Inter-American Development Bank
Banco Interamericano de Desarrollo (BID)
Research Department
Departamento de Investigación
Working Paper #617

Minority Enrollments at Public Universities of Diverse Selectivity Levels under Different Admission Regimes: The Case of Texas

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October 2007

Alfonso, Mariana.

Minority enrollments at public universities of diverse selectivity levels under different admission regimes : the case of Texas / by Mariana Alfonso, Juan Carlos Calcagno.

p. cm. (Research Department Working paper series ; 617)
Includes bibliographical references.

1. Affirmative action programs—United States—Texas. 2. Universities and colleges—Entrance requirements. 3. Minorities—Education (Higher)—United States—Texas. I. Calcagno, Juan Carlos. II. Inter-American Development Bank. Research Dept. III. Title. IV. Series.

LB2351 .A54 2007

Inter-American Development Bank
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Washington, DC 20577

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Abstract[1]

This study describes how minority enrollment probabilities respond to changes in admission policies from affirmative-action to merit-only programs and then to percentage plans when the demographic composition of the potential pool of applicants is also shifting. It takes advantage of admission policy changes that occurred in the state of Texas with the *Hopwood* and HB588 decisions and of a unique administrative dataset that includes applications, admissions, and enrollments for three public universities of different selectivity levels. The findings suggest that the elimination of affirmative action and the introduction of the Top 10% plan had differential effects on minority enrollment probabilities as well as on application behavior depending on the selectivity level of the postsecondary institution. In particular, *Hopwood* is related to shifts in minority enrollments from selective institutions to less selective ones as the cascading hypothesis predicts. And although the Top 10% plan seems to have helped increased minority enrollment probabilities at the selective college as the upgrading hypothesis predicts, once the increases in minority shares among high-school graduates are taken into account, we find that the Top 10% plan can no longer be related to improvements in minority representation at selective universities.

JEL Classification: I28; I23; J11
Keywords: college enrollments; admission policies; minorities

[1] This research uses data from the Texas Higher Education Opportunity Project (THEOP) and acknowledges the following agencies that made THEOP data available through grants and support: Ford Foundation, The Andrew W. Mellon Foundation, The William and Flora Hewlett Foundation, The Spencer Foundation, National Science Foundation (NSF Grant # SES-0350990), The National Institute of Child Health & Human Development (NICHD Grant # R24 H0047879), and The Office of Population Research at Princeton University. The authors wish to thank Mark Long and Marta Tienda for their outstanding comments and suggestions. Helpful comments were also provided by seminar participants at the THEOP Research Meeting. The views expressed here are those of the authors and do not necessarily reflect the official position of the Inter-American Development Bank or of THEOP's funding agencies. All errors remaining are our responsibility. Corresponding author: Mariana Alfonso, Research Department, Inter-American Development Bank, 1300 New York Ave, NW, Washington, DC 20577. Phone: 202-623-2804. Fax: 202-623-2481. Email: marianaa@iadb.org.

1. Introduction

The 1990s were times of turmoil for higher education in Texas. Although the use of race as a "plus" factor in admission decisions to create a diverse student body had been upheld in the 1978 *Bakke* ruling, the *Hopwood* decision in 1996 effectively ended the consideration of race as a plus factor in Texas and the other states that fall within the Fifth Circuit (Horn and Flores, 2003). Because *Hopwood* severely affected the number of minorities enrolling at the most selective Texas campuses—University of Texas-Austin and Texas A & M—the Texas legislature sought to reverse this negative impact by passing House Bill 588 in 1997. HB588, known as the "Top 10% plan," guarantees all seniors graduating in the top decile of their class automatic admission to any public institution of their choice, and in a sense constitutes a "color-blind" affirmative action program (Fryer, Loury, Yuret, forthcoming; Horn and Flores, 2003; Niu, Tienda, and Cortes, 2006; Tienda et al., 2003).

Several researchers have studied the impact on minorities of eliminating affirmative action and implementing the Top 10% plan by focusing on the application, admission, and enrollment behaviors of students in Texas. These researchers have found that the probability of minority students applying to, being admitted to, and enrolling at public flagship universities in Texas decreased considerably after *Hopwood* (Chapa and Lazaro, 1998; Finnell, 1998; Kain, O'Brien, and Jargowsky, 2005; Long, 2007; Texas Higher Education Coordinating Board, 1998; Tienda et al., 2003).[2] Furthermore, despite its good intentions, the Top 10% plan also significantly reduced the percentage of minority students taking college admission tests (Dickson, 2006) as well as minority enrollments at the public flagship universities (Kain, O'Brien, and Jargowsky, 2005; Long, 2007; Tienda et al., 2003), and has not been able to restore the number of minorities to pre-*Hopwood* levels.

However, changes in admissions policies are not the only source of variation in the composition of public colleges' freshman classes. Demographic forces also affect the number of minority and majority students who constitute the potential pool of applicants, and they are particularly important in Texas, a state that is on the verge of becoming the second state in the

[2] The decrease in minority enrollments at flagship universities as a result of the elimination of affirmative action is not characteristic of Texas only. Although the evidence on the effect of affirmative action policies on SAT sending behavior is debated (see Card and Krueger, 2005; Dickson, 2006; Long, 2004), studies using administrative data from California and Washington reached the same conclusion: the elimination of affirmative action reduces the percentage of minorities enrolled at highly selective public colleges (Brown and Hirschman, 2006; Lomibao, Barreto, and Pachon, 2004).

country where whites are no longer in numerical majority (Purdum, 2000). In fact, the minority shares of Texas high-school graduates have been increasing since the year before *Hopwood*: 50 percent of high-school graduates in the 2001–02 academic year were white—a decrease of 7 percentage points from academic year 1991–92—while the number of Hispanic high school graduates increased by 20 percent between 1991–92 and 2001–02.[3]

Nonetheless, research on the impact of eliminating affirmative action and implementing the Top 10% plan in Texas has, for the most part, ignored these demographic shifts in the state's high-school graduate population.[4] Moreover, this literature has focused only on the two flagship universities (UT-Austin and Texas A&M) while ignoring how these policy changes and demographic trends affected minority enrollments at universities of lower selectivity levels. One of the expected effects of eliminating affirmative action is to produce a shift in minority students rejected from top-tier universities to lower-ranked colleges (Long, 2004). This *cascading effect* needs to be studied,[5] as does determining whether the opposite shift—which we will call the *upgrading effect*—occurred after the Top 10% plan was introduced.

Given the changes in admissions policies and the demographic trends observed in Texas, this study seeks to answer the following questions:

1. How have minority enrollment probabilities at Texas public universities of different selectivity levels changed with the elimination of affirmative action and the introduction of the Top 10% plan? In particular, has there been a cascading effect in response to *Hopwood* and an upgrading effect in response to HB588?
2. To what extent have student behavior (measured by minority application and enrollment patterns) or admission decisions (measured by admission rates) contributed to the changes observed in minority enrollment probabilities during the different admission regimes?
3. What has been the impact of the demographic transition on how minority applications, admissions, and enrollments changed during the different admission regimes?

[3] Authors' calculations based on Texas Education Agency (various years).

[4] See Dickson (2006), Kain, O'Brien, and Jargowsky (2005), and Tienda et al. (2003) for examples of research that has examined the impact of these policy changes on enrollment rates without netting out the effect of demographic trends in the population of high-school graduates. In contrast, using data on applicants to UT-Austin and Texas A&M, Long (2007) takes into account demographic changes in the high-school graduating classes when estimating the effect of these admission policy changes.

[5] Using data on SAT takers residing in Texas, Long (2004) simulated what would be the effect of the elimination of affirmative action on the number of SAT scores reports sent to public universities of different selectivity levels. His model predicted a decline in the number of SAT score reports sent by underrepresented minorities to top-, second-, and third-quintile public universities, but his data did not allow him to estimate what happened with admissions and enrollments.

This study is the first in a series of papers that use administrative data from one Texas flagship university, one selective public university, and one less-selective public university to investigate minority enrollment probabilities during different admission regimes. Its goal is to provide an overall description of what happened to minority enrollments at three public universities of different selectivity levels when admission regimes were changing and the demographic composition of the high-school graduating class was also shifting. It is organized as follows. Section 2 describes the data and the empirical strategy and Section 3 describes the overall state-level trends in minority college enrollment during the period in which Texas was changing admission policies. Section 4 analyzes how minority enrollment probabilities at three universities of different selectivity levels changed with the different admission regimes, analyzes how the different components of this enrollment probability behaved during these transitional times, and provides preliminary evidence of the cascading and upgrading effects. Section 5 decomposes the change in transition rates from high school to college to understand the relative importance that applications, admissions, and enrollments have on the changes observed in enrollment probabilities. Lastly, Section 6 relates the changes observed in minority applications, admissions, and enrollments to the demographic transition experienced by the high-school graduating classes to analyze whether demographic shifts smooth out or deepen the consequences of the changes in admission policies. Section 7 concludes with a summary of results and some policy implications.

2. Data and Empirical Methodology

2.1 Data

The state of Texas provides a unique policy experiment by which to analyze the impact of changes in admission policies on a variety of educational outcomes, since it has experienced three particular admission regimes in the last decade: affirmative action, merit-based admissions, and the Top 10% plan (Dickson, 2006). The affirmative action regime was in effect until the spring of 1997 and covers the period before *Hopwood* when public and private colleges used race as a plus factor when considering admissions. The merit-based admission period extended from the fall of 1997 to the spring of 1998. During this period, colleges in Texas could not use race as a plus factor and did not have to automatically admit students in the top 10 percent of their class. The Top 10% plan became effective in the fall of 1998; it requires public colleges to

admit students graduating in the top 10 percent of their class, but cannot use race as a plus factor.[6]

This study takes advantage of these policy experiments and relies on administrative data from the Texas Higher Education Opportunity Project (THEOP) at Princeton University. We use administrative data from three public universities: Texas A&M University (flagship), Texas Tech (selective), and Texas A&M University (TAMU)-Kingsville (less selective).[7] These universities were selected to cover the entire range of institutional selectivity of public universities in Texas. In addition, the THEOP data collected from these institutions cover the three admission regimes. The THEOP dataset is extremely rich and contains information on applicants, admissions, and enrollments. From these administrative records, we are able to estimate the number of all applicants, admitted students, and first-year enrollees during the three admission periods for each of the universities and for each racial/ethnic group. In addition, the THEOP administrative files contain information on applicants' individual characteristics, such as SAT scores and high-school rank.

