The Impact of Affirmative Action Bans in Graduate Education

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FOREWORD
By Gary Orfield

This study by Dr. Liliana Garces raises an issue of great importance for both the nation's future and the national debate over the necessity of affirmative action. America's future depends on effectively competing in a global market and maintaining the world's strong research capability. That capability is developed in graduate training at leading universities. As the nation passes through an historic demographic transformation and members of traditionally excluded racial and ethnic minorities make up a far larger proportion of the next generation, we are failing to train these students with the skills needed to sustain and expand our technology and research capacity. The most important tools for recruiting traditionally excluded students include a variety of affirmative action programs that identify and nurture talent among groups often denied equal opportunity to prepare for such training. All of our leading research universities and professional associations adopted such policies.

As affirmative action has been banned in several states and the U.S. Supreme Court is set to consider the issue for the third time this fall in *Fisher v. University of Texas at Austin* (2011), it is vital to understand what impact the loss of affirmative action has had in particular states and to consider whether these states have found alternatives that maintain diversity without affirmative action. It is particularly important to consider graduate education since the major alternatives proposed for undergraduate access—the percent plan and admission by social and economic status—cannot be applied to graduate admissions where decisions are not made among students from a single state, undergraduate programs vary widely in terms of adequate preparation for graduate work, and students are admitted as adults, not on the basis of their family circumstances.

If the need is truly urgent and the programs in states prohibiting affirmative action don't work, the country's ability to prepare its changing population to sustain and expand these critical capacities will be severely damaged. Dr. Garces' important work suggests that this is a likely outcome.

Executive Summary

Graduate education is a key pathway to important areas of influence in our nation and the training ground for acquiring the specialized knowledge critical to individual, national, and global economic success (CGS, 2009b). Yet, despite recent increases in enrollment for students of color, this population remains severely underrepresented in graduate studies. Latinos make up 16 percent of the U.S. population, but only 6 percent of the entire graduate-student population in 2008; of all the doctoral degrees conferred in 2007, only 4 percent were granted to Latinos and 6 percent to African Americans, who represent 12 percent of the U.S. population (Aud, Fox, & KewalRamani, 2010). These disparities are notably starker within science-related disciplines. In science and engineering—fields that are critical to the economic competitiveness of the United States in a global market and to our national security (CGS, 2009b)—Latinos and African Americans each comprised only about five percent of students enrolled in 2008 (NSF, 2011). And of all the doctoral degrees that were awarded in engineering in 2009, only two percent each were granted to Latinos and African Americans (NSF, 2010).

These disparities are even more troubling as racial and ethnic minorities are projected to make up 54 percent of the population by midcentury and already account for 45 percent of all public school students (U.S. Census Bureau, 2008). In today's increasingly diverse society, the legitimacy and strength of our institutions and economy depend on equitable access to graduate education for individuals from all races and ethnicities (e.g., *Grutter v. Bollinger*, 2003; Bowen, Kurzweil, & Tobin, 2005). Thus, if left unaddressed in the future, enrollment disparities in graduate education will undermine our nation's ability to compete in a globalized economy, further exacerbate racial and ethnic inequities in our country, and undermine the realization of our democratic ideals.

To address these concerns, institutions of higher education have implemented affirmative action—or the consideration of race or ethnicity—as a factor in admissions practices (see Bowen & Bok, 1998; Bowen, Kurweil, & Tobin, 2005). Although the U.S. Supreme Court upheld the constitutionality of considering race as one of a number of other factors in admissions decisions in the landmark 2003 decision, *Grutter v. Bollinger*, these practices remain the target of legal challenges and controversy. Less than a decade since *Grutter*, the Court is scheduled to revisit the constitutionality of the practice in *Fisher v. University of Texas at Austin* (2011) in its 2012 fall term. Currently, seven states ban affirmative action practices. Of these, five (Arizona, California, Washington, Michigan, and Nebraska) implemented the bans through voter-approved initiatives or referenda; two others (Florida and New Hampshire) banned the practice, respectively, by executive decision or legislative vote.[1] In the meantime, opponents of these bans have challenged the state-ballot measures in California and Michigan as unconstitutional (see *Coalition to Defend Affirmative Action v. Regents of the University of Michigan*, 2011; *Coalition to Defend Affirmative Action v. Brown*, 2011). While these legal challenges are pending, public postsecondary institutions in states with affirmative action bans have implemented "race-blind" admissions policies.

[1] In 2001, University of Georgia officials also eliminated the consideration of race in admissions following a court of appeals decision in *Johnson v. Board of Regents of the University of Georgia* (11th Cir. 2001) (Hebel, 2001).

After bans were implemented in some of these states, selective colleges and schools of law and medicine experienced declines in the enrollment rates of students of color. In graduate schools, which use race-conscious factors and standardized testing in their admissions (Attiyeh & Attiyeh, 1997; Dugan, Baydar, Grady, & Johnson, 1996), one might also anticipate similar declines in the proportion of student of color enrollment as a consequence of the banning of affirmative action. Yet, the effects of these bans on graduate enrollment have not been studied systematically. As in the fields of law and medicine, graduate programs provide students with specialized training across a variety of fields that have important consequences for the nation's economic competitiveness and leadership. Thus, we need to better understand the impact of affirmative action bans at the graduate school level.

To this end, this study examines whether bans on affirmative action across four states—Texas (during *Hopwood v. State of Texas*), California (with Proposition 209), Washington (with Initiative 200), and Florida (with One Florida Initiative)[2]—have reduced the enrollment rates of underrepresented students of color in graduate studies and in a cross-section of graduate fields: the natural sciences, engineering, social sciences, business, education, and humanities. Unlike most prior studies, which have examined the effects of an affirmative action ban in one state, this study adopts a cross-state approach to estimate the effect of multiple bans on the enrollment rates of graduate students of color. In this analysis, the outcome is defined as the *proportion* of first-year graduate students who are underrepresented students of color because the overall enrollment of graduate students changes over time; this measure has also been used in other studies (e.g., Howell, 2010; Hinrichs, 2009). This definition of underrepresented students of color includes students whose self-reported race or ethnicity is African American, Latino, and/or Native Americans/Alaska Natives, and who are not international students.[3]

The findings contribute to the mounting evidence about the detrimental effects bans on affirmative action have had on the representation of students of color in postsecondary education. Specifically, the bans in Texas, California, Washington, and Florida have reduced by about 12 percent the average proportion of graduate students who are students of color across all the fields of graduate study included in the evaluation. In *engineering*, the bans have led to about a 26-percent reduction in the mean proportion of all enrolled graduate students who are students of color; a 19-percent decline in the *natural sciences*; a 15.7-percent drop in the *social sciences*, and a 11.8-percent drop in the *humanities*. Bans on affirmative action have also led to about a 13-percent decline in *education*, though the effect in this field is only marginally statistically significant. I did not find an overall impact of affirmative action bans on the proportion of graduate students of color who are enrolled in the field of *business*. In terms of individual students, these declines confirm an average of about 12 fewer students of color in engineering in total across these states; an average of 21 fewer underrepresented students of color in the natural sciences; an average of 10 fewer students of color in the social sciences; and an average of 8

[2] This study does not include in the analyses the affirmative action bans in Arizona, Nebraska or Michigan because their implementation has been too recent (2010, 2008, and 2006, respectively) to determine their impact.
[3] I do not include Asian American/Pacific Islanders students in my definition of underrepresented students of color because the category, as defined in the survey, includes many subgroups within the Asian American population, masking the wide differences in educational attainment that exist for students of different ethnicities in the category (CARE, 2010; Teranishi, 2010).

fewer students of color in the humanities. These numbers reflect the already minimal representation of students of color in most of these fields, even with affirmative action policies.

These findings also have broad implications for higher education institutions across the nation. Institutions located in states where they can still pursue affirmative action may be faced with ballot initiatives that seek to ban the practice. In these cases, information about the detrimental effects affirmative action bans have had at the undergraduate level, for the profession of law and, as documented in this study, across other graduate fields of study, needs to be considered by all stakeholders: the general public, policymakers, and institutional actors. These findings should also help inform pending challenges to the constitutionality of affirmative action practices, such as *Fisher v. University of Texas at Austin* (2011). They can also inform challenges to the constitutionality of bans on affirmative action in cases such as *Coalition to Defend Affirmative Action v. Regents of the University of Michigan* (2011). Simultaneously, postsecondary institutions and policymakers at the state-level need to continue to implement and explore effective strategies for increasing student of color representation and persistence to degree across fields of study. In light of the systemic inequities that contribute to the general underrepresentation of students of color at higher score percentiles in standardized tests, the findings should lead educators to reconsider their reliance on these measures in admissions, particularly in states where the tool of affirmative action is no longer available.

