The Impact of Tuition Increases on Undocumented College Students' Attainment*

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Abstract

We examine the impact of a temporary price shock on the attainment of undocumented college students enrolled in a large urban college system. Using a differences-in-differences identification strategy, we estimate impacts on reenrollment, credits, grades, and degree completion. The price shock led to an immediate 8 percent fall in senior college students' enrollment. Senior college students who entered college the semester prior to the price shock experienced lasting reductions in attainment, including a 22 percent decrease in degree receipt. Conversely, among senior college students who been enrolled for at least a year, the price shock only affected the timing of exit.

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1 Introduction

Undocumented college students lie at the intersection of policy debates about immigration reform and growing higher education costs in the United States. While efforts to pass legislation extending federal financial aid to undocumented students attending US colleges and universities have not been successful, currently, 18 states have extended in-state tuition benefits to these young adults. Given the limited resources at undocumented students' disposal, the in-state subsidy represents a substantial reduction in postsecondary costs, since at most public four-year institutions, out-of-state tuition is more than twice the in-state cost (Hemelt and Marcotte, 2011). Although an extensive literature suggests that decreases in postsecondary prices can increase college entry (e.g., Deming and Dynarski, 2010), low college completion rates underscore the importance of understanding the impact of price shocks on enrolled students' ultimate attainment (Bound, Lovenheim and Turner, 2010).

In this paper, we estimate the impact of a tuition increase on the postsecondary outcomes of undocumented college students within a major urban university system. For a single semester, the City University of New York (CUNY) reversed its long-standing policy of charging in-state tuition rates to undocumented students from New York. For students enrolled in one of CUNY's "senior" colleges (institutions that offer both bachelor's and associate's degrees), tuition increased by 123 percent, while associate's degree-seeking community college students experienced a 23 percent price increase.[1] This one-semester price shock offers a natural experiment for examining the effect of tuition on undocumented students' attainment, measured by their reenrollment, credit accumulation, grades, and degree receipt.

To identify impacts on short-run outcomes, we use a generalized differences-in-differences identification strategy that compares changes in undocumented students' outcomes before and after the tuition hike to differences in the outcomes of documented noncitizens, a group unaffected by the policy change. The elimination of the in-state tuition subsidy substantially decreased undocumented senior college students' short-run attainment, with reenrollment falling by 8 percent in spring 2002. Conversely, among undocumented community college students, the price increase did not affect reenrollment but resulted in an approximately 8 percent decrease in credits earned. We can rule out all but very small impacts on grades and provide evidence that senior college students induced to leave school by the price shock were not negatively selected, on average.

We estimate that over half of the senior college students induced to drop-out by the spring 2002 price

[1] Though postsecondary institutions are typically classified as "four-year" or "two-year", we use the CUNY System's label of "senior" college (as opposed to "four-year" college) because approximately 40 percent of CUNY's senior college students start out in an associate's degree program and these students face the same tuition charges as senior college students enrolled in a bachelor's degree program. Thus, the magnitude of the price change is specific to the institution, not the degree. We elaborate on this point in Section 2.

shock would not successfully maintained enrollment in the following semesters, even in the absence of any price increase. For these "inframarginal" students, the price shock affected the timing of college exit but not long-run attainment. We document that inframarginal exits are driven by students from the 1999 and 2000 entry cohorts, who spent at least one year in college before the price shock occurred. Conversely, senior college students who entered college in fall 2001 - the semester immediately prior to the price shock - experienced lasting reductions in attainment. One interpretation of this finding is that as college students gain more experience, they are better able to predict their long-run success. As a result, price shocks close to college entry are more likely to affect marginal students who would have ultimately been successful.

To estimate the long-run impacts of the price shock, we compare the outcomes of undocumented students in the the 2000 and 2001 entry cohorts to those of undocumented students who started college in 1999, again using differences in documented noncitizens' outcomes by entry cohort to generate a counterfactual. We estimate that the price shock experienced by undocumented senior college students from the 2001 entry cohort resulted in a 22 percent decrease in degree receipt within eight years of entry. We find no evidence of heterogeneous impacts of the price increase by entry cohort on community college students' outcomes and no evidence of long-run impacts on degree receipt or credit accumulation.

Our paper contributes to two relatively underexplored areas relevant to the economics of higher education and immigration reform. First, we provide strong evidence that price shocks affect the outcomes of students who have already enrolled in college. Research reviewed by Deming and Dynarski (2010) points to significant increases in college-going among students who experienced an exogenous drop in price due to policy changes, such as the introduction of a state merit-based aid program. However, there is less evidence on the impact of price changes on the postsecondary attainment of students after they have already spent time in college. Although gaps in college attendance by family income have shrunk in recent years, poor students' graduation rates remain low (Bailey and Dynarski, 2011), suggesting that the effects of financial need on attainment persist beyond the enrollment margin. Undocumented youth likely face similar or larger financial constraints than poor young adults who are citizens due to a lack of access to formal credit markets and federal and state need-based financial aid.

