Pricing Out the Disadvantaged? The Effect of Tuition Deregulation in Texas Public Four-Year Institutions

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This article examines whether tuition deregulation in Texas (in 2003 the state legislature gave tuition-setting authority to institutional governing boards) has affected the college enrollment of underrepresented and low-income students. Using a difference-in-differences research design, we find that Hispanic students have been most negatively affected by tuition deregulation. Results for black students are largely mixed, in that we find an increase in college enrollment after deregulation in some specifications, while Pell Grant recipients, incoming and returning, appear to have experienced an increase in college enrollment following deregulation. Implications and recommendations for state governments considering this contentious legislation are provided.

Keywords: financial aid; tuition; college access; race; ethnicity; low-income students

$\mathbf{A}$s is the case in other states, the Texas public higher education system is experiencing two major shifts. The first shift pertains to changing demographics. From 2002 to 2011, the number of Hispanic high school graduates—and thus the number of individuals eligible to attend college—increased by an unprecedented 72 percent (from 74,446 to 127,746), and the number of African American high school graduates increased 29 percent (from 30,030 to 38,755).[1] Meanwhile, beginning in 2008, the state's white college-age population declined, and this decline is expected to

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continue at least until 2015.[2] Nationally, Texas has the second largest Hispanic population (after California) and the third largest number of blacks after New York and Florida (Ennis, Rios-Vargas, and Albert 2011; Mackun and Wilson 2011; Rastogi et al. 2011).

The second shift is the remarkable rate at which tuition at four-year colleges and universities is increasing. The Texas Higher Education Coordinating Board reported in 2010 that average tuition for a student with 15 credit hours at a public university increased by 72 percent between fall 2003 and fall 2009. This growth in tuition in Texas followed the passage of House Bill 3505 in 2003. This tuition deregulation bill amended the Texas Education Code to allow the governing boards of public higher education institutions to set tuition rates. There is no tuition cap at Texas universities and the amount charged can vary according to considerations such as the nature of the academic program and the level of courses taken.

The deregulation of tuition is perhaps not surprising, given decreased state support of higher education at a time when colleges and universities are also being asked to serve more students. Moreover, Texas was not the only state to deregulate tuition in the last decade; Virginia and Florida have adopted similar policies in response to increased enrollments and cuts in state appropriations (McBain 2010).

In return for the ability to set tuition, Texas' deregulation law imposes a few new requirements on participating universities. For example, these universities must reserve at least 15 percent of in-state tuition charges in excess of $46 per credit hour to offset the higher cost of attendance. The law also requires universities to improve key student and institutional outcomes as stipulated by the state's master plan for higher education: "Closing the Gaps." These outcomes include measures of enrollment, persistence, graduation, performance, quality, and, of specific importance to this analysis, student diversity (Texas Higher Education Coordinating Board 2010).

Why Tuition Deregulation May Matter to Student Enrollment by Institutional Context

Tuition-setting authority varies substantially across the United States, with "multiple policy rationales" and stakeholders ultimately influencing a state's decision on how to set such tuition (McBain 2010). The American Association of State Colleges and Universities reports that three states (Texas, Virginia, and Florida) had adopted a version of tuition deregulation as of 2010; two other states (Washington and New York) had submitted similar legislative proposals that were not adopted (McBain 2010).

Proponents of tuition deregulation argue that increased institutional autonomy in setting tuition is one of the only ways universities can generate additional revenue, and these revenues are required to strengthen campus services and allow individual campuses to achieve their strategic goals. Opponents caution,

however, that tuition deregulation will result in tuition increases that ultimately reduce college access for low-income and underrepresented students.

Concerns about the consequences of tuition deregulation for college access have focused primarily on four-year institutions rather than two-year community colleges. This focus is appropriate, as the steepest tuition increases have occurred at four-year colleges and universities (Heller 2013). Focus on four-year colleges is also justified because beginning college at a two-year institution is associated with low odds of transferring to and graduating from a four-year college (Doyle 2009; B. Long and Kurlaender 2009). Moreover, although two-year colleges educate almost half of all students entering postsecondary education, the payoff is higher for those who start at and graduate from a four-year university than for those who do so at a two-year college; returns are even higher for those attending a selective four-year university (M. Long 2010). For underrepresented students, such as African Americans and Latinos, the odds of graduating are considerably higher for those who attend a more- rather than less-selective four-year institution (Melguizo 2010). In Texas, the state's highest ranked research institutions are likely to produce the greatest payoff in terms of wages and occupational prestige. If tuition increases limit access, students who cannot pay the higher prices will be increasingly concentrated in lower-tier four-year institutions and two-year institutions—institutions associated with lower odds of bachelor's degree completion.

Tuition deregulation in Texas thus touches some of the most critical issues facing U.S. higher education: state-level student aid policy; access to four-year public universities at a time of unprecedented growth in low-income and minority populations; and the implications for low-income and underrepresented students of limited attendance at the state's most selective public institutions. We use Texas as a case study to examine these issues, with particular attention to understanding the effect of state-legislated tuition deregulation on the college enrollment of populations that are historically underrepresented in higher education.

Previous research on the effects of tuition deregulation on the enrollment of low-income students and students in general has yielded mixed results (Eisenkopf 2004; Frenette 2005). Much existing research has taken the form of simulation studies incorporating theoretical frameworks from political science and economics. Such studies provide critical foundations for understanding the hypothesized effects of tuition deregulation but are often constrained by regional location or by binary assessments of groups of students (low-income versus not-low-income). Using institutional data from Texas, this article builds on prior research by employing a quasi-experimental technique, a difference-in-differences strategy, to estimate the effect of tuition deregulation in Texas on college student enrollment by race, ethnicity, and low-income status. Unlike most prior research, this study pays attention to tuition deregulation's impact on Hispanic student enrollment. We specifically ask:

1. To what extent did the introduction of tuition deregulation, via HB 3505, affect the participation of underrepresented students in Texas public research universities?
2. How did the effects of tuition deregulation vary across underrepresented groups?

In this analysis, we define underrepresented students as those who identify as (1) Hispanic or Latino, (2) black, and (3) low income as determined by receipt of a federal Pell Grant. Pell Grant recipients are deemed low income by the federal government and generally have family incomes below $50,000. We discuss the limitations and advantages of the data for each of these primary groups. For example, although Pell Grant recipients are low income, they likely are observationally different from a typical low-income student who did not seek or was not successful in mitigating the process to obtain federal aid (Deming and Dynarski 2009). Deming and Dynarski (2009) document the substantial paperwork burden imposed on eligible low-income students and their families to receive such aid. The application for student aid is longer and more complex than a federal tax return, which often deters families from engaging in the financial aid process, especially those families in which the parents have never attended college (Dynarski and Scott-Clayton 2006). In sum, Pell Grant recipients have successfully navigated through another series of barriers in the college access battle despite their disadvantage.