The Impact of Affirmative Action Bans in Graduate Education

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Affirmative Action in Higher Education & Current Statewide Bans on Affirmative Action Policies

The debate surrounding the use of race-based affirmative action has had a long history at institutions of postsecondary education, where leaders have sought to implement its use as a tool for increasing the representation on campus of students of color (Bowen & Bok, 1998). These efforts to employ affirmative action, however, have also been the target of legal challenges and public controversy. Sustained efforts by the higher education community to defend their practices culminated in 2003 when, in *Grutter v. Bollinger*, the U.S. Supreme Court upheld the right of the University of Michigan Law School to consider race in its admissions decisions. In its rationale, the Court emphasized the need for colleges and universities to consider race "in a society, like our own, in which race unfortunately still matters," not only so that the institution could obtain the educational benefits of student body diversity but also "to cultivate a set of leaders with legitimacy in the eyes of the citizenry." The Court thus emphasized the important role that colleges and universities play as a training ground for the future leaders of our nation, and endorsed the use of carefully implemented race-conscious policies as a tool for increasing the representation of students of color and for furthering institutional missions.[5]

When the Court issued its decision, bans on race-based policies in education were already in place in four states: Texas, California, Washington, and Florida. The ban in Texas was implemented because of a Fifth Circuit decision that prohibited the consideration of race in higher education admissions (*Hopwood v. State of Texas*, 1996). The Texas ban was in place from 1997 until 2003, when the Court's decision in *Grutter* overruled *Hopwood*. After *Grutter* overruled *Hopwood* and lifted the ban on affirmative action in Texas, the permission to consider race as a plus factor in admissions helped increase the proportion of students of color who enrolled in public graduate and professional schools in the state in 2006 by 3.4 percent (Garces, 2012a). The bans in California, Washington and Florida were the result of voter-approved statewide ballot measures or executive orders that prohibited the consideration of race in

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[5] Along with *Grutter*, the Court issued a separate decision in *Gratz v. Bollinger* (2003), which involved a challenge to the University of Michigan's undergraduate admission policy. In *Gratz*, the Court struck down the undergraduate admissions policy on the grounds that the policy's point system was not flexible enough to comply with the individualized consideration of race required in *Grutter*. Thus, together, *Gratz* and *Grutter* provide the parameters for postsecondary institutions to implement the consideration of race as a factor in admissions decisions in a constitutionally permissible manner.

employment, education, and contracting decisions in public institutions in the state. *Grutter* did not reverse the bans in California, Washington and Florida; though *Grutter* was a federal-court decision that applied nationally, and superseded court-based decisions such as *Hopwood*, it did not supersede state decisions to ban affirmative action in public universities. Thus, although the U.S. Supreme Court endorsed the constitutionality of affirmative action in *Grutter*, giving universities the right, if they wished, to practice affirmative action under strict limits, the practice can be banned on a state-by-state basis in public institutions through statewide initiatives, executive orders, or legislation; universities can also ban the practice through university policy.[6]

After *Grutter*, the trend toward limiting affirmative action through state-ballot measures continued, with voters in Michigan approving a statewide affirmative action ban in 2006, voters in Nebraska approving a ban in 2008, and, most recently, voters passing a similar ban in Arizona in 2010. As a result of these and other measures, currently seven states prohibit affirmative action at public universities: (1) California, with Proposition 209; (2) Washington, with Initiative 200; (3) Florida, with the One Florida Initiative; (4) Michigan, with Proposal 2; (5) Nebraska, with Initiative 424; (6) Arizona, with Proposition 107, and (7) New Hampshire by legislative vote. Colorado voters rejected a ballot measure in 2009. This study investigates the impact of the affirmative action bans on graduate student of color enrollment in the first three of these states as well as the state of Texas when *Hopwood* was in effect.

Notably, opponents of affirmative action bans have challenged the state-ballot measures in two states, California and Michigan, as unconstitutional (see *Coalition to Defend Affirmative Action v. Regents of the University of Michigan*, 2011; *Coalition to Defend Affirmative Action v. Brown*, 2012). In April 2012, the Ninth Circuit Court of Appeals dismissed the challenge to proposition 209 in California (*Coalition v. Brown*). In July 2011, the Sixth Circuit Court of Appeals struck down Proposal 2 in Michigan as unconstitutional under the Equal Protection Clause of the 14th Amendment to the U.S. Constitution. The ruling is limited to states in the Sixth Circuit, which includes Kentucky, Ohio, and Tennessee. The case is currently being considered by the full court of appeals and may eventually be heard by the U.S. Supreme Court. Meanwhile, postsecondary institutions in states with affirmative action bans have eliminated the consideration of race in their admissions policies.

Studies on the Effect of Affirmative Action Bans on the Admission and Enrollment of Students of Color

Undergraduate Education

Most studies on the effect of affirmative action bans in higher education have been at the undergraduate level. Before the implementation of the bans in Texas, California, Washington, and Florida, researchers focused primarily on simulating the effects of a ban on affirmative action on the enrollment of students of color. These studies predicted that undergraduate enrollment would fall among students of color in the absence of affirmative action policies.

[6] While statewide bans on affirmative action only apply to public universities, it is possible that a broad ruling by the U.S. Supreme Court in *Fisher,* finding affirmative action unconstitutional, could apply to private and public institutions.

Bowen & Bok (1998), for example, estimated that at selective colleges and universities, the percentage of African Americans in incoming classes would decline from 7.1 percent to 3.6 percent; Espenshade & Chung (2005) estimated that at highly selective private research universities, the proportion of admitted African American and Latino students would decline from 9 percent to 3.3 percent and 7.9 percent to 3.8 percent, respectively. Other studies reached similar conclusions (Arcidiacono, 2005; Kane, 1998; Long, 2004b). Most recently, Howell (2010) simulated the impact that a nationwide ban on affirmative action would have on the representation of students of color at four-year colleges. Her results indicate that the proportion of black and Latino students at all four-year colleges would decline by roughly 2 percent (or 0.6 percentage points), whereas the proportion of students of color at the most selective institutions would decline by approximately 10 percent (from 3.04 percent to 2.73 percent of all students).

The findings of empirical studies at the undergraduate level have been consistent with the findings of these simulation studies. Empirical studies have examined the impact of affirmative action bans at the different stages where one might anticipate an impact, such as the application, admission, and enrollment stages, and have confirmed an impact at selective undergraduate institutions. Studies that have examined the effect of affirmation action bans on the college-application behavior of students have been able to support causal inference. For instance, using standardized test-taking behavior as a proxy for a decision to apply to college, Dickson (2006) found a decline in the number of minority students who took college entrance examinations once affirmative action was banned in Texas, while Long (2004a) documented a large decrease in the number of SAT score reports that minorities sent to selective colleges in California and Texas. In contrast, Card and Krueger (2004) found that highly qualified African-American and Latino students did not change their submission of SAT scores to elite public institutions in either state.

Other undergraduate-level studies have documented declines in the proportion of students of color at the admission and enrollment stage in Texas, California and Florida. After *Hopwood's* ban of affirmative action in Texas, for instance, Tienda *et al.* (2003) documented a decline in the percentage of African-American and Latino students enrolled at the state's two most selective institutions, University of Texas (UT) Austin and Texas A&M, with enrollment dropping by about one-percentage point among African Americans at Texas A&M (from 3.7 percent to 2.4 percent) and UT Austin (from 4 percent to 3.3 percent), and dropping by over two-percentage points, or about one-seventh (from 15.8 percent to 13.7 percent) among Latinos at UT Austin between 1997-2000 (see also Chapa & Lazaro, 1998; Finnell, 1998). Kain, O'Brien, and Jargowsky (2005) also found that among underrepresented minorities in Texas who attended a public institution in the state, the affirmative action ban had a negative impact on the probability of enrolling at a selective institution (see also Bucks, 2005).

Other studies also documented enrollment-rate declines in both California and Florida, most strikingly with the proportion of underrepresented minority students dropping by half at the University of California at Berkeley immediately after the affirmative action ban was implemented (Colburn, Young & Yellen, 2008; Cross & Slater, 2002; Karabel, 1998; Kaufmann, 2007). In a recent study of the impact of affirmative action bans across all four states that have had a ban (California, Florida, Texas, and Washington), Hinrichs (2009) found that while the ban appeared to have no effect on the enrollment of underrepresented minority students at four-year institutions, the bans did decrease by nearly 4.3-percentage points their enrollment at public

selective colleges, or those ranked in the top 50 of the 1995 *U.S. News and World Report* college rankings. This study is similar to Hinrichs' (2009) in that it also examines the impact of the affirmative action bans on enrollment rates of students of color across states, though the focus here is at the graduate level.

Graduate Education

Far fewer studies examine the impact of affirmative action bans at the graduate level. This gap in the research is, however, not surprising given the specialized nature of graduate education, where admissions considerations differ by discipline and profession, as well as the limited sources of data that exist for consistent tracking of graduate-student enrollment by field of study. Before the implementation of the bans, simulation studies predicted declines in enrollment among graduate students of color when race or ethnicity ceased to be considered in admissions decisions. In a study of admission into graduate-management programs, Dugan *et al.* (1996) estimated that not considering race during the admissions process for applicants who registered for the GMAT between 1990-1991, would reduce the probability of acceptance of African-American students from 70 percent to 52 percent and of Latino students from 78 percent to 60 percent. In an investigation of law-school admissions, Wightman (1997) projected that, at the twenty-five to thirty most selective law schools, the first-year enrollment of African-American students in 2000 would decline from 6.5 percent to less than one percent (see also Cross & Slater, 1997).

After affirmative action bans were established, schools of law and medicine experienced declines of similar magnitudes in the enrollment or admission of students of color. In a study of the enrollment rates at five selective law schools in California, Texas and Washington, for example, Kidder (2003) documented a drop of about four percentage points, or nearly two-thirds, in the small enrollment rates of African Americans (from 6.5 percent to 2.25 percent) and more than a third for Latinos (from 11.8 percent to 7.4 percent) after the implementation of affirmative action bans in these states.[7] In a comparison of black and Chicano students who were admitted at UC medical schools between 1996 and 1997, Karabel (1998) showed that the numbers enrolled dropped by 38 and 29 percent, respectively, immediately after the ban took effect.