A handful of studies suggest that increases in need-based grant aid may increase the attainment of enrolled students when such increases are not offset by reductions in other aid.[2] Bettinger (2004) provides evidence that Pell Grant aid may increase Ohio public college students' reenrollment.[3] Goldrick-Rab et al. (2012) examine the impact of a need-based grant program that provided additional funding to a randomly-

[2]A related topic is the role of credit constraints in students' postsecondary decisions. In a setting where students faced no direct tuition charges, Stinebrickner and Stinebrickner (2008) find that most dropouts do not face credit constraints, suggesting a potentially large role for non-financial factors in students' persistence decisions.

[3]Estimates suggest that an additional $1,000 in Pell Grant aid increases reenrollment by 3 to 4 percentage points, although these estimates are not robust to controlling for institution fixed-effects.

selected group of bachelor's degree-seeking Pell Grant recipients attending public institutions in Wisconsin. When the additional grant aid was not offset by reduced borrowing, the authors find impacts on first- to second-year reenrollment. Illustrating the importance of accounting for loan crowd-out, Marx and Turner (2015) estimate that Pell Grant aid does not increase persistence or attainment in a setting where additional grant aid reduces aid from federal loans. Castleman and Long (2013) estimate the impact of state need-based grant aid on Florida high school graduates' college enrollment and attainment and impacts on both initial enrollment and degree receipt. However, the positive effect of grant eligibility on enrollment makes it is difficult to determine whether grant aid eligibility increased attainment above and beyond its impacts on college attendance. Addressing concerns of both selection into college and crowd-out of federal and institutional grant aid, Angrist et al. (2014) examine the impact of a merit-based scholarship in Nebraska. They find substantial impacts on the persistence of nonwhite students, but estimate that overall, at least 80 percent of funds were spent on applicants whose behavior was not affected by the grant.[4]

We build on this literature by estimating both short- and long-run impacts of a price shock on enrolled students' outcomes. Since undocumented students are ineligible for federal grants and loans, our context allows us to isolate the impact of price increases on student outcomes, as price increases cannot be offset by changes in grant aid or borrowing. Finally, ours is the first study to provide suggestive evidence that students early in their college careers are more vulnerable to price increases than more experienced students.

Our paper's second contribution is to provide direct evidence on how tuition shocks affect the attainment of undocumented students. Like other low-income, first generation college students in the U.S., undocumented students are likely more price sensitive than the average college student (Gonzales, 2011). Undocumented students also face a severely restricted labor market, which may render a college degree less (or perhaps more) valuable to them than other low-income students. Understanding the effect of tuition and aid policies on this population is particularly important as recent discussions around immigration reform have focused on providing undocumented youth with a pathway to citizenship through college attendance and completion.

Four prior studies use national survey data and a standard difference-in-difference framework to estimate

[4]A related body of research explores the role of monetary incentives tied to other supports (such as mentors) or requirements (such as a minimum course load or grade point average) on enrolled students' effort and degree completion. Dynarski (2008) estimates positive impacts of state merit-based aid on persistence and graduation with larger effects among female students. Scott-Clayton (2011) studies West Virginia's PROMISE scholarship and finds positive impacts only during years in which aid was tied to performance. Results from the Student Achievement and Retention Project, an experimental study that randomly-assigned students in a Canadian university to receive financial aid (tied to grades), support services, or both, suggests higher levels of merit aid coupled with support services increased female (but not male) students' grade point average and persistence(Angrist, Lang and Oreopoulos, 2009). However, a follow-up study that involved stronger incentives found smaller impacts on attainment (Angrist, Oreopoulos and Williams, forthcoming). Finally, a series of papers examine the impact of randomly assigned student incentives and find evidence of small, but significant impacts on attainment (e.g., Patel and Rudd, 2012; Barrow et al., forthcoming). Although most studies examining student incentives in higher education find positive impacts on enrolled students' attainment, assistance is based on performance and often involves both monetary and additional supports. Our study focuses exclusively on the estimation of tuition price effects.

the effects of in-state tuition subsidies on undocumented students' college enrollment decisions. Kaushal (2008), Chin and Juhn (2011), and Darolia and Potochnick (2014) examine the average effects of in-state tuition programs offered in all states, while Flores (2010) focuses on the effects of the Texas program. All four studies rely on data from the Current Population Survey (CPS) or the American Community Survey (ACS) and proxy for undocumented status with Mexican (or Hispanic) students who are not citizens. Three of the four studies find positive impacts of eligibility for the in-state tuition subsidy on college enrollment of 2 to 6 percentage-points (Kaushal, 2008; Flores, 2010; Darolia and Potochnick, 2014). However, since the CPS and ACS do not distinguish between documented and undocumented noncitizens, such analyses potentially misestimate aid effects on undocumented students' enrollment. In addition, none of the studies examine how prices affect the attainment of undocumented students who have already enrolled.