The Texas Higher Education Policy Context: An Active Legislative Field

Although there have been a number of state policy changes relevant to college access in Texas higher education since the mid-1990s, with the exception of Domina (2007), few researchers have specifically considered the role of tuition deregulation as a potential explanation for changes over time in college enrollment in the state. Recent policy changes include the 1998 alternative admissions policy known as the Top Ten Percent Plan (TTPP), which originally allowed the top 10 percent of a high school's graduating class to be admitted to any public institution in the state (M. Long and Tienda 2008; M. Long, Saenz, and Tienda 2010); legislatively approved increases in state financial aid for need as well as merit in 2001; tuition deregulation in 2003 as discussed in this analysis; and high school curricular reform that included dual high school–college enrollment and increased advanced placement (AP) offering in 2006. Accompanying these legislative changes was the adoption by the Texas Higher Education Coordinating Board[3] of the state master plan, "Closing the Gaps," in 2000. This plan specified targets for improved performance, most notably to increase by more than 350,000 the number of students from underserved groups who would enter Texas higher education by 2015. In particular, the goals recognized that Hispanics are expected to become the largest racial/ethnic group in the state by 2015. When the plan was adopted, the Texas higher education system included fifty community college districts, four technical colleges, two state colleges, thirty-five universities, forty independent colleges and universities, and thirty-one degree-granting private career colleges and other health-related institutions (Texas Higher Education Coordinating Board, n.d.).

The goals specified in "Closing the Gaps" have not yet been met. Progress toward reaching target college-participation rates of the largest minority groups has been mixed. Despite an increase in college enrollment of more than 237,000 Hispanics between 2000 and 2011, enrollment remains well below specified goals. The growth in African American students' enrollment actually exceeded the target, increasing by 100,942 from 2000 to 2011. Yet, like Hispanics, this group's enrollment has increased most notably in the two-year community college sector (Flores and Park 2013; Texas Higher Education Coordinating Board, n.d.).

A Review of the Literature: Price, Aid, and Other Deregulation Experiments

Building primarily from human capital theory, we examine research that focuses on student response to tuition and financial aid in the college enrollment process. Guiding this analysis is the premise that individuals will invest in postsecondary education despite the cost, provided that they believe their investment will translate into improved income (Becker 1957/1971; Bound, Lovenhein, and Turner 2009; Mincer 1974). However, how students interpret their potential outcomes in the context of changing tuition policy may largely depend on information regarding how such changes will affect returns to that investment. For example, tuition prices have risen over the last three decades (from 1981 to 2011) at the unprecedented rate of more than 177 percent above inflation, with the most prominent growth seen in the four-year public college sector (Heller 2013). Although more than two-thirds of students are eligible for some kind of tuition discount, the process whereby a student learns whether he or she is eligible for discounted tuition is complex because of the range of state and federal aid programs that exist (Baum and Ma 2011; Dynarski and Scott-Clayton 2013; Perna 2006). This complexity is problematic because students' enrollment decisions are influenced by their understanding of their financial aid eligibility and by how they respond to published tuition and fees.

Student response to price

Of particular interest to this analysis are students' responses to increasing prices, or "sticker shock," and whether such responses differ by student characteristics, such as race and ethnicity. Studies that have examined the effect of tuition increases on various student groups over time and use different data sources to do so have found remarkably similar results (Kane 1995; Heller 1997; Perna 2000, 2006). Kane (1995) uses the Current Population Survey to examine youths' sensitivity to price and finds that states whose public universities had higher tuition also had lower enrollment rates. Heller (1997), whose meta-analysis expanded this line of work, finds evidence that the enrollment of low-income students was more sensitive to increases in college tuition than the enrollment of

their wealthier peers. Perna (2000) produces new evidence of a differential response to price by race and ethnicity in terms of college enrollment. Perna also includes measures of students' varying levels of awareness and general understanding of the costs of attending college and financial aid options. Dynarski (2003) finds that ending the Social Security Benefit Program that ran from 1965 to 1982 (in effect a tuition increase), reduced college enrollment by nearly one-third for all students, with a greater effect on black students. The results of these studies demonstrate that the decision to invest in college can indeed vary by income, race, and ethnicity.

The impact of aid

Financial aid is the tool used most often to counter negative implications on college enrollment from an increase in price. Dynarski and Scott-Clayton (2013) conclude that more than 30 years of research indicate that financial aid, primarily in the form of grants, tuition discounts, and scholarships, positively affects college enrollment. College enrollment tends to increase when students receive financial aid, although variations in program design can have different effects. On average, $1,000 of tuition assistance, defined broadly as grant aid, is likely to lead to an increase of 3 to 6 percentage points in college enrollment (Dynarski and Scott-Clayton 2013; Kane 2003; Seftor and Turner 2002). Other work documents that students who receive a Pell Grant are less likely to drop out of college than similar students without this aid (Bettinger 2004). Research has also found that grant aid influences the type of institution attended (Dynarski 2004).

Research suggests that the consequences of tuition increases vary based on students' family income. When an institution raises tuition, applicants, even those who are high achieving, may respond differently based on their family income. Avery and Hoxby (2004) find that students whose parents had attended less selective colleges were more averse to higher tuition, as their probability of matriculating declined by 2 to 3 percent per $1,000 of tuition increase. The authors also find different responses to increases in price between students who attended public versus private secondary schools: among students who attended public high schools, the authors document a 19 percent lower probability of college matriculation for every $1,000 increase in room and board.

Examples of tuition deregulation experiments: A developing literature

Studies that examine the national or regional effects of deregulation are rare, with most focusing on simulations and international examples. Eisenkopf (2004) examines the impact of deregulation policies on student enrollment, comparing tuition and fee arrangements between the United States and Europe. He finds that tuition deregulation can lead to two outcomes associated with stratification. The first is increased competition among universities. Competition increases because students are generally risk averse and the lowest ability students are likely to prefer a program with a more certain outcome even at the expense of a

lower expected yield. Such behavior can lead to product differentiation, the second outcome. As students self-sort from risk aversion and uncertain information, universities may be more likely to increase attention to student characteristics and preferences of the higher achieving and thus offer different educational products at different prices. The relationship between student choice and institutional response to this choice, likely a result of changes in tuition price, thus suggests the phenomenon of continued increasing stratification across institutions of higher education.

From 1995 to 2003, Canada experienced nearly a doubling of the cost of tuition. Frenette (2005) found that tuition increases had no effect on undergraduate or graduate enrollment. The author offers three explanations for the lack of impact: the availability of additional need-based aid provided from the Ontario government; an increase in applications to programs with more stable tuition and fees; and an increase in the capacity of professional programs within Canada during this period. In other words, the supply of and demand for enrollment in professional programs was changing in the Canadian market.