Just as in the fields of law and medicine, one might anticipate that bans on affirmative action would affect the enrollment of graduate students of color in other domains. This is a reasonable expectation in light of prior research that documented the existence of race-conscious admissions practices across a variety of fields of graduate study (Attiyeh & Attiyeh, 1997; Dugan *et al.*, 1996). Until now, however, no empirical research has addressed the effects of affirmative action bans in fields of graduate study, outside the fields of medicine and law. Whether affirmative action bans have had a negative impact on student of color enrollment in this critical area of education should be considered in the public debate about whether affirmative action practices should be banned.

[7] The study compared the enrollment rates five years after the bans in California and Texas to enrollment rates four years before in those states and enrollment rates three years after the ban in Washington to enrollment rates three years before in that state. The study, like Karabel's (1998), is descriptive and does not support causal inference as it does not account for other trends in enrollment.

The Different Contexts and Timing of Affirmative Action Bans Considered in this Study

Texas: Hopwood v. University of Texas Law School (1996)

As noted, the affirmative action ban in Texas was the result of the now well-documented case of *Hopwood v. University of Texas Law School*, a Fifth Circuit court opinion that departed from otherwise binding U.S. Supreme Court precedent (*Regents of the University of California v. Bakke*, 1978) and found that the consideration of race or ethnicity as a factor in admissions did not serve a compelling governmental interest and thus did not meet constitutional scrutiny. In 1997, Texas' Attorney General interpreted the decision to apply to both public and private institutions in the state and to extend to admissions decisions, financial aid, scholarships, and recruitment and retention practices (Chapa *et al.*, 1997). The impact of affirmative action bans on private institutions in Texas is not considered here because the affirmative action bans in the other states examined in this study (California, Washington, and Florida) only applied to public institutions. Including private institutions in Texas may thus bias the results since the characteristics of private institutions differ from those of the public institutions that make up the rest of the sample. The prohibition on the consideration of race in admissions by *Hopwood* took effect in fall of 1998. Following *Hopwood*, the Texas State legislature also adopted additional race-neutral initiatives and passed the 1997 Top Ten Percent Plan (HB 588), which granted high school seniors in the top 10 percent of their class automatic admission to state universities. These alternative strategies, which sought to mitigate potential declines in the enrollment of students of color, applied to undergraduate students, not those in graduate programs.

California and Washington: Voter-Approved Initiatives

Unlike Texas, the bans on affirmative action in California and Washington were the result of voter-approved measures, Proposition 209 and Initiative 200, respectively. The path toward a ban on affirmative action in California dates back to 1995, when the California Board of Regents first voted to pass resolution SP-1, which barred the consideration of race in admissions across the UC system. The resolution was amended subsequently in 1997 and first applied to professional- and graduate-school admissions in fall 1997 (Guerrero, 2002). In November 1996, voters passed Proposition 209, though the measure did not take effect until 1998 after legal challenges to its constitutionality were resolved. Although Proposition 209 did not take effect until the entering class of 1998, it arguably affected applications and enrollment decisions as early as fall 1997 because of the public discussion and attention to the issue during the time it was being litigated, notably when the Regents' policy was also already in place. For these reasons, the main analysis here anticipates the impact of the ban in California to have started in 1997; however, additional analyses assume that effects of the ban in California began in 1998, the year that the initiative writing the ban into the state constitution was implemented officially in the state. Following the ban on affirmative action, California enacted a policy titled "Eligibility in the Local Context," under which students in the top 4 percent of their high school class are guaranteed admission to at least one campus of the University of California. As in Texas, this policy did not apply to graduate school admissions.

Florida: Florida One Initiative

In contrast to Texas, California and Washington, the ban on affirmative action in public institutions in Florida was the result of an executive order issued by then-Governor Jeb Bush and approved by the state legislature in February 2000. Presumably, by February 2000, admissions decisions for the 2001 entering class would have already have been made; thus, the ban would not have applied to institutional admissions decisions until 2002. However, in this study's analyses, the impact of the Florida ban is anticipated as starting as early as 2001 since it may have affected students' decisions to enroll in the 2001 incoming class. The results, however, are consistent under either year (2001 or 2002). As in Texas and California, Florida also implemented a version of a percent plan called the Talented Twenty Program, which offered automatic admission to the state's public undergraduate institutions for the top 20 percent of high school graduates; the program did not apply to graduate school admissions. Except for the University of Florida, the universities in the state tend to be far less selective than those in California (Marin & Lee, 2003).

Research Questions

This study addresses the following two research questions:

1) *Did the elimination of affirmative action in Texas, California, Washington, and Florida reduce the overall enrollment rates of underrepresented students of color in graduate programs of study at public institutions in these states?*

2) *Did the impact of the statewide affirmative action bans, if any, reduce the enrollment of underrepresented students of color in any of six selected fields of study—the natural sciences, engineering, social sciences, business, education, and humanities—at public institutions in these states?*

Because there are no previous studies that have documented the causal impact of affirmative action bans at the graduate-school level, this study first examines whether the bans have had an impact across all the fields of interest in the study (Garces, 2012b).[8] Because admissions practices differ by graduate field of study, it is also possible that the impact of the bans on affirmative action differed by field of study. Thus, the impact within six selected fields of study—the natural sciences, engineering, social sciences, business, education, and humanities—is also examined. These fields represent the great majority of all graduate students who were enrolled in fall 2009 (about 92 percent) (CGS, 2009a).

Methods, Data, and Sample

Analytic Strategy

This study uses an analytic strategy that compares the enrollment rates of underrepresented students of color "before" and "after" affirmative action bans were

[8] Findings from this analysis are forthcoming in Garces (2012b).

implemented to estimate their effect. This strategy, termed difference-in-differences, also adjusts for other factors, including changes in the labor market conditions or the demographics of a state. This estimation strategy has been used in a number of important research studies to document the impact of policy changes on education outcomes (Dynarski, 2004; Flores, 2010; Kane, 2003; Long, 2004) and is well suited for estimating the impact of the affirmative action bans on the enrollment rates of students of color in graduate programs. As a quasi-experimental method, however, it is limited in its ability to support causal claims so plausible alternative explanations for the findings must be considered and ruled out (Shadish, Cook, and Campbell, 2002).[9] Of course, it is impossible to conduct a true randomized experiment in light of the ethical implications for the students whose educational opportunities could potentially be inequitably altered through participation.

Datasets

Data analyzed are from the *CGS/GRE Survey of Graduate Enrollment and Degrees*, a national survey co-sponsored by the Council of Graduate Schools (CGS) and Graduate Record Examinations Board. The *CGS/GRE Survey* includes responses from graduate-level institutions that are representative of all the graduate programs in our nation, outside the professional fields of medicine or law. Participating institutions grant approximately 90 percent of the doctorates awarded each year in the United States and 75 percent of the nation's master's degrees (CGS, 2009a). It is also the only annual survey that collects enrollment information by race and ethnicity across 51 distinct fields of study in graduate school. Thus, it presents an informative dataset for addressing this important policy question across a broad range of fields. Among other variables, these data also describe whether the institution was public or private, its total enrollment size, its Carnegie classification (based on the 2000 Carnegie classification definitions, which include doctoral/research extensive, doctoral/research intensive, and masters/specialized institutions), and the state where the institution was located. I merged these data with information on state demographics and labor-market conditions from the U.S. Census Bureau and Bureau of Labor Statistics to control for critical external forces.

The terms under which access was granted to *CGS/GRE Survey* require the anonymity of the institutions. The removal of the names of the institutions presented limitations for this analysis because the study was unable to include, and control for, additional specific institutional-level characteristics that may have influenced enrollment (such as average GRE scores, average tuition, and financial aid) and could have increased the precision of estimates. The institutional and state-level control variables included in this analysis, such as the Carnegie classification, state demographics and socioeconomic characteristics, do, however, help capture some information that overlapped with those characteristics.

Sample

From all of the institutions that responded to the *CGS/GRE Survey*, this study's sample only included public institutions and excluded those classified as Historically Black Colleges and

[9] As I explain in Appendix A, I implemented the difference-in-differences estimation strategy in a Tobit regression framework and incorporated weights in the analyses.

Universities. Although these latter institutions have important graduate programs, they may not have responded to bans on affirmative action in a manner comparable to other institutions in the sample because they generally enroll high percentages of students of color. From that subset, the study also omitted institutions whose reported first-time enrollment values in a particular major were missing for students of all races across all years of the analytic window (1994 to 2003) or across a pre-ban or post-ban period for a respective state.[10] After imposing these limitations, the final sample included 118 graduate institutions: 33 graduate institutions in the four studied states (Texas, California, Washington and Florida) and 85 institutions in the comparison group.

This latter "comparison" group consisted of 17 states (Arkansas, Arizona, Colorado, Illinois, Indiana, Kansas, Massachusetts, Maryland, North Carolina, New Jersey, New Mexico, Nevada, New York, Ohio, Oklahoma, Pennsylvania, and Virginia) with graduate programs, demographic characteristics, levels of educational attainment, and labor markets comparable to those in the studied states with affirmative action bans. Seven southern states (Alabama, Georgia, Louisiana, Mississippi, Tennessee, Kentucky, and South Carolina) were considered for the comparison group but ultimately excluded because the public institutions in those states faced desegregation litigation and thus may have adopted remedial policies in a manner not comparable to the voluntary affirmative action processes outside the South. The state of Michigan was left off the sample due to the ongoing litigation on affirmative action in the state during 2000-2003, which may have led individuals or institutions to respond in a way that would not reflect general trends in the enrollment of students of color.

