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**Do In-State Tuition Benefits Affect the
Enrollment of Non-Citizens?
Evidence from Universities in Texas**

IHELG Monograph

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Do In-State Tuition Benefits Affect the Enrollment of Non-Citizens?

Evidence from Universities in Texas

Lisa M. Dickson*

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Abstract: In 2001, the Texas state legislature passed House Bill 1403 and became the first state to offer in-state tuition rates at public universities for non-citizens (including illegal immigrants) who attended high school in the state for three years. As a result of the policy change, the cost of attending college at public universities in Texas fell dramatically for non-citizens. Using administrative data from six universities in Texas, we employ a quasi-experimental design to identify the effects of the policy change on the probability of enrollment. The results demonstrate a large and significant positive effect of lowering tuition on the enrollment of non-citizens at the University of Texas at Pan American and the University of Texas at San Antonio. The results also suggest that the policy had a negative effect on enrollment at Southern Methodist University, a private university whose tuition was unchanged by the policy.

JEL Codes: I22, I28

Keywords: financial aid, non-citizens, in-state tuition benefits

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I. INTRODUCTION

In 2001, the Texas state legislature passed House Bill 1403 (HB 1403) that guaranteed in-state tuition rates at public universities in Texas for non-citizens (including illegal immigrants) who attended a high school in the state for three years. While much of the discussion concerning the law in Texas has focused on illegal immigrants, the law is broader than that as it does provide in-state tuition to legal immigrants as long as they were not permanent residents. Permanent residents were already eligible for in-state tuition. Since the Texas state legislature passed HB 1403, ten other state governments have passed laws that extend in-state tuition rates to non-citizens with similar qualifications (Flores, 2010). The goal of these policies is to improve access to higher education to non-citizens who may be unable to pay out-of-state tuition rates at state public universities. Since non-citizens do not qualify for federal financial aid and are ineligible for most jobs if undocumented, the reduction in the price of higher education that comes from offering in-state tuition benefits may be the only source of financial aid that these students receive. To provide some context, the difference between paying in-state tuition rates and out-of-state tuition rates in 2001 at the Texas state flagship universities was approximately \$6,500.¹

Given the large immigrant population within Texas, it is perhaps not surprising that it was the first state to pass a law offering in-state tuition benefits to non-citizens. The legal

¹ The Integrated Postsecondary Education Data System (IPEDS) provided by the National Center for Education Statistics records the cost of attending the University of Texas at Austin in 2000-2001 for an in-state student were \$3,575 while the cost for an out-of-state student were \$10,025. The comparable numbers for Texas A&M University were \$3,374 for an in-state student and \$9,824 for an out-of-state student.

support for the extension of education benefits to non-citizens comes from the *Plyer v. Doe* (1982) Supreme Court case that led to the expansion of education benefits to non-citizens at the elementary and secondary level. Yet even with the legal support for the provision of educational benefits to non-citizens at the primary and secondary education levels, the extension of in-state tuition rates to non-citizens in public higher education has remained controversial. One of the reasons why there is debate over whether non-citizens can be charged in-state tuition rates is due to the federal guidelines provided in the 1996 Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA). According to IIRIRA, non-citizens cannot be given preferential treatment relative to citizens. Opponents of in-state tuition benefits for non-citizens argue that by charging them a lower price than citizens from other states that these non-citizens are receiving preferential treatment (e.g. Kobach, 2006-2007). Lawsuits, such as *Day v. Sebelius*, have been filed on behalf of out-of-state citizens under the claim that charging them out-of-state tuition rates and non-citizens in-state tuition rates violates IIRIRA (Feder, 2006). Proponents of the legislation point out that the legal requirements for a non-citizen to obtain in-state tuition are more stringent than the legal requirements for a citizen who moves to Texas (e.g. Olivas 2004). With this reasoning, non-citizens are not receiving preferential treatment but rather are facing more scrutiny.² As evidence of the controversy over the provision of in-state tuition rates, the

² The Texas Higher Education Coordinating Board provides information on in-state tuition rates and this document describes why non-citizens are not treated preferentially to citizens. The document is available at:

<http://www.thecb.state.tx.us/download.cfm?downloadfile=03A4BCDB-FD53-D986-CDBDC76B63559D55&typename=dmFile&fieldname=filename>

state government of Oklahoma both passed and repealed the law that offered in-state tuition rates to non-citizens (Flores, 2010).

Researchers for several decades have sought to evaluate the effects of college costs on educational attainment.³ Due to the endogeneity of college costs, it is often difficult to credibly identify the effects of college costs on enrollment. Only a few studies in the literature focus on the effects of offering in-state tuition rates on enrollment. Bridget Long (2004) provides an analysis of how in-state tuition rates affect where students choose to attend college. She finds that if the students were offered grants rather than in-state tuition at the state public universities that many more students would choose a private university. Recently, a few studies have employed a quasi-experimental design to identify how extending in-state tuition rates to previously ineligible groups of students affects college enrollment rates. Abraham and Clark (2006) provides an analysis of the District of Columbia Tuition Assistance Grant (DCTAG) program that offers in-state tuition benefits at all public universities to students who graduate from high schools in Washington, D.C. Abraham and Clark (2006) find the program increases college enrollment rates. Flores (2010) and Kaushal (2008) use the CPS and difference-in-differences estimation to analyze how the introduction of in-state tuition benefits affect college attendance rates of Latinos and Mexicans, respectively. Both studies report positive and statistically significant effects. Chin and Juhn (2010) analyze the effects using a similar identification strategy and data from the American Community survey but find no significant effects.

³ Leslie and Brinkman (1988) provide a review of the early literature. Cellini (2008) provides a review of the recent literature and emphasizes the current techniques used to identify the causal effects of college costs on college enrollment.