In sum, tuition deregulation increases the price of tuition. The work to date suggests the possibility of differential outcomes. On one hand, autonomous tuition pricing by institutions may lead to increased stratification between similarly ranked universities. In addition, universities may engage in the process of distinguishing their product from other institutions to make it more attractive to a potentially new target market that may be associated with this stratification. On the other hand, other work suggests that low-income students, the group on the lower end of this stratification, may not be affected by these changes if there is enough governmental support (in the form of student financial aid) to offset the negative impact of these changes.

Research Design

This study uses a difference-in-differences model, a quasi-experimental technique employed in econometric analyses (Dynarski 2003, 2004; B. Long 2004), to investigate the effects of tuition deregulation on the enrollment of racial/ethnic minority and low-income students at public research universities in Texas. The analysis compares changes in enrollment at public institutions in Texas to changes that occurred at similar institutions across the country that did not experience tuition deregulation during the same period of time. Texas public research institutions that are affected by tuition deregulation are considered treatment schools, while public research institutions from other states are the control group. Although we do not interpret our results as causal, this model is a considerable improvement over an interrupted time series design or general multivariate analysis. The analysis allows us to not only examine the trend over time (slope) and policy intervention (intercept) in Texas but also compare changes in Texas to changes at similar institutions in other regions. This comparison helps to control for confounding events that may have occurred at the time of adoption

across the higher education sector as large changes in the higher education land-scape would appear for both Texas and the control group. The difference-in-differences design is the best way to address our research questions and control for the effects of time and history that might otherwise bias estimates of the effects of the policy intervention.

The Texas deregulation policy neither mandated nor restricted institutions' tuition policies, but instead allowed institutions to decide whether to raise tuition and, if so, by how much. Because this decision fell to institutional administrators rather than state policy-makers, we use the institution as the unit of analysis. We control for time prior to the deregulation and time after the deregulation, using three years of data on each side of the policy change. The variable AFTER takes the value of 0 for the years 2001–2003 and 1 for the years 2004–2006, because the 2003 deregulation went into effect for the 2004 academic year. We are limited to three years because of a tuition deregulation policy that occurred in Florida in 2007, a key comparison state given its institutional and demographic similarities to Texas. The interaction among the Texas institutions both before and after deregulation is compared to the control group to give an estimate of the policy's effect, shown in Equation 1 as β_3. This interaction takes the value 1 for Texas institutions after 2003 to reflect the new authority of these institutions to set their own tuition.

$$
\begin{aligned}
\text{ENROLL}_{it} = \ &\beta_0 + \beta_1 \text{TEXAS}_i + \beta_2 \text{AFTER}_{it} + \beta_3 \left(\text{TEXAS}_i * \text{AFTER}_{it} \right) \\
&+ \beta_4 X_{it} + \delta_t + \varepsilon_{it}
\end{aligned}
\tag{1}
$$

The dependent variables measure enrollment of underrepresented minority and low-income students.

Minority student enrollment data measure first-time enrollment by race and are retrieved from the Integrated Postsecondary Education Data System (IPEDS). Low-income student enrollment is defined as the number of Pell recipients on a campus; these data are retrieved from the Federal Student Aid Data Center. Pell recipient data are for total enrollment, not just first-time enrollment, meaning that these models include both those first enrolling and those continuing their education. This confounding of enrollment and persistence may suppress the magnitude of the effect of tuition deregulation for Pell recipients because those already enrolled at an institution are less likely to leave, despite an increase in tuition. Therefore, the effect of tuition deregulation produced in these analyses is likely to be smaller than if only first-time Pell Grant recipients were included.

The coefficient of interest is β_3 ($\text{TEXAS}_i * \text{AFTER}_{it}$), the difference-in-differences estimator. We hypothesize that tuition deregulation will have a negative effect on enrollment in Texas for students who are Latino, black, and who receive Pell grants, relative to similar students in states that did not experience tuition deregulation. This result would suggest that tuition deregulation in Texas negatively affected underrepresented student enrollment at public research universities.

We also include a number of institutional and state controls, captured by the vector X_{it}, which might influence enrollment. For institutional controls, tuition and fees are included to differentiate between the increases in tuition and fees that occur over time[4] from the shock that occurred at the time of the tuition deregulation, thereby separating out the time effect from the policy effect. We also include institutional controls for the average amount of tuition discount per full-time equivalent (FTE) student and state appropriations per FTE student. These measures are calculated from institution-reported revenues and expenses divided by FTE numbers, according to IPEDS weighting standards. These controls account for the offset in out-of-pocket expenses through state and institutional financial aid. Similar to the variable for tuition and fees, these controls adjust for the time effect of state and financial aid policies on tuition, separate from the effect of the deregulation. Finally, selectivity is defined by the number of students admitted as a percentage of those who applied. High values for this variable indicate an institution that has more open enrollment or is less selective, whereas lower values reflect greater selectivity. If an institution were to change its enrollment policies in conjunction with the tuition deregulation, failure to control for selectivity might bias the results.

For state controls, we include measures of demographic and economic conditions using U.S. census data from the American Community Survey.[5] We also include a categorical variable designating the state in which an institution is located. This approach is used over state fixed effects because of the small number of public research institutions in any given state (and the resulting limitations on degrees of freedom). We include the youth population to control for changing demand for postsecondary education and unemployment to account for changing educational requirements for available employment opportunities. We include per-capita income as a measure of personal finance to control for the link between average financial resources and educational attainment. These controls also reflect the human capital framework guiding this study. As economic conditions such as unemployment and personal income change, individuals must evaluate their relative position in the labor market and decide whether an investment in higher education is worth the financial and opportunity costs of enrollment.

Finally, we include δ_t as year fixed effects to control for the longitudinal nature of the data. We cluster our standard errors by institution to account for observations across years for each institution. The use of the difference-in-differences methodology using longitudinal data and a control group, the institutional and state control variables, and the fixed effects for time help to account for the potential bias stemming from confounding federal and state initiatives and educational, demographic, and economic shifts.

The sample

We restrict our sample to 120 public undergraduate institutions that are classified as having high or very high research activity, according to the Carnegie Commission on Higher Education.[6] The sample includes seven institutions in

Texas (the treatment group) and 113 institutions throughout the rest of the United States (the control group). These institutions were chosen because we expect the largest effect of tuition deregulation to occur at state flagship and elite public institutions, as these institutions may raise tuition to compete with other elite public institutions or even private institutions throughout the country that charge higher tuition. In addition, research universities are the most expensive to operate. Given the economic decline of the early 2000s, states have been considering policy changes, such as tuition deregulation, to alleviate the financial burden on the state for supporting these expensive institutions and shift revenue reliance to tuition. In Texas, before deregulation, public research institutions charged relatively low tuition and fees compared with peer institutions elsewhere. Following deregulation, these institutions raised their tuition dramatically. Students might react to this tuition increase by choosing to enroll in less expensive lower tier or two-year institutions or by not enrolling at all. We use the Carnegie classification over other measures, such as Barron's, because the Carnegie designation more closely identifies institutions with similar missions and operations in a state.