Table 1 presents descriptive statistics on selected institutional and state characteristics for the sample. First, the left columns provide the number of public institutions in total and by Carnegie Classification (i.e., whether the institution is "research extensive", "research intensive," or "masters"/"specialized"). As shown in the table, public institutions that are "research extensive" and "master's/specialized" are represented across all the states with an affirmative action ban and most states in the comparison group, whereas institutions that are "research intensive" are underrepresented in the sample, limiting this study's ability to generalize findings to these institutions. The right columns present summary statistics on selected state characteristics. Overall, the states are fairly comparable across these measures, with some exceptions where the percent of the Latino population is substantially lower (Arkansas, Indiana, Maryland, Ohio, Pennsylvania) or the percent of the Native American population is substantially higher (New Mexico and Oklahoma) than the respective Latino or Native American population in the target states. However, the statistical analyses included covariates that controlled for these demographic differences.

The number of observations in the dataset is: natural sciences (n=1,060), engineering (n=634), social sciences (n=959), business (n=835), education (n=935), and humanities (n=942). The main period of analysis included all years between 1994 and 2003.[11] This time period

[10] In these instances, I assumed that the institution did not offer the major. The original survey instrument that each institution received listed all possible majors within a field of study; institutions that did not offer the major may have left enrollment figures in these majors blank.

[11] The observations include each observed proportion of first-time underrepresented students of color of all graduate students, who are enrolled at a particular institution, in each of the six fields of interest, across each of the years in the main analytic window, from 1994 to 2003.

maximized the number of observations present in the sample while staying close to either side of the policy disruptions (Murnane & Willett, 2011), capturing at least three years of data before the implementation of the first ban in Texas, and three years of data after the last ban in Florida.

Sensitivity Analyses

In each phase of this analysis, some of the assumptions were modified to test whether the results would be the same under a variety of conditions. For instance, additional analyses used 1998, instead of 1997, as the implementation year of the affirmative action ban in California and the results were found to be consistent under either year. The study also used a narrower (1996-2002) and broader (1992-2005) time period than the one used for the main analyses (1994-2003) to systematically consider whether the impact of the bans might have been more immediate or longer-term than anticipated; the results were also consistent under these other time periods. Finally, analyses included other states in the "comparison" group to ensure that the states selected were capturing general underlying trends in enrollment. The results were again consistent under a broader group of comparison states, which included all the states in the United States (except those excluded because of ongoing litigation related to desegregation or affirmative action), and under a narrower group of states, which included those closest in geographic proximity to states with affirmative action bans.

Findings

The Impact of Affirmative Action Bans across All Graduate Programs

Bans on affirmative action led to an estimated drop of 1.2 percentage points in the proportion of students of color enrolled across all graduate degree programs.[12] To better understand the magnitude of this estimated decline in enrollment, this final estimate can be converted into an overall percentage decline that considers the baseline percent of graduate students who were students of color across the states before the bans. Before any of the bans were implemented in each state, the average percentage of enrolled graduate students who were students of color was about 9.9 percent. The estimated 1.2 percentage point drop thus represents a decline to about 8.7 percent.[13] Expressed as a fraction of the initial value, this is a 12.2 percent drop in the proportion of graduate students enrolled who are underrepresented students of color, or a drop of about an eighth. Figure 1 below illustrates these results.

The Impact of Affirmative Action Bans on the Enrollment of Students of Color in the fields of Natural Sciences, Engineering, Social Sciences, Business, Education, and Humanities

After the bans on affirmative action, the percent of enrolled graduate students who were students of color declined by an estimated two percentage points in each of four fields of study—

[12] In Appendix B, I explain how I reached this final estimate, which was consistent under the different conditions that I considered in my sensitivity analyses: a different implementation year in California, different time periods, and different control groups.

[13] In terms of individual students, this decline represents an average of about 60 fewer students of color enrolled across graduate programs.

engineering (1.6 percentage points), natural sciences (1.5 percentage points), social sciences (1.9 percentage points), and education (two percentage points, though the effect is only marginally statistically significant)—and by 1.2 percentage points in the humanities. Consistently across models, there appeared to be no impact in the field of business.[14] As with the findings described above, these final estimates translate into an overall percentage decline in each field. Because the baseline percent differs across fields, this step also allows one to better compare the impact of the bans across fields. As Figure 1 illustrates, in *engineering*, the percent of graduate students who were students of color before the bans was about 6.2 percent. The estimated 1.6 percentage point drop from the analyses thus represents a decline to about 4.6 percent. Expressed as a fraction of the initial value, this is a decline of over a fourth, or 26 percent. Similarly, the bans led to a 19 percent drop in the *natural sciences* (from 7.8 percent to 6.3 percent), a 15.7 percent drop in the *social sciences* (from 12.1 percent to 10.2 percent), and an 11.8 percent decline in the *humanities* (from 10.2 percent to 9 percent).[15]

It is important to consider that these findings may also reflect an attenuated impact of the bans in these various fields of study. This study captures the impact of affirmative action bans in a context in which faculty or administrators in various programs may have engaged in efforts to mitigate the potential decline in the enrollment of students of color after the bans. Despite these likely efforts, there is a statistically significant and meaningful decline in the representation of students of color across graduate studies and within fields of study.

[14] In Appendix C, I explain how I reached these final estimates, which were consistent under the different conditions that I considered in my sensitivity analyses.

[15] In terms of individual students, these declines confirm: an average of 12 fewer underrepresented students of color in engineering in total across these states; an average of about 21 fewer students of color in the natural sciences; an average of 10 fewer students of color in the social sciences; and an average of 8 fewer students of color in the humanities. These numbers reflect the minimal representation of underrepresented students of color in most of these fields, even with affirmative action policies.

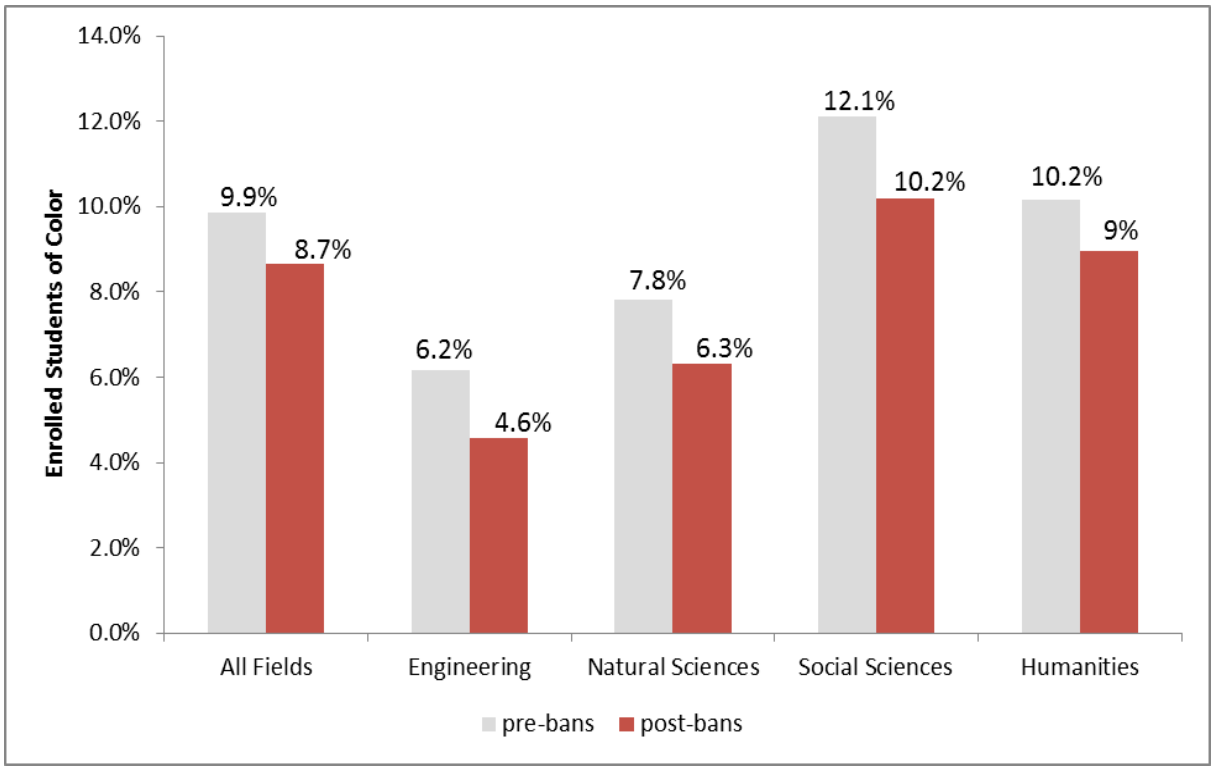

Figure 1. Findings for the impact of affirmative action bans across fields and by field of study.

Are These Reductions Large Enough to Matter?