The remainder of this paper proceeds as follows: in Section 2, we describe the CUNY system and provide background information on the circumstances of undocumented young adults. We discuss our data and sample in Section 3 and describe our empirical approach in Section 4. In Section 5, we present estimates of the impact of the price increase on undocumented students' attainment during the semester of the policy change and in the immediately following semesters. Section 6 presents our estimates of the impact of the tuition increase on longer-run outcomes, including degree receipt, while Section 7 concludes.

2 The CUNY System and Undocumented Students

As an established immigrant gateway, New York is home to approximately three million foreign-born residents, an estimated 625,000 of whom are undocumented (American Community Survey, 2010; Passel and Cohn, 2010). In fall 2013, approximately 8,300 undocumented students were enrolled in New York state colleges, with 80 percent residing in New York City and attending one of the CUNY System institutions (DiNapoli and Bleiwas, 2014).[5]

In the period we examine, the CUNY System included 11 senior colleges and 6 community colleges. We label CUNY schools as senior or community colleges instead of using the standard labels of two- or four-year institutions because four of the 11 senior CUNY colleges offer both associate's and bachelor's degree programs.[6] In addition, CUNY senior college students who are enrolled in an associate's degree program face the same tuition rates as those in a bachelor's degree program. In 2001, nominal in-state tuition for a full-time student was $3,200 per year at senior colleges and $2,500 per year at community colleges.

[5] An additional 18 percent of undocumented students were enrolled in a SUNY institution in one of the five counties surrounding New York City, and the remaining 2 percent attended a SUNY institution elsewhere in the state.

[6] This practice is not unique to the CUNY System; according to data from the Integrated Postsecondary Education Data System, 60 percent of public institutions categorized as "four-year" schools in 2013 also offered certificate or associate's degree programs.

Our identification strategy relies on unanticipated shocks to undocumented students' eligibility for the in-state tuition rate. In 1989, long before any US state considered granting in-state tuition to undocumented students, New York City Mayor Edward Koch issued an executive order that extended in-state rates to CUNY students who lacked documentation but who could demonstrate that they graduated from a New York high school or received a GED from the state (Rincón, 2008). Yet in the fall of 2001, shortly after the terrorist attacks of September 11, the CUNY Chancellor overturned the policy and announced that the institution would charge undocumented students who had previously qualified for the in-state subsidy out-of-state tuition rates.[7] CUNY's new tuition policy was in place for exactly one semester (spring of 2002) and was subsequently overturned by the New York State legislature, which passed a law in the summer of 2002 that reinstated in-state tuition benefits for eligible undocumented students.[8] During the spring of 2002 only, the tuition rates for undocumented students at senior colleges (including those in associate's and bachelor's degree programs) more than doubled (from $133 to $283 per credit). With a full-course load of 12 credits, this represented a tuition increase of $1,800 in the spring of 2002. For undocumented community college students, the price increase was smaller (from $104 to $128 per credit), with the policy change increasing full-time students' tuition by approximately $300 (23 percent).

2.1 Characteristics and outcomes of undocumented students

The Pew Hispanic Center estimates that there are approximately 1.7 million undocumented immigrants under the age of 31 who migrated to the US at before they were 16 (Passel and Lopez, 2012). The proposed the *Development, Relief, and Education for Alien Minors* (DREAM) Act provides eligible youth with a pathway to permanent residency status and access to federal benefits, such as aid for college.[9] Congress voted against the DREAM Act in 2001, 2007 and 2010. In 2012, the Obama administration announced the *Deferred Action for Childhood Arrivals* (DACA) program, which is an executive order that shields eligible undocumented immigrants from deportation and provides them with temporary work authorization. As part of his larger executive action on immigration reform announced in November 2014, President Obama expanded eligibility for the DACA program. In addition, over a dozen states have passed legislation to extend in-state tuition benefits to eligible undocumented college students enrolled in public institutions; as of 2014,

[7] See, for instance, Karen W. Arenson's 2001 *New York Times* article, "CUNY raises tuition rates for foreigners here illegally." Downloaded on 2/2/2014 from http://www.nytimes.com/2001/11/03/nyregion/cuny-raises-tuition-rates-for-foreigners-here-illegally.html.

[8] As of February 2002, this legislation was largely unanticipated, according to Joyce Purnick's *New York Times* article, "Metro Matters; Tuition, Out of State And Beyond," (downloaded 1/5/2015 from http://www.nytimes.com/2002/02/18/nyregion/metro-matters-tuition-out-of-state-and-beyond.html). However, by April, Governor George Pataki had announced his support of legislation offering in-state tuition to undocumented students with ties to New York State. See Sara Hebel's May 2002 *Chronicle of Higher Education* article, "N.Y. Governor Backs Plan to Help Some Illegal Immigrants."

[9] In addition to removing the threat of deportation and the opportunity for legal employment, the bill encourages college enrollment by offering a pathway to legalization for students who obtain a college degree.

all of the top immigrant-receiving states (including California, New York, Texas, Florida, New Jersey, and Illinois) have granted the subsidy to eligible undocumented youth.