We excluded a number of institutions from the national group of control institutions. First, Virginia underwent a restructuring of its higher education system in 2005, which gave its institutions greater autonomy in administrative management and setting tuition. This change means that Virginia would have its own treatment effect in 2005 for its policy, thereby making Virginia's institutions ineligible for inclusion in the control group. Virginia was the only state excluded in our analyses because no other state reported variations in tuition-setting authority for the years 2001–2006 (Bell, Carnahan, and L'Orange 2011). Finally, we exclude seven research universities that have admissions rates above 90 percent, thereby dropping open-access institutions from our analysis. Enrollment at open-access institutions is not competitive, thereby making the enrollment profile different from most research institutions. The use of tuition in an institution's enrollment strategy is therefore likely to differ between selective and nonselective institutions, with nonselective institutions keeping tuition low to increase enrollments. This difference suggests that including open-enrollment institutions would reduce the observed impact of tuition deregulation on enrollment.

Thus, 113 institutions are the control group in the analysis of the effects of tuition deregulation on Hispanic, black, and low-income enrollments. We further divided these institutions into a number of subnational comparison groups based on the demographic characteristics of the state and region. As Latino and African American college students are dispersed differentially across the country, we construct different comparison groups by underrepresented status. For example, in our analysis of Hispanic enrollments, we assess the effects of tuition regulation in Texas compared with other states that have a large Hispanic population. These states are in the southwestern region, defined by the IPEDS as Texas, Oklahoma, New Mexico, and Arizona, and two states in the west with large Latino populations, California and Nevada. We also include a comparison group from Florida; however, although Florida has the third highest number of Latino students in the nation, its growing Latino population is more ethnically diverse than that of Texas

and the southwestern states (e.g., a higher percentage of Latinos in Florida are not of Mexican origin). Although both Texas and Florida have large Hispanic populations, the different national origins between these populations may contribute to different responses to tuition deregulation.

For the analysis of black student enrollment, the control group includes institutions in states in the IPEDS-defined southeast: Alabama, Arkansas, Florida, Georgia, Louisiana, Kentucky, Mississippi, North and South Carolina, and Tennessee. Given its small black population relative to the rest of the southeast and Texas, we exclude West Virginia from the comparison group. We create two comparison groups of institutions from this region, one with Florida included and another without Florida. We adopt this approach because Florida has the second-largest black population in the nation and one of the highest enrollments of black higher education students, making it regionally and structurally similar to but demographically different from Texas when it comes to raw number of black students.

In our analysis of Pell Grant recipients, in addition to the nationwide comparison, we create a comparison group of institutions in states with the largest number of individuals living in poverty, according to the U.S. census. These states include California, Florida, New York, Illinois, Pennsylvania, and Ohio. These high-poverty states have large higher education systems similar to those in Texas.

Descriptive statistics

Table 1 presents the mean and standard deviations of the key dependent and independent variables for the different comparison groups, pre- and post-tuition deregulation. Texas, the treatment group, is presented in the first column with various control group configurations in the columns that follow.

This table shows that average first-time college enrollment for Hispanic students attending public research universities in Texas rose after deregulation, jumping from 516.76 students to 609.05. This increase occurred in every comparison group, reflecting an increase in Hispanic enrollment in higher education across the nation. This increase likely reflects growth in the overall population of Hispanics and illustrates the need to include population controls to account for the change in demand for higher education that is unrelated to deregulation policy. In addition, when comparing these descriptive statistics, the southeast has a very low level of Hispanic enrollment. By contrast, the average Hispanic student populations in Florida, California, and the southwest are much more comparable to that of Texas. Therefore, we focus on the nation, southwest, and Florida comparison groups in our analysis of Hispanic enrollment.

Table 1 also shows an increase in the average number of first-time black enrollees at public four-year research institutions in Texas after deregulation. Prior to deregulation, the average first-time undergraduate black enrollment in Texas was 267.05; after deregulation it increased to 311.86. As for Hispanics, this increase in enrollment of blacks is consistent across all of the control groups except California. The pattern for Texas is most similar to that of the southeast. The southeast region has an average of 391.31 black students before deregulation

TABLE 1
Descriptive Statistics: State Averages by Region and Time

	Texas		Nationwide		Florida		California		Southeast		Southwest	
	2001–03	2004–06	2001–03	2004–06	2001–03	2004–06	2001–03	2004–06	2001–03	2004–06	2001–03	2004–06
Dependent Variables												
First-time black undergraduate enrollment	267.05	311.86	245.23	260.57	527.22	548.89	124.89	122.26	391.31	408.26	127.78	152.04
	(174.53)	(195.60)	(214.60)	(228.91)	(135.35)	(141.30)	(56.67)	(56.17)	(216.63)	(222.83)	(68.75)	(90.25)
First-time Hispanic undergraduate enrollment	516.76	609.05	220.59	263.15	784.72	1022.94	551.04	624.37	48.96	67.50	473.00	561.96
	(319.08)	(388.65)	(279.57)	(357.01)	(442.39)	(761.52)	(155.71)	(200.61)	(38.54)	(44.53)	(365.67)	(417.47)
Number of first-time students receiving federal grant awards	786.33	952.71	687.89	692.61	942.89	925.11	982.04	996.52	582.22	614.82	738.22	716.48
	(367.89)	(570.12)	(321.62)	(337.61)	(279.44)	(291.66)	(219.69)	(233.89)	(241.89)	(215.24)	(325.39)	(292.94)
Total number of Pell recipients (in thousands)	5.43	6.17	4.81	4.90	7.63	8.38	6.42	6.46	3.95	4.04	6.02	6.36
	(2.00)	(2.11)	(2.51)	(2.66)	(1.35)	(2.01)	(1.85)	(1.69)	(1.30)	(1.37)	(2.72)	(3.08)
Institutional Variables												
First-time undergraduate enrollment (in thousands)	4.01	4.05	3.29	3.43	4.64	5.06	3.92	4.03	2.72	2.90	3.46	3.65
	(2.23)	(2.24)	(1.62)	(1.71)	(1.65)	(1.62)	(0.42)	(0.61)	(1.16)	(1.28)	(1.60)	(1.79)
Admissions rate	69.27	66.31	70.98	69.53	61.30	53.58	54.43	50.57	71.60	70.31	83.61	80.89
	(10.48)	(10.64)	(15.34)	(15.54)	(7.62)	(9.96)	(20.34)	(18.52)	(17.87)	(14.39)	(7.22)	(12.51)
Tuition and fees (in thousands)	4.11	5.83	5.11	6.28	2.98	3.24	5.16	6.66	4.17	4.86	3.30	4.24
	(0.66)	(0.87)	(1.76)	(2.47)	(0.21)	(0.28)	(1.31)	(1.31)	(0.59)	(0.84)	(0.44)	(0.49)
State appropriations per FTE (in thousands)	6.95	6.43	9.84	9.33	9.36	9.64	14.01	11.52	10.80	10.60	9.80	9.94
	(1.78)	(1.74)	(3.80)	(3.99)	(2.37)	(2.39)	(4.23)	(3.43)	(4.16)	(4.28)	(2.46)	(2.60)
Average tuition discount per FTE (in thousands)	0.93	1.45	1.59	1.96	1.43	1.91	1.73	2.42	1.42	1.65	1.36	1.54
	(0.41)	(0.49)	(0.77)	(1.14)	(0.61)	(0.42)	(0.72)	(1.05)	(0.50)	(0.54)	(0.29)	(0.44)

