic students.

Table 4.3 is constructed to present the actual differences between the pre-period and post-period averages for the schools in our sample. For each school in the sample, I produce means[9] for the variables in both the pre-period and the pos-period. The means were subtracted in order to produce the average difference between periods for the schools in the sample.

The percentage of graduates taking an admissions exam has declined by 3.4 percent

[8] Poor is defined as students who meet the eligibility requirements to receive free or reduced price meals

[9] Consider a school i in either the pre or post period. Let X_i be a characteristic of the school. To generate the mean of this variable in either period I sum this measure for all the years the school was present within the period and then divide this sum by the number of years the school was present in the period.

relative to the mean percentage of graduates who attempt an admissions examination in the period prior to the change this in the admissions regime; although this difference is not statistically distinguishable from zero, its magnitude is considerable. The differences in the other variables mimic the patterns demonstrated in Tables 4.1*a* and 4.1*b*. The fourth column in Table 3 contains the overall sample means and standard deviations for the dependent variable and some of the controls used in the model.

The descriptive statistics suggest that more rigorous analytical methods are required. I run a few basic regression models to determine if the post-affirmative action regime is associated with differential examination taking propensity. The results of these regressions are contained in Table 4.4.

4.5.2 Regression Results

Model 1 is a pooled ordinary least squares specification. I ignore the panel structure of the data and treat each campus-year as unique observation. Nearly all the covariates enter significantly. The coefficient associated with the binary variable post is of particular interest. This coefficient is negative and statistically significant. It suggests that a -2.90 percentage point drop in the rate at which graduates of Texas's high schools take admissions examinations is associated with the post-affirmative action regime.

However, one should be careful in using these estimates. This is a pooled model. The variation used to generate the estimates are derived both from variation within schools and variation between schools. Consider the coefficient associated with the variable for the percentage of a school that is Hispanic. It enters positively and is statistically significant. Given the pattern of immigration in Texas and the relative socioeconomic status of the immigrants, I find this estimate to be dubious.

Hudson (2003) using the National Education Longitudinal Study of 1988 documents that Hispanics are far less likely than whites or Asians to both obtain a high School diploma and then, within a year of graduating from high school, enroll in a post-secondary institution. This finding—coupled with the socioeconomic status of the immigrants—

makes it highly unlikely that an increase in the percentage of a high school that is Hispanic is associated with an increase in the rate at which the graduates of the high school take admissions examinations.

Model 2 is a fixed effects specification that accounts for the fact that I have up to nine years of data on each school in the sample. The coefficients associated with school size, per pupil instructional costs, student to teacher ratio, teacher experience, and the percentage of the campus population that is poor decreased in magnitude and became statistically insignificant. The coefficient associated with the percentage of the campus that is Hispanic changed sign and increased in magnitude relative to the estimate from model one. A ten percentage point increase in the percentage of a high school that is Hispanic is associated with a 3.7 percentage point decline in the rate at which graduates from Texas's high schools take admissions examinations. This is a 5.9 percent decrease relative to the overall sample mean.

The coefficient associated with the percentage of a campus that is black retained both its sign and significance, but doubled in magnitude. A ten percentage point increase in the percentage of a campus that is black is associated with a 1.5 percentage point decrease in the rate at which graduates from Texas's high schools take admissions examinations. This is a 2.3 percent decrease relative to the overall sample mean. Given the arguments I made earlier in the paper, I am a bit more comfortable with these estimates.

Model 2 was estimated without the binary variable post. With this specification, I am interested in looking at the effects of the covariates on the rate at which Texas's high school graduates take college admissions examinations. A majority of the covariates become insignificant in the fixed effects specification. This is to be expected. For a number of the covariates, there is not much within school variation. For example, high schools are generally designed to house a certain number of students. With such constraints in mind, I shouldn't expect a great deal of within school variation in the number of students. Similar arguments are applicable for most of the other covariates. However, it is worth noting that the coefficient associated with the percentage of students on campus that are poor decreased in magnitude and is no longer significant.

Model 3 is a fixed effects specification in the mold of model 2. The binary variable Post was added. The coefficient associated with Post is negative and highly significant. This is evidence that there is differential test taking propensity associated with the post-affirmative action admissions regime. The post period is associated with a 2.9 percentage point decrease in the percentage of graduates from Texas's high schools take admissions examinations. This is a 4.6 percent decrease relative to the overall sample mean.

The dependent variable is the ratio of graduates who have taken an admissions examination to the total number of graduates. One argument is that my findings result from an accounting issue. The composition of Texas's high school graduates have changed and this accounts for the finding of the model. I control for the demographic characteristics of the campus over time. These controls account for the impact of the demographic changes on the nature of Texas's high school graduates. Furthermore, I control for size of the school. This accounts for the changes in the size of the cohort of graduates[10]. Hence, I am reasonably assured that my findings reflect the impact of the post-affirmative action regime on post-secondary educational expectations.