Despite the ample policy attention given to undocumented college students, there are few large-scale analyses of their outcomes because federally-sponsored surveys and other administrative data sources are prohibited from asking respondents to state their immigration status. Several qualitative studies of undocumented college students identified through non-probabilistic sampling methods find that students who lack documentation face substantial barriers to college success (Abrego, 2006; Contreras, 2009; Perez, 2009; Gonzales, 2011; Muñoz and Maldonado, 2012). Most undocumented students come from families with limited financial resources and parents who are themselves undocumented and unable to provide guidance and support in navigating US institutions. Thus, undocumented students face many of the same hurdles faced by other low-income, first generation, college students. Their lack of documentation poses greater challenges to normal college pursuits, such as obtaining driver's licenses, places to live, student identification cards, and employment both off and on campus (Contreras, 2009; Muñoz and Maldonado, 2012).

At the same time, these studies suggest that undocumented youth demonstrate a high level of ambition and resilience. Consistent with this anecdotal evidence, Conger and Chellman (2013) find that undocumented students in the CUNY System tend to resemble other noncitizen immigrant groups (namely permanent residents and visa holders) on academics, all of whom earn higher GPAs and complete more credits than US citizens. These findings are in line with the research on immigrant students in the K-12 education system, which often finds that they are a positively-selected group who outperform native-born students with observably-similar race and class profiles (e.g., Kao and Tienda, 1995; Schwartz and Stiefel, 2006).

In short, many undocumented college students appear to fall in the category of high-ability, low-income students. As low-income students, they should be highly responsive to tuition shocks. Furthermore, they are ineligible for most other sources of financial aid and loans and are less able to compensate for tuition increases with anything other than employment in the informal labor market or loans from family members or other informal sources. Following the news that tuition will increase in the next semester, we predict that some undocumented students will exit college, reduce their credit-load, and/or devote less time to their school work. These negative impacts may continue in later semesters even when the in-state rates are restored if students face costs associated with switching between working and attending college or expect to face other tuition increase in the future.[10]

[10]While some students can also choose to lower their consumption, two-thirds of students enrolled in the CUNY System already live with their parents or guardians making reductions in housing consumption less of an option for lowering the cost of attendance. See CUNY's "2012 Student Experience Survey," available at: http://cuny.edu/about/administration/offices/ira/ir/surveys/student/SES2012FinalReport.pdf for further details (accessed 23 September 2014).

3 Data and Sample

Our analyses rely on administrative data from the CUNY System, which contains information on first-time, degree-seeking students' demographic characteristics and academic outcomes. Crucially, CUNY records students' citizenship and immigration status in the US for the purpose of tuition determination. Upon enrollment, students are asked to identify themselves as US citizens, permanent residents, student or temporary visa holders, asylees or refugees, or undocumented.[11] Students must submit documentation to validate their self-reported status and those who either report that they are undocumented or who fail to provide valid documentation (e.g., current visa, temporary authorizations to live and work in the US) are recorded as undocumented. To qualify for in-state tuition, undocumented students are required to submit a notarized affidavit stating that they plan to legalize their status as soon as they are eligible. These students also must demonstrate that they received their secondary schooling in New York State, either from a New York high school or GED program.

The first three columns of Table 1 display the characteristics of the 61,074 students who earned a high school degree or GED and belonged to one of the cohorts that entered college between fall 1999 and fall 2001, by citizenship and documentation status. Of these students, 29 percent are noncitizens and approximately 3 percent are undocumented. Our main sample consists of the 17,915 noncitizen students who obtained a high school diploma or GED from New York State and entered an associate's or bachelor's degree program between fall 1999 and fall 2001.[12]

Compared to noncitizens, CUNY students with US citizenship are younger, more likely to be Hispanic or White and less likely to be Asian. Citizens are also slightly more likely to be classified as disabled at entry. Citizens are less likely to have graduated from a New York City high school or be GED recipients compared to noncitizens. Although citizens enter CUNY with lower high school achievement, as measured by the CUNY college admissions average, a standardized measure of high school GPA ranging from 0 to 100, they are less likely to require remedial classes compared to noncitizens.

Documented and undocumented noncitizen students also differ by their racial/ethnic backgrounds; un-

[11] A US citizen is an individual who either was born in the US or obtained citizenship through the process of naturalization. Permanent residents (also known as a green card holders) are defined by the US Citizenship and Immigration Services as "any person not a citizen of the United States who is residing the in the U.S. under legally recognized and lawfully recorded permanent residence as an immigrant" (see the U.S. Citizenship and Immigration Services Glossary, available at: http://www.uscis.gov/tools/glossary). Visa holders are individuals who reside in the U.S. temporarily for a specific purpose, typically to work or attend school. Finally, an undocumented immigrant is one who does not have legal authority to live or work in the US. This status is achieved either by entering the country illegally, or by violating the terms of a legal visa. US citizens and permanent residents are eligible for all forms of aid and loans from governmental and private sources. Most visa holders are ineligible for these sources of aid, with the one exception being Cuban and Haitian entrants.