(continued)

TABLE 1 (CONTINUED)

	Texas		Nationwide		Florida		California		Southeast		Southwest	
	2001–03	2004–06	2001–03	2004–06	2001–03	2004–06	2001–03	2004–06	2001–03	2004–06	2001–03	2004–06
	State Variables											
Unemployment	7.20	7.57	7.07	6.83	6.87	6.30	7.83	7.13	7.81	7.64	7.20	6.34
	(0.87)	(0.46)	(1.26)	(1.19)	(0.41)	(0.67)	(0.69)	(0.42)	(1.05)	(0.84)	(0.93)	(0.80)
Per capita income (in thousands)	23.06	22.86	24.52	24.67	24.68	25.27	26.90	27.25	21.27	21.45	22.47	23.17
	(0.22)	(0.28)	(3.22)	(3.14)	(0.15)	(0.12)	(0.11)	(0.30)	(1.90)	(1.81)	(1.84)	(1.95)
Population aged 15 to 19 (in thousands)	1554.40	1653.41	637.68	684.39	1010.69	1120.09	2384.11	2566.74	330.45	354.57	234.75	253.82
	(3.57)	(84.67)	(628.93)	(680.07)	(19.38)	(43.91)	(11.92)	(129.20)	(129.10)	(155.89)	(99.05)	(114.11)
Population aged 20 to 24 (in thousands)	1525.87	1648.88	630.38	673.58	949.41	1094.91	2364.06	2514.53	340.50	354.50	234.00	258.03
	(40.73)	(69.59)	(621.21)	(665.91)	(38.30)	(43.77)	(61.18)	(132.48)	(137.90)	(151.09)	(109.14)	(118.55)
Black population aged 15 to 19 (in thousands)	190.26	216.41	91.82	101.41	217.18	236.75	168.20	188.53	100.62	108.63	11.35	13.79
	(3.91)	(14.73)	(72.66)	(81.22)	(8.23)	(12.48)	(6.83)	(12.46)	(48.81)	(57.85)	(6.22)	(6.14)
Black population aged 20 to 24 (in thousands)	163.45	193.28	81.86	89.93	185.54	216.27	136.11	156.49	93.79	100.30	10.62	12.38
	(6.58)	(18.29)	(63.49)	(72.52)	(6.43)	(14.82)	(5.10)	(12.88)	(44.39)	(52.39)	(6.59)	(5.72)
Hispanic population aged 15 to 19 (in thousands)	625.30	657.56	150.99	165.52	205.32	237.47	986.68	1084.22	11.71	15.05	68.26	77.17
	(7.87)	(31.67)	(280.31)	(305.19)	(5.92)	(14.64)	(10.66)	(54.14)	(11.12)	(14.87)	(44.82)	(51.03)
Hispanic population aged 20 to 24 (in thousands)	653.66	690.66	165.63	172.86	222.64	257.12	1059.79	1080.91	21.15	22.61	72.78	78.78
	(25.86)	(12.83)	(298.47)	(306.39)	(9.05)	(12.84)	(28.03)	(35.24)	(23.10)	(21.45)	(48.11)	(50.42)
Number of institutions	7		120		6		9		24		9	

SOURCE: Analyses of data from Integrated Postsecondary Education Data System.
NOTE: Nationwide is the average across all states excluding Virginia. The southeast region consists of Alabama, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and West Virginia. The southwest region consists of Arizona, Nevada, New Mexico, and Oklahoma.

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and 408.26 after deregulation. These numbers make institutions in the southeast the closest comparison group for Texas in terms of black enrollment. We also conduct analyses that do and do not include institutions in Florida in the southeast comparison group, because of the large black enrollment in Florida.

Florida is an important comparison state in both the Hispanic and black analyses. Its enrollment of both Hispanic and black students exceeds that in Texas, the nation, and the southeast region; its average Hispanic enrollment even exceeds that of states in the southwest. Therefore, we treat Florida somewhat separately, including it in various comparison groups regardless of region because of its demographic profile and similarities to Texas.

Results

As seen in the descriptive statistics in Table 1, tuition and fees at public research institutions in Texas were lower than the national average. Average tuition in Texas from 2001 to 2003 was roughly $4,110, while the national average was $5,110. However, Florida had much lower tuition, approximately $2,980, while California slightly exceeded the national average with tuition and fees of $5,160.

As expected, following the adoption of the tuition deregulation policy, Texas had a larger increase in average tuition than other regions. Average preentregulation tuition and fees were $4,110 but increased after 2003 to $5,830 following deregulation. This increase is the largest observed increase across the states in both dollars ($1,720) and percentage (42 percent). However, Texas also shows the highest increase in the average tuition discount per FTE student, with the exception of California. The increase of $520 per FTE student in Texas is the same amount as the decrease in state appropriations in the same period of time. This finding may reflect an attempt by policy-makers to shift state funding from institutions to individual students through tuition assistance. In most other comparison states, state appropriations declined by a larger amount than the tuition discount increased. This gap means institutions are getting less from the state and charging more, and the tuition discount is not enough to cover the increase in costs passed on to the student.