Finally, this study also relies on data from the Texas Education Agency's Public School Statistics, which are linked to the THEOP administrative dataset. From this source, we compute the number of high-school graduates from each racial/ethnic group, and the percentage of the total of high-school graduates that each racial/ethnic group represents to evaluate how the demographic composition of high-school graduates has changed during the different admission regimes in Texas.

2.2 Empirical Methodology

One could be inclined to compare minorities in each entering class for each of the three Texas universities as a share of minority high-school graduates to determine whether their enrollment probabilities have declined, which seems to be a straightforward computation. However, the probability of enrollment at a particular postsecondary institution depends on (i) the proportion of high-school graduates who apply; (ii) the proportion of applicants who are admitted; and (iii) the proportion of admitted students who enroll (Brown and Hirschman, 2006; Manski and Wise, 1983; Tienda et al., 2003). The first stage in this sequential process is taken by students, who

[6] After the 2003 Supreme Court ruling on *Grutter v. Bollinger*, race can again be considered by admission officers. However, the use of race is limited to being part of a full-file review and cannot be used in a mechanical way.
[7] Selectivity ratings are based on *U.S. News and World Report* (2003) profiles.

have to decide whether to apply to college, and to which colleges. The second stage is taken by the universities, which decide whether to admit the applicants. This stage is directly affected by affirmative action and percentage-plan polices because these policies can constrain the proportion of minority students each university admits. The last stage in the enrollment decision is again taken by students who must decide where to enroll—if they have been admitted to at least one university.

Thus, the probability of enrollment at university *j* by race/ethnic group *i* at time *t* can then be written as:

$$\Pr(Enr_{ijt}) = \frac{Enr_{ijt}}{HS_{ijt\text{-}1}} = \left(\frac{App_{ijt}}{HS_{ijt\text{-}1}}\right) \times \left(\frac{Adm_{ijt}}{App_{ijt}}\right) \times \left(\frac{Enr_{ijt}}{Adm_{ijt}}\right) \qquad (1)$$

where *HS* is the number of high-school graduates of race/ethnicity *i* at time *t-1* and measures the demographic composition of the potential applicant pool. *App* is the number of applicants of race/ethnicity *i* to university *j* at time *t*, *Adm* is the number of admitted applicants at university *j* of race/ethnicity *i* at time *t*, and *Enr* is the number of admits of race/ethnicity *i* who enroll in university *j* at time *t*. The first factor represents the application rate, the second factor the admission rate, and the last factor the enrollment rate, for each racial/ethnic group, at university *j* at time *t*. This approach allows decomposing the probability of enrollment into the different decision processes that feed into it, and suggests that demographic trends can considerably modify the pool of potential applicants and as a result, affect the composition of the student body. For example, if there is a significant increase in the number of minority students among high-school graduates and the college application rates remain the same, we should expect the number of minority applicants to grow. And if minority applicants are spread out in the ability distribution, we should also see the number of minority admits and enrollees go up, *ceteris paribus*. However, a limitation of this approach is that it assumes that only Texas high-school graduates apply to a Texas institution of higher education. Nevertheless, this assumption does not appear to be problematic since 90 percent of college students in Texas are state residents (National Center for Education Statistics, 2003).

Measuring the intervening steps in race/ethnicity *i*'s probability of enrollment at institution *j* during time *t*, however, does not show the relative importance of each of the processes involved in that probability. A decomposition of differences in rates, which is

essentially the total derivative of equation (1), can be used to estimate the relative impact of these three processes on the overall change in the probability of enrollment (Brown and Hirschman, 2006; Preston, Heuveline, and Guillot, 2001):

$$\Delta_{t,t+1}[\Pr(Enr_{ijt})] = \left\{\Delta_{t,t+1}\left(\frac{App}{HS}\right)\times\left[av_{t,t+1}\left(\frac{Adm}{App}\right)\right]\times\left[av_{t,t+1}\left(\frac{Enr}{Adm}\right)\right]\right\}$$

$$+\left\{\Delta_{t,t+1}\left(\frac{Adm}{App}\right)\times\left[av_{t,t+1}\left(\frac{App}{HS}\right)\right]\times\left[av_{t,t+1}\left(\frac{Enr}{Adm}\right)\right]\right\}$$

$$+\left\{\Delta_{t,t+1}\left(\frac{Enr}{Adm}\right)\times\left[av_{t,t+1}\left(\frac{App}{HS}\right)\right]\times\left[av_{t,t+1}\left(\frac{Adm}{App}\right)\right]\right\} \quad (2)$$

where $\Delta_{t,t+1}$ indicates the percentage point change in the application, admission, and enrollment rates from *t* to *t+1*, and *av* indicates the average application, admission, and enrollment rate, respectively, between *t* and *t+1*. Although changes in admission policies directly modify the proportion of minority applicants who are admitted to a university, they can also indirectly affect the proportion of minority high-school graduates who apply and the percentage of admitted candidates who enroll. For example, policies that eliminate or modify affirmative action programs can be seen by prospective students as a signal that minorities are no longer welcome on campus, and can influence how high-school counselors advise students, thereby reducing minority application and enrollment rates (Brown and Hirschman, 2006; Tienda et al., 2003). Thus, this decomposition helps evaluate whether the elimination of affirmative action and the introduction of the Top 10% plan also modified the application and enrollment behaviors of different racial/ethnic groups.

3. From High-School Graduation to College Enrollment: The Texas Context

This section first analyzes trends in the demographic composition of Texas high-school graduates, then discusses trends in the demographic composition of enrollees at Texas public universities, and finally examines the overall probability of minority enrollment in the Texas system of public postsecondary education.

As Figure 1 shows, there has been a considerable increase in the number of students graduating from Texas high schools in the decade 1992–2002, with the graduating class of 2001 (application year 2002) being 42 percent larger than the class of 1991 (application year 1992).

This important growth in the number of high-school graduates could certainly create a "squeeze" in college admissions, since we cannot expect colleges and universities to generate so many additional spaces given budgetary, physical, and educational constraints. Figure 1 indicates that although the number of freshmen enrolled at Texas public colleges and universities increased by 30 percent in these 10 years, it has not kept pace with the surge in college-age students in the state. This demographic momentum and the squeeze it creates leads to questions about which students are being displaced from the most prestigious public four-year colleges, and whether this displacement is associated with the students' race/ethnicity. Both these questions are analyzed below.

Texas has not only experienced an important increase in the size of its high-school graduating classes, but also an important change in its demographic composition (Table 1, Panel A). The largest increases in the number of high-school graduates were among Hispanics and "others" (Asians, Native Americans, and mixed races) and as a result, whites no longer made up the majority of high-school graduates in the state of Texas by 2002. The demographic make up of the entering class at public institutions of higher education, however, has not reflected these compositional changes in the potential pool of applicants. Among enrollees at Texas public universities, the share of blacks and Hispanics has remained relatively stable (Table 1, Panel B).

Relating high-school graduates to first-year college enrollments leads us to compute the probability of enrollment, also known as the *transition rate* from high school to college, which is simply the share of Texas public high-school graduates who enroll at a Texas public college. In a sense, the transition rates adjust for changes in the supply of students (Brown and Hirschman, 2006). Figure 2 shows that the highest transition rate belongs to "others" (mostly Asians), while the lowest rate belongs to Hispanics. The share of Hispanic and black high-school students who attended a Texas public college started to decline even before the *Hopwood* decision, and this trend continued at least during the initial years of the Top 10% policy. It is important to note, however, that the largest absolute *and* relative declines in transition rates for blacks and Hispanics occurred between 1996 and 1997, the year that affirmative action ended. In contrast, the share of "other" high-school graduates enrolling at Texas public colleges increased considerably during the transition years from *Hopwood* to the Top 10% plan (more exactly, from 1995 to 1997).

In sum, although the elimination of affirmative action in the state of Texas apparently did not induce a decline in the overall percentage of minority high-school graduates enrolling in public colleges and universities since the percentage was declining before *Hopwood*, it deepened reductions in their transition rates. Whites also experienced a decline in their transition rate concomitant to *Hopwood*, but their decline in relative terms was only minor (4 percentage points). Thus, while the declines were not limited to minority students, they were considerably larger for minorities than for whites and were outside the ranges of the pre-*Hopwood* trend; therefore, these declines might be the consequence of the end of affirmative action. Moreover, the introduction of the Top 10% plan did not necessarily help minority enrollment shares recover to pre-*Hopwood* levels.

Nonetheless, these statewide trends could mask important variations in how the probability of enrollment at universities of different selectivity levels changed with the end of affirmative action and the introduction of the Top 10% plan. Previous research showing similar effects to the ones just described focused only on selective colleges in Texas (Chapa and Lazaro, 1998; Finnell, 1998; Kain, O'Brien, and Jargowsky, 2005; Texas Higher Education Coordinating Board, 1998; Tienda et al., 2003). However, using data from the state of Washington, Brown and Hirschman (2006) found that minority enrollments varied considerably as a result of the elimination of affirmative action depending on the selectivity level of the university. To see whether this occurred in Texas, the next section analyzes data from three public universities covering the entire range of selectivity.