This study focuses on the effects of offering in-state tuition for non-citizens on the enrollment yields of non-citizens at six universities in Texas. The enrollment yield is the fraction of students who choose to enroll at the university conditional upon being admitted to the university. Van der Klaauw (2002) and Linsenmeier, Rosen and Rouse (2006) provide recent examples of studies that analyze the effects of lower costs on enrollment yields though each study only focused on one university. Five of the universities in this study (Texas A&M, University of Texas at Austin, University of Texas at Pan American, University of Texas at San Antonio and Texas Tech University) are public and therefore extended in-state tuition benefits to non-citizens after the implementation of HB 1403. The sixth university, Southern Methodist University (SMU), is a private university. The policy change did not directly affect the university's tuition policy for non-citizens. However, due to the decrease in price at the public universities for non-citizens, the relative price of SMU for non-citizens increased after the policy change. Due to the “natural experiment” of the passage of HB 1403, we can measure the effects of the policy using difference-in-difference techniques. Explicitly, we compare the difference in the enrollment yields of non-citizens before and after the policy to the difference in enrollment yields of citizens before and after the policy. Citizens who were residents of Texas serve as a control group as they were already eligible for the in-state tuition rates prior to the passage of HB 1403.

This study provides several contributions to the growing literature on the effects of college costs on college enrollment. Previous studies of in-state tuition rates have focused only on the effects on Hispanics and find mixed results with Chin and Juhn (2010) finding no significant effects and Kaushal (2008) and Flores (2010) finding significant effects. None of the previous studies analyzed the effects at specific universities and therefore left many questions

unanswered. Among the unanswered questions are: 1) Does the policy affect enrollment at four-year universities? Since many immigrants choose to attend two-year colleges, there is some question as to whether there is an effect at four-year universities. 2) Are the effects uniform across universities? Does the policy affect enrollment only at the state flagship universities? Does the effect vary according to university selectivity? 3) Does the policy lead to a shift away from private universities? As Bridget Long (2004) demonstrates in her study, in-state tuition can lead to students substituting away from private universities. The answers to these questions are relevant and important to policymakers who are concerned about the educational attainment of non-citizens as well as to policymakers who are considering legislation on immigration and educational benefits. While the states seem to be leading the way on passing in-state tuition benefits for non-citizens, there is a national policy, the DREAM act, which has also been considered by the US Congress that would provide educational benefits to non-citizens.⁴

In addition to the contribution to the literature on the effects of college costs on enrollment, this study also compares the estimated effects of the policy using both a linear and nonlinear model. The dependent variable in the analysis is the binary variable for whether an individual chooses to enroll in the university or not. As mentioned in Ai and Norton (2003), the difference-in-difference estimation technique was used in 72 published studies with a binary dependent variable and in all of the published studies the estimated effect was miscalculated. In order to circumvent the time costs of correctly evaluating marginal effects in nonlinear models or perhaps for ease of interpretation, some authors choose to present only estimates from linear models (e.g. Borjas, 2003; Dynarski, 2000, 2003). This study provides estimates of the effects of the policy using both a linear model and the appropriate marginal effect from a nonlinear model.

⁴ Olivas (2010) provides a political analysis of the DREAM Act.

By providing both estimates, this study can demonstrate whether policy analysis is affected by the regression technique.

II. THEORETICAL FRAMEWORK

A large literature currently investigates the theoretical reasons why an individual should invest in a college education. According to Becker (1962), individuals should invest in education if the present discounted value of the benefits of a college education outweigh the present discounted value of the costs of a college education. Within this theoretical framework, two of the reasons why an individual may choose not to invest in a college education are: 1) the benefits to a college education are less than the costs of a college education or 2) the individual faces credit constraints that prevent them from financing the initial costs of a college education. Non-citizens may be more likely to choose not to invest in a college education due to both of these reasons. Non-citizens, if undocumented, receive very little benefits to a college degree unless they plan to work outside of the United States. Non-citizens are also more likely to come from families of very low income and thus may not be able to finance the temporary costs of a college education. Therefore, the effects of lowering college costs for non-citizens on enrollment may be lower than that for citizens.

This study focuses on the effects of lowering college costs on the enrollment yields of non-citizens. As discussed in Manski and Wise (1983) and mentioned in Van der Klaauw (2002), the decision to matriculate in college is actually the result of several steps. Individuals must first apply to college and be accepted to college. After being accepted to college, the students (if they did not apply early decision) are usually notified of their financial aid and then

must decide whether to enroll at that particular college.⁵ This study focuses on the last decision of non-citizens to choose to enroll at a specific university after being accepted to that university. Unlike citizens, non-citizens are not eligible for federal financial aid (work-study programs, loans, or grants). Therefore, their decision is mainly based on the listed tuition for each university and the change from out-of-state tuition to in-state tuition represents a large reduction in costs.

In theory, the individual should decide to enroll at a specific university if the expected utility from attending that university is higher than the alternatives. Let's assume that the expected utility from attending university j for a non-citizen is equal to:

$$E(U_{college\ j\ nc}) = pU(G - tuition_0) + (1 - p)U(F - tuition_0)$$

where p is the probability the student graduates from the university, G is the earnings if they graduate from the university, F is the earnings if they fail out of the university, and for simplicity let's assume that the tuition costs are the same for both outcomes and is currently equal to the out-of-state tuition rates. The alternatives to enrolling at university j could be either attending another university or choosing to attend no university. For now, let's assume that the utility from choosing the best option from all of the alternatives is equal to $E(U_B) = B$.