Figure 1 offers a graphical depiction of the increase in tuition and fees at Texas public four-year research universities relative to the comparison groups. The dashed lines in these graphs are fitted to 2001 to 2003 projections. As expected, these lines have positive slopes, reflecting tuition increases over time. The solid lines are fitted to 2004 to 2006 values. In the graph for Florida and the southeast and southwest combined, the two lines virtually overlap, which means that there was little change in the trajectory of tuition over time. In California, the line shows a slight decline in inflation-adjusted tuition and fees after 2004. For Texas, we would expect to see a break in the two fitted lines, showing a jump in tuition following deregulation. Indeed, both the dashed and solid lines have a similar slope, but a jump in tuition and fees occurs in 2004, corresponding to the implementation of the deregulation policy. The one-year jump equates to roughly 13.5

FIGURE 1
Tuition and Fees at Public Four-Year Institutions by State and Region, 2001–2006
(Adjusted to 2011 Dollars using the BLS Adjustment for Inflation)
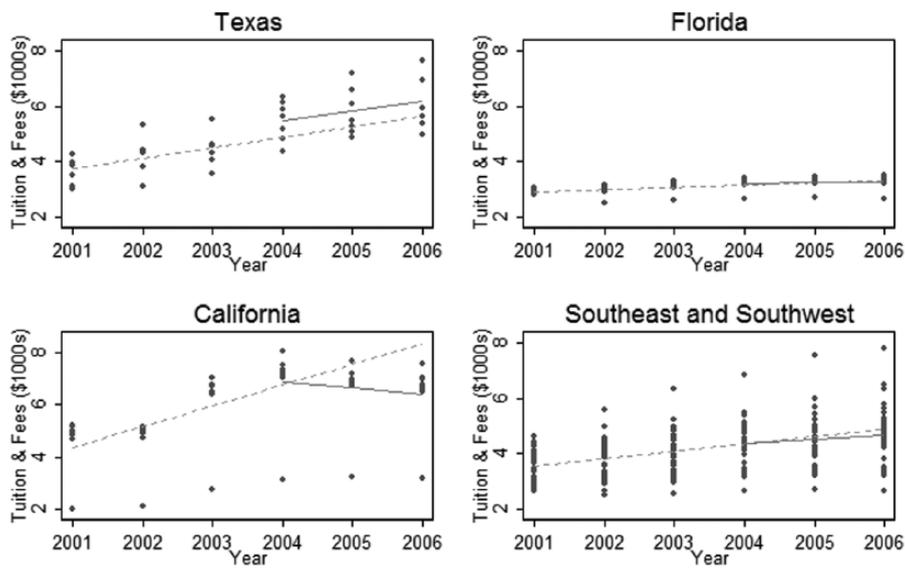
percent in tuition and fees, or roughly $604 more than what was predicted without deregulation. From 2004 forward, the trend in tuition increases continues to be the same as before deregulation. Therefore, the break seen in Texas, and lack of a significant difference in other regions, is likely explained by the deregulation policy.

We now examine whether the deregulation and associated jump in tuition and fees brought changes in enrollment. The results of our difference-in-differences estimates are presented in three separate tables, one for each dependent variable: Hispanic, black, and Pell recipient enrollment. Each column in these tables presents a different comparison group used in the estimate. The key coefficient of interest in each table is the difference-in-differences estimator, which estimates the effect of the deregulation policy. In general, we find that, following tuition deregulation in Texas, Hispanic first-time enrollments declined, black first-time enrollments slightly increased, and Pell recipients showed no change in enrollment patterns.

Hispanic first-time enrollment

Table 2 compares the effect of deregulation policy in Texas on first-time Hispanic enrollment using various control groups. Using the nationwide sample, Hispanic enrollment in Texas increased after deregulation by roughly eighty-three students. However, this increase likely reflects the small number of

TABLE 2
Difference-in-Differences Results, Tuition Deregulation Effect on First-Time Hispanic Enrollment

	(1)	(2)	(3)
	Nationwide	Southwest with CA & NV	Southwest with CA, NV, & FL
After deregulation	106.56***	366.48***	323.54***
	(28.30)	(91.38)	(85.46)
TX publics	84.97	−14.31	14.37
	(89.49)	(194.35)	(276.84)
Diff-in-diff estimator	83.29*	−318.17**	−235.53*
	(39.74)	(110.49)	(102.03)
Admissions rate	−1.39	3.34	−4.02
	(1.97)	(2.66)	(5.74)
Tuition and fees (in thousands)	−71.40**	−75.36*	−54.55
	(22.17)	(33.64)	(38.59)
Average tuition discount per FTE (in thousands)	82.76**	22.54	−3.31
	(28.90)	(61.54)	(51.80)
First-time undergraduate enrollment	0.07***	0.13***	0.11**
	(0.01)	(0.02)	(0.03)
State appropriations per FTE (in thousands)	−10.72	7.42	−20.23
	(7.12)	(16.00)	(25.36)
Hispanic population aged 15 to 19 (in thousands)	0.37	0.34	−0.27
	(0.81)	(1.06)	(1.22)
Hispanic population aged 20 to 24 (in thousands)	−0.01	−0.14	0.10
	(0.76)	(1.05)	(1.07)
Unemployment	−0.12	312.40**	244.15*
	(10.48)	(93.45)	(95.55)
Per capita income (in thousands)	13.02*	−33.94	−6.22
	(5.22)	(37.59)	(45.16)
State controls	YES	YES	YES
Year fixed effects	YES	YES	YES
Constant	45.01	−1372.92	−442.77
	(288.78)	(873.31)	(1150.01)
R-squared	0.47	0.55	0.29
F-statistic	12.94	55.52	14.05
Observations	674	150	186
Groups	115	25	31

SOURCE: Analyses of data from Integrated Postsecondary Education Data System.
NOTE: Standard errors in parentheses.
*$p < .05.$ **$p < .01.$ ***$p < .001.$

Hispanics in many states and institutions in the national comparison group. Restricting the analyses to states in the southwestern region with large Hispanic populations, plus California, Nevada, and Florida, shows a reversal in the effect of the deregulation policy. The difference-in-differences estimator now shows that, following tuition deregulation, Hispanic enrollment declined by roughly 236 students (9.1 percent) when using this comparison group (column 3) and by 318 students (13.5 percent) when using the southwest, California, and Nevada comparison group (column 2). The magnitude of the declines following the policy adoption, however, are not enough to offset the increase in enrollments that occurred over time, as seen in the large increases in the *after deregulation* variable. Therefore, net Hispanic enrollments actually increased in Texas over this period, but this increase would likely have been even greater had the deregulation policy not been in place.

A review of the effects of the institutional controls provides additional insights. An increase of 100 first-time undergraduates is associated with an increase of 7 to 13 Hispanic students depending on the comparison group. The analyses also show that increases in tuition are associated with decreases in enrollment in the nationwide analysis of 71 students per $1,000 of tuition increase but an 83-student increase per $1,000 of tuition discounting. These relationships operate as expected, with rising tuition associated with lower enrollment, and more tuition discounting associated with higher enrollment.