4. Cascading and Upgrading? Admission Policies and Minority Enrollment Probabilities at Public Universities of Different Selectivity Levels

A particular concern that arises when affirmative action can no longer be practiced is whether minority students might feel discouraged from applying to and enrolling at selective institutions. Indeed, previous studies have found that the number of minority enrollments at the most selective colleges in Texas declined after *Hopwood* (Chapa and Lazaro, 1998; Finnell, 1998; Kain, O'Brien, and Jargowsky, 2005; Texas Higher Education Coordinating Board, 1998; Tienda et al., 2003). However, these studies did not include less-selective institutions and did not determine whether there was a *cascading (upgrading) effect*; that is, whether minority students responded to the elimination of affirmative action (and the introduction of the percentage-plan policy) by shifting their application and enrollment patterns from selective to less-selective

universities where their chances of being admitted might not have been affected (or from less-selective to more-selective once admissions were guaranteed).[8]

Our unique administrative dataset contains information on applications, admissions, and enrollments from Texas A&M, Texas Tech, and TAMU-Kingsville. Texas A&M is one of the two most selective public postsecondary institutions in Texas. In 2002, it admitted 68.3 percent of its 17,281 applicants and enrolled close to 7,000 students in its freshman class,[9] of which only 12.3 percent were traditionally underrepresented minorities (blacks and Hispanics).[10] Texas Tech is located in the middle of the selectivity distribution. Of the 12,313 students that applied in 2002, it admitted 74.6 percent and had an enrollment yield of 48.1 percent, representing close to 4,400 students. Although it enrolls fewer students than Texas A&M, it has a similar share of minorities (13.2 percent).[11] Lastly, TAMU-Kingsville is a non-selective institution that admits all applicants.[12] It is much smaller than the other two universities, enrolling approximately 1,100 students in its 2002 freshman class—an enrollment yield of 48.6 percent. It can also be labeled as a Hispanic-serving institution, since Hispanics represented 70.6 percent of all first-year students in 2002. Because the three public universities attract mostly in-state students[13] and because we wish to compare the racial composition of college enrollees with that of Texas' high-school graduating class, we will limit our discussion to Texas residents.

The probabilities of minority and non-minority[14] enrollment under the different admission regimes at these three public universities are shown in Figure 3. Enrollment probability is computed, as indicated by the left-hand-side term of Equation (1), as the percentage of first-year in-state enrollments out of the total number of Texas high-school graduates in the previous

[8] Long (2004) examined the SAT-sending behavior of minority students (but not the actual applications) and his simulations suggest that this cascading effect in minority college applications is indeed plausible once race can no longer be used as a plus factor for admissions. However, Long's study included only data on SAT-sending behavior, which may only signal application preferences, and thus it was not possible to tell whether cascading also occurred with enrollments.

[9] These figures include in-state and out-of-states applicants, admits, and enrollees. The yield rate for Texas A&M in 2002 was 59 percent. These are authors' calculations based on THEOP administrative data.

[10] Throughout the remainder of the paper "minorities" will refer only to blacks and Hispanics, who are the groups traditionally underrepresented in higher education.

[11] Of the 105,390 students in the Texas Tech dataset, 421 did not report their race/ethnicity. Most of the non-reporting occurs after 1999. These are authors' calculations based on THEOP administrative data.

[12] In 2002, 2,363 people applied to TAMU-Kingsville and all were admitted.

[13] In 2002, Texas residents constituted 86 percent of Texas A&M's applicants, 92 percent of Texas Tech's, and 97 percent of TAMU-Kingsville's applicants. Texas residents represented more of 94 percent of all first-year enrollees at these three universities.

[14] Throughout the remainder of the paper, "non-minorities" refers to whites and Asians. We include Asians because they are more likely to be overrepresented in higher education in general, and in very selective institutions in particular.

academic year. First, as Panel A indicates, minority enrollments at Texas A&M as a share of minority high-school graduates declined considerably with the *Hopwood* ruling, which took effect in March of 1996 and as a result affected admissions (and therefore enrollment probabilities) for the academic year 1996. Although the reductions in enrollment probabilities between 1995 and 1996 and between 1996 and 1997 are small in absolute terms—in the order of 0.2/0.3 percentage points for blacks and 0.3/0.4 percentage points for Hispanics—they represent a relative decline of more than 20 percent. In contrast, non-minority enrollment probabilities at Texas A&M increased by about 12 percent at the time of *Hopwood* (although they declined in the year of merit-only admissions, but by only 4 percent). The introduction of the Top 10% program clearly did not positively affect minority enrollment probabilities at Texas A&M, since they continued their declining trend and never recovered to pre-*Hopwood* levels. At Texas Tech (Panel B), *Hopwood* is also negatively related to minority enrollment probabilities, which decreased by 16 percent for blacks and 25 percent for Hispanics when affirmative action ended. Non-minority enrollment probabilities also decreased between 1996 and 1997, but only by 3 percent. However, and in contrast to what happened at Texas A&M, the introduction of the Top 10% plan appears to have been instrumental in helping minority enrollment probabilities reach pre-*Hopwood* levels by 2000. Nevertheless, non-minority enrollments grew stronger with HB588 and therefore the gap between minority and non-minority enrollment probabilities at Texas Tech widened considerably. Lastly, Panel C indicates that Hispanics' enrollment probability at TAMU-Kingsville was declining considerably before 1996 and that it increased slightly once *Hopwood* took effect, significantly contrasting with what happened at the other two universities. However, after the Top 10% plan was implemented, Hispanic enrollees at TAMU-Kingsville as a share of high-school graduates reverted to the previous declining trend. In contrast, non-minority enrollment probabilities at TAMU-Kingsville suffered an important decline of 24 percent with *Hopwood*, but increased by about 5 percent between 1997 and 1998 when the Top 10% plan was introduced.

Thus, our analysis of minority and non-minority enrollment probabilities constitutes preliminary evidence that a cascading effect may have occurred in Texas when affirmative action ended, with decreases in minority enrollment probabilities at the two selective institutions and slight increases at the non-selective one. The Top 10% plan did not help recover minority enrollment probability at the most selective college—Texas A&M. Nonetheless, HB588 appears

to be related to changes in minority enrollment probabilities, but only at the lower section of the selectivity tier, generating a redistribution of minorities from the non-selective institutions to the selective institutions—but not most selective—as our upgrading hypothesis predicts. In order to understand whether the observed trends in minority enrollment probabilities are related to changes in admissions or to changes in student behavior (application and enrollment decisions), we need to decompose the enrollment probability into the preliminary processes that are part of it. As is shown in the right-hand-side of Equation (1), the enrollment probability at a particular university depends on the proportion of high-school graduates who apply (the application rate), the proportion of applicants who are admitted (the admission rate), and the proportion of applicants who enroll (the enrollment rate or yield).

Applying to college is the first step in the process of enrolling in postsecondary education. The number of in-state applicants to our three universities increased between 1992 and 2002 in parallel with the surge in high-school graduates. Of an applicant pool of 225,000 students in 2002, the highest in-state application rate belongs to the flagship university Texas A&M, with an application rate of 6.5 percent. In-state application rates at the other two universities are lower: 5 percent of high-school graduates applied to Texas Tech in 2002, and only 1 percent applied to TAMU-Kingsville.[15] These overall application rates, however, mask important differences by race/ethnicity. Figure 4 suggests that minority in-state application rates are significantly below non-minority application rates at Texas A&M (Panel A) and Texas Tech (Panel B), while the opposite occurs at TAMU-Kingsville (Panel C).[16] Minority in-state application rates at Texas A&M were increasing at the beginning of the 10-year period, but declined considerably (by as much as 16 percent) in coincidence with the *Hopwood* ruling. They continued this decline when the Top 10% plan was introduced, by as much as 25 percent between 1997 and 1998, and started to recover in 1999 but never reached pre-*Hopwood* levels. Non-minority application rates continued their increasing trend until the introduction of HB588, when they suffered an important decline (about 14 percent, although not as considerable as the decline in the minority rate) and they quickly recovered. At Texas Tech, minority in-state application rates decreased considerably between 1996 and 1997 with the end of affirmative

[15] These are authors' calculations based on THEOP administrative data and Texas Education Agency (various years).

[16] This can be explained by the geographic location of TAMU-Kingsville, which is a predominantly Hispanic residential area and is located only 100 miles away from the U.S.-Mexico border.

action, and continued their decreasing trend during the first years of the Top 10% plan. However, they reached pre-*Hopwood* levels by 2000. In contrast, non-minority application rates at Texas Tech increased by about 9 percent with *Hopwood,* but declined considerably with the introduction of the Top 10% plan.[17] Lastly, Hispanic application rates at TAMU-Kingsville barely increased between 1996 and 1997, but suffered from an important decline with the introduction of the Top 10% plan. Non-minority in-state application rates to TAMU-Kingsville, in contrast, decreased by as much as 15 percent with *Hopwood* but increased considerably with the Top 10% plan. These trends in applications rates, therefore, suggest that the elimination of affirmative action discouraged minorities from applying to the most selective universities while encouraging them to apply to non-selective institutions, as the cascading effect predicts, although these trends do not appear to suggest that applications experienced upgrading when HB588 was enacted.

Admission constitutes the only stage in the college enrollment process that depends solely on the postsecondary institution, although it can be conditioned by the qualifications of candidates, the absorptive capacity of the institution, and the expected enrollment yield (Brown and Hirschman, 2006). Moreover, it is the stage that is directly affected by affirmative action and percentage-plan policies, since these policies also impose a constraint on the number of minority applicants that can be admitted to a university—although we have seen that the changes in admission policies in Texas can also be related to changes in minority application rates.

Overall, the number of in-state applicants admitted to Texas A&M, Texas Tech, and TAMU-Kingsville shows an increasing trend during the 10-year period of analysis. The most selective university in the sample, Texas A&M, has the lowest average admission rate; in 2002 it admitted 71 percent of its in-state applicants.[18] Admission rates at Texas Tech are not much higher than at Texas A&M; in 2002 it admitted 75.4 percent of in-state applicants. TAMU-Kingsville, as a less-selective institution, admits all of its applicants.[19] In a clear suggestion that affirmative action was actively used at Texas A&M before the *Hopwood* ruling, in-state admission rates for minorities were considerable higher than for non-minorities (Figure 5, Panel A). In fact, in the year preceding *Hopwood,* more than 90 percent of minority in-state applicants

[17] The initial confusion generated by the Top 10% plan might have caused the decline in application rates to Texas A&M and Texas Tech for students of all racial/ethnic backgrounds.
[18] Although *U.S. News and World Report* (2003) classifies this university as "most selective," it has mildly selective admission policies, particularly with regard to in-state applicants.
[19] These are authors' calculations based on THEOP administrative data.

were admitted to Texas A&M. In contrast, affirmative action does not seem to have been used as extensively at Texas Tech (Panel B), since in-state admission rates for minorities at this university were considerably below those for non-minorities when race was considered a plus factor in admission decisions. With the elimination of affirmative action, minority admission rates at Texas A&M declined by as much as 20 percent, to levels below those for non-minorities, and stayed below non-minority rates even after the introduction of the Top 10% plan. Non-minority admission rates, in contrast, experienced an increase after *Hopwood*. At Texas Tech, minority admission rates declined considerably after the *Hopwood* ruling, with blacks' admission rates decreasing by 25 percent and Hispanics by 15 percent between 1996 and 1997. Non-minority admission rates also declined during the merit-only admission period, but their decrease in relative terms was considerably smaller. And while minority admission rates increased during the first years of the Top 10% plan, they regressed to below pre-*Hopwood* levels by 2000, and by the end of the 10-year period the gap between minority and non-minority in-state admission rates widened.[20] In sum, this analysis of admission rates suggests that the universities seemed to have responded to the elimination of affirmative action and the introduction of the Top 10% plan as expected (by reducing admission rates for minorities during the merit-only period, and increasing them—but only slightly—with the percentage plan). In addition, it suggests that the negative effect of *Hopwood* on minority admissions was considerably stronger at the most selective institution in the sample, an institution that was actively practicing affirmative action.