The initial findings indicate that the post-affirmative action regime is associated with a decrease in the propensity of high school graduates to take admissions examinations. I have yet to speak to the distribution of the impact. Is it the case that the policies enacted had disparate impacts upon schools of different "type"? Students in the top decile are now admitted regardless of the score they obtain on the admissions examination. For students not in the top decile, admissions operates in a classical sense—test scores and the curriculum count a great deal. The "type" of high school that students attend impacts how admissions officers evaluate their applications. Given that all students who attend college do not graduate in the top ten percent, differences in school characteristics will have an

[10]Though not included in this paper, I have estimated models where the number of graduates per school was used explicitly as a control. The inclusion of this variable does not alter the conclusions

impact on both the admissions probabilities of students and the students' expectations of admission to more selective colleges and universities. This implies that the impact of the post-affirmative action regime will differ for students who attend different types of schools..

The comparison of $Poor$ and $Non - Poor$ schools, using the descriptive statistics in Table 4.5a, reveal several interesting facts. Relative to $Non - Poor$ schools, $Poor$ schools are on average smaller in size, tend to have higher instructional costs per pupil, and possess a student body that has a lower percentage of graduates that take admissions examinations, 58.95 percent versus 66.22 percent for $Non - Poor$ schools. Table 4.6a reveals that 147 Hispanic schools and 127 $Minority$ are classified as being $Poor$. Table 4.6b shows that 87 $Hispanic$ Schools and 45 $Minority$ Schools are also classified as being $Non - Poor$ schools. This reveals a positive correlation between the the presence of under-represented minorities and the socioeconomic status of a high school.

Table 4.7 contains the results from the second step of the estimating procedure described in the previous section. The table includes the estimates for variables that do not vary at the group level. The second column estimates the model for schools classified as being $Poor$. The coefficient associated with $Post$ is -2.71 percentage points and it is significant at the one percent level. The coefficient associated with $Post$ is an estimate of the overall decline in the percentage of graduates that take admissions examinations.

The estimate of the coefficient associated with $Poor$ is -26.50 percentage points and it is significant at the one percent level. This reflects the height difference between the regression adjusted means. The appropriate interpretation of $Poor$ is that it reflects the difference between $Poor$ schools and $Non{-}Poor$ schools that remains even after accounting for differences in the covariates that vary at the high school level.

The difference-in-differences estimate, the coefficient associated with $Post * Poor$, has a value of -2.60 percentage points, and it is significant at the one percent level. Using the average of the percentage of graduates from $Poor$ schools who take admissions examinations in the period prior to the change in the admissions regime as a reference, this indicates that a *Poor* school, on average, experiences a 7.91 percent decline relative to a *Poor* school in the period before the change in the admissions policy.

Figure 4.1 graphs the regression adjusted group-year means used to estimate the second step. The $Non - Poor$ group-year means do a good job of tracking the pattern of the *Poor* high schools prior to the change in the regime. I also consider the "false experiment" of looking for difference-in-differences findings prior to the change in the admissions regime. The graph demonstrates that one can reject the existence of spurious difference-in-differences results prior to the change in the admissions regime.

Inspection of Table 4.5a reveals that the graduates of $Hispanic$ schools, on average, take admissions examinations at a rate that is 5.2 percentage points lower relative to $Non - Hispanic$ schools in the period prior the change in the admissions regime. $Hispanic$ schools are, on average, larger and possessed a demographic profile that with nearly three times the percentage of minority students, 79.31 versus 27.76 for $Non - Hispanic$ schools. 64.47 percent of $Hispanic$ schools are classified as *Poor* while only 9.46 percent of $Non - Hispanic$ are classified as *Poor*.

The third column of of Table 4.7 contains the estimates for $Hispanic$ schools. The coefficient associated with *Post* has a value of -3.00 and is highly significant. The coefficient associated with the indicator for $Hispanic$ group membership is -23.21 and is highly significant. No surprises here, $Hispanic$ schools are different from their $Non - Hispanic$ counterparts.

The difference-in-differences estimate is -1.70 and significant at the five percent level. Using the average of the percentage of graduates from $Hispanic$ schools who take admissions examinations in the period prior to the change in the admissions regime as a reference, this indicates that a $Hispanic$ school, on average, experiences a 7.76 percent decline relative to a $Hispanic$ school in the period prior to the change in the admissions policy.

The results indicate that the colorblind admissions regime adversely impacts the test taking behavior of the graduates from *Poor* schools and *Hispanic* schools. The purpose of *House Bill 588* was to restore diversity to Texas's post-secondary institutions. It is possible for the program to both permit some graduates to gain admissions to more selective institutions and, simultaneously, diminish the post-secondary opportunities of other students. For *Poor* schools and *Hispanic* schools, the losses outweigh the gains.

Figure 4.2 contains the graph of the regression adjusted group-year means for *Hispanic* and $Non - Hispanic$ schools. The $Non - Hispanic$ group-year means do a good job of tracking the time pattern of *Hispanic* schools group year means prior to the change in the admissions regime. Figure 4.2 demonstrates that one can reject the existence of spurious difference-in-differences results prior to the change in the admissions regime.

Black schools have, on average, larger student bodies. Teachers at *Black* schools have more than a year of experience relative to their counterparts at $Non{-}Black$ schools. *Black* schools have a higher percentage of minorities relative to $Non - Black$ schools but with less than half the percentage of Hispanic students relative to $Non - Black$ schools. The graduates of *Black* schools on average attempt an admissions examination 3.28 percentage points less than $Non - Black$ schools.