With regard to state context controls, the analyses show that the size of the Hispanic population was unrelated to enrollment, but unemployment rate was positively related to enrollment in the two southwestern comparison groups. The latter finding suggests that, in states with high unemployment, Hispanics may view college as a way to improve their long-term economic and social prospects.

Black first-time enrollment

The results for black enrollment, presented in Table 3, show positive coefficients on the difference-in-differences estimator in the two regional groups but not in the nationwide comparison. This finding means that black first-time enrollments increased in Texas after deregulation relative to what occurred with black enrollments in the southeastern region. Following deregulation, black first-time enrollment increased by 127 students (5.5 percent) in Texas relative to the southeast including Florida comparison group and 101 students (4.9 percent) in the southeast excluding Florida (although the latter is only significant at the $p < .10$ level). This increase seems counterintuitive, but additional analyses[7] reveal that the increase is concentrated in institutions with very high research activity, particularly the University of Texas and Texas A&M University. Both of these institutions engaged in considerable outreach efforts to boost underrepresented student enrollment during the time period examined (Domina 2007). Also important are the large negative values for initial black enrollments in Texas, as depicted by the *TX publics* variable. The large negative coefficient indicates that Texas had lower initial black enrollments than the three comparison groups.

TABLE 3
Difference-in-Differences Results, Tuition Deregulation Effect on First-Time Black Enrollment

	(1)	(2)	(3)
	Nationwide	Southeast excluding FL	Southeast including FL
After deregulation	–10.19	135.91+	127.16+
	(19.12)	(67.03)	(67.39)
TX publics	–186.10˚	–262.24+	–283.13˚
	(87.26)	(145.27)	(129.76)
Diff-in-diff estimator	–36.59	101.38+	126.66˚
	(24.68)	(58.28)	(61.37)
Admissions rate	–1.18	–3.91	–3.31
	(1.76)	(2.95)	(2.75)
Tuition and fees (in thousands)	–9.78	–65.09	–82.69+
	(14.26)	(53.56)	(43.90)
Average tuition discount per FTE (in thousands)	–1.67	–78.12	–53.61
	(24.95)	(84.45)	(53.65)
First-time undergraduate enrollment	0.03˚˚˚	0.01	0.03
	(0.01)	(0.02)	(0.02)
State appropriations per FTE (in thousands)	–6.48	–8.30	–7.28
	(4.57)	(14.58)	(11.25)
Black population aged 15 to 19 (in thousands)	–1.92	–1.81	–0.94
	(1.77)	(1.42)	(1.52)
Black population aged 20 to 24 (in thousands)	3.39+	1.56	0.66
	(2.00)	(1.50)	(1.81)
Unemployment	41.59˚	–1.41	7.24
	(19.76)	(36.06)	(30.26)
Per capita income (in thousands)	–10.81	–1.67	–1.33
	(7.22)	(23.12)	(22.42)
State controls	YES	YES	YES
Year fixed effects	YES	YES	YES
Constant	236.75	1107.68	979.91
	(313.83)	(679.31)	(682.73)
R-squared	0.34	0.34	0.35
F-statistic	10.54	2.27	3.85
Observations	637	176	212
Groups	111	30	36

SOURCE: Analysis of data from Integrated Postsecondary Education Data System.
NOTE: In these analyses, the southeast region does not include Virginia or West Virginia. Standard errors in parentheses.
+$p < .10$. ˚$p < .05$. ˚˚˚$p < .001$.

Unlike the analyses of Hispanic enrollments, few of the other control variables in the analysis of black student enrollment are significant. In the nationwide comparison, total enrollment, black population aged 15 to 19, and unemployment are statistically significant with coefficients in the expected direction, but only the coefficient for tuition and fees is significant in the southeastern region when including Florida. The lack of significance for most control variables may be attributable to the low enrollment of black students in research institutions, not only in Texas but also throughout the nation. A substantially larger number of black students are enrolling in open-access and two-year institutions (Flores and Park 2013).

Total Pell recipients

The final table looks at effects of tuition deregulation in Texas on the enrollment of Pell recipients. Whereas the regressions for Hispanics and blacks use first-time enrollment, these analyses include total Pell recipients (not just first-time enrollees). This difference in the definition of enrollment alters the interpretation of the coefficients to an estimate of the impact on all low-income students who receive Pell grants, including those already enrolled at an institution.

Table 4 shows that, contrary to expectations, 580 more Pell recipients were enrolled at Texas research universities after deregulation in the nationwide comparison group. This counterintuitive finding may reflect the large negative coefficient of initial Pell enrollment at Texas research universities, as captured by the variable *TX publics*. Roughly 2,795 fewer Pell recipients were enrolled in Texas research institutions prior to deregulation than in the rest of the nation (column 1), and 8,480 fewer Pell Grant recipients were enrolled in Texas than in low-income states (column 2).

There are several potential explanations for the increase in Pell Grant enrollments following deregulation in the national analysis. Perhaps the positive coefficient on the difference-in-differences estimator reflects efforts by Texas research universities to catch up with the rest of the nation in terms of Pell enrollees. The positive coefficient for the admissions rate measure is consistent with this explanation; after controlling for other variables, the higher the admissions rate, the higher the enrollment of Pell Grant recipients. The analyses also show that, as the percentage of underrepresented minority students increases, the number of Pell recipients also increases; many blacks and Hispanics are from low-income families. In addition, it is possible that, with tuition deregulation, Texas public research universities could have initiated additional aid programs, thereby mitigating the negative effects of the sharp rise in tuition. Moreover, with the increase in tuition, more students could have become eligible for Pell grants.

Part of the enrollment story for Pell recipients is that there are relatively few high-achieving Pell recipients (as well as percentage of underrepresented minority students) at these institutions (e.g., Bettinger 2004). Ultimately, however, Table 4 shows that an increase in tuition and fees is associated with reduced enrollments. In essence, after controlling for the negative effect of tuition and

TABLE 4
Difference-in-Differences Results, Tuition Deregulation on Total Pell Recipients