Lastly, enrolling at a postsecondary institution is the final stage of the college choice process. After being admitted, students decide where to enroll, and changes in admission policies could affect enrollment preferences if minority students sense that even though they qualify for admission, the campus does not offer a welcoming environment to minorities. Texas A&M has the highest average enrollment yield and attracted 63.3 percent of the in-state admitted students in 2002, a reflection of the high demand that comes attached to its selectivity. Interestingly, the enrollment yield of Texas Tech in 2002 was similar to that of TAMU-Kingsville, attracting 48.9 percent of their in-state applicants. But the overall enrollment rate at Texas Tech showed little fluctuation during the 10 years for which there are data, while enrollment rates at TAMU-Kingsville decreased considerably throughout this period.[21] As Figure 6 shows, in-state

[20] Admission rates for TAMU-Kingsville are not analyzed because they are always 100 percent.
[21] The data presented in this paragraph are authors' calculations based on THEOP administrative data.

enrollment yields behave differently from application and admission rates. For example, enrollment yields at Texas A&M (Panel A) and Texas Tech (Panel B) show an overall decreasing trend before the elimination of affirmative action. Moreover, increases and decreases in enrollment rates do not appear to be closely related to changes in admission policies. Minority and non-minority enrollment rates at Texas A&M started to decline in 1993, three years before the *Hopwood* ruling, although the decline accelerated with *Hopwood* and this acceleration was stronger among minorities. Both minority and non-minority enrollment yields at Texas A&M increased with the introduction of the Top 10% plan, and after 1998 they continued on a parallel trend. At Texas Tech, blacks' enrollment yield actually increased by 14 percent during the year of merit-based admissions while Hispanics' yield decreased by only 1 percent and non-minorities by 6 percent. These enrollment rates climbed above pre-*Hopwood* levels during the first years of the Top 10% plan. Lastly, in-state enrollment rates for minorities and non-minorities at TAMU-Kingsville show a declining trend, although Hispanics' enrollment yield did not decrease when affirmative action ended and the Top 10% plan was introduced (Panel C). Thus, this analysis of enrollment yields indicates that there is some evidence of discouragement of enrollment by minorities at the most selective university once affirmative action was eliminated, and that cascading might have taken place given the slight increase in minority enrollment rates at TAMU-Kingsville. However, these effects appear to be much weaker at this stage of the enrollment process and suggest that changes in admission policies have a smaller impact on the universities' ability to attract minority admitted students than on their ability to attract minority applicants and to admit them.

5. The Contributions of Applications, Admissions, and Enrollments to Changes in the Probability of Enrollment

Our analysis so far has related trends observed in minority enrollment probability and in its components (application, admission, and enrollment rates) to the changes in admission policies experienced by Texas public universities in the 1990s. However, these trends do not reveal anything about the relative importance of each of these processes. Understanding the relative contribution of each of the stages of the enrollment decision is important for policy purposes; if application and the enrollment yield are found to be more critical than admissions (the component affected by policy changes), then college administrators should focus their efforts on improving the recruitment of minorities or on establishing programs that lead to increases in their

yield. In addition, since the universities in our sample have at best mildly selective admission policies, we need to know how important student decisions are in determining the impact of changes in admission policies. Therefore, in this section we decompose the year-to-year changes in college enrollment as a share of high-school graduates—that is, the change in the transition rate from high school to each of the universities in our sample—into its three preliminary stages, as explained in Equation (2). Although we present information for all the years available in our dataset, we restrict most of our discussion to the years when admission policies were experiencing changes: 1995 to 1996 (both affirmative action years, although *Hopwood* was adopted in March 1996), 1996 to 1997 (from affirmative action to merit-only admissions), 1997 to 1998 (from merit-only to the Top 10% plan), and 1998 to 1999.

When *Hopwood* was adopted in March 1996, the Texas attorney general ordered all universities in the state to immediately halt the use of race in admissions. At the time of the ruling, Texas A&M had already received applications, but had not made admission decisions. As a consequence of the timing of the judicial decision, the impact of *Hopwood* on minority in-state enrollment probabilities at this flagship university was first reflected in declines in admissions (between admission years 1995 and 1996) and then in reductions in minority applications (between 1996 and 1997), as seen in Panel A of Figure 7. Changes in application and admission rates, in contrast, are less important for explaining the changes observed in non-minority in-state transition rates during these years (Panel B). As expected, the introduction of the Top 10% plan mostly affected student behavior—given that universities must automatically admit all applicants in the top decile of their high school class—and the changes observed in the share of both minority and non-minority high-school graduates enrolled at Texas A&M can be mostly attributed to application and enrollment decisions. However, once students became aware of the details of the Top 10% plan, admissions again took pre-eminence in explaining the observed changes in transition rates for both groups.

At Texas Tech, in contrast, minority in-state transition rates did not experience a decline until the merit-only period. This difference with Texas A&M could be explained by the timing of the *Hopwood* ruling vis-à-vis Texas Tech's timing of its admission decisions. When admission officers could no longer use race as a plus factor in admissions, admissions explain the brunt of the decline in minority in-state transition rates at this university (Figure 8, Panel A). In contrast, the decrease we observe in non-minority transition rates between 1996 and 1997 can be

associated with changes in student behavior (Figure 8, Panel B). Once the Top 10% plan was implemented, most of the observed changes in the share of Texas minority and non-minority high-school graduates enrolling at Texas Tech can be attributed to changes in student behavior—changes in the application rate or in the enrollment yield, but mostly in applications.

Lastly, since TAMU-Kingsville is a non-selective institution, admissions remained unaffected—at 100 percent for all groups—when affirmative action ended and the Top 10% plan was introduced (Figure 9). In the case of this university, almost all of the changes in in-state transition rates for both minorities and non-minorities can be attributed to changes in application rates, which explain more than those of enrollments. Lack of data on applications before 1996, unfortunately, do not allow us to analyze whether these patterns were also observed during the period in which affirmative action was a policy commonly used by selective universities.

In sum, the decomposition of differences in transition rates shows that although changes in admission policies from affirmative action to merit-only do indeed seem to have affected institutional behavior—with the two selective institutions reducing the share of minority applicants being admitted—changes in the behavior of potential students also play a considerable role in explaining the observed changes in minority enrollment probabilities. In particular, student behavior becomes an important factor in explaining enrollment probabilities once the Top 10% plan was introduced. Finally, changes in minority in-state application rates tend to exceed changes in the enrollment yield. Thus, from a policy perspective, our analysis suggests that college administrators might need to concentrate their efforts in reaching out to minorities while they are still in high school so as to provide incentives for them to apply.

6. Accounting for the Demographic Transition

So far we have suggested that the elimination of affirmative action in Texas can be related to decreases in minority enrollment probabilities at the most selective institutions, Texas A&M and Texas Tech, and that the introduction of the Top 10% plan does not appear to have had an immediate positive impact on minority enrollments. Moreover, we have seen that applications are as important as admissions in explaining the preponderance of these declines in minority enrollment probabilities. And although we have related these changes to the number of minority and non-minority students graduating from Texas high schools, we have not fully accounted for the important demographic shifts that the state of Texas was experiencing during the changes in

admission policies. These demographic shifts could exacerbate or smooth out the impact of the end of affirmative action and the implementation of percentage-plan alternatives. Thus, this section examines the relationship between the demographic composition at the end of high school and at college entrance under different admission regimes by analyzing the degree of minority representation in applications, admissions, and enrollments at the three public universities of different selectivity levels. Representation is computed as the difference between a minority group's share of university applicants, admits, and enrollees and its share of high-school graduates the previous spring (Long, 2007). It acquires negative values when a group is underrepresented and positive values when it is overrepresented.

As Panel A of Figure 10 shows, minorities were considerably underrepresented among in-state applicants to Texas A&M and Texas Tech even before *Hopwood*, with a representation gap of more than 20 percentage points, although this underrepresentation was relatively stable. When affirmative action ended in 1996, minority underrepresentation at both universities experienced a small increase—that is, minorities became more underrepresented—and in the case of Texas A&M, this increase continued after the introduction of the Top 10% plan. In the case of Texas Tech, minority underrepresentation stabilized with the Top 10% plan but at a level below pre-*Hopwood*. In contrast, minorities were considerably overrepresented among in-state applicants to TAMU-Kingsville, and this overrepresentation peaked during the time of the merit-only admission policy and slightly declined with the introduction of the Top 10% plan. These trends in minority representation constitute further evidence of *Hopwood*'s cascading effect on applications.

Panel B of Figure 10 reinforces our previous suggestion that Texas A&M was actively practicing affirmative action, since minority underrepresentation among admitted students was less prominent than among applicants. Moreover, it was declining before affirmative action was struck down in March 1996. After that, minority representation among admits at Texas A&M deteriorated. Although Texas Tech did not seem to have practiced affirmative action as strongly as Texas A&M, minority representation also deteriorated with *Hopwood* and continued to decline with the Top 10% plan.

Lastly, minority underrepresentation among in-state freshman enrollments at Texas A&M was slightly improving at the beginning of the period of analysis. However, it worsened considerably when affirmative action was eliminated, and the implementation of the Top 10%

plan did not help recuperate minority representation among enrollees at this selective institution. Minority underrepresentation at Texas Tech deteriorated slightly with *Hopwood* and remained relatively stable, but below pre-*Hopwood* levels. once HB588 took effect. In contrast, minority overrepresentation among enrollments at TAMU-Kingsville experienced a small increase with *Hopwood* but declined slightly with the introduction of the Top 10% plan (Panel C, Figure 10). Again, the different ways in which minority representation changed among enrollments at selective and non-selective institutions with the elimination of affirmative action offer further evidence of cascading.