Column four of Table 4.7 contains the results for *Black* schools. The coefficient associated with *Post* is -3.35 percentage points, and it is highly significant. The coefficient associated with an indicator for being classified as a *Black* school is -18.93 percentage points, and it is highly significant. Again, no surprises here. *Black* schools are different. The difference-in-differences estimate is 1.69 percentage points and highly significant. Using the average of the percentage of graduates from *Black* schools who take admissions examinations in the period prior to the change in the admissions regime as a reference, this indicates that a *Black* school, on average, experiences a 2.67 percent decline relative to a *Black* school in the period prior to the change in the admissions policy.

Figure 4.3 contains the graph of the regression adjusted group-year means for *Black* and $Non - Black$ schools. The $Non - Black$ group-year means do a good job of tracking the time pattern of *Black* schools group year means prior to the change in the admissions regime. Figure 4.3 demonstrates that the decline in test-taking propensity was greater in magnitude for $Non - Black$ schools. This explains the positive estimate returned by the difference-in-differences estimator. Let δ_B and δ_{NB} be the differences in the means between the period prior to the regime change and the period after the regime change for *Black* and $Non - Black$ schools, respectively. The difference-in-differences estimator essentially estimates, $\delta_B - \delta_{NB}$. The positive estimate is obtained because δ_{NB} is both negative and of greater magnitude than δ_B. One interpretation of this finding is that, on average, the set of schools classified as *Black* aren't as responsive to the change in the admissions regime as students in both *Hispanic* schools and *Poor* schools. This idea will be discussed later in the paper.

The percentage of graduates from *Minority* schools that attempt at least one admissions examination is smaller than the analogous number from $Non - Minority$ schools by 7.74 percentage points. *Minority* schools are larger and spend nearly 230 dollars less in instructional costs per pupil. *Minority* schools also have, on average, nearly double the percentage of poor students.

Column four of Table 4.7 contains the results for estimates with respect to *Minority* schools.The coefficient associated with *Post* has a value of -3.65 percentage points. The coefficient associated with being classified as a *Minority* school has a value of -21.92 percentage points,and it is significant at the one percent level. the difference-in-differences estimate is .801. The estimate is statistically insignificant. Using the average of the percentage of graduates from *Minority* schools who take admissions examinations in the period prior to the change in the admissions regime as a reference, this indicates that a *Minority* school, on average, experiences a 4.87 percent decline relative to a *Minority* school in the period prior to the change in the admissions policy.

Figure 4.4 contains the graph of the regression adjusted group-year means for *Minority* and $Non - Minority$ schools. The $Non - Minority$ group-year means do a good job of tracking the time pattern of *Minority* schools group-year means prior to the change in the admissions regime. Figure 4.4 demonstrates that the decline in test-taking propensity was greater in magnitude for *Non − Minority* schools. This parallels what happened when the difference-in-differences estimate for *Black* schools was estimated. The positive estimate is a result of test-taking declining less for *Minority* schools relative to *Non − Minority* schools.

The impact of Texas's colorblind admissions policy differs for different types of schools. The difference-in-differences estimates for both *Black* and *Minority* schools are positive. Table 4.5*b* offers some clues as to why *Black* schools aren't as adversely affected by the change in the admissions regime. Relative to *Poor*, *Hispanic*, and *Minority* schools, *Black* schools have far smaller concentrations of Hispanic and Poor students. Only 3.11 percent of *Black* schools are classified as *Hispanic*. Only 17.11 percent of *Black* schools are classified as *Poor*. In Texas, schools I classify as being *Black* aren't as likely as *Poor* schools and *Hispanic* to contain students of low socioeconomic status who are likely to be impacted by the policy.

Nearly thirty percent of the *Minority* schools in my sample are Longhorn Opportunity Scholarship Schools. The University of Texas at Austin established the Longhorn Opportunity Scholarship to recruit at Texas high schools that traditionally had not had many graduates attend the University of Texas at Austin. High schools that qualify for this program have, on average, both high minority populations and students from families of low socioeconomic status. The program offers financial aid to a few of the graduates in the top decile from the seventy Texas high schools that were selected. In addition to financial aid, students who were recruited via this program received priority status in registration, the opportunity to receive mentoring and free tutoring. The University of Texas at Austin established recruitment centers to inform students about the application process and the availability of this program.The University of Texas at Austin used the Longhorn Opportunity Scholarship as a segue to recruit other students.

Dickson (2006) finds that the program has a positive impact on the percentage of graduates who attempt an admissions program. This would tend to bias the estimate of the difference-in-differences coefficient upwards for $Minority$ schools.

4.6 Conclusion

There are two main findings in this paper: First, there was a negative change in the propensity for graduates of Texas's to attempt admission's examinations associated with the change in the admissions regime in Texas. Second, the impact of these changes varied according to the type of school.

House Bill 588 is an effort to increase diversity at Texas's public colleges and universities. It uses an unwieldy measure of merit, class ranking, to determine admissions for the upper decile of a high school's graduating class. Relative to admissions in the classical sense, Texas's Top Ten Percent Rule alters the incentives both within and between schools.

The June 13, 2004 issue of the New York Times contained a article which highlighted just this issue (Glater, 2004). In this article the father of a young man denied admission to the University of Texas at Austin complains that his son was penalized because the son attended a competitive high school. The father implies his son was crowded out due to the automatic admissions granted to graduates from less competitive high schools. This research is intended to provide information for policy makers that reveals the true impact of the changes and places narratives—like the one mentioned above—in the appropriate context.