[12] Among the 83,041 degree-seeking students in these entry cohorts, we drop 5,033 (6 percent) with missing citizenship or documentation information and an additional 455 (less than 1 percent) missing age at entry. Additionally, restricting our sample to students who earned their high school diploma or GED in New York State excludes 375 (17 percent) undocumented students and 8,553 (35 percent) documented noncitizens. We impose this restriction to ensure that undocumented students in our sample were eligible for in-state tuition prior to Fall 2001 and to increase the comparability of documented and undocumented noncitizens. Among citizens, 7,555 (15 percent) are excluded due to this restriction.

documented students are more likely to be Black and less likely to be White or Asian than their documented classmates. Undocumented students are the least likely of the three groups to pursue a bachelor's degree at entry, and enter less selective CUNY institutions than citizens and documented noncitizens.[13] Finally, undocumented students are more likely to be GED recipients and less likely to be graduates of New York City high schools compared to documented students.

The final three columns of Table 1 display p-values from tests of the equality of the characteristics of citizen versus noncitizen students, undocumented versus documented noncitizens, and all three groups, respectively. Although many of the differences in characteristics across groups are statistically significant, by in large, these differences are small in magnitude, especially when comparing documented and undocumented noncitizens. Appendix Tables A.1 and A.2 display the characteristics of senior and community college students, respectively; after conditioning on college type, we find even fewer significant differences in the characteristics of documented and undocumented students.

Table 1 also highlights one of the unique features of our study location. New York City is one of the largest cities in the US with a diverse student population (of both natives and immigrants). Undocumented students in New York City come from all over the world, not just from Latin and South America as is common in other regions. Thus, the responses of CUNY undocumented students to tuition shocks may not resemble the responses of other undocumented students across the nation. We address concerns over the generalizability of our estimates by examining whether the impact of the tuition increase varies by race/ethnicity.

4 Empirical Framework

Our setting allows us to address several challenges that are inherent to estimating the effect of prices on enrolled students' postsecondary outcomes. First, the decision to reverse the in-state tuition policy appears to have been made in reaction to 9/11 and not to any patterns observed among undocumented students or documented students (Rincón, 2008). Thus, there is no reason to expect that the students who experienced the price change differ from their unaffected counterparts on relevant drivers of attainment, such as financial need, courses, institutions, or grades. Second, undocumented students are ineligible for most other sources of federal, state, or private grant aid and loans, making it difficult for the undocumented to buffer the tuition hike with increased financial support from other sources.[14] In addition, no exceptions to the policy appear

[13] We classify institutions' selectivity using the Barron's Guide, which places the following colleges in each rank: "Very Competitive" includes Baruch; "Competitive" includes Brooklyn, City, Hunter, John Jay, and Queens; Less "Competitive" includes Lehman; "Noncompetitive" includes City Tech, Medgar Evers, New York City College of Technology, Staten Island, and York; "Nonselective" includes Borough of Manhattan Community College and Bronx, Hostos, Kingsborough, LaGuardia, and Queensborough Community Colleges.

[14] Undocumented students are ineligible for all federal sources of aid and loans, including the Pell and Stafford programs. They are also ineligible for the New York Tuition Assistance Program (TAP), the New York State funded grant to low-income students of up to $5,000.

to have been made, or additional supports made available, rendering all previously-eligible undocumented students subject to the same price increase. These unique circumstances means that our estimates will more closely measure the theoretical effects of price shocks on postsecondary attainment than studies that examine the effect of a specific subsidy (e.g., Pell Grant aid) on students who have access to other potentially offset financial resources.

Additionally, our data and context allow us to overcome a challenge faced by researchers examining the outcomes of undocumented youth. Most surveys do not request that respondents state their immigration status or provide documentation to validate their responses. Thus, the handful of studies that have examined the effect of in-state tuition subsidies on undocumented students' college-going code both undocumented students and other noncitizen immigrants (namely, those with legal visas and permanent residents) as treatment group members, leading to measurement error that likely biases estimates. These studies also cannot rule out the possibility that changes in tuition policies affect both undocumented and documented noncitizens via reductions in "chilling" effects.[15] We address this challenge by using documented noncitizens as our primary control group. If the tuition increase led noncitizens to feel less welcome in the CUNY System, our approach will difference out these non-price impacts on attainment.