In sum, although some immediate improvements in minority application, admission, and enrollment rates were observed at Texas A&M and Texas Tech with the introduction of the Top 10% plan,[22] when the increase in the share of minority students graduating from high school is taken into account, it becomes clear that minority representation among applicants, admits, and freshmen at these institutions does not appear to have been affected much by the Top 10% plan. Thus, these findings point to the limitations of percentage-plan policies in recovering minority representation at selective public colleges after the elimination of affirmative action when the demographic composition of high-school graduates is also shifting and becoming increasingly minority.

7. Conclusion

This study has provided a thorough description of how minority enrollment probabilities at public universities of different selectivity levels respond to changes in admission policies from affirmative action to merit-only to a percentage plan when the demographic composition of the potential pool of applicants is also shifting. We have taken advantage of admission policy changes that occurred in the state of Texas with *Hopwood* and HB588, which constitute two natural experiments, and of a unique administrative dataset that includes applications, admissions, and enrollments to Texas A&M (most selective), Texas Tech (selective), and TAMU-Kingsville (less selective).

Although our analysis has been descriptive and, therefore, does not allow us to assign causality,[23] we are confident that the changes we observed in minority enrollment probabilities,

[22] Recall Section 4, which showed that admission, application, and enrollment rates for minorities increased with the Top 10% plan but not enough to reach pre-*Hopwood* levels.
[23] We leave this for a future study.

in the components of these probabilities, and in minority representation can be related to the exogenous variations in admission policies. Our confidence stems from clear breaks from pre-*Hopwood* trends and from magnitudes in the changes that are so sizable that they fall outside the normal ranges of variation.

Our analysis of minority enrollment probabilities suggest that the elimination of affirmative action and the introduction of the Top 10% plan has had a differential effect depending on the selectivity level of the postsecondary institution. We found that *Hopwood* is related to shifts in minority enrollments from selective institutions to less selective ones, a result predicted by the cascading hypothesis. Although the Top 10% plan does not appear to be related to improvements in minority enrollment probabilities at our most selective university, this policy seems to have helped increased minority enrollment probabilities at the selective university while reducing them at the non-selective one, as the upgrading hypothesis predicts. Thus, it appears that the Top 10% plan positively affected minority enrollments—but only at the lower section of the selectivity tier. However, once the important increases in minority shares among high-school graduates were taken into account, we found that the Top 10% plan can no longer be related to improvements in minority representation at the selective university.

In addition, our study has found that changes in admission policies appear to have affected not only the institutional decision of who to admit, but also the application and enrollment decisions made by students. Minority admission rates suffered an important decline with *Hopwood*, but reductions in minority application rates also explain a large share of the declines observed in transition rates. In particular, we found that the elimination of affirmative action has discouraged minority students from applying to the selective universities and that the Top 10% plan did not provide enough encouragement to return minority enrollment probabilities to pre-*Hopwood* levels. And although after the elimination of affirmative action minorities experienced a discouragement effect from applying to the most selective universities, they did not necessarily feel discouraged from enrolling at these selective institutions once they had been admitted.

What are the implications of our findings? First, the cascading of minority students from selective to non-selective institutions when affirmative action ended and the very limited upgrading effect of HB588 can have a long-term negative impact on minorities. Six-year

graduation rates are considerably higher at more selective institutions,[24] and *Hopwood* decreased the number of minorities applying to, being admitted to, and enrolling at the most selective college in our sample. As a result, the number of minority students who receive bachelor's degrees in the state of Texas may also have experienced a decline. This, in turn, can exacerbate social and economic inequalities between white and minority groups given that college selectivity has been related to increased earnings, particularly for minorities (Brewer, Eide, and Ehrenberg, 1999; Daniel, Black, and Smith, 1995; Hoxby, 1998; Loury and Garman, 1995). And so far, the Top 10% plan does not seem to be a tool that can help reverse this trend.

A second implication relates to the ability of race-based admission policies to yield a "critical mass" of students; that is, a student body that reflects the demographic composition of high-school graduates. Our decomposition exercise suggested that although affirmative action resulted in very high minority admission rates at the most selective institution, most of the changes in minority enrollment probabilities are explained by student behavior given that even the most selective university has an admission policies that is actually only mildly selective. A back-of-the-envelope calculation to understand the potential of the three strategies available to college administrators for increasing minority enrollments (Brown and Hirschman, 2006) suggests that raising minority application rates to the average application rate for all groups[25] would have increased 2002 minority enrollments by 200 percent at Texas A&M and by 134 percent at Texas Tech. In contrast, admitting all minority students who apply (that is, having a 100 percent admission rate) without modifying admission and enrollment rates would have increased minority enrollments by 51 percent and 71 percent, while persuading all admitted minorities to enroll would have resulted in increases of 80 percent and 142 percent at Texas A&M and Texas Tech, respectively. These calculations imply that if policymakers and college administrators want to increase the number of minorities in selective public universities, they should try to concentrate on reaching out to minorities while they are still in high school— by, for example, improving the quality of high schools, offering advanced placement courses and college counseling services at traditionally disadvantaged high schools, strengthening the

[24] Six-year graduation rates for the universities in our sample are obtained from IPEDS and are as follows. Texas A&M: average, 77 percent; black, 60 percent; Hispanic, 72 percent. Texas Tech: average, 55 percent; black, 45 percent; Hispanic, 43 percent. TAMU-Kingsville: average, 28 percent, black, 16 percent; Hispanic, 29 percent (Integrated Postsecondary Education Data System, 2006).

[25] These were in 2002 6.5 percent at Texas A&M and 5 percent at Texas Tech.

relationships between K-12 and college through dual enrollment, and waiving college application fees.

Finally, this study highlights the limitations of a percentage-plan policy in increasing minority representation at selective public universities when there are important demographic transitions taking place. Moreover, it suggests that percentage-plan policies are not necessarily a good substitute to race-based admission policies since they fail to increase minority representation in applications, admissions, and enrollments to affirmative action levels.

In conclusion, the Texas experiments leave us in a conundrum. We have seen that affirmative action policies yield the smallest underrepresentation of minorities at selective universities. But we also found that by minimizing minority underrepresentation, policymakers and admission officers would need to focus mostly on enticing minority students to apply and not so much on giving race-based preferences. However, the use of race as a plus factor at selective colleges in the end acts as a signal to minorities that they are welcome there. As a result, affirmative action policies still constitute an important policy tool to increase minority representation in higher education and, presumably, minority graduation rates.

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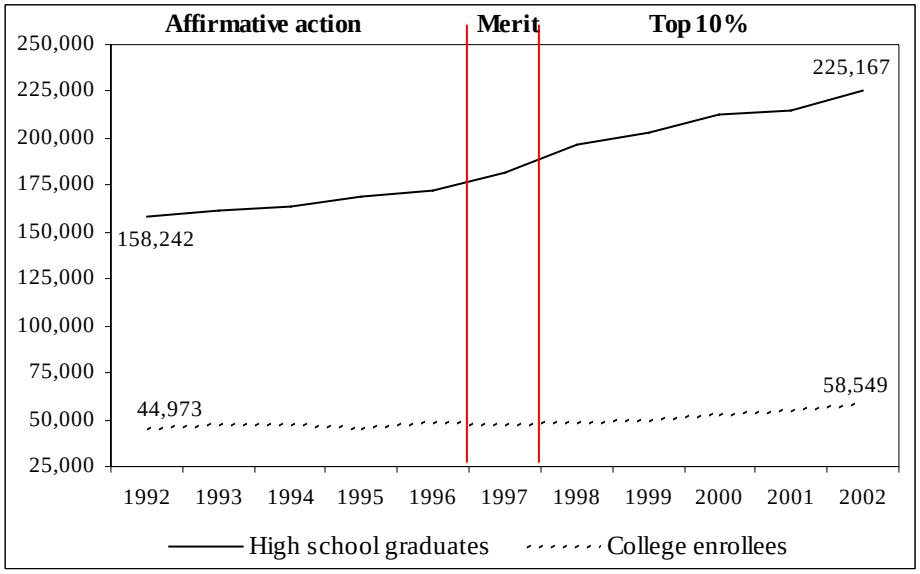
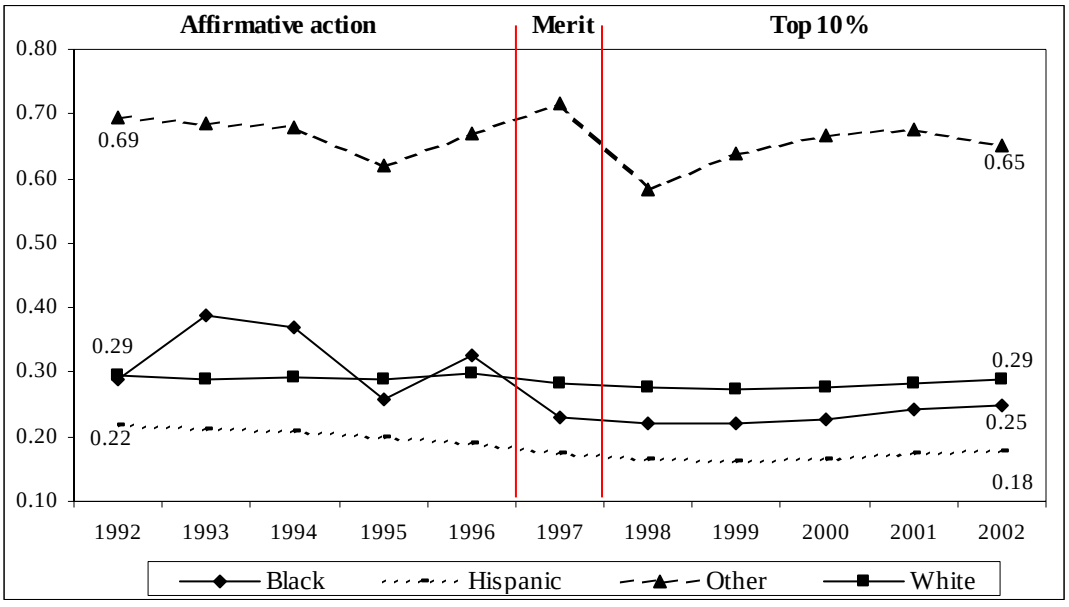
Figure 1. Trends in Public High School Graduates and Enrollments at Public Colleges and Universities in Texas