I find an overall decline in the percentage of graduates who take an admissions examination. Furthermore, I am able to determine that these impacts are particularly severe at historically *Poor* schools, *Hispanic* schools. For *Black* schools and $Minority$ schools the impact 0f the post-affirmative action regime is positive, though significant only for *Black* schools. It was shown, however, that *Black* schools are different from the other ethnic types with respect to minority concentration and the concentration of poor students. For

Minority schools, the Longhorn Opportunity Scholarship program and the fact that there is considerable overlap between *Minority* schools and *Black* schools likely attenuate the impact of the admissions regime change.

House Bill 588 sought to remedy the dearth of minorities by easing admissions for the top decile to take advantage of the fact that a number of Texas's high schools are racially identifiable. Using the racial identifiability of Texas's high schools in conjunction with a blunt measure of student quality—like class rank—produces perverse incentives. This paper finds that for some schools students reacted negatively to the incentives.

I mentioned before that the success of the Top Ten Percent Plan in its primary mission, which is restoring an acceptable minority presence to Texas's public colleges and universities, has been called into question. The proportion of minorities on the campuses of Texas's public colleges and universities is less than the proportion of college age minorities relative to the total population of college age youth in Texas. This paper provides a possible explanation for this lack of results. Given that the policy negatively impacts *Hispanic* schools, it stands to reason that the pool of applicants will not equate with the proportion of minorities present in Texas's college age youth. This is especially important when one considers the growth rate of the Hispanic population. In attempting to restore diversity to its post-secondary institutions, particularly the flagship schools, surely Texas's legislators did not intend to dampen the educational expectations of Hispanic students and poor students.

This paper estimates the impact of the post-affirmative action regime on the admission's examination taking propensity of Texas's high school graduates. I find that the *House Bill 588* had a negative impact on the test taking propensity and that the impact is worse for schools classified as being *Poor* schools or *Hispanic* schools. In the future, all the potential impacts of diversification efforts must be taken into account. To ignore these effects will prove costly and damaging to those most in need of assistance.

4.7 Tables

Table 4.1a: **Descriptive Statistics: Pre Period**

Variable	1993 − 1994	1994 − 1995	1995 − 1996	1996 − 1997
% Taking Exam|Graduate	64.47	64.54	64.63	63.86
	(16.10)	(15.58)	(16.61)	(15.82)
School Size	817.26	832.91	850.74	876.11
	(785.12)	(789.79)	(807.30)	(830.58)
Instructional Costs	3083.19	3085.65	3142.73	3180.40
	(929.34)	(630.17)	(646.24)	(658.33)
Teacher's Experience	12.96	12.92	12.99	12.99
	(2.12)	(2.12)	(2.07)	(2.07)
Student\Teacher Ratio	13.67	13.55	13.38	13.45
	(2.94)	(2.89)	(3.06)	(3.58)
% Black	13.55	13.72	13.70	13.59
	(19.23)	(19.19)	(19.03)	(18.69)
% Hispanic	32.95	32.93	32.92	33.89
	(31.32)	(31.05)	(30.77)	(30.81)
% Minority	46.50	46.64	46.62	47.48
	(31.18)	(31.07)	(30.97)	(30.93)
% Poor	30.74	31.73	31.59	33.41
	(21.48)	(21.69)	(22.06)	(22.69)
N	1088	1102	1098	1108

Notes: The table consists of means with standard deviations in parentheses
School size is in number of students.
Instructional costs are per pupil and in constant 2001 dollars.
Teacher's experience is the average number of years of experience per teacher.

Table 4.1b: **Descriptive Statistics: Post Period**

Variable	1997 − 1998	1998 − 1999	1999 − 2000	2000 − 2001	2001 − 2002
% Taking Exam|Graduate	62.21	62.78	62.63	63.26	61.98
	(15.86)	(16.02)	(16.22)	(16.35)	(16.59)
School Size	900.06	892.78	895.77	895.34	891.13
	(852.43)	(849.17)	(851.13)	(848.59)	(853.77)
Instructional Costs	3320.10	3340.31	3563.47	4094.85	4168.68
	(646.94)	(652.91)	(689.13)	(1137.20)	(1143.47)
Teacher's Experience	13.03	13.07	12.86	13.08	13.03
	(2.05)	(1.99)	(2.38)	(2.33)	(2.34)
Student\Teacher Ratio	13.20	13.08	12.88	12.75	12.61
	(2.93)	(2.85)	(2.85)	(2.83)	(2.34)
% Black	13.68	10.80	13.28	10.85	10.72
	(18.58)	(17.98)	(16.21)	(16.57)	(16.23)
% Hispanic	34.04	34.33	29.37	30.21	30.88
	(30.46)	(30.31)	(28.25)	(28.18)	(28.11)
% Minority	47.73	47.61	40.02	41.07	41.60
	(30.81)	(30.73)	(29.50)	(29.61)	(29.53)
% Poor	34.42	34.19	37.21	38.01	39.34
	(23.15)	(22.72)	(21.01)	(21.41)	(21.69)
N	1101	1100	1097	1087	1094

Notes: The table consists of means with standard deviations in parentheses

School size is in number of students.
Instructional costs are per pupil and in constant 2001 dollars.
Teacher's experience is the average number of years of experience per teacher.