The individual will rationally choose to enroll at college j if the expected utility of college j is higher than the utility from the best alternative.

$$Enroll = 1\ if\ E(U_{college\ j\ nc}) > B$$

⁵ Students who apply early decision are often bound to attend the university if accepted. They usually are not made aware of their financial aid offers prior to having to decide whether to attend the university.

$$Enroll = 0 \text{ if } E(U_{college\ j\ nc}) < B$$

In this study, we compare the enrollment yields of non-citizens before and after the implementation of HB 1403. After the implementation of HB 1403, the tuition costs fell by approximately \$6500. The reduction in tuition costs should increase the expected utility of attending the public universities. If the utility of the alternatives has remained constant, then the yield rates of the universities who lowered tuition rates for non-citizens should demonstrate increased yield rates. One exception would be if the student was considering a public in-state university and the best alternative was also an in-state public university. In this case, both universities would have reduced tuition by approximately the same amount and the enrollment probability between enrolling at university j and the best alternative would have been unchanged.

In this study, we will be evaluating the effects of the policy by comparing the yield rates of non-citizens before and after the policy to the yield rates of citizens before and after the policy. Since the policy change did not affect citizens, the difference in the yield rates of citizens can be used to control for other factors that may have affected the desirability of universities over time. The underlying causal identification of the policy on the enrollment yields of non-citizens relies on the assumption that absent the change in policy no other factors would cause the enrollment yields of citizens and non-citizens to diverge.

III. DATA AND ESTIMATION STRATEGY

The Texas Higher Education Opportunity Project (THEOP) collected administrative data from several universities in Texas.⁶ This study uses data from six of these universities: Texas

⁶ The THEOP project was led by Marta Tienda and Teresa Sullivan. A description of the project, data, and research papers are available from the Texas Higher Education Opportunity

A&M, UT-Austin, UT-Pan American, UT-San Antonio, Texas Tech University and Southern Methodist University (SMU). For each of the universities, the administrative records include detailed information on applicants' demographic characteristics and academic qualifications. Due to the enormous changes in college admissions in the 1990s in Texas, this study only uses data after 1998 (see Card and Krueger, 2005; Dickson, 2006a, 2006b; Long 2004a, 2004b). For all years used in this study, the top ten percent rule is in place (see Long and Tienda, 2008). Given that we are interested in comparing students who are similar in background, we focus only on students who possibly meet the required in-state tuition requirements and only on students who are considering enrollment during the fall semester. Students who may meet the in-state tuition requirements are either students recorded as being Texas residents or students who report that they graduated from a Texas high school.

Since we are interested in the effects of the policy on the enrollment yield of students, we present the characteristics of all of the accepted applicants at each of the universities in Table 1. The first noticeable difference between the universities is the difference in the average enrollment yield. For the state flagship universities (UT-Austin and Texas A&M), the

Project website: <http://theop.princeton.edu/> While the study originally collected data from nine universities only six of the universities could be used in this analysis. Three of the universities did not record information on the citizenship status of the student and thus were dropped from the analysis. One of the main reasons for the collection of the data was to study the effects of ending affirmative action on college admissions. However, due to the time period that the data was collected it is also possible to evaluate the effects of offering in-state tuition on the enrollment yields of non-citizens.

enrollment yield is higher than 60 percent. At the remaining universities, the enrollment yields are lower. SMU, the one private university in the sample, has the lowest enrollment yield at approximately 37.5 percent over the time period of interest. At each of the universities, the fraction of non-citizens who may qualify for in-state tuition is very small. This is consistent with the information available from the Texas Higher Education Coordinating Board.⁷ The fraction of non-citizens who are either Texas residents or graduated from a Texas high school ranges from less than 1 percent at UT-Austin to 4 percent at UT-San Antonio. The policy variable shows the fraction of the sample that was admitted after HB 1403 was passed. The interaction between non-citizen in-state and policy provides the share of students affected by the policy as a fraction of the entire applicant pool over the time period. The respective shares range from half a percent at UT-Austin to almost 3 percent at UT-San Antonio.

The demographic characteristics of the admitted students also vary considerably across universities. Noticeably, the share of male students admitted is less than half at all of the universities except for Texas Tech. This is in accordance with national trends as discussed in Goldin, Katz, and Kuziemko (2006). Notably, blacks and Hispanics make up a small fraction of admitted students at the state flagship universities. However, for two of the universities in the sample (UT-Pan American and UT-San Antonio), Hispanics constitute the majority of admitted

⁷ The Texas Higher Education Coordinating Board provides information on in-state tuition rates and this document estimates that eight/tenths of one percent of all students enrolled in higher education in Texas qualify for the policy. The document is available at:

<http://www.theccb.state.tx.us/download.cfm?downloadfile=03A4BCDB-FD53-D986-CDBDC76B63559D55&typename=dmFile&fieldname=filename>

students. At UT-Pan American, Hispanics include more than three quarters of the admitted students. At UT-San Antonio, Hispanics are approximately half of all admitted students.

The academic qualifications of the students vary considerably by the university as well. The state flagship universities report the highest SAT scores. More than half of the admitted students at the state flagship universities are in the top decile of their high school class. The average class ranks of students at the remaining universities are considerably lower. UT-Pan American appears to be the least selective in admissions as students admitted at this university report the lowest class ranks and the lowest SAT scores. A high school is defined as a feeder high school if it is among the top twenty high schools at either Texas A&M or UT-Austin for the number of high school graduates accepted at UT and TAMU as of 2000. A description of feeder high schools can be found in Tienda and Niu (2006). A high school that is a feeder high school to the state flagship universities is considered to be of higher quality than a high school that does not have as many students accepted at the state flagships. Students from feeder high schools make up almost 20 percent of admitted students at Texas A&M and Texas Tech. At UT-Austin, students from feeder high schools constitutes approximately 24 percent of the admitted students. Students from private high schools make up a large proportion of admitted students at SMU, a private university.

An evaluation of the effects of HB 1403 on the enrollment yields of non-citizens requires identification of students who may potentially be eligible for the policy. The requirements of the law are that individuals must have graduated from a Texas high school and have resided in the state for at least three years. Unfortunately, these administrative data from the universities do not include information on the time the student lived in Texas. Due to this problem, we are only able to identify the possible treatment group by whether they are a non-citizen who identified as

either a Texas resident or reported graduating from a high school in Texas. Since we can not perfectly capture and potentially over-estimate the treatment group, our estimates of the effects of the policy may be downwardly biased.