These are meaningful declines in the context of graduate programs, where cohorts of classes can be smaller than undergraduate college classes and where even a difference of a few graduate students of color in a cohort can have important consequences for the experiences of all students. If a "critical mass" of students of color is no longer enrolled, students of color who remain may experience feelings of "tokenism" and stereotype threat, which can affect negatively an individual's educational experience and persistence to degree (Chang, Eagan, Lin, & Hurtado, 2009; Steele, 1997; Taylor & Antony, 2000). Indeed, the social and cultural climate in science-related fields like STEM (science, technology, engineering, and mathematics) is one of the leading barriers to the persistence of women of color in STEM career trajectories (Ong, Wright, Espinosa, & Orfield, 2011). A large survey study of women of color in STEM graduate programs (Brown, 1994, 2000) revealed that isolation, racism, and being racially/ethnically identifiable, among other climate factors, present more difficulty for women of color than structural factors, such as financial aid or the composition of the faculty, in their persistence. Thus, a decline of one or two students of color in a science-related field can make it remarkably more challenging for students of color to persist through their program.

The lack of a racially and ethnically diverse student body also deprives students across all races and ethnicities of the benefits of a diverse learning environment, such as enhanced critical and complex thinking skills (Gurin 1999; Gurin, Dey, Hurtado, & Gurin, 2002; Pascarella, Bohr, Nora, & Terenzini, 1996), improved cross-racial understanding and cultural awareness (Milem,

1992, 1994), civic engagement (Bowen & Bok, 1997; Chang, Astin, & Kim, 2004), and cross-cultural workforce competencies and leadership skills (Jayakumar, 2008).[16] In many graduate fields of study, these benefits are critical either for understanding the issues being researched or for preparing individuals for effective professional practice in multiracial settings, particularly in our diverse society, which is often polarized along racial and ethnic lines.

These declines also have important consequences for institutional outreach and recruitment efforts. In graduate studies, the racial and ethnic characteristics of the student body can play an important role in the decisions of students of color to apply or enroll. This is because the presence of students of color can help other students of color feel more welcome at an institution; if none or only a few students of color are enrolled, students risk the possibility of being "tokenized" in the classroom (Chang, Eagan, Lin, & Hurtado, 2009; Steele, 1997; Taylor & Antony, 2000). Thus, in science-related fields, where students of color are already severely underrepresented, a drop of one or two students of color can have negative long-term consequences on the decision of other students of color to apply or enroll in a specific graduate field of study. These challenges can make institutional outreach and recruitment efforts more difficult and thus hinder the institution's attempts to mitigate the negative impact of not being able to consider race in admissions (see, e.g., Chan & Eyster, 2005).

Differences by Field of Study

Given that students of color are generally underrepresented at higher score percentiles on standardized tests and generally overrepresented at lower percentiles (see, e.g., Bowen & Bok, 1998)—differences in performance that are not necessarily related to ability, but may reflect social and environmental factors that contribute to underperformance of students of color in standardized testing (see, e.g., Steele, 1997)—it is not surprising that the impact is greater in science-related fields like engineering (26 percent), natural sciences (17 percent), and social sciences (15.2 percent). This is because the overall mean score for standardized tests like the GRE, particularly in the quantitative portion of the test, is generally higher in these fields than in fields like the humanities and education. Indeed, in the most recent and comprehensive study of the background and experiences of doctoral students in the United States, Nettles & Millett (2006) found that for the 9,036 students who participated in the study and were representative of the graduate student body in the nation, the overall mean quantitative GRE score was highest in engineering (757), "followed by those in sciences and mathematics (731), social sciences (656), humanities (614), and education (567)" (p. 62). The average GRE analytic scores reflected a similar ordering, with the highest mean in science and mathematics (679), followed by engineering (677), social sciences (646), humanities (645), and education (571). Profile information for the fall 2010 entering classes in engineering and education at the University of California, Berkeley, supports this contrast, with the average quantitative GRE score in engineering at 773, compared to 624 in education (U.S. News and World Report, 2010).[17]

[16] For a more in-depth discussion of the documented educational benefits of racial and ethnic diversity, see Milem 2003, and Orfield, Frankenberg, and Garces (2008).

[17] By contrast, the highest verbal GRE score mean was in the humanities (669), followed by social sciences (601), sciences and mathematics (575), engineering (562), and education (556) (p. 61)." The authors speculate that this ordering is not surprising given the nature of the work in each field and suggest that the lower scores in education

Implications and Conclusion

Implications for Policymakers, Researchers, the Media, and Litigation

These findings are particularly relevant in the current federal- and state-policy context affecting higher education. Despite the U.S. Supreme Court's guidance on the constitutionality of affirmative action practices in *Grutter* and *Gratz*, the use of the state ballot to enact policies that ban the practice is a growing phenomenon affecting higher education policy (McLendon & Eddings, 2002). While this process is often considered to be an exercise in direct democracy, the findings from this study indicate that this trend is undermining the efforts of institutions of higher education to further the educational and democratic goals in our society, which in the words of the U.S. Supreme Court involves "cultivat[ing] a set of leaders with legitimacy in the eyes of the citizenry" (*Grutter v. Bollinger*, 2003). Thus, as the use of the ballot initiative process continues to affect higher education policy on affirmative action, stakeholders should proceed in an informed manner. That is, if a state ballot measure to ban affirmative action is introduced in the state, then stakeholders, including policymakers, higher education administrators, educators, researchers, and the general public, should consider the reductions that these bans have had on the enrollment rates of students of color in graduate fields of study and weigh the long-term effects on our nation's leadership and economy.

Consequently, it is important to consider how information about these effects can be disseminated to the general public and policymakers to help inform the debate, particularly with an issue as controversial as affirmative action. In a qualitative content analysis of the news media print coverage of the ballot initiative that banned affirmative action in Michigan, Saenz and Moses (2010) found that little substantive information about the initiative (Proposal 2) was available in print news to inform voters about the policy issues involved. The authors argue for greater collaboration among the media, education policy researchers and the general public to improve the quality of information that is available publicly on these issues. In addition to increased collaboration, stakeholders should also consider that the way in which the information is framed can influence the formation of attitudes that support or oppose affirmative action policies (Glaser, 2010). Ultimately, having more complete information about this issue is crucial for voters to make informed decisions.

The findings from this study should also help inform the legal determinations in the affirmative action case currently before the Supreme Court (*Fisher v. University of Texas at Austin*, 2011), in which the Court will assess whether race-conscious admissions policies at the University of Texas, Austin, are necessary to further a compelling interest in student body diversity. Documented declines in graduate student of color enrollment under race-blind admissions policies support the need for postsecondary institutions to implement race-conscious practices in graduate student admissions to maintain racial and ethnic student body diversity.

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may reflect diversity of interests in the field and demographic diversity such as age and race (Nettles & Millett, 2006).

Implications for Institutional Responses and Future Research

In states with affirmative action bans, questions also remain regarding how various graduate schools or departments have responded to the bans and about the effectiveness of alternative policies to affirmative action for reversing or mitigating the decline in the proportion of graduate students of color. A clear directive of affirmative action bans is that faculty, administrators and admissions officers cannot explicitly consider race as a plus factor when making graduate admissions decisions. However, policymakers and other institutional actors help mediate how the bans on affirmative action are implemented and may have employed "race-neutral" policies that sought to mitigate potential declines in the enrollment of students of color. In her recent study simulating the impact that a nationwide ban on affirmative action would have on student of color representation at four-year colleges, Howell (2010) found that replacing the policy with a top ten percent plan, based on the relative standing in high schools within a single state—or intensified recruiting efforts by colleges, or other programs to improve the perception or reputation of a college—would not restore student of color representation at the most selective campuses successfully. The feasibility and effectiveness of a percent plan at the graduate school level is questionable since the basis for admission to graduate school depends on a student's college experience (versus high school) and graduate schools draw a student body from a wide variety of institutions located across different states. Further studies are needed to investigate whether policies or programs that do not explicitly consider race would be effective for maintaining racial and ethnic diversity in various graduate fields of study.

Another important avenue is to modify admissions practices so that the definition of achievement, success and merit better reflects the mission of graduate schools to generate innovate solutions to complex problems and to train the next generation of leaders. The negative consequences of continuing to use standardized tests as a criterion for admissions, particularly in states with affirmative action bans, should motivate educators to reconsider their admissions practices and exercise their discretion to consider additional factors that would contribute to a racially and ethnically diverse student body. These factors can include diverse experiences, potential to contribute to research, community involvement or service, research activity on and off campus, and creativity in problem-solving. Moreover, standardized test scores should be considered in light of family circumstances (parental educational levels and socioeconomic status) or other contextual factors (existing community resources, geographic location) shown to be highly correlated with performance on standardized tests like the GRE (ETS, 2011). In fact, given the limited predictive validity of the GRE, the Educational Testing Service discourages use of a GRE score as the sole or best indicator of achievement and academic ability (ETS, 2011).

Of similar importance are open questions about how bans on affirmative action have affected the decision of students of color to apply to, or enroll in, various graduate programs located in states with an affirmative action ban. These decisions, which can help explain the negative impact of the bans detected here, are also likely to be influenced by the outreach and recruitment efforts of institutional actors and practices that can help provide a more welcoming and inclusive environment for students of color, such as more faculty of color, student support networks, and an inclusive curriculum with classes and topics that appeal to specific interests of students of color (Gasman, *et al.* 2009; Harper & Hurtado, 2007; Morelon-Quainoo, *et al.*, 2009). In addition to helping create a more inclusive environment that may influence students' decisions

to apply or enroll, these efforts are also likely to improve students' experiences during their graduate studies. An in-depth understanding of how outreach or recruitment efforts may have helped influence student decisions to consider graduate study, and potentially affect the experiences or persistence to degree of underrepresented graduate students of color, is needed. Of course as public institutions face higher education funding cuts, it will be increasingly difficult for institutions to engage in these outreach efforts.