Table 4.2: **Descriptive Statistics by Period**

Variable \ **Time Period**	**Pre**	**Post**
% *TakingExam—Graduate*	64.74	62.52
	(14.47)	(14.50)
School Size	832.01	876.49
	(800.15)	(845.05)
Instructional Costs	3614.53	4032.62
	(1342.57)	(1104.68)
Teacher's Experience	12.33	12.84
	(2.28)	(2.17)
Student\Teacher Ratio	13.44	12.81
	(2.93)	(2.81)
% Black	10.84	10.64
	(16.79)	(16.35)
% Hispanic	27.16	29.59
	(27.98)	(28.08)
% Minority	38.00	40.23
	(29.09)	(29.39)
% Poor	35.07	37.88
	(19.83)	(20.94)
N	1148	1148

The table consists of means with standard deviations in parentheses.

Table 4.3: **Cross-Period Differences**

	Differences		Sample Means
$\Delta Colladm_{post-pre}$	-2.22 (9.69)	$Colladm$	63.3 (16.48)
$\Delta(Student\backslash Teacher\ Ratio)_{post-pre}$	$-.625$ (1.22)	$Student\backslash TeacherRatio$	13.17 (2.98)
$\Delta(Teacher's\ Experience)_{post-pre}$	.519 (1.47)	$Teacher'sExperience$	12.64 (2.37)
$\Delta(School\ Size)_{post-pre}$	44.48 (175.48)	$SchoolSize$	874.06 (830.63)
$\Delta(Per\ Pupil\ Costs)_{post-pre}$	418.08 (1160.36)	$PerPupilCosts$	3800.911 (1080.80)
$\Delta(\%Poor)_{post-pre}$	2.82 (7.33)	$\%Poor$	36.31 (20.77)
$\Delta(\%Black)_{post-pre}$	$-.196$ (2.68)	$\%Black$	10.88 (16.66)
$\Delta(\%Hispanic)_{post-pre}$	2.43 (3.58)	$\%Hispanic$	28.45 (28.16)
N [$No.\ of\ schools$]	1148	N [$school-by-year$]	9875

Notes: This table presents the difference in means between the pre and post periods. The second column contains the average differences in the variables for schools that appeared at least once in both the pre and post periods.

Table 4.4: **Basic Regressions**

Dependent variable: $\frac{\#(exam\ takers|graduates)}{\#graduates}$

Covariates	Model 1	Model 2	Model 3
School Size	.0017	−.0006	−.0003
	(.0003)	(.0009)	(.0009)
Instructional Costs	.0009	.00001	.00003
	(.0002)	(.0002)	(.0002)
Student\Teacher Ratio	−.932	−.091	−.098
	(.096)	(.100)	(.100)
Teacher Experience	.860	.091	.101
	(.070)	(.094)	.094)
% Disadvantaged	−.281	−.018	−.019
	(.013)	(.020)	(.020)
% Hispanic	.044	−.365	−.371
	(.010)	(.047)	(.047)
% Black	−.064	−.134	−.146
	(.011)	(.062)	(.062)
Post	−2.90	.	−2.92
	(.621)	.	(.423)
Fixed Effects	No	Yes	Yes
N	9875	9875	9875
R^2	.132	.041	.044

Model 1 is pooled OLS.
Model 2 and Model 3 are fixed effects specifications.
The above models control for the presence of linear time trends.

Table 4.5a: **Descriptive Statistics by School Type: Pre-Period**

Variable \ **School Type**	**Poor**	**Non-Poor**	**Hispanic**	**Non-Hispanic**
% Taking Exam|Graduate	58.95	66.22	60.57	65.77
	(15.19)	(13.90)	(15.06)	(14.13)
School Size	787.26	843.47	1086.66	768.91
	(791.86)	(802.29)	(874.71)	(768.13)
Instructional Costs	4041.36	3505.26	3613.72	3614.74
	(2450.62)	(820.48)	(902.95)	(1431.18)
Teacher's Experience	11.62	12.51	11.95	12.42
	(2.61)	(2.14)	(2.35)	(2.25)
Student\Teacher Ratio	12.72	13.62	13.91	13.32
	(3.30)	(2.79)	(3.15)	(2.86)
% Black	10.36	10.96	3.12	12.75
	(20.96)	(15.56)	(5.41)	(18.06)
% Hispanic	60.08	18.73	76.19	15.01
	(33.14)	(18.82)	(17.20)	(12.65)
% Minority	70.45	29.69	79.31	27.76
	(27.75)	(22.96)	(16.28)	(21.50)
% Poor	65.86	27.18	58.62	29.23
	(11.72)	(12.39)	(17.46)	(15.60)
N	234	914	228	920