In this study, we exploit the natural experiment of HB 1403 to identify the effects of lowering tuition costs on the enrollment probabilities of non-citizens. Since citizens who were residents of the state already qualified for in-state tuition rates at public universities, they can be used to control for other factors that may affect enrollment probabilities. We identify the effect of the policy by constructing a double-difference where the first difference is the difference in the enrollment probabilities of non-citizens after the policy and before the policy. The second difference subtracts off the difference in the enrollment probabilities of citizens after the policy and before the policy for citizens. This is shown in the following equation:

$$\Delta = [\text{Pr}(\text{enroll})_{NC \text{ Post}} - \text{Pr}(\text{enroll})_{NC \text{ Pre}}] - [\text{Pr}(\text{enroll})_{C \text{ Post}} - \text{Pr}(\text{enroll})_{C \text{ Pre}}] \quad (1)$$

where NC denotes non-citizen and C denotes citizen. This double difference can be calculated using the means for the probabilities of enrollment at each of the universities.

Table 2 shows the enrollment probabilities of non-citizens and citizens prior to the implementation of HB 1403 and after the implementation of HB1403 for each of the universities. The table presents evidence on how the enrollment yields of non-citizens and citizens changed after the policy and provides t-tests to identify whether the changes were statistically significant. In addition, the table presents the mean difference in enrollment yields between non-citizens and citizens for each of the time periods. For all of the time periods at all of the public universities, non-citizens demonstrate lower enrollment yields than do citizens. At SMU, prior to the implementation of the policy, the enrollment yield of non-citizens was higher than the enrollment yield of citizens. For each of the universities, we calculate the double-difference. The means

show that the policy increased the probability of enrollment at UT-Pan American significantly. The means show a 11.8 percent increase in enrollment due to the policy for non-citizens after subtracting the positive trend in enrollment exhibited by citizens. The double-difference is marginally significant at the 10% level for UT- San Antonio and suggests that the policy increased the probability of enrollment by 6.3 percentage points. At Texas A&M, the enrollment yields of non-citizens fell by more than the enrollment yields of citizens. This led to an estimated double-difference that is negative and marginally significant. At SMU, the means show that the policy led to a large reduction in the probability of enrollment for non-citizens. The double-difference at SMU indicates a 23.6 percentage point decrease in the probability of enrollment.

The difference in the mean probabilities of enrollment does not separate the effects of individual characteristics from the effects of the policy change. It may be that the characteristics of the accepted students changed over the time period which may lead to differences in the probabilities of enrollment. In order to capture this, we estimate the following regression separately for each of the six universities:

$$Pr(Enroll = 1) = \beta_0 + \beta_1 NC + \beta_2 Policy + \beta_3 NC * Policy + \beta_4 Demographics + \beta_5 SAT + \beta_6 Class Rank + \beta_7 High School Characteristics + \varepsilon \quad (2)$$

The dependent variable in the regression is whether the student chooses to enroll at the university given that the student is already accepted. NC is an indicator for whether the student is a non-citizen. Policy is an indicator for whether the in-state tuition policy for non-citizens is in effect. The main coefficient of interest in the regression is β_3 which is our estimate of the effect of the double-difference. Demographics is a vector of indicator variables for the applicant's race and ethnicity. SAT denotes the applicant's SAT score. If the student took the ACT, the ACT score

was translated into the appropriate SAT score. The class rank for the student is controlled for using both the student's reported class rank and an indicator for whether the student graduated in the top ten percent of their high school class.⁸ The indicator for individuals in the top ten percent of their high school class is used to account for any nonlinearities in the effect of class rank on the probability of enrollment that may be due to the top ten percent rule.⁹ Since this policy may also affect enrollment probabilities, the indicator for top ten percent students is included in the regression analysis. The high school characteristics included in the regression are: an indicator for whether the high school sends a disproportionate number of students to the state flagships and is called a feeder school in the data and an indicator for whether the high school the student attended was private.

Since the dependent variable in the regression is binary, there are some options as to the estimation method used to evaluate the effects of the policy. The potential problem with this type of model is that this model can lead to predictions outside of the 0 to 1 interval and leads to errors that are heteroskedastic. However, the coefficients from the linear probability model are easy to interpret. With a linear model, the estimate of the policy is simply the coefficient β_3

⁸ For those students that had a missing class rank, the missing value is imputed using the mean class rank by gender, year, and university. A missing indicator is then included in the regression analysis. This is the same technique used by Long and Tienda (2008) who also used the THEOP data.

⁹ The top ten percent rule guarantees students in the top ten percent of their graduating high school class in Texas admission to the public university of their choice (see Dickson 2004a, Long 2004b).

which is constrained to be the same for all individuals. Another method that could be employed to estimate the model is a probit regression. The advantages of the probit regression are that the predictions lie within the 0 to 1 interval and that the estimated marginal effect of the policy can vary across individuals. The disadvantage of the probit regression is that the appropriate marginal effect is difficult to calculate. According to Ai and Norton (2003) 72 authors in published studies inaccurately calculated the marginal effect. Due to the difficulty of calculating the appropriate marginal effect in nonlinear models, the ordinary least squares method of estimating differences-in-differences has become more common despite its' known shortcomings (e.g. Borjas, 2003; Dynarski, 2003).¹⁰ This study provides a comparison between the estimates obtained from ordinary least squares and the estimates obtained from the probit regression to see whether the differences in estimation technique affects the interpretation of the effects of the policy.