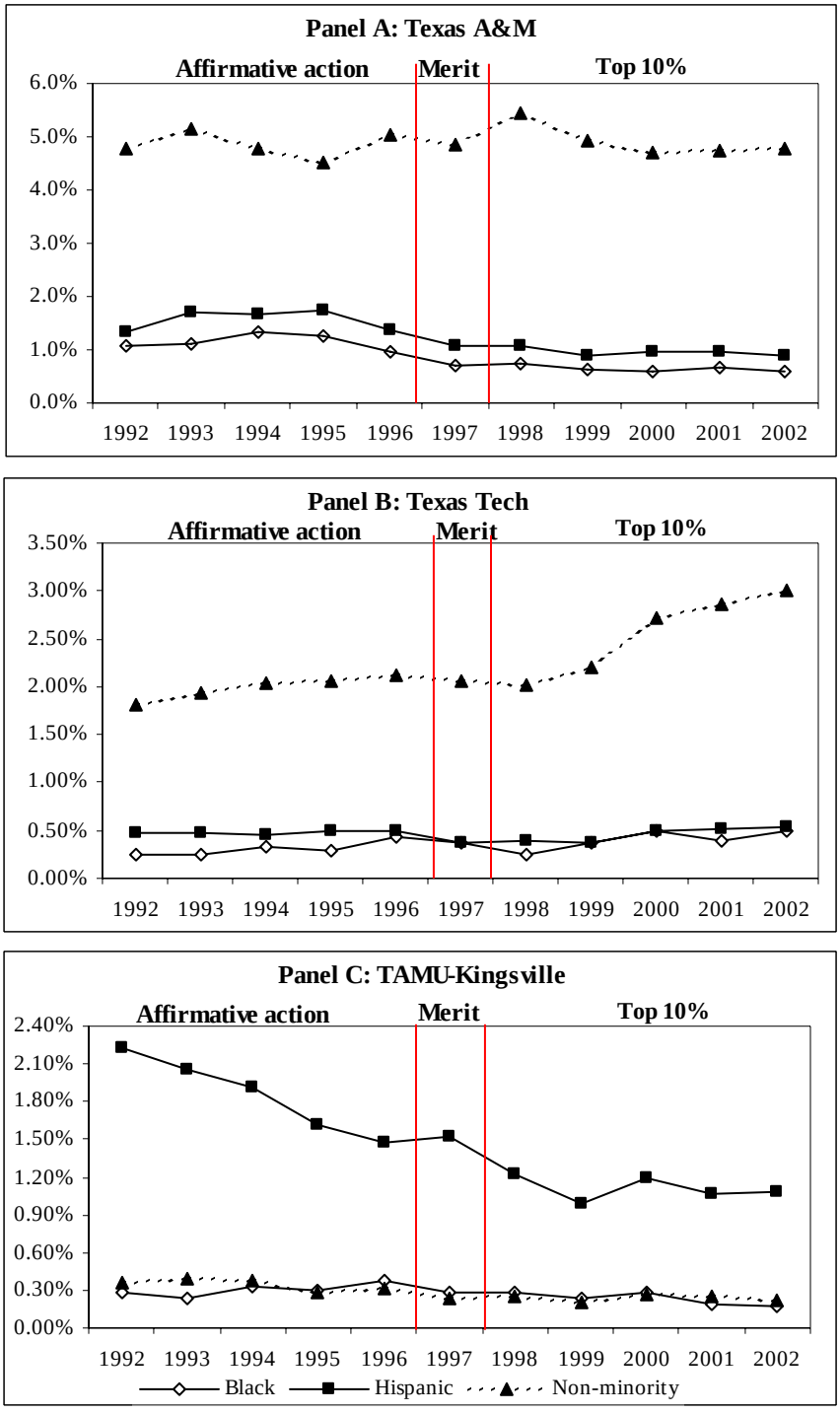
Sources: Texas Education Agency (various years), IPEDS, and Texas Higher Education Coordinating Board (various years).
Note: College enrollees include Texas residents and non-residents.

Figure 2. Trends in Enrollment Probabilities at Texas Public Colleges and Universities



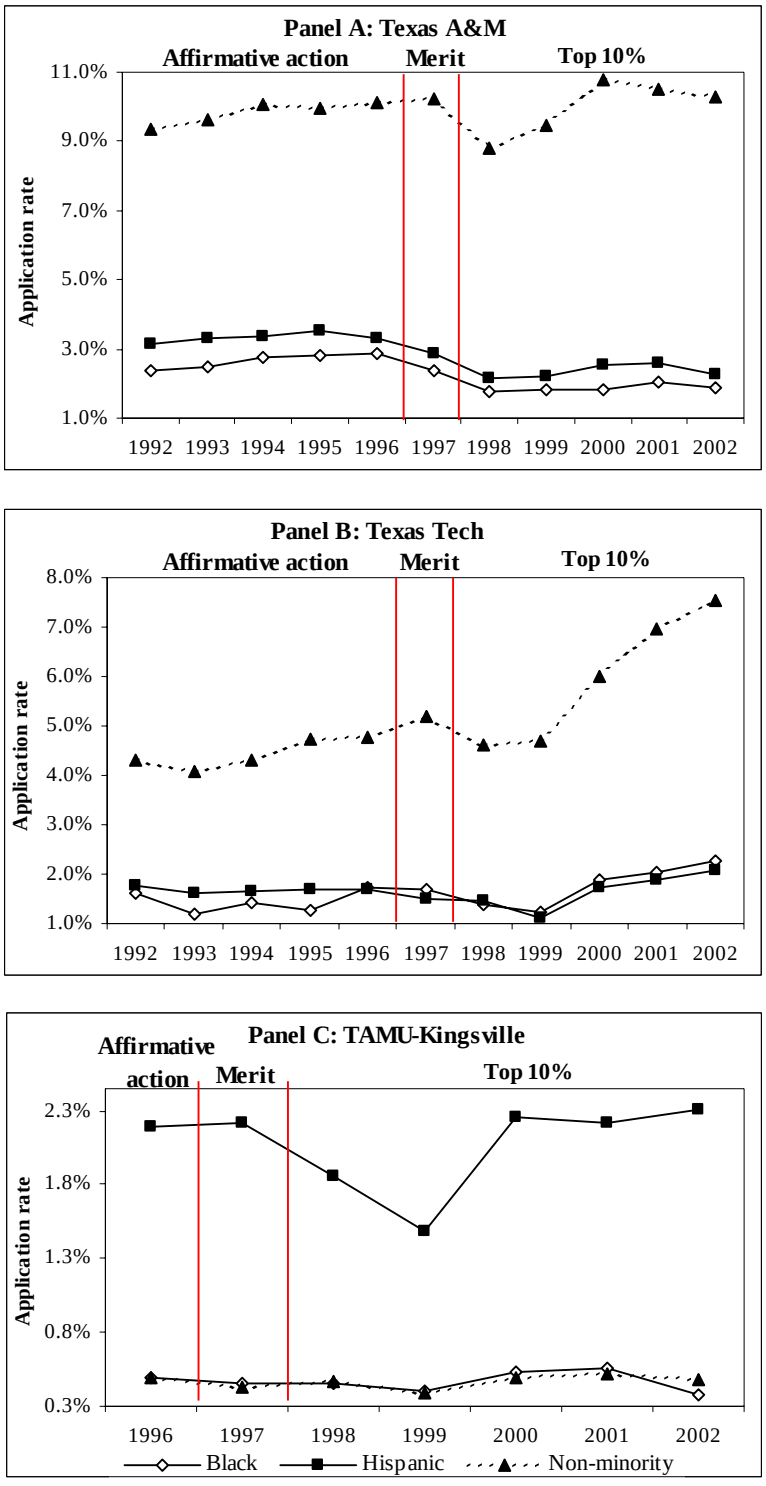
Source: Authors' calculations based on Texas Education Agency (various years), IPEDS and Texas Higher Education Coordinating Board (various years).

Figure 3. Enrollment Probabilities at Three Texas Public Universities



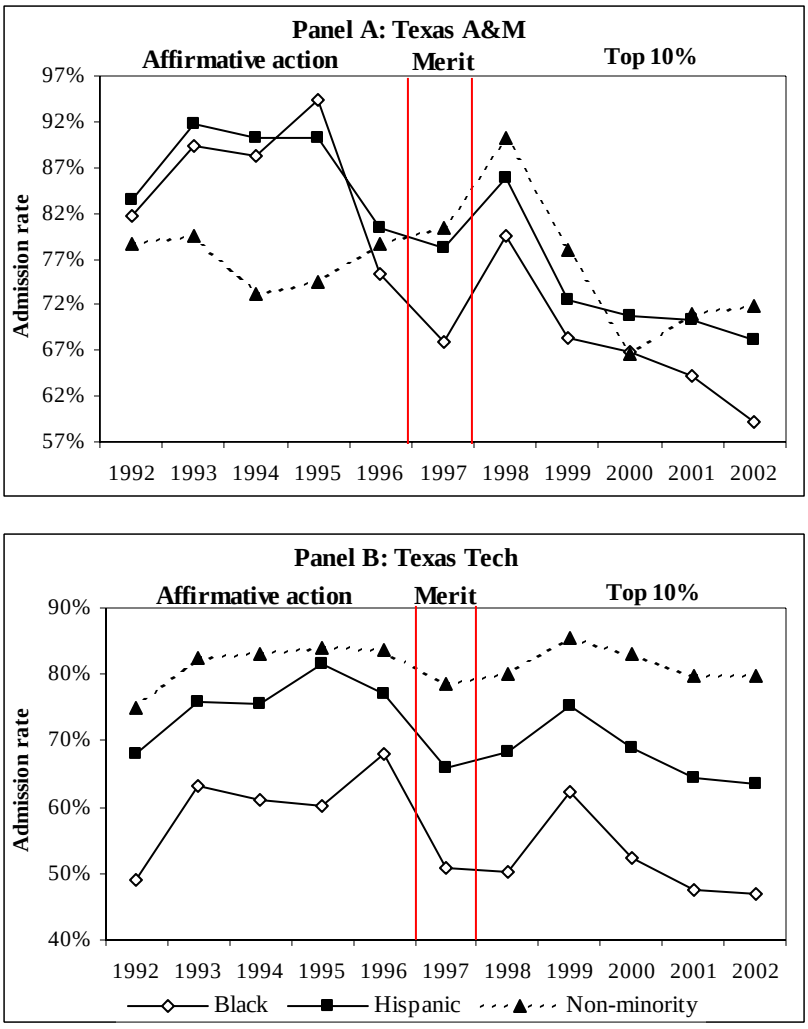
Source: Authors' calculations based on THEOP Administrative Data and Texas Education Agency (various years).
Note: First-year enrollments include Texas residents only.