Notes:The table consists of means with standard deviations in parentheses

Table 4.5b: **Descriptive Statistics by School Type: Pre-Period**

Variable \ **School Type**	**Black**	**Non-Black**	**Minority**	**Non-Minority**
% Taking Exam|Graduate	62.10	65.38	58.54	66.28
	(13.22)	(14.69)	(14.69)	(14.00)
School Size	1025.66	784.81	1244.34	729.83
	(808.58	(791.37)	(874.71)	(757.40)
Instructional Costs	3438.12	3657.54	3429.51	3660.39
	(784.29)	(1443.42)	(821.03)	(1439.64)
Teacher's Experience	13.20	12.12	12.52	12.28
	(2.21)	(2.24)	(2.55)	(2.20)
Student\Teacher Ratio	14.39	13.21	14.96	13.06
	(3.00)	(2.86)	(3.10)	(2.76)
% Black	37.86	4.25	18.78	8.87
	(20.91)	(4.79)	(29.52)	(10.83)
% Hispanic	15.02	30.12	67.85	17.07
	(14.16)	(29.67)	(30.38)	(15.38)
% Minority	52.88	34.37	86.63	25.94
	(24.04)	(29.07)	(11.25)	(17.10)
% Poor	36.52	34.71	58.41	29.28
	(16.00)	(20.64)	(18.59)	(15.38)
N	225	923	228	920

The table consists of means with standard deviations in parentheses

Table 4.6a: **School-Type Comparisons—Conditional on Schools being Poor**

School Type	Hispanic	Black	Minority	Non-Hispanic	Non-Black	Non-Minority
Hispanic	147	2	127	0	145	20
Black		39	22	37	0	17
Minority			147	20	125	0
Non-Hispanic				87	50	67
Non-Black					195	70
Non-Minority						87

Table 6a allows allows one to identify the number of schools that overlap with respect to two types given that the schools are classified as being Poor. The diagonal entries contain the number of schools that are Hispanic, Black, Minority, Non-Hispanic, Non-Black, and Non-Hispanic, respectively. For example, to figure out the percentage of Hispanic schools that are Black, given that the schools in the table are classified as Poor, you would take the entry from M_{12} and divide it by the entry from M_{11}, which is $\frac{2}{147}$ or 1.36%. There are 234 Poor schools.

Table 4.6b: **School-Type Comparisons—Conditional on Schools being Non-Poor.**

School Type	Hispanic	Black	Minority	Non-Hispanic	Non-Black	Non-Minority
Hispanic	81	5	45	0	70	36
Black		186	41	181	0	145
Minority			81	36	40	0
Non-Hispanic				833	652	797
Non-Black					728	688
Non-Minority						833

Table 6b allows allows one to identify the number of schools that overlap with respect to two types given that the schools are classified as being Poor. The diagonal entries contain the number of schools that are Hispanic, Black, Minority, Non-Hispanic, Non-Black, and Non-Hispanic, respectively. For example, to figure out the percentage of Hispanic schools that are Black, given that the schools in the table are classified as Poor, you would take the entry from M_{12} and divide it by the entry from M_{11}, which is $\frac{5}{81}$ or 6.17%. There are 234 Poor schools.

Table 4.7: **Difference-in-Differences Estimates**

Dependent variable: $\frac{\#(exam\ takers|graduates)}{\#graduates}$

Covariates	Model 1	Model 2	Model 3	Model 4
Post	−2.71	−3.00	−3.35	−3.65
	(.271)	(.359)	(.305)	(.404)
Poor	−26.50	.	.	.
	(.484)	.	.	.
Post*Poor	−2.60	.	.	.
	(.659)	.	.	.
Hispanic	.	−23.21	.	.
	.	(.503)	.	.
Post*Hispanic	.	−1.70	.	.
	.	(.630)	.	.
Black	.	.	−18.93	.
	.	.	(.354)	.
Post*Black	.	.	1.69	.
	.	.	(.525)	.
Minority	.	.	.	−21.92
	.	.	.	(.388)
Post*Minority	.	.	.	.801
	.	.	.	(.672)
N_{Groups}	18	18	18	18
R^2	.9983	.9977	.9971	.9964

Notes: Standard errors in parentheses.
Only the coefficients of interest are shown.
Results are from a regression of group means that have been regression adjusted for covariates that vary within group on covariates that do not vary at the group level.