IV. RESULTS

The results from ordinary least squares regression for each of the universities are provided in Table 3. The regression results are substantially different from the means presented in Table 2. Notably, after controlling for individual characteristics and academic preparation, prior to the policy change, non-citizens are significantly more likely to enroll at UT-Austin, UT-Pan American and SMU. The effect is very large with non-citizens being 41 percentage points more likely to enroll than citizens at UT-Austin prior the policy change. The effect is smaller at UT-Pan American and SMU at approximately 14 percentage points at both universities prior to

¹⁰ Norton, Wang and Ai (2004) provide a description and example of how to calculate the appropriate marginal effects for interaction terms in nonlinear models.

the policy change. For four of the universities, the enrollment yields fell significantly following the implementation of HB 1403 controlling for individual characteristics. The effect of the policy change is statistically significant at each university except for UT-Pan American. The effect ranges from an increase of 2.2 percentage points at UT-Austin to a decrease of 4.8 percentage points at UT-San Antonio.

The results in Table 3 suggest that the policy significantly affected enrollment at three of the six universities: UT-San Antonio, UT- Pan American, and SMU. At UT-San Antonio, the magnitude suggests the policy led to a 11.1 percentage point increase in the probability of enrollment for non-citizens. The difference in tuition levels for in-state and out-of-state students at UT-San Antonio in 2000-2001 was \$5,160. This suggests that for every \$1,000 in aid the enrollment probability increased by approximately 2 percentage points. The magnitude of the effect at UT- Pan American is substantially larger suggesting that the policy led to an 18 percentage point increase in the probability of enrollment for non-citizens. The difference in tuition levels for in-state and out-of-state students at UT-Pan American in 2000-2001 was approximately \$6,000. This suggests that a \$1,000 decrease in costs leads to a 3 percentage point increase in the probability of enrollment. This is similar to the magnitude recorded in Dynarski (2000, 2003) for overall enrollment effects of financial aid. The effect is also substantially larger and is statistically significant in contrast to the results found by Linsenmeier, Rosen and Rouse (2006). The effect of the policy for Southern Methodist University is a decrease in the probability of enrollment for non-citizens of approximately 18 percentage points and this is significant at the 5% level. At the remaining universities, the estimated effect of the policy, the double-difference, is statistically insignificant.

The results from the ordinary least squares regression suggest that the policy did not increase the probability of enrollment at all universities. Rather the positive effects of the policy seem to be concentrated at universities that historically enrolled a large percentage of Hispanic students. This is interesting as the policy did not significantly increase the probability of enrollment at the most selective public universities. It may be that this is due to the small percentage of non-citizens accepted at these universities. The negative effect at SMU is suggestive that the policy possibly led to substitutions between public and private universities for non-citizens.

The signs on the remaining coefficients are also of interest. It appears that at the state flagship universities both blacks and Hispanics are less likely to enroll conditional on being accepted than are white students. For all of the universities except for UT-San Antonio, the higher a student's SAT score, the less likely they are to enroll at that particular university. This suggests possibly that these students had other options outside of the current school being considered. Students who declared that they were Texas residents were significantly more likely to enroll at each of the universities than were students who had only graduated from a Texas high school.

For each of the regressions, we also calculated the percent of predictions that lie outside of the 0 to 1 range. The predicted probabilities can be calculated by multiplying the characteristics of each student by the coefficients provided by the regression results. As a probability can only possibly lie between 0 and 1, it is troubling if there are predictions outside of the 0 to 1 range. Notably, with this particular model across universities very few observations lie outside the 0 to 1 range. The last line of table 3 provides the fraction of predicted probabilities outside of the 0 to 1 range. The largest number of values outside of the 0 to 1 range

is for UT-Pan American with 3.09% of the sample. The smallest values are for UT-San Antonio and Texas Tech with 0 predicted values outside of the 0 to 1 range.

The effects of the policy are also calculated using a probit regression. The advantages of the probit regression are that the model does not lead to predictions outside of the 0 to 1 range and that the marginal effect of the policy can vary by individuals. It may be that the policy has very little effect on students who already have a high probability of enrolling. It may also have little effect on students who have a very low probability of enrolling. The largest effects may be on those that are unsure as to whether to enroll. By estimating the model with a probit regression, the marginal effect of the policy varies according to the characteristics of the student. Table 4 provides the average of the marginal effects for the double-difference for each individual for each university and the relative z-statistic.

When estimating a probit regression, the estimated effects of the policy suggest a positive and significant impact on the enrollment probability at UT-Pan American and UT-San Antonio. Noticeably, the estimated effects are smaller at UT-Pan American with the probit specification when compared to the linear specification. The estimated effect according to the probit regression suggests that the policy increased the probability of enrollment by approximately 14 percentage points. The comparable number from the linear model is that it increased the probability of enrollment by 18 percentage points. However, it appears that the estimates are both within the standard error of one another. At UT-San Antonio, the estimated effect of the policy is that it increases the probability of enrollment by 12 percentage points. This estimate is very similar to the estimate obtained from the linear model and is again significant at the 1 percent level. The effects at SMU from the probit model are similar to the estimated effects from the linear model.

V. ROBUSTNESS TESTS

Comparison of non-citizen Hispanics to citizen Hispanics

Previous studies on the effects of in-state tuition rates on the educational attainment of non-citizens have focused exclusively on Hispanics.¹¹ The focus on this group of individuals is due to the fact that the majority of undocumented citizens within the United States are Hispanics. While limiting the sample to these individuals does allow for homogeneity of the population, there is a tradeoff as there are still some individuals who are also affected by the policy that are not included. In order to provide some comparison with previous studies, we also conduct an analysis of the effects of the policy only on Hispanics. This may also be of interest as our earlier results demonstrated that the largest policy effects were at UT-San Antonio and UT-Pan American, universities that enroll a large number of Hispanic students.