Figure 4. In-State Application Rates at Three Texas Public Universities



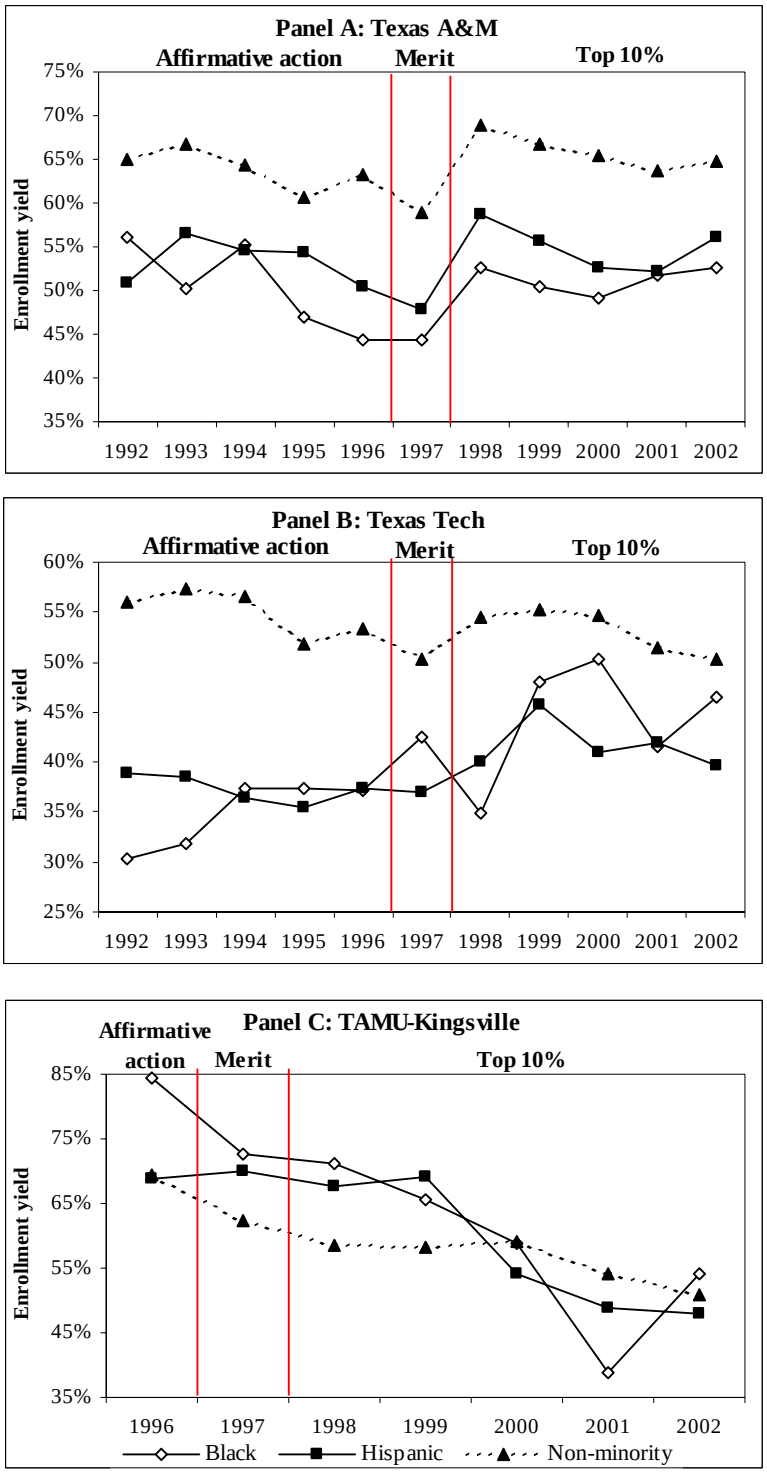
Source: Authors' calculations based on THEOP Administrative Data and Texas Education Agency (various years).
Note: Includes in-state students only.

Figure 5. In-State Admission Rates at Two Texas Public Universities



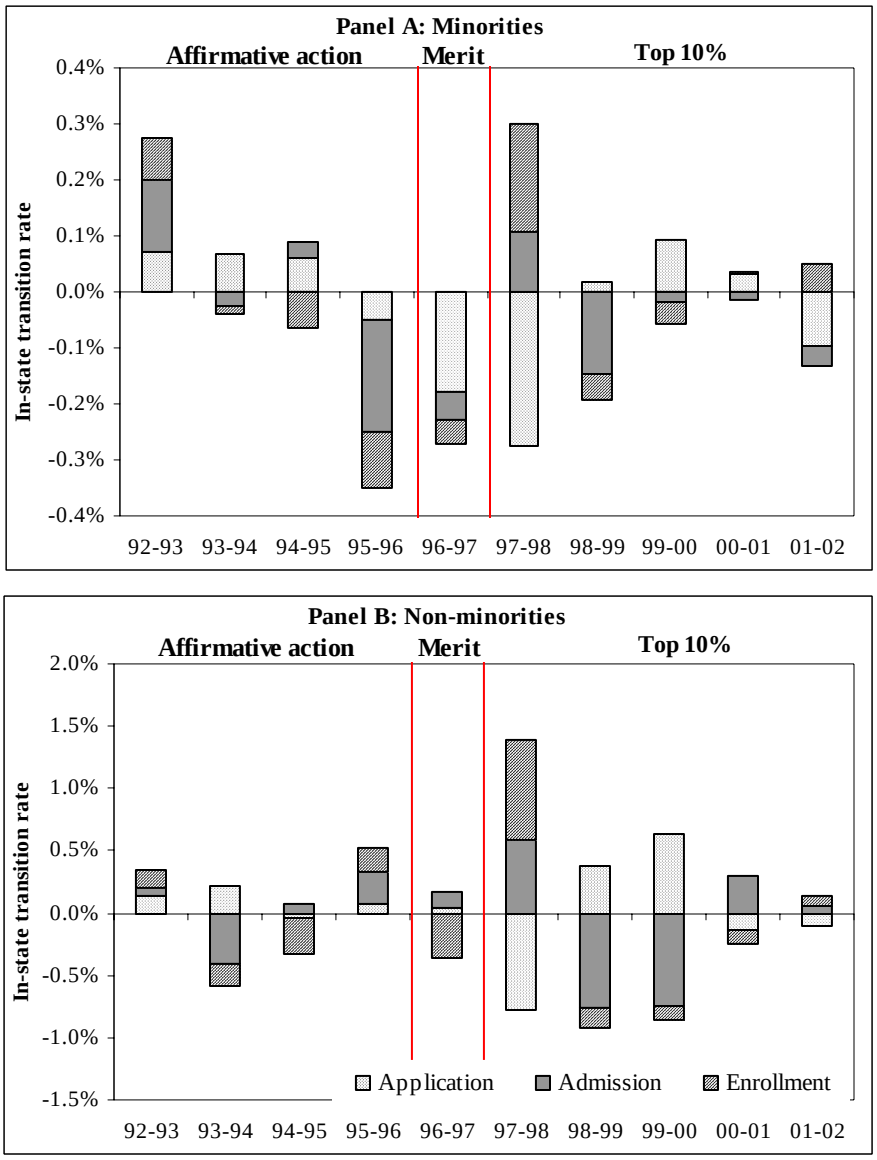
Source: Authors' calculations based on THEOP Administrative Data.
Note: These rates are conditional on application.

Figure 6. In-State Enrollment Rates at Three Texas Public Universities



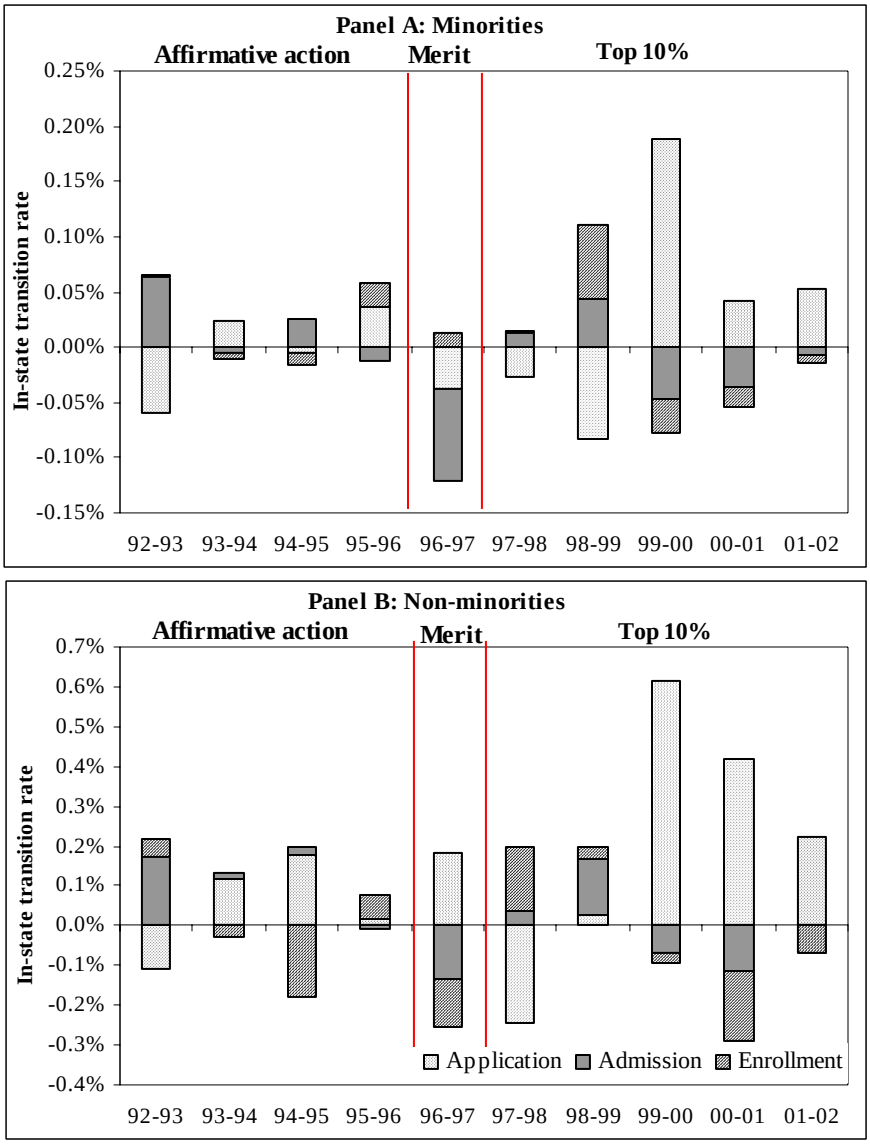
Source: Authors' calculations based on THEOP Administrative Data.
Note: These rates are conditional on admission.