4.8 Figures

Figure 4.1: **Poor Schools vs. Non-Poor Schools**

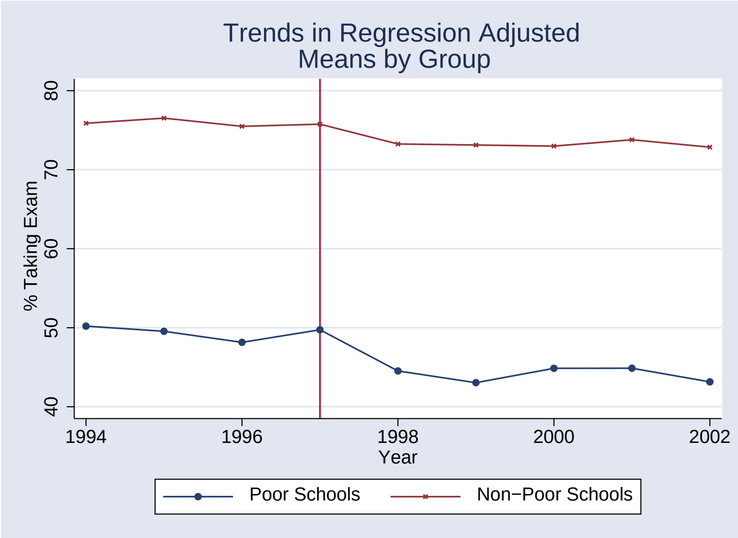


Figure 4.2: **Hispanic Schools vs. Non-Hispanic Schools**

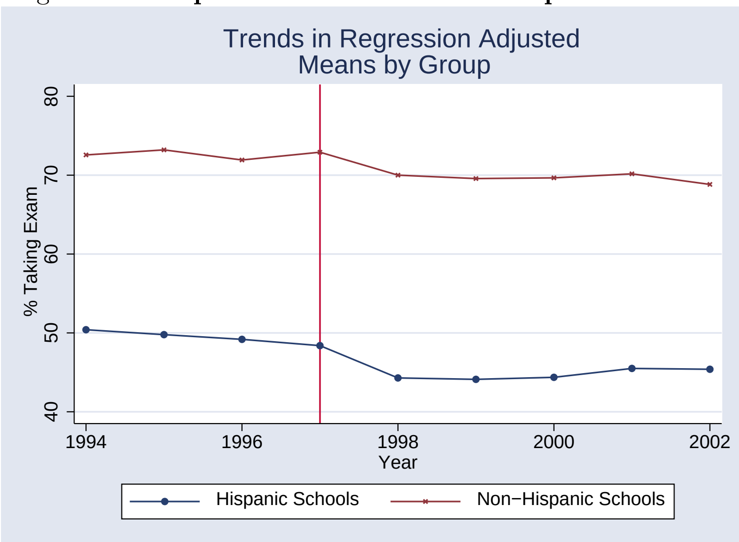


Figure 4.3: **Black Schools vs. Non-Black Schools**

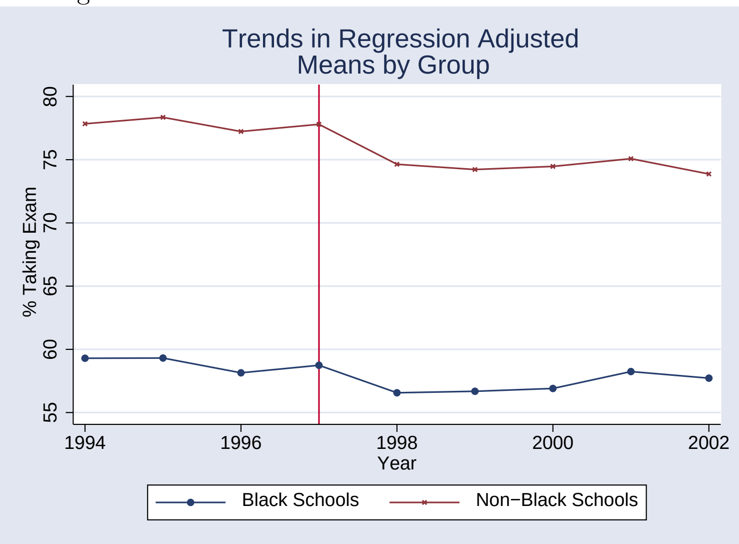
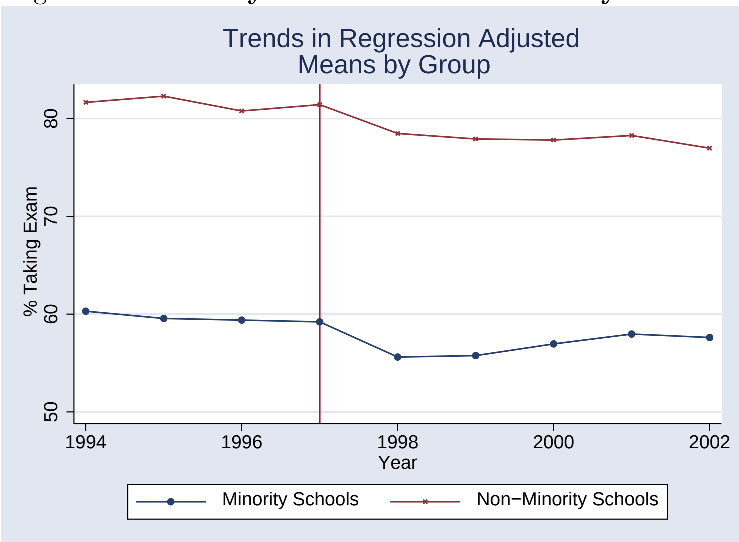


Figure 4.4: **Minority Schools vs. Non-Minority Schools**



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CHAPTER V

Conclusion

This dissertation is a collection of papers that examine the impact of legal challenges to Affirmative Action and the subsequent policy responses on educational outcomes. The first chapter examined the impact of the Supreme Court's decisions in *Gratz v. Bollinger* and *Grutter v. Bollinger* on applications and admissions at the University of Michigan. The second and third chapters examine the impact of *Hopwood v. Texas* and Texas's Top Ten Percent Rule (TTTPR) on score report sending behavior and the rate at which the graduates of Texas high schools attempt admissions examinations, respectively.