Table 5 provides the average characteristics of the subsample of individuals who are Hispanic. The limitation to only Hispanics severely limits the sample and eliminates the possibility of studying UT-Austin as no non-citizen Hispanic students are admitted during the available time period. Some other noticeable differences occur when comparing the limited sample of Hispanics (Table 5) to the previous sample of all individuals (Table 1). Within the Hispanic subsample, more than half of the admitted Hispanic students choose to enroll at Texas A&M, UT-Austin, UT-Pan American, and UT-San Antonio. Approximately half of all admitted Hispanic students at UT-Pan American choose to enroll and this can be compared to a yield rate of 44 percent for the entire sample of admitted students. At SMU, the yield rate is approximately 3 percentage points higher in the Hispanic subsample than it is for the universe of all admitted students. Other noticeable differences between the Hispanic subsample of admitted

¹¹ Flores (2010) focuses on all Latinos. Kaushal (2008) focuses on Mexicans.

students and the universe of all admitted students is the difference in the proportion of students in the top decile of their high school class. At Texas A&M, 58 percent of admitted Hispanics are in the top decile this can be compared to only half of all admitted students in the full sample. At UT-Austin, almost 70 percent of Hispanic students are in the top decile and this can be compared to 59 percent of all admitted students. Noticeably, the share of admitted Hispanics at feeder high schools and private high schools are considerably smaller than for the share of all admitted students at these universities.

Table 6 provides the estimated coefficients from estimating equation 2 for the Hispanic subsample. The main coefficient of interest is the estimated double-difference which is the coefficient on the interaction between non-citizen and policy. Within the Hispanic subsample, the double-difference is statistically significant at UT-Pan American and marginally significant at Texas Tech. The estimate at UT-Pan American indicates that the policy led to an increase in the probability of enrollment by 15.5 percentage points for Hispanic non-citizens. At Texas Tech, the estimated effect is a decrease in the probability of enrollment. However, some caution should be mentioned in interpreting the effect as the reduction in the sample to only Hispanics leads to the treatment group only consisting of 62 individuals at Texas Tech University. For three of the universities (Texas A&M, UT-Pan American, and SMU), a higher SAT score suggests a decrease in the probability of enrollment. This is suggestive again that these students may have other options than do students with lower SAT scores. Students who reported being a resident of Texas were significantly more likely to enroll at Texas A&M, UT-San Antonio, and UT-Pan American. Noticeably, these students were significantly less likely to enroll at SMU. This may be due to the relatively high tuition rates at SMU when compared to the in-state rates at the public universities.

Table 7 shows the estimated average of the marginal effects for the Hispanic sample for each of the universities. With the probit regression, the only significant effect is for Texas Tech University with a decrease in 21 percentage points. While the effect is statistically significant at the 5 percent level, the treatment group again only consists of 62 individuals. The positive effect at UT-Pan American is now not statistically significant. With the Hispanic subsample, the regression technique affects the significance levels of the coefficients.

VI. CONCLUSIONS

The extension of in-state tuition rates to non-citizens increases the probability of non-citizens enrolling at a few universities. Notably, across specifications, non-citizens are significantly more likely to enroll at the University of Texas Pan American and the University of Texas at San Antonio. The estimated effects of lowering tuition for non-citizens on enrollment yields are similar to those presented in Dynarski (2000, 2003) for overall enrollment. A \$1000 decrease in costs increases the probability of enrollment at UT-Pan American by approximately 3 percentage points and at UT-San Antonio by approximately 2 percentage points. Notably, the policy does not seem to affect the enrollment at the state flagship universities.

The results from this study also suggest that the policy may have had unintended consequences on the higher education market. There is some suggestive evidence that the policy decreased the probability of enrollment at private universities. This may be due to students substituting public universities for private universities. As mentioned by Bridget Long (2004), in-kind benefits such as in-state tuition rates may have unintended and undesired effects on the market for higher education. In particular, it may lead to inefficient matches between students and colleges. It seems that this effect is probably driven by legal immigrants, foreign students,

who are now eligible for in-state tuition rates at public universities. Undocumented students are unlikely to have considered SMU before the policy due to the high tuition costs.

Due to the complexity of calculating and interpreting the appropriate marginal effects in nonlinear models, the use of nonlinear models has become less common. This study demonstrates that the method of estimation does appear to affect the significance levels of coefficients. While the results from the full sample are robust to differences in estimation technique, the results from the Hispanic subsample are not. Within the Hispanic subsample, the large and statistically significant effect of the policy on enrollment yields at UT-Pan American disappears and the negative effect at Texas Tech becomes stronger. The differences in the results by regression technique suggests that caution should be taken when analyzing policy effects using only one technique.

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Table 1: Accepted Student Characteristics by University

Variable	Texas A&M	UT- Austin	UT-Pan American	UT-San Antonio	Texas Tech	SMU
Enroll = 1	0.624	0.616	0.440	0.538	0.457	0.375
<i>Policy Variables</i>						
Non-citizen in-state	0.022	0.007	0.025	0.041	0.016	0.015
Policy	0.414	0.488	0.427	0.632	0.611	0.734
Non-citizen in-state * Policy	0.010	0.005	0.012	0.028	0.011	0.009
<i>Demographic Characteristics</i>						
Male	0.477	0.465	0.451	0.440	0.545	0.392
Black	0.033	0.041	0.016	0.063	0.036	0.061
Hispanic	0.110	0.153	0.762	0.490	0.114	0.100
American Indian	0.005	0.004	0.001	0.005	0.005	0.006
Asian	0.059	0.177	0.022	0.054	0.039	0.081
Texas Resident	0.978	0.989	0.864	0.963	0.985	0.426
<i>Academic and High School Characteristics</i>						
SAT score / 100	11.867	12.398	8.609	9.998	11.210	12.028
Top Decile	0.504	0.588	0.065	0.178	0.212	0.330
High School Class Rank	13.550	10.982	39.451	31.583	27.167	19.402
Feeder High School	0.183	0.241	0.033	0.089	0.183	0.164
Private High School	0.079	0.096	0.018	0.071	0.072	0.241
Years	1998-2002	1998-2003	1998-2002	1998-2003	1998-2003	1998-2005
N	50214	56660	11481	27420	27359	10783

Notes: Out-of-state students and students considering enrollment outside the fall semester are dropped. Individuals who do not have information on gender, citizenship status, or a test score are also dropped. Individuals who report an ACT score had their score converted to the appropriate SAT score.