To estimate the effects of the policy change, we focus on outcomes in the three semesters surrounding the policy change and the semester of the price shock: fall 2000 through fall 2004 (with spring 2002 at the center of the series).[16] We estimate generalized differences-in-differences models, where we allow the impact of the policy change to have persistent effects after the policy change was reversed:

$$Y_{isct} = \beta_1 Treat_t \times Undoc_i + \beta_2 Post_t \times Undoc_i + \boldsymbol{\gamma}\mathbf{X_i} + \delta_{sc} + \delta_t + \tau \times \delta_c + \epsilon_{isct} \quad (1)$$

Where Y_{isct} is one of several attainment outcomes in semester t for student i who initially entered college s as a member of cohort c, and $\tau = t - c$ represents semesters since entry. $Undoc_i$ is set to one if the student is undocumented and $\mathbf{X_i}$ is a vector of student covariates measured in the first semester of college including indicators for documentation status, initial degree program, high school GPA, high school type (NYC public, NYC private, GED, or other New York state school), need for remedial courses, disability, age, gender, race/ethnicity (Black, Hispanic, White, or other), and single parent status. We include semester and college by cohort fixed effects, δ_t and δ_{sc}, respectively, and cohort-specific linear trends $\tau \times \delta_c$. Finally, under the identifying assumption that the outcomes of undocumented and documented noncitizen students would have followed similar trends in the absence of the price increase, ϵ_{isct} represents a random error component.[17]

[15] For instance, Watson (2014) examines the "chilling effect" of policies targeting undocumented immigrants on documented immigrants' behavior and finds evidence of lowered Medicaid take-up among eligible noncitizens.

[16] We also show that our results are robust to larger and smaller windows.

[17] Main effects for $Treat_t$ and $Post_t$ are subsumed by the vector of semester fixed effects while the main effect for $Undoc_i$ is

We estimate separate models for students enrolled in senior and community colleges. Student-semester observations are dropped following degree receipt.[18]

The coefficient on the interaction between the indicator for the semester of the price increase ($Treat_t$) and undocumented status, β_1, represents the change in attainment during the semester of the tuition hike on the outcomes of undocumented students relative to documented noncitizens. Additionally, β_2 represents the change in outcomes for undocumented students in the semesters after the tuition hike (compared to the semesters before the increase) relative to the same change for documented noncitizens. Standard errors are clustered at the cohort by college level.

The main identifying assumption underlying our research design is that, in the absence of the tuition increase, the choices of documented noncitizen and undocumented students in the spring 2002 and later semesters would have followed similar trends. A possible violation of this assumption would be underlying trends in the outcome variables that are correlated with the policy change. Examination of the pre-policy trends in attainment, discussed in the following section, suggests that prior to the policy change, outcomes of documented and undocumented noncitizens followed similar paths.

Yet in this case, a stronger potential violation is the terrorist attacks of September 11, 2001. These attacks had a major impact on New York City residents and their institutions and may have uniquely influenced the schooling choices of the city's immigrant students. If the undocumented students felt disproportionately impacted, perhaps reducing their schooling investments due to a decrease in morale or increased fear of deportation, then observed changes in spring 2002 could be due to the terrorist attack and not to the change in the tuition policy. Though we are unable to directly examine the academic response to 9/11, we can test whether the policy change led to significant reductions in attainment among documented noncitizens relative to citizens. Documented noncitizens at CUNY were not directly subject to the new tuition policy, but they were subject to the post 9/11 environment in the city and may have felt a similar level of hostility and reduction in attachment to US institutions. We find no evidence that documented noncitizens' enrollment or attainment was negatively impacted by 9/11 relative to citizens (results available upon request).

5 The Impact of Tuition Increase on Attainment

Figures 1 through 3 illustrate our identification strategy and preview our main results. Panels A and B display plots of average reenrollment, credits attempted, and credits earned of citizens, documented noncitizens, and undocumented students over the seven semesters surrounding the policy change.[19] The sample in Panel A

included in $\mathbf{X_i}$.

[18] Only 2 percent of student by semester observations are dropped due to this restriction.

[19] Note that we use the term "reenrollment" as opposed to "enrollment" as the latter is typically used to refer to the decision to pursue a degree. We also do not use the term "persistence" because we focus here on reenrollment that is not conditional on

is limited to students who initially enrolled in a CUNY senior college between fall 1999 and fall 2001, while Panel B is limited to community college students in these entry cohorts. Since these outcomes are not conditioned on enrollment, changes in credits attempted and earned will represent a combination of intensive (e.g., course load reductions or less effort devoted to courses) and extensive margin (e.g., drop-out) responses. The solid black line represents the average outcomes of undocumented students, the dashed dark gray line represents the average outcomes of documented noncitizens, and the solid light gray line represents the average outcomes of citizens. Thus, the difference between the black and dashed gray lines before the policy change to the difference between these outcomes in the semester of (and after) the tuition increase approximates our differences-in-differences estimates.

Panel A of Figure 1 displays average reenrollment among CUNY students who initially entered a senior college. Prior to spring 2002, both groups of noncitizens were more likely to reenroll relative to citizens. The general decline in mean reenrollment for all groups reflects decreases in persistence over time. Among senior college students, reenrollment rates for documented noncitizen and undocumented students are quite similar prior to spring 2002. Yet, in the spring of 2002, when undocumented students' tuition rates doubled, reenrollment drops substantially. Following spring 2002, reenrollment of all three groups continues to monotonically decline, but relative to documented noncitizens and citizens, decreases in undocumented students' reenrollment slow slightly after in-state tuition rates were restored, suggesting that some portion of the students induced to leave school by the tuition hike would have left in the following semesters even in the absence of a price increase. Conversely, trends in community college students' reenrollment shown in Panel B suggest that the price shock did not lead to changes in undocumented students' reenrollment relative to their documented or citizen peers.