In the first chapter, I find that the pool of applicants changed. The size of the applicant pool changed, as well as the racial/ethnic makeup.The academic quality of the applicant pool, as measured by average SAT scores and average ACT scores, increased. The pool of admitted students changed as well. The academic quality of the admitted students increased; however, the increase wasn't as large as the increase in the academic quality of the applicant pool. With respect to the probability of admission, I find no evidence that the probability of admissions declined for black applicants, a finding that was contrary to expectations. I also show that the admission probabilities of whites and asians with relatively low selection index scores, the metric I use to identify similar applicants, converged, somewhat, after the Supreme Court decisions, with the advantage that white applicants with low selection index scores had over Asian applicants with low selection index scores declining.

The above findings should be interpreted with caution. There were discrepancies in one of the data sets I used to produce my estimates. Namely, the admissions data set had too many Hispanic students; therefore, I excluded Hispanics from the portion of the analysis that compared intertemporal changes in the probability of admission. This is a weakness of the analysis, as I am unable to analyze the impact of the changes in the admissions regime on one of the largest under-represented minority groups.

In addition, the analysis in the first chapter exploited the fact that the two samples were purportedly independently drawn ninety percent random samples of applicant and admits. The discrepancy with the Hispanic implies that the data wasn't a ninety percent random sample. This likely affects the results.

The questions that I address in this article have important policy implications. As such, the data used to inform policy should be as consistent as possible. In future research, I intend to use a complete and accurate data set. Such data minimizes the need for statistical assumptions and maximizes the reliability of the results obtained from the empirical investigation.

This paper examines the impact of both Texas's Top Ten Percent Rule (TTPR) and the targeted recruitment and financial aid programs instituted by the University of Texas Austin and Texas A&M-College Station on the score-report sending behavior—our proxy for applying to a particular college—of Texas's public high school students. Recall that TTPR grants automatic admission to any Texas public college or university to any graduate of a Texas high school—public or private—who finishes in the top decile of her class and completes the admission process within two years of graduating. TTPR was intended to restore minority enrollment at Texas's elite institutions, the University of Texas at Austin and Texas A&M-College Station.

I find that evidence that the Top Ten Percent rule matters and that the effects vary according to self-reported class rank. Students in the top decile under TTPR are less likely to submit score reports to more than four schools, less likely to submit to non-selective institutions, and more likely to submit to selective institutions in Texas. Students in the first decile under TTPR are less likely to submit score reports to non-selective institutions. Students in the fourth and fifth quintiles under TTPR are more likely to send score reports to non-selective institutions.

I also find evidence that students from high schools that are eligible for the Longhorn Opportunity Scholarship program who self-report as being ranked in the top three rank classifications increase the likelihood that they submit an application to the University of Texas at Austin. The effects of the Century Scholar program on the likelihood that students from designated high schools submit score reports to Texas A&M are smaller in magnitude relative to the effects of the Longhorn Opportunity Scholarship program and are statistically indistinguishable from zero. Both programs increase the likelihood that students in the top decile submit score reports to selective institutions in Texas.

The analysis of the top ten percent rule on score report sending behavior shows that the inter-temporal variation in the importance of class rank to the admissions decision does influence the score-report sending behavior of SAT test takers in Texas. The Longhorn Opportunity Scholarship program demonstrates that it is possible to successfully recruit at high schools with a high percentage of minorities in an environment where race can't be used explicitly. The relative lack of success of the Century Scholar program suggests that targeted recruitment isn't necessarily a panacea for minority enrollment deficits. Knowledge of how these race-neutral programs affect student choice is important as race-sensitive admissions and recruiting programs remain a contentious issue.

Access to education at elite institutions in the United States is highly competitive. The use of race-conscious admissions policies and race-neutral admissions in determining who deserves access to education at elite universities remains contentious. This dissertation contributes to understanding how these policies affect how students select colleges and how an elite institution distributes access.

ABSTRACT

THE IMPACT OF LEGAL CHALLENGES TO AFFIRMATIVE ACTION ON EDUCATIONAL CHOICE

by

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The first chapter of the dissertation explores the impact of the United State's Supreme Court's 2003 decisions in *Gratz v. Bollinger* and *Grutter v. Bollinger* on applications and admissions at an elite public university. The decisions proscribed the use of point systems; however, they permitted the use of race in a holistic review. I find that the size of the applicant pool declined and that the academic quality of applicants and admits increased. I find no evidence that the conditional probability of admissions declined for black applicants or that the advantage that white applicants with relatively low selection index scores held over Asian applicants with similar scores declined.

The second chapter examines the impacts of both Texas's Top Ten Percent Rule (TTTPR) and targeted recruitment programs on the score report sending behavior of SAT test-takers in Texas. Texas's Top Ten Percent Rule guarantees admission to any public college in Texas to high school graduates who finish in the top decile. Using SAT data and Texas High School data, I examine the score report sending behavior of SAT takers by self-reported class rank. I find that TTTPR affects score report sending behavior and that the effects

vary with self-reported rank. I find that the targeted financial aid program instituted by the University of Texas was successful in attracting score reports, a proxy for applications, from targeted high schools; the program instituted by Texas A&M-College Station was not as successful.

The third chapter examines the effects of the implementation of Texas's Top Ten Percent Rule on the rate at which graduates from Texas's high school attempt an admissions examination, a proxy for applying to a more selective college. Using high school level data from the Academic Excellence Indicator System, I find a decrease in the percentage of graduates who attempt an admissions examination and that the decrease is larger at schools that had student bodies with socioeconomically disadvantaged students or high schools with student bodies that had a high percentage of Hispanic Students.