Table 2: Double-Differences for Each of the Universities in Enrollment Yields

Texas A&M University			
Group	Fall 1998 - Fall 2000 Pre – policy	Fall 2001 - Fall 2002 Post – policy	Mean difference: Post-policy - Pre- policy by group
Non-citizens Texas Residents (NCTX)	0.427 (0.020)	0.347 (0.021)	-0.080*** (0.029)
Citizens Texas Residents (CTX)	0.642 (0.003)	0.611 (0.003)	-0.030*** (0.004)
Mean difference: NCTX-CTX	-0.215*** (0.020)	-0.264*** (0.022)	
Double Difference			-0.050* (0.029)

University of Texas at Austin			
Group	Fall 1998 - Fall 2000 Pre – policy	Fall 2001 - Fall 2003 Post – policy	Mean difference: Post-policy - Pre- policy by group
Non-citizens Texas Residents (NCTX)	0.571 (0.043)	0.583 (0.030)	0.012 (0.052)
Citizens Texas Residents (CTX)	0.612 (0.003)	0.621 (0.003)	0.010** (0.004)
Mean difference: NCTX-CTX	-0.040 (0.042)	-0.038 (0.029)	
Double Difference			0.003 (0.051)

University of Texas Pan American			
Group	Fall 1998 - Fall 2000 Pre – policy	Fall 2001 - Fall 2002 Post – policy	Mean difference: Post-policy - Pre- policy by group
Non-citizens Texas Residents (NCTX)	0.132 (0.028)	0.304 (0.039)	0.172*** (0.047)
Citizens Texas Residents (CTX)	0.423 (0.006)	0.477 (0.007)	0.054*** (0.009)
Mean difference: NCTX-CTX	-0.291***	-0.173***	

	(0.040)	(0.043)	
Double Difference			0.118** (0.059)

University of Texas at San Antonio

Group	Fall 1998 - Fall 2000 Pre – policy	Fall 2001 - Fall 2004 Post – policy	Mean difference: Post-policy - Pre- policy by group
Non-citizens Texas Residents (NCTX)	0.413 (0.027)	0.445 (0.016)	0.031 (0.033)
Citizens Texas Residents (CTX)	0.562 (0.005)	0.530 (0.004)	-0.032*** (0.006)
Mean difference: NCTX-CTX	-0.148*** (0.029)	-0.085*** (0.017)	
Double Difference			0.063* (0.033)

Texas Tech University

Group	Fall 1998 - Fall 2000 Pre – policy	Fall 2001 - Fall 2003 Post – policy	Mean difference: Post-policy - Pre- policy by group
Non-citizens Texas Residents (NCTX)	0.418 (0.042)	0.324 (0.028)	-0.094** (0.050)
Citizens Texas Residents (CTX)	0.480 (0.005)	0.445 (0.004)	-0.036*** (0.006)
Mean difference: NCTX-CTX	-0.061 (0.042)	-0.121*** (0.030)	
Double Difference			-0.060 (0.051)

Southern Methodist University

Group	Fall 1998 - Fall 2000 Pre – policy	Fall 2001 - Fall 2005 Post – policy	Mean difference: Post-policy - Pre- policy by group
Non-citizens Texas Residents (NCTX)	0.612 (0.060)	0.322 (0.049)	-0.289*** (0.077)
Citizens Texas Residents (CTX)	0.413 (0.009)	0.360 (0.005)	-0.053*** (0.011)

Mean difference: NCTX-CTX	0.198*** (0.061)	-0.037 (0.050)	
Double Difference			-0.236*** (0.078)

Table 3: OLS - Does lowering tuition increase enrollment yields?

	Texas A&M	UT- Austin	UT-Pan American	UT-San Antonio	Texas Tech	SMU
Non-citizen	-0.018 (0.020)	0.414*** (0.050)	0.141*** (0.034)	-0.045* (0.026)	0.012 (0.059)	0.142** (0.060)
Policy	-0.025*** (0.004)	0.022*** (0.004)	-0.006 (0.008)	-0.045*** (0.006)	-0.026*** (0.006)	-0.048*** (0.014)
Non-citizen*Policy	0.021 (0.028)	-0.001 (0.052)	0.183*** (0.045)	0.111*** (0.031)	-0.059 (0.055)	-0.179** (0.077)
Male	0.010** (0.004)	0.035*** (0.004)	0.018** (0.008)	0.030*** (0.006)	0.021*** (0.006)	0.053*** (0.010)
Black	-0.226*** (0.012)	-0.125*** (0.011)	-0.056** (0.022)	-0.056*** (0.013)	-0.141*** (0.016)	0.039** (0.020)
Hispanic	-0.164*** (0.007)	-0.077*** (0.006)	0.053*** (0.010)	-0.041*** (0.007)	-0.146*** (0.009)	-0.001 (0.016)
American Indian	-0.064** (0.030)	-0.012 (0.031)	0.058 (0.060)	0.028 (0.044)	-0.015 (0.043)	0.061 (0.060)
Asian	-0.237*** (0.009)	0.054*** (0.005)	-0.012 (0.018)	-0.0004 (0.014)	-0.148*** (0.015)	0.043** (0.017)
SAT/100	-0.047*** (0.002)	-0.041*** (0.002)	-0.008*** (0.003)	0.024*** (0.002)	-0.027*** (0.003)	-0.052*** (0.004)
Top Decile	0.027*** (0.006)	-0.031*** (0.007)	-0.03 (0.020)	-0.082*** (0.009)	0.048*** (0.009)	0.029* (0.015)
Class Rank	0.003*** (0.0003)	0.003*** (0.0003)	0.0002 (0.0002)	0.002*** (0.0002)	0.003*** (0.0002)	0.004*** (0.0004)
Missing Rank	-0.029*** (0.010)	-0.052*** (0.010)	-0.495*** (0.008)	-0.043*** (0.015)	0.019 (0.074)	-0.007 (0.014)