Figures 2 and 3 display trends in credits attempted and credits earned, respectively. Both documented and undocumented noncitizens attempt and earn more credits than citizens. Among senior college students, trends in credits attempted and earned are similar for documented and undocumented noncitizens before the policy change. In the semester of the price increase, undocumented senior college students' attempted and earned credits fall by more than that of documented students, suggesting that the policy change reduced both credits attempted and earned. Following spring 2002, undocumented senior college students' credit accumulation rebounds slightly, but remains lower than in the pre-spring 2002 semesters. Among undocumented community college students, pre-spring 2002 trends in credit accumulation do not track documented noncitizens' trends as well as in the case of senior college students. Additionally, 2 and 3 show no evidence of significant decreases in credits attempted or earned except in the spring 2002.

the previous semester (later, we examine persistence rates where renerollment in time t is conditional on enrollment in $t-1$).

5.1 Regression results

Table 2 reports the coefficients and standard errors on the interaction of undocumented status and indicators for the semester of the price increase (spring 2002) and semesters following the price increase (post-spring 2002) from estimation of Equation (1). We examine impacts on reenrollment (Panel A), credits attempted (Panel B), and credits earned (Panel C). For each regression, we provide the test of equality between the estimated parameters on the interaction of undocumented and spring 2002 and the interaction of undocumented and post-spring 2002. This allows us to test whether the initial impacts of the price increase led to persistent reductions in undocumented students' attainment relative to documented noncitizens. Again, we do not condition on enrollment when estimating impacts on credits attempted and earned, therefore, our point estimates represent the combined impact of the price increase on intensive and extensive margin responses by undocumented students.

Reenrollment of undocumented senior college students fell by 7 percentage points (8 percent relative to fall 2001 reenrollment rates) in spring 2002. Among undocumented community college students, we find small and insignificant impacts of the price increase on reenrollment in both spring 2002 and later.[20] Our estimates imply a price elasticity of enrollment equal to -0.06 for senior college students and -0.08 for community college students. Thus, even though the estimated impact of the price shock on community college students' reenrollment is substantially smaller than that of senior college students, because the price shock undocumented community college students were exposed to was also small, our estimates imply a slightly larger (albeit insignificant) price elasticity of reenrollment.

The price shock led to smaller, but still significant impacts on senior college students' reenrollment in the semesters after the tuition hike was reversed, resulting in a 3 percentage point (4 percent) decrease in reenrollment. The difference between the immediate and medium-run impacts of the tuition hike on enrollment suggest that either some undocumented senior college students induced to leave college in spring 2002 returned to school after in-state tuition rates were restored or that approximately half of the students who initially dropped out in response to the price shock would have left in the following semesters even in the absence of the policy change. We distinguish between these explanations by examining whether the the probability of returning to a CUNY institution, conditional on having dropped-out, increased among undocumented students in the post-spring 2002 semesters. We find no evidence that undocumented senior college students who left CUNY in spring 2002 or earlier were more likely return to college once in-state

[20] We can reject the equality of the estimated impact of the price increase in spring 2002 for community and senior college students with $p = 0.005$, but the difference in the estimated impact of the price change after spring 2002 is not statistically significant ($p = 0.291$).

tuition rates were restored.[21]

Undocumented students in both senior and community colleges attempted and earned fewer credits in spring 2002 (Table 2, Panels B and C).[22] Undocumented senior college students attempted 0.9 fewer credits in spring 2002 (a 10 percent decrease relative to fall 2001) and earned 0.8 (9 percent) fewer credits. Undocumented community college students attempted and earned 0.4 fewer credits in spring 2002, representing 7 and 8 percent declines from baseline attainment, respectively. Both groups of students continued to earn fewer credits even after in-state tuition rates were restored. The similarities between impacts on credits attempted and earned, as well as the trends shown in Figures 2 and 3, suggest that observed decreases in credit accumulation are largely driven by decreases in credits attempted, rather than declines in course pass rates. Thus, we focus on estimating impacts on credits earned in our regression analyses. Estimated impacts on credits attempted quite similar (available upon request).[23]

In Figures 4 and 5, we display point estimates and corresponding 95 percent confidence intervals from a modified version of equation (1), where $Treat_t \times Undoc_i$ and $Post_t \times Undoc_i$ are replaced with interactions between $Undoc_i$ and a set of indicators for semesters before and after the price increase. Fall 2001 (the semester immediately prior to the price shock) serves as the omitted category. These "event study" models serve two purposes. First, we can test for differences in the trends in documented and undocumented students' outcomes prior to the price shock. Second, we can test how the impact of the price shock changes in each semester after spring 2002.