In sum, the findings from this study contribute to the mounting evidence about the detrimental effects bans on affirmative action have had on the representation of students of color in postsecondary education. Specifically, the bans in Texas, California, Washington, and Florida have reduced by about 12 percent, the average proportion of graduate students of color across all the fields of graduate study included in the evaluation. In *engineering*, the bans have led to about a 26-percent reduction in the mean proportion of all graduate students enrolled who are students of color; a 19-percent decline in the *natural sciences*; a 15.7-percent drop in the *social sciences*, and a 11.8-percent drop in the *humanities*. As our nation struggles to increase the representation of students of color in graduate programs, particularly in the areas of science, technology, engineering, and mathematics, these findings suggest that the trend toward banning affirmative action through the use of the state ballot is inhibiting these efforts, causing declines in enrollment of students of color in graduate programs at a time when the racial and ethnic diversity of the U.S. population is increasing. Given that we are not benefitting from a large share of potential human resources in these critical fields, shutting down narrow pathways into them by banning affirmative action could do lasting harm to our nation. Graduate education programs will need to rise to the challenge and adopt innovative outreach and recruitment practices, and modify admissions criteria if they are to reverse this trend.

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Appendix A: Analytic Strategy

Tobit Regression

I chose a Tobit regression framework because exploratory analyses confirmed that the distributional properties of my outcome did not satisfy the usual normal-theory assumptions required by OLS regression methods. For instance, the values of my outcome had a positively skewed distribution and were truncated in the lower tail at a value of zero, while retaining a disproportionate number of zero values. It was not surprising that the outcome distribution contained many zero values as students of color are highly underrepresented in these graduate programs. In many cases, the distribution of a skewed variable can be rendered more symmetric by a *log* or *logit* transformation (Ramsey & Schafer, 2002). In my case, however, such transformations did not succeed because they could not separate from each other the many zero values that existed at the low end of the distribution. To model outcomes with these distributional properties, researchers have used Tobit regression analysis (e.g., Jacobs & O'Brien, 1998; Grogan-Kaylor & Otis, 2007). The approach, developed originally by Tobin (1958), is a hybrid of Probit and OLS regression analysis. In the higher education context, for instance, the method has been used to analyze the determinants of out-of-state enrollments, where the outcome, i.e., percentage of enrollment, was also truncated in the lower tail at values of zero (Mixon & Hsing, 1994). For comparison purposes, I also replicate my main results using OLS regression analysis.

Weighting

I incorporated two types of weights into my Tobit regression analyses. The first was a set of inverse variance-based weights to account for differences in the level of precision with which the values of my outcome, which were proportions, were known.[18] This had the effect of ensuring that observations whose proportions were known more precisely counted more heavily in the estimation (e.g., Afifi, Clark, & May, 2004). I also used a second type of weight to account for the fact that my data were aggregated to the institutional level and that graduate enrollment differed at various institutions. This second type of sampling weights ensured that institutions with a larger number of first-time enrolled students, either across all fields of study or within a field of study, were weighted more heavily in the model-fitting than those with a smaller number of first-time enrolled students.[19] I then multiplied the two types of weights together prior to including them in the analyses.

[18] Because of the aggregate-level nature of my data—where each observation is a combination of different observations, such as different underlying number of majors and number of students who make up a particular field of study at an institution—each observation had a different level of precision, or variability. The variance-based weights were inversely proportional to the variance of each observation (w=1/y*(1-y)).

[19] Here, the weights were equal to the total number of first-time enrolled students across the fields of interest in the study in a given year, or within a field of study at a given institution in a given year.

Appendix B: Impact Across Graduate Studies

Taxonomy of Fitted Models

I obtained the final estimate for the impact of affirmative action bans across all graduate programs by fitting a taxonomy of OLS and Tobit regression models, and abstracting the difference-in-differences estimate (displayed in **Table B1** found in Appendix D below) under a variety of methods of estimation. In Panel A of the table, I provide the results from unweighted analyses; in Panel B, I present results from the weighted analysis. All fitted models included vectors of institutional-level and state-level covariates. For comparison purposes, I present the results from both OLS and Tobit regression analyses. Because the estimated Tobit coefficients offer unbiased estimates of the hypothesized relationship of interest, I focus on interpreting these coefficients in discussing my results below. However, the OLS and Tobit estimates are similar in magnitude and consistent in direction in all fitted models.

As all the fitted models in Table B1 illustrate, there is a statistically significant decline of between one to three percentage points in the percent of enrolled graduate students of color, across all fields of study. The unweighted estimates in Panel A display about a two percentage point drop in student of color enrollment after the bans on affirmative action, while the weighted results in Panel B show a one percentage-point drop in student of color enrollment. When year fixed effects are replaced by a linear time-trend, the estimated drop in the enrollment of students of color due to the bans is about three percentage points (unweighted) or one percentage point (weighted). The weighted analysis allows the effect at institutions with larger graduate enrollments to count more heavily in the overall estimates. Thus, the difference in estimates between Panel A and Panel B suggests that the effect of the bans is less at larger institutions than at smaller ones.

Because of the importance of adjusting for the differing levels of precision for which I know the values of the outcome, and differences in the size of graduate enrollment across institutions, I regard the estimates in Panel B as the best estimate. So, the effect of the affirmative action bans on the enrollment of students of color in graduate programs, across all states that implemented such bans was a decline of 1.2 percentage points. In addition, I prefer the estimated effect from model 3 to that from model 1 because the former is the most parsimonious and well-fitting model.

Sensitivity Analyses

In **Table B2** (found in Appendix D below), I present the results of my different sensitivity analyses of my preferred model 3, fitted using the weighted approach. For ease of comparison, in Panel A of this table, I summarize the final results of the main analysis, which employed an analytic window that extended from 1994-2003 and used all 17 selected comparison states. In Panel B, I display results that employ a policy change date in California of 1998 instead of 1997. Here, the results remain robust to the change in implementation year in California, though the estimated effect of the bans drops slightly by 0.02 percentage points. This drop, however, may be expected since individuals and institutions in California may have responded to the affirmative action bans as early as 1997. The slight drop in the size of the

estimated effect suggests that institutions may have started to implement alternative measures as early as 1997 to mitigate potential declines in the enrollment of students of color.

The main results, moreover, are robust to my choice of different analytic windows. In Panel C(1), I display findings from a narrow analytic window, i.e., 1996-2002, that covered at least one year before the first affirmative action bans took effect (in Texas and California) and one year after the last ban (in Florida). Here, the estimated effect of the bans remains negative and of similar magnitude, which suggests that the impact of affirmative action bans may have been more immediate than anticipated. In Panel C(2), I display findings that employ a broader analytic window, i.e., 1992 to 2005. Here, the estimated impact increases by 0.05 percentage points, suggesting that the negative impact of the bans persisted past 2004.

Finally, the main results are robust to different compositions of the comparison group: (1) a broader sample of all states in the United States with eight states excluded because of ongoing desegregation or affirmative action litigation during the time covered in the analysis (Panel D), and (2) a subset of the selected group of comparison states (10 total) that were closest to those in the target states in terms of breadth of graduate programs offered, demographic characteristics, levels of educational attainment and labor markets, but not necessarily close in geographic proximity (Panel D). The estimates of the impact of the ban on the enrollment rates of students of color remain substantially the same in both cases. These results suggest that my choice of the 17 states in the comparison group reflected national trends in enrollment.

Appendix C: Impact by Field of Study

Taxonomy of Fitted Models

To obtain the estimates of the average effect of the affirmative action bans on the enrollment rates of graduate students of color by field of study, I fitted a taxonomy of models, which I present in **Table C1** (see Appendix D below). In all my analyses, the results using Tobit and OLS regression methods were similar in magnitude and consistent in direction. For the sake of simplicity, I report only the Tobit results in the tables.

In panel A, I present the results without a state-specific year trend. In panel A(1), I present the unweighted results; in panel A(2), I show the weighted results. In the latter weighted analysis for all fields, the enrollment rates drop in magnitude in the fields of the natural sciences and engineering, suggesting that in these fields of study larger institutions may have experienced a lower drop in the enrollment of students of color than did smaller institutions. By contrast, it appears that in the humanities, larger institutions may have experienced a larger decline in the enrollment rates of students of color than smaller ones since in the weighted analysis the negative effect of the bans is larger in magnitude and becomes statistically significant.

In panel B, I show the results of a model with a state-specific year trend, and compare the findings from the unweighted and weighted analyses, respectively. By allowing the year trend to differ by state (assuming a linear trend), the negative impact of the bans on the enrollment rates of students of color is larger in magnitude in three of the six fields: the natural sciences, engineering, and humanities (compare panels A(1) and B(1), and panels A(2) and B(2)). The estimates drop in magnitude once the results are weighted in the natural sciences, engineering and education, suggesting, again, that larger institutions may have experienced a lower decline in the enrollment of students of color in these fields than did smaller institutions. Finally, a statistically significant impact in the social sciences emerges once I weight the analyses and allow the year trend to differ by state.