	(1)	(2)
	Nationwide	TX, CA, FL, NY, IL, PA, & OH
After deregulation	28.25	656.25˚
	(150.48)	(314.79)
TX publics	−2794.92˚˚˚	−8480.48˚˚˚
	(554.24)	(1624.63)
Diff-in-diff estimator	580.34˚˚	−335.21
	(184.17)	(449.77)
Admissions rate	21.71˚	−1.95
	(10.55)	(12.54)
Tuition and fees (in thousands)	−95.48	−413.48˚˚
	(105.00)	(131.75)
Average tuition discount per FTE (in thousands)	87.15	164.49
	(199.77)	(268.75)
Undergraduate enrollment	0.19˚˚˚	0.17˚˚˚
	(0.02)	(0.02)
Percent underrepresented minority enrollment	60.57˚˚˚	78.07˚˚˚
	(11.49)	(10.43)
State appropriations per FTE (in thousands)	7.70	129.24˚
	(32.07)	(51.51)
Population aged 15 to 19 (in thousands)	4.40	3.86˚
	(3.31)	(1.48)
Population aged 20 to 24 (in thousands)	−3.21	−1.98
	(3.34)	(1.48)
Unemployment	−52.56	933.05˚
	(78.82)	(437.33)
Per capita income (in thousands)	−85.38˚	−193.80
	(40.81)	(189.44)
State controls	YES	YES
Year fixed effects	YES	YES
Constant	−279.32	−5685.89
	(1615.34)	(6369.66)
R-squared	0.69	0.79
F-statistic	29.49	66.83
Observations	653	185
Groups	111	31

SOURCE: Analyses of data from Integrated Postsecondary Education Data System and Federal Student Aid Data Center.
NOTE: Standard errors in parentheses. CA, FL, NY, IL, PA, & OH represent states with similar socioeconomic landscapes to that of Texas.
$^+p < .10.$ $^˚p < .05.$ $^{˚˚}p < .01.$ $^{˚˚˚}p < .001.$

fees on enrollment, the deregulation policy had mixed effects on enrollment relative to the comparison group.

Implications

A key finding of this research is that tuition deregulation at public research institutions in Texas affected some groups of students (Hispanics) more negatively than others (blacks, Pell recipients). In particular, despite the fact that Hispanic enrollments increased dramatically overall during this period, public research institutions in Texas did not experience as large of an increase in the enrollment of this population as would have been expected without the tuition increase. This finding likely reflects the pricing out of these students, who were either unable to afford the higher tuition or no longer perceived the increase in their human capital provided by these institutions to be worth the higher price. Hispanics likely opted to attend less expensive alternatives, including nonresearch, two-year, or for-profit institutions; or no attendance at all (Flores and Park 2013).

In an era of continued constraints on state revenues, states are likely to explore avenues for new and increased sources of additional revenue for higher education such as tuition deregulation. In the context of this new reality, our examination offers three important policy and research lessons. First, the public higher education sector in Texas already suffers from stratified enrollment patterns, with minority and low-income students overrepresented in two-year and open-access institutions, while white and Asian students are overrepresented in elite four-year institutions (Horn and Flores 2012). Allowing institutions to set their own tuition could exacerbate this discrepancy. Second, without other forms of revenue generation, tuition deregulation is not likely to disappear as a viable tool for states and institutions. One lesson may be that in and of itself, tuition deregulation may not be as problematic to enrollments as anticipated, if institutions maintain a commitment to mitigating potential negative effects by providing increased resources, information, outreach, and aid for the students most likely to demonstrate greater financial need in the college search process. The findings suggest that states considering deregulation maintain some sort of oversight on institutional behavior to ensure actions that offset the consequences of tuition deregulation. Such checks tend to take the form of caps in tuition increases, mechanisms that hold institutions accountable for their enrollment profiles, and the use of funding formulas that allocate institutional funding based on institutional performance in meeting state-mandated benchmarks. States should also use (or adjust) these oversight policies and strategies to ensure continued higher education opportunity for students from historically underrepresented groups (Perna and Finney 2014).

Further research is needed to understand how enrollment preferences are changing in response to deregulated tuition. A suggested improvement, when possible, is to use student-level data to examine whether students of different groups are deterred from enrolling at research institutions as a result of tuition

spikes and whether there are tipping points at which students of different groups decide to enroll at other four-year, two-year, or for-profit institutions.

Ultimately, one of the most consistent conclusions in the assessment of student response to price and aid is that, while price may affect different groups differentially, the availability of financial aid remains a reliable mechanism to increase and sustain college enrollment. Any state considering tuition deregulation should remember the role of this particular policy tool in mitigating the potential negative effects of tuition deregulation on disadvantaged students. Moreover, how knowledge of such aid is disseminated to different groups may be as critical a tool as the availability of the aid itself. Continued attention to these issues is necessary to ensure that a student's ability to pay for higher tuition does not limit the ability to benefit from higher education.

Appendix:

Tuition and Fees at Public Four-Year Institutions in Texas by Year
(Adjusted to 2011 Dollars Using the BLS Adjustment for Inflation)
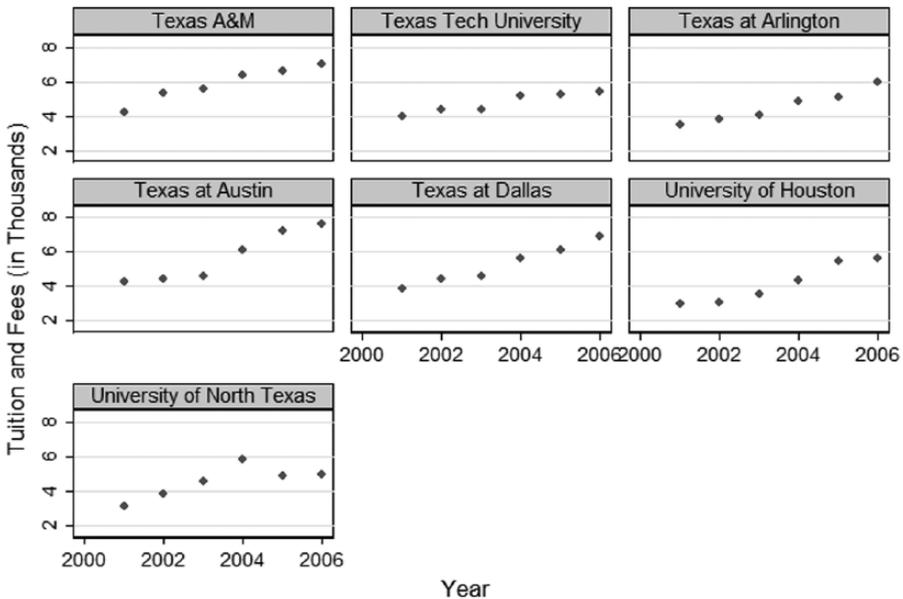
Graphs by Institution

Notes

1. We use the terms *Hispanic* and *Latino* interchangeably.
2. Texas Higher Education Coordinating Board. 2012. Available from http://www.thecb.state.tx.us/.
3. Ibid.

4. All financial data are adjusted for inflation, according to the U.S. Bureau of Labor Statistics standards.

5. We use American Community Survey one-year estimates, in line with instructions provided by the U.S. census, to prevent overlap found in the three- and five-year smoothing estimates.

6. To ensure a balanced control group, we selected institutions listed as research institutions across the entire span of our sample, according to 2005 Carnegie classification.

7. Results available from author upon request.

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