Texas Resident	0.446*** (0.011)	0.463*** (0.026)	0.531*** (0.012)	0.281*** (0.016)	0.0001 (0.065)	-0.073*** (0.013)
Feeder High School	-0.025*** (0.006)	0.001 (0.005)	-0.067*** (0.012)	-0.057*** (0.011)	-0.131*** (0.008)	-0.070*** (0.013)
Private High School	-0.063*** (0.009)	-0.125*** (0.009)	0.095*** (0.021)	-0.035*** (0.012)	-0.176*** (0.011)	-0.034** (0.014)
Constant	0.756*** (0.023)	0.651*** (0.033)	0.158*** (0.030)	0.032 (0.031)	0.739*** (0.072)	0.971*** (0.049)
N	50214	56660	11481	27420	27359	10783
R-squared	0.071	0.037	0.331	0.034	0.037	0.058
Number of Predictions <0 or > 1	171 (0.34%)	16 (0.03%)	355 (3.09%)	0 (0%)	0 (0%)	1 (0.01%)

Notes: Robust standard errors are presented in parentheses. * denotes significance at 10%, ** denotes significance at 5%, *** denotes significance at 1%

Table 4: Probit: Average Marginal Effects of the Double Difference

	Texas A&M	UT- Austin	UT-Pan American	UT-San Antonio	Texas Tech	SMU
Interaction	0.0003	-0.015	0.137***	0.120***	-0.0665	-0.176***
Standard error	0.0306	0.018	0.058	0.033	0.0561	0.079
z-statistic	0.0111	-0.978	2.295	3.682	-1.185	-2.234
N	50214	56660	11481	27420	27359	10783

Table 5: Average Characteristics for Hispanic Subsample

Variable	Texas A&M	UT- Austin	UT-Pan American	UT-San Antonio	Texas Tech	SMU
Enroll = 1	0.526	0.582	0.501	0.505	0.357	0.408
<i>Policy variables</i>						
Non-citizen	0.043	0.000	0.012	0.039	0.031	0.032
Policy	0.429	0.514	0.482	0.616	0.625	0.734
Non-citizen * policy	0.021	0.000	0.005	0.026	0.021	0.012
<i>Demographic Characteristics</i>						
Male	0.479	0.460	0.441	0.423	0.543	0.389
<i>Academic Characteristics</i>						
SAT/100	11.176	11.414	8.297	9.622	10.639	11.438
Top Decile	0.580	0.692	0.069	0.231	0.315	0.364
Class Rank	11.979	9.049	39.713	28.214	23.416	18.975
Texas Resident	0.965	0.997	0.953	0.966	0.972	0.388
Feeder High School	0.083	0.085	0.007	0.032	0.086	0.080
Private High School	0.091	0.086	0.009	0.085	0.083	0.241
Sample size	5529	8693	8745	13449	3126	1073

Table 6: Ordinary Least Squares Regression for Hispanic Subsample

	Texas A&M	UT-Pan American	UT-San Antonio	Texas Tech	SMU
Non-citizen	-0.056 (0.045)	0.022 (0.050)	-0.009 (0.036)	0.063 (0.133)	0.14 (0.119)
Policy	0.001 (0.014)	0.003 (0.009)	-0.038*** (0.009)	0.004 (0.018)	0.039 (0.050)
Non-citizen*Policy	-0.003 (0.062)	0.155*** (0.058)	0.044 (0.043)	-0.219* (0.017)	-0.026 (0.168)
Male	0.002 (0.013)	0.021** (0.009)	0.036*** (0.009)	0.011 (0.017)	0.016 (0.030)
SAT/100	-0.027*** (0.005)	-0.007** (0.003)	0.034*** (0.003)	0.002 (0.007)	-0.071*** (0.011)
Top Decile	-0.004 (0.021)	-0.032 (0.023)	-0.077*** (0.012)	-0.086*** (0.024)	-0.028 (0.049)
Class Rank	0.005*** (0.001)	0.0002 (0.0002)	0.002*** (0.0002)	0.004*** (0.0006)	0.005*** (0.001)
Missing Rank	0.009 (0.032)	-0.517*** (0.010)	-0.093*** (0.024)	0.206 (0.275)	-0.078* (0.047)
Texas Resident	0.436*** (0.023)	0.495*** (0.017)	0.289*** (0.021)	-0.071 (0.166)	-0.086* (0.045)
Feeder High School	0.056** (0.024)	-0.184*** (0.033)	0.003 (0.024)	-0.099*** (0.032)	-0.005 (0.058)
Private High School	-0.033 (0.024)	0.021 (0.035)	-0.023 (0.015)	-0.181*** (0.031)	-0.066* (0.040)
Constant	0.350*** (0.061)	0.245*** (0.035)	-0.128*** (0.042)	0.356* (0.183)	1.155*** (0.139)
N	5529	8745	13449	3126	1073
R-squared	0.046	0.282	0.037	0.048	0.077
Number of Predictions <0 or > 1	13 (0.24%)	160(1.83%)	2(0.01%)	0	2(0.19%)

Notes: Robust standard errors are presented in parentheses. * denotes significance at 10%, ** denotes significance at 5%, *** denotes significance at 1%

Table 7: Probit: Average Marginal Effects for Hispanic Subsample

Hispanic subsample	Texas A&M	UT-Pan American	UT-San Antonio	Texas Tech	SMU
interaction	-0.008	0.190	0.050	-0.209**	-0.018
standard error	0.067	0.124	0.047	0.107	0.170
z-statistic	-0.122	1.566	1.07	-1.963	-0.109
N	5529	8745	13449	3126	1073