Because of the importance of adjusting for the varying levels of precision with which I can estimate enrollment rates, and for the size of the enrollment in each field, I prefer the estimates of the impact of the ban on the enrollment of students of color from the fitted models in Panels A(2) and B(2) rather than Panels A(1) and B(1). To select the most parsimonious model, I conducted goodness of fit tests that compared the change in -2LL deviance statistic in the weighted models that included state-specific time trends and those that did not. The results of these tests indicated that inclusion of the state-specific year trend improved the prediction of the impact of the bans in all the fields of study, except in the humanities.

Sensitivity Analyses

In **Table C2** (found in Appendix D below), I present the results of my sensitivity analyses of the preferred models from each field, fitted using my weighted approach. Again, for the sake of simplicity, I do not report the results from my OLS analyses, which were similar in magnitude and consistent in direction to the results obtained in the Tobit regression analyses across all fitted models. For ease of comparison, in panel A, I summarize the final results of the

main analysis, employing the analytic window that extended from 1994-2003 and used the 17 selected comparison states. In panel B, I present results for when I estimated the policy change in California to begin in 1998 rather than 1997. Here, the results are consistent across fields, except in the social sciences, where the negative impact is slightly larger in magnitude.

In Panel C, I display the results for different analytic windows: (1) a narrow analytic window, i.e., 1996-2002, which covered at least one year before the first affirmative action bans took effect in Texas and California and one year after the last ban in Florida, and (2) a broad window, i.e., 1992-2005, which included five years before the implementation of the first ban in Texas and California and five years after the last ban in Florida. With a narrow analytic window, the estimated effect of the bans on the enrollment of students of color remains negative and of relatively similar magnitude as that in the main analysis in the natural sciences, engineering, and social sciences, though not in the fields of education and the humanities, where it loses its statistical significance. This change may be expected when analyses are conducted in a narrower analytic window, which reduces my statistical power to detect the effect of the bans automatically. These results also indicate that it may have taken longer for the bans on affirmative action to have had an impact in the fields of education and the humanities. With a broad analytic window, the estimated effect also remains negative and of similar magnitude across fields, with a slightly larger negative effect in the field of social sciences (an additional one-percentage-point drop).

My main results are also robust to the different compositions of the comparison group: (1) a broader sample of all states in the United States with the eight excluded states, and (2) a subset of the selected group of comparison states. As I show in table C2, the results in panels D(1) and D(2) are about the same as those in Panel A. The consistency of my findings with the different compositions of the comparison states suggests that the selected 17 states in the main analysis reflected national trends in graduate enrollment. With a narrow sample of comparison states, the negative impact of the bans is slightly larger in magnitude in all fields except the natural sciences and engineering. These results support the possibility that students in non-science related fields chose to enroll in graduate programs located in nearby states without a ban.

Appendix D: Tables

Table 1. Selected summary characteristics on the public institutions in the sample and selected state characteristics, for year 2000.

	Public Institutions Characteristics				State Characteristics						
	#	*Research Extensive*	*Research Intensive*	*Masters or Specialized*	*Total Population*	*Percent White*	*Percent Latino*	*Percent Black*	*Percent Native American*	*Percent 25 yrs+ with Bachelor's degree*	*Un-employment rate for 25-34 yr olds*
United States*	155	64	20	71		75.1	12.5	12.3	0.9	24.4	3.7
States with Bans											
California	16	7	0	9	33,871,648	59.5	32.4	6.7	1	26.6	4.9
Florida	6	4	1	1	15,982,378	78	16.8	14.6	0.3	22.3	3.1
Texas	6	2	0	4	20,851,820	71	32	11.5	0.6	23.2	3.4
Washington	5	2	0	3	5,894,121	81.8	7.5	3.2	1.6	27.7	4.9
Total No.	33	15	1	17							
Comparison States											
Arizona	3	2	1	0	5,130,632	75.5	25.3	3.1	5	23.5	3.7
Arkansas	1	0	0	1	2,673,400	80.0	3.2	15.7	0.7	16.7	4
Colorado	5	2	1	2	4,301,261	82.8	17.1	3.8	1	32.7	2.3
Illinois	9	4	1	4	12,419,293	73.5	12.3	15.1	0.2	26.1	4.1
Indiana	3	2	0	1	6,080,485	87.5	3.5	8.4	0.3	19.4	2.7
Kansas	3	1	0	2	2,688,418	86.1	7.0	5.7	0.9	25.8	2.9
Massachusetts	4	1	0	3	6,349,097	84.5	6.8	5.4	0.2	33.2	2
Maryland	4	1	0	3	5,296,486	64.0	4.3	27.9	0.3	31.4	3
North Carolina	6	2	1	3	8,049,313	72.1	4.7	21.6	1.2	22.5	2.8
New Jersey	5	1	2	2	8,414,350	72.6	13.3	13.6	0.2	29.8	3.6
New Mexico	5	2	1	2	1,954,599	67.83	44.03	2.03	9.68	25.3	3.6
Nevada	1	1	0	0	2,495,529	73.65	24.45	7.34	1.22	20.8	3.7
New York	7	5	0	2	18,976,457	67.9	15.1	15.9	0.4	27.4	4.5
Ohio	8	3	4	1	11,353,140	85	1.9	11.5	0.2	21.1	4
Oklahoma	1	0	0	1	3,450,654	76.2	5.2	7.6	7.9	20.3	3.4
Pennsylvania	13	3	1	9	12,281,054	85.4	3.2	10	0.1	22.4	3.9
Virginia	7	4	2	1	7,078,515	72.3	4.7	19.6	0.3	29.5	2.2
Total No.	85	34	14	37							
No. of institutions	118	49	15	54							

Sources: CGS/GRE Survey of Graduate Enrollment and Degrees, U.S. Census Bureau American Community Survey, and Bureau of Labor Statistics Geographic Profile of Employment and Unemployment.

Notes: * Total number of public institutions and selected institutional characteristics include institutions that responded to the CGS Survey and includes institutions in all states, except those that are excluded in the sample (Alabama, Georgia, Louisiana, Michigan, Mississippi, Tennessee, Kentucky, and South Carolina). Institutional type categories are based on 2000 Carnegie Classifications. "Research Extensive" institutions include institutions committed to graduate education through the doctorate and those that awarded 50 or more doctoral degrees per year across at least 15 disciplines, where as "Research Intensive" include those that awarded at least 10 doctoral degrees per year across three or more disciplines, or at least 20 doctoral degrees per year overall. "Masters" include institutions committed to graduate education through the master's degree and "Specialized" offer degrees ranging from the bachelor's to the doctorate, and typically award a majority of degrees in a single field.

Table B1. Main Findings, All Fields.

	All Fields			
	No State-Specific Year Trend		State-Specific Year Trend	
	(1) OLS	(2) Tobit	(3) OLS	(4) Tobit
A. Unweighted				
BAN	-0.016* (0.007)	-0.016* (0.007)	-0.025* (0.011)	-0.025* (0.011)
-2LL		-3071.702		-3083.778
B. Weighted				
BAN	-0.005* (0.003)	-0.006* (0.003)	-0.012** (0.005)	-0.012* (0.004)
-2LL		4058.71		3952.72
Number of obs.	1084	1084	1084	1084
left-censored		21		21
uncensored		1063		1063
No. of institutions	118	118	118	118

~p<.10. *p<.05. **p<.01. ***p<.001. Standard errors in parentheses.

Table B1 Description: Average effect of affirmative action bans on the average enrollment of graduate students of color, from fitted regression models without and with state-specific time trends, unweighted, and weighted to adjust for the precision of institutional summary information and the size of first-time enrollment across fields of study, for the main analytic window (1994-2003) and all 17 comparison states.

Note: All models include state fixed effects and a full set of institutional- and state-level covariates; institutional-level covariates include whether institution is research extensive (vs. research intensive or masters/specialized); state-level covariates include percent of population by race (White, Black, Native American, Latino, Asian), percent of population with a bachelor's degree, and percent of 25-34 year olds unemployed. Models without a state-specific year trend include year fixed effects; Models with a state-specific year trend do not include year fixed effects to avoid collinearity. All models account for the clustering of observations within institution over time (with institutional random effects) and within state (with state fixed effects). The 17 comparison states include Arkansas, Arizona, Colorado, Illinois, Indiana, Kansas, Massachusetts, Maryland, North Carolina, New Jersey, New Mexico, Nevada, New York, Ohio, Oklahoma, Pennsylvania, and Virginia.

Table B2. Sensitivity Analyses, All Fields.