Figure 7. Decomposition of the Transition Rate from High School to Enrollment at Texas A & M



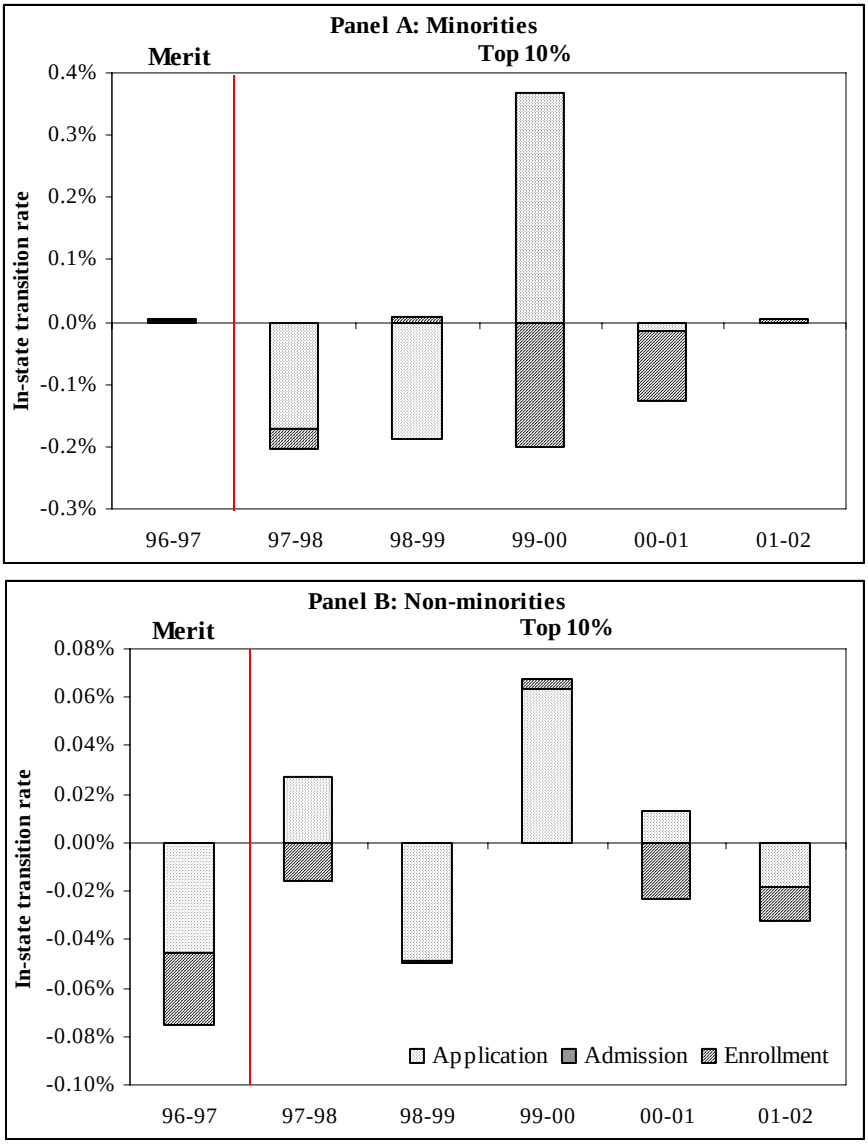
Source: Authors' calculations based on THEOP Administrative Data and Texas Education Agency (various years).
Note: Includes in-state students only.

Figure 8. Decomposition of the Transition Rate from High School to Enrollment at Texas Tech



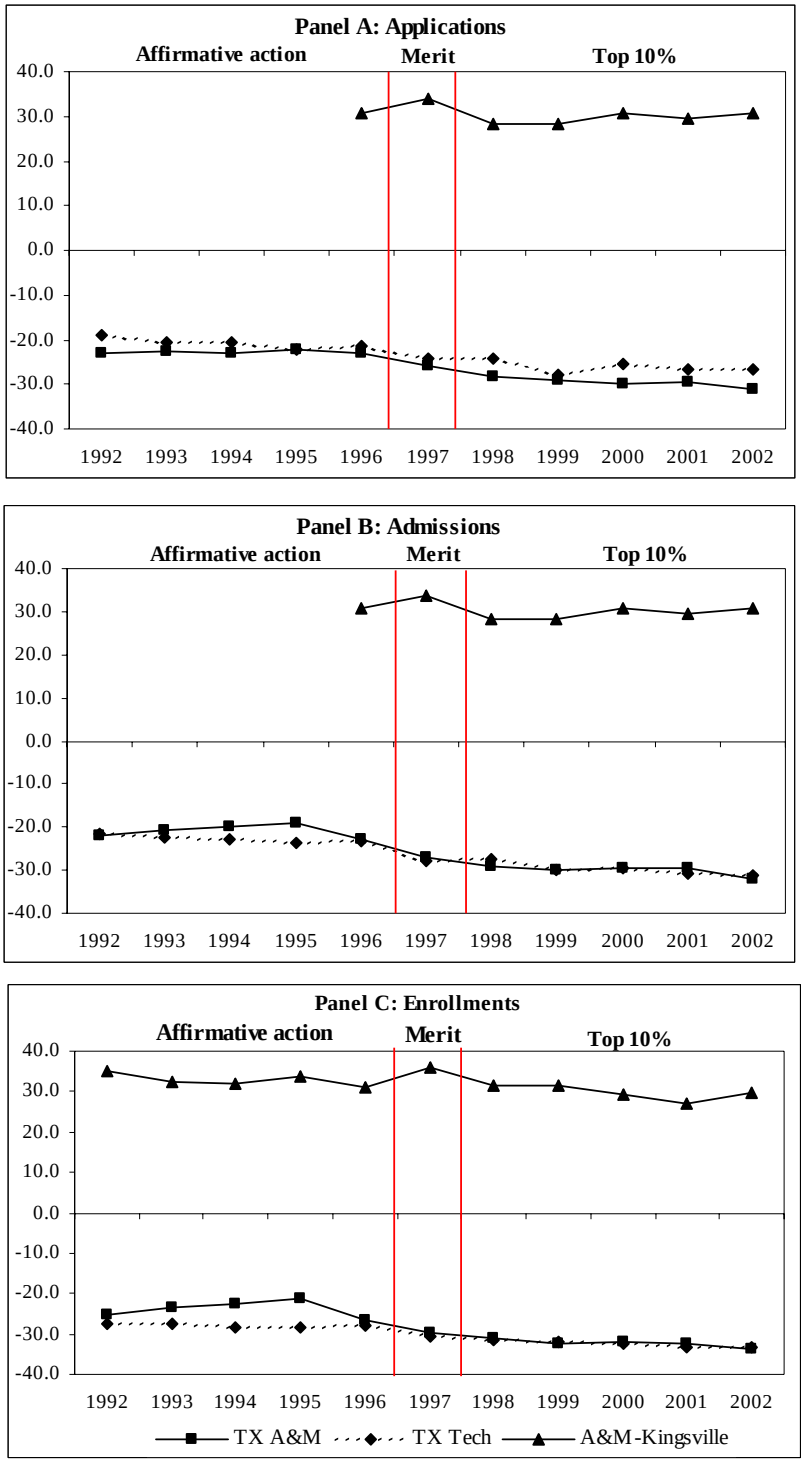
Source: Authors' calculations based on THEOP Administrative Data and Texas Education Agency (various years).
Note: Includes in-state students only.

Figure 9. Decomposition of the Transition Rate from High School to Enrollment at TAMU-Kingsville



Source: Authors' calculations based on THEOP Administrative Data and Texas Education Agency (various years).
Note: Includes in-state students only. Data on applications are available only from 1996 onward.

Figure 10. Degree of Minority Representation at Three Texas Public Universities



Source: Authors' computations based on THEOP Administrative Data.
Note: includes in-state residents only.

Table 1: Demographic Composition of High-School Graduates and College Freshman Class Texas Public Institutions

	Affirmative Action					Merit	Top Ten Plan				
Race/Ethnicity	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Panel A - Composition of High School Graduates											
Black	12.53	11.85	11.78	12.01	12.12	12.56	12.76	12.64	12.92	13.14	13.34
Hispanic	27.53	28.31	29.35	29.17	29.12	29.78	30.61	31.01	32.08	32.32	33.07
White	57.15	56.82	55.59	55.53	55.41	54.38	53.14	52.99	51.53	50.92	49.91
Other	2.79	3.02	3.29	3.29	3.34	3.28	3.48	3.36	3.47	3.62	3.68
Panel B - Composition of Freshman Class											
Black	12.73	15.80	15.06	11.47	13.98	11.16	11.45	11.45	11.92	12.38	12.77
Hispanic	21.16	20.52	21.08	21.47	19.62	20.22	20.66	20.37	21.22	21.82	22.60
White	59.30	56.58	56.14	59.48	58.44	59.57	59.64	59.40	57.52	56.29	55.40
Other	6.81	7.10	7.72	7.58	7.96	9.05	8.25	8.77	9.34	9.51	9.23

Source: Authors' computations based on Texas Education Agency (various years), IPEDS and Texas Higher Education Coordinating Board (various years).

Note: Includes Texas residents and non-residents.