	All Fields of Study	
	(1) OLS	(2) Tobit
A. Main Results – Analytic Window 1994-2003 and 17 Comparison States		
BAN	-0.012** (0.005)	-0.012* (0.004)
Number of obs.	1084	1084
left-censored		21
uncensored		1063
No. of institutions	118	118
B. California policy change as 1998 (rather than 1997)		
BAN	-0.010** (0.004)	-0.010** (0.004)
No. of obs.	1084	1084
left-censored		21
uncensored		1063
No. of institutions	118	118
C. Different Analytic Windows		
1. Narrow analytic window (1996-2002)		
BAN	-0.013** (0.003)	-0.013** (0.005)
No. of obs.	754	754
left-censored		15
uncensored		739
No. of institutions	118	118
2. Broad analytic window (1992-2005)		
BAN	-0.017*** (0.003)	-0.017*** (0.003)
No. of obs.	1514	1514
left-censored		31
uncensored		1483
No. of institutions	118	118
D. Different Sample of Comparison States		
1. Broad sample (all US states, with exclusions)		
BAN	-0.012** (0.004)	-0.012** (0.004)
No. of obs.	1399	1399
left-censored		43
uncensored		1356
No. of institutions	155	155
2. Narrow sample of comparison states (10 comparison states)		
BAN	-0.014** (0.004)	-0.014** (0.004)
No. of obs.	900	900
left-censored		20
uncensored		880
No. of institutions	99	99

~p<.10. *p<.05. **p<.01. ***p<.001. Standard errors in parentheses.

Table B2 Description: Average effect of affirmative action bans on the average enrollment of graduate students of color, for all fields of study, from fitted regression models with state specific trends, weighted to adjust for the precision of institutional summary information and the size of enrollment, for the main analytic window and all 17 comparison states with California policy change in 1997 (Panel A) and policy change in 1998 (Panel B), different analytic windows and all 17 comparison states (Panel C), and the main analytic window with different comparison states (Panel D).

Note: All models include state fixed effects and a full set of institutional- and state-level covariates; institutional-level covariates include whether the institution is research extensive (vs. research intensive or masters/specialized); state-level covariates include percent of population by race (White, Black, Native American, Latino, Asian), percent of population with a bachelor's degree, and percent of 25-34 year olds unemployed. Models do not include year fixed effects to avoid collinearity with state-specific year trend. All models account for the clustering of observations within institution over time (with institutional random effects) and within state (with state fixed effects). The 17 comparison states in main analysis include Arkansas, Arizona, Colorado, Illinois, Indiana, Kansas, Massachusetts, Maryland, North Carolina, New Jersey, New Mexico, Nevada, New York, Ohio, Oklahoma, Pennsylvania and Virginia. Excluded states in broad sample of comparison states (Panel D1) include Alabama, Georgia, Louisiana, Michigan, Mississippi, Tennessee, Kentucky, and South Carolina. Selected subset of 10 comparison states (Panel D2) include Illinois, Indiana, Massachusetts, Maryland, North Carolina, New Jersey, New York, Ohio, Pennsylvania and Virginia.

Table C1. Main Findings, by Field of Study.

	Field of Study					
	Natural Sciences	**Engineering**	**Social Sciences**	**Business**	**Education**	**Humanities**
	(1)	(2)	(3)	(4)	(5)	(6)
A. No State-Specific Time Trend						
1. Unweighted						
BAN	-0.018~	-0.020*	0.007	0.009	-0.015	-0.004
	(0.011)	(0.009)	(0.011)	(0.011)	(0.011)	(0.013)
2. Weighted						
BAN	-0.002	-0.006~	-0.001	-0.005	0.009	-0.012*
	(0.004)	(0.004)	(0.006)	(0.005)	(0.007)	(0.005)
B. State-Specific Time Trend						
1. Unweighted						
BAN	-0.040*	-0.023~	0.013	0.025	-0.030~	-0.019
	(0.016)	(0.013)	(0.016)	(0.017)	(0.017)	(0.021)
2. Weighted						
BAN	-0.015**	-0.016**	-0.019*	0.004	-0.020~	-0.019**
	(0.006)	(0.005)	(0.009)	(0.007)	(0.011)	(0.007)
No. of obs.	1060	634	959	934	935	942
left-censored	143	96	88	99	60	145
uncensored	917	538	871	835	875	797
No. of institutions	116	68	105	103	102	103
Final Model[+]	Panel B(2)	Panel B(2)	Panel B(2)	Panel B(2)	Panel B(2)	Panel A(2)

~p<.10. *p<.05. **p<.01. ***p<.001. Standard errors in parentheses.

Table C1 Description: Average effect of affirmative action bans on the average enrollment of graduate students of color by field of study, from fitted regression models without and with state-specific time trends, unweighted, and weighted to adjust for the precision of institutional summary information and the size of first-time enrollment in each field of study, for the main analytic window (1994-2003) and all 17 comparison states.

Note: [+]Final model selected from results of goodness of fit tests comparing the change in -2LL between fitted models in Panel A(2) and those in Panel B(2). All models include state fixed effects and a full set of institutional- and state-level covariates; institutional-level covariates include whether the institution is research extensive (vs. research intensive or masters/specialized); state-level covariates include percent of population by race (White, Black, Native American, Latino, Asian), percent of population with a bachelor's degree, and percent of 25-34 year olds unemployed. Models without a state-specific year trend include year fixed effects; Models with state-specific year trend do not include year fixed effects to avoid collinearity. All models account for the clustering of observations within institution over time (with institutional random effects) and within state (with state fixed effects). The 17 comparison states include Arkansas, Arizona, Colorado, Illinois, Indiana, Kansas, Massachusetts, Maryland, North Carolina, New Jersey, New Mexico, Nevada, New York, Ohio, Oklahoma, Pennsylvania, and Virginia

Table C2. Sensitivity Analyses, by Field of Study.

	Natural Sciences	Engineering	Social Sciences	Business	Education	Humanities
	(1)	(2)	(3)	(4)	(5)	(6)
A. Main Results – Analytic Window 1994-2003 and 17 Comparison States						
BAN	-0.015**	-0.016**	-0.019*	0.004	-0.020~	-0.012*
	(0.006)	(0.005)	(0.009)	(0.007)	(0.011)	(0.005)
No. of obs.	1060	634	959	934	935	942
left-censored	143	96	88	99	60	145
uncensored	917	538	871	835	875	797
No. of institutions	116	68	105	103	102	103
B. California policy change in 1998 (instead of 1997)						
BAN	-0.015**	-0.016**	-0.024**	0.003	-0.020~	-0.011*
	(0.006)	(0.005)	(0.009)	(0.007)	(0.012)	(0.005)
No. of obs.	1060	634	959	934	935	942
left-censored	143	96	88	99	60	145
uncensored	917	538	871	835	875	797
No. of institutions	116	68	105	103	102	103
C. Different Analytic Windows						
1. Narrow analytic window (1996-2002)						
BAN	-0.014*	-0.013*	-0.019~	0.004	-0.013	-0.005
	(0.007)	(0.006)	(0.010)	(0.009)	(0.013)	(0.006)
No. of obs.	741	441	668	651	651	654
left-censored	104	66	60	74	42	95
uncensored	637	375	608	577	609	559
No. of institutions	116	68	105	103	102	103
2. Broad analytic window (1992-2005)						
BAN	-0.016***	-0.011**	-0.026***	-0.001	-0.021*	-0.011*
	(0.004)	(0.004)	(0.007)	(0.006)	(0.009)	(0.005)
No. of obs.	1479	890	1341	1305	1301	1317
left-censored	200	134	116	138	81	205
uncensored	1279	756	1225	1167	1220	1112
No. of institutions	116	68	105	103	102	103
D. Different Sample of Comparison States						
1. Broad sample of comparison states (all US states, with exclusions)						
BAN	-0.015**	-0.016**	-0.018*	0.004	-0.018~	-0.012**
	(0.005)	(0.005)	(0.008)	(0.007)	(0.011)	(0.004)
No. of obs.	1333	807	1198	1221	1232	1201
left-censored	184	160	144	175	101	224
uncensored	1149	647	1044	1046	1135	977
No. of institutions	147	88	136	138	138	132
2. Narrow sample of comparison states (10 comparison states)						
BAN	-0.015**	-0.016**	-0.022*	0.001	-0.022~	-0.019*
	(0.006)	(0.006)	(0.009)	(0.007)	(0.012)	(0.008)
No. of obs.	878	509	784	769	778	785
left-censored	107	78	61	78	56	111
uncensored	771	431	723	691	722	674
No. of institutions	97	55	87	86	86	87

~p<.10. *p<.05. **p<.01. ***p<.001. Standard errors in parentheses.

Table C2 Description: Average effect of affirmative action bans on graduate student of color enrollment by field of study for fitted models with state-specific time trends (except for field of humanities, which did not include state-specific time trends), weighted to adjust for the level of precision of information and size of field of study.

Note: The models for Humanities do not include state-specific time trend. All models include state fixed effects and a full set of institutional- and state-level covariates; institutional-level covariates include whether institution is research extensive (vs. research intensive or masters/specialized); state-level covariates include percent of population by race (White, Black, Native American, Latino, Asian), percent of population with a bachelor's degree, and percent of 25-34 year olds unemployed. Models with a state-specific year trend do not include year fixed effects to avoid collinearity with state-specific year trend. Models without a state-specific year trend (Humanities) include year fixed effects. All models account for the clustering of observations within institution over time (with institutional random effects) and within state (with state fixed effects). The 17 comparison states in main analysis include Arkansas, Arizona, Colorado, Illinois, Indiana, Kansas, Massachusetts, Maryland, North Carolina, New Jersey, New Mexico, Nevada, New York, Ohio, Oklahoma, Pennsylvania, and Virginia. Excluded states in broad sample of comparison states include Alabama, Georgia, Louisiana, Michigan, Mississippi, Tennessee, Kentucky, and South Carolina. Selected group of 10 comparison states include Illinois, Indiana, Massachusetts, Maryland, North Carolina, New Jersey, New York, Ohio, Pennsylvania, and Virginia.