Prior to the price shock, differences in reenrollment rates between documented and undocumented senior college students were not statistically significant (Figure 4, Panel A). However, undocumented senior college students were more than 5 percentage points less likely to reenroll in spring 2002 and around 3 percentage points less likely to reenroll in fall 2002. After fall 2002, impacts on undocumented senior college students' reenrollment remain negative but are no longer statistically significant. Conversely, we find no evidence of statistically significant decreases in enrollment of undocumented community college students in spring 2002 or later semesters relative to their documented peers (Panel B). Differences in reenrollment three semesters prior to the price shock are statistically significant, suggesting that among community college students, trends in documented noncitizens' outcomes may not provide as good a counterfactual for undocumented

[21] Our point estimates, although insignificant, suggest that undocumented senior college students were 3.4 percentage points (14 percent) less likely to return to a CUNY institution after spring 2002 (full results available upon request).

[22] We can reject the equality of the estimated impact of the price shock on credits attempted by senior versus community college students in spring 2002 with $p = 0.032$. Differences in estimated impacts on credits earned in spring 2002 are not statistically significant ($p = 0.103$). In the semesters after spring 2002, impacts on credits attempted and earned are not statistically distinguishable between senior and community college students ($p = 0.400$ and $p = 0.520$ for credits attempted and earned, respectively).

[23] We also investigate whether the impact of the price increase on senior college students differed by students initial degree program, since some senior colleges contain both bachelor's and associate's degree seeking students. As shown in Appendix Table A.3 , none of the differences in the estimated impact of the price increase by degree program are statistically significant.

students as in the case of senior college students.

Trends in credits earned for documented and undocumented senior college students prior to the price shock are not statistically distinguishable (Figure 5, Panel A). Although the drop in credits earned by undocumented senior college students relative to their documented counterparts is largest in spring 2002, statistically significant differences in credit accumulation persist in the next two semesters. Among undocumented community college students, only the spring 2002 difference in credit accumulation is statistically significant at the 95 percent level (Panel B).

5.2 Robustness tests

Tables 3 and 4 display estimated impacts on reenrollment and credits earned from additional robustness tests. Column 1 includes estimates from models that include student fixed effects. Column 2 contains estimates from models that use a larger window around the policy change (4 semesters) and column 3 contains estimates from models that use a smaller window (2 semesters).

Including student fixed effects will account for time-invariant characteristics that are specific to students. To the extent that students' time-invariant unobservable characteristics are correlated with both their attainment and exposure to the policy change, our main results will suffer from omitted variables bias. Conversely, our fixed effects models use students' own pre-treatment outcomes as their counterfactual outcome in the absence of the policy change. In this case, documented noncitizens only allow us to identify cohort by school and semester fixed effects, as these students experience no change in their exposure to the tuition increase. The disadvantage of using student fixed effects is that attenuation bias due to measurement error in the "treatment" variables will be exacerbated, biasing our estimates towards zero. Even if documentation status contains minimal measurement error, our "treatment" variable will contain measurement error by construction. This is because not all students are still enrolled in spring 2002, but we treat all students as being affected by the price increase. The second and third robustness tests vary the size of the window around the policy change that we use to define our sample, to show that our results are not driven by the three semester window we use in our main specification.

Overall, we find similar impacts of the price increase on undocumented students' reenrollment using these alternative models (Table 3). Including a larger or smaller window around the price increase results in estimates that are quite similar to our main results. Impacts on undocumented community college students' reenrollment are insignificant in every specification. The estimated impacts of the policy change on credits earned are also robust to these alternative specifications (Table 4). Among senior college students, the estimates suggest that the price increase led to an 8 to 9 percent decrease in credits earned in spring 2002,

and a 5 to 6 percent decrease after the in-state subsidy was restored. Among community college students, estimates suggest that the price increase resulted in an 5 to 8 percent decrease in credits earned in spring 2002 and a 2 to 7 percent decrease in credits earned in the following semesters.

Finally, Fitterman Hall, part of the Borough of Manhattan Community College (BMCC) campus, was destroyed in the attacks, leading to a loss of one-third of the college's classroom space. This shock to college quality may have exacerbated the negative impact of the spring 2002 price increase on undocumented students. In Appendix Tables A.4 and A.5, we show that our main estimates are robust to excluding BMCC students.

5.3 Disentangling extensive and intensive margin responses to the price shock

To better understand how much of the reduction in credits earned by senior college students was driven by decreases in reenrollment, we estimate a second set of models that condition on enrollment. We first examine whether the policy change affected the hazard of reenrollment, which is defined as the probability of reenrolling in semester t conditional on semester $t-1$ enrollment (Table 5, Panel A). Consistent with the estimates displayed in Table 2, undocumented senior college students experienced a a 6.5 percentage point (7 percent) decrease in persistence in spring 2002. Among community college students, our estimates suggest that the price increase led to an insignificant 1.8 percentage point (2 percent) decrease in persistence. Unlike our unconditional reenrollment estimates in Table 2, we find no evidence of impacts on undocumented students' persistence after spring 2002. This is to be expected since most of the reduced rates of reenrollment in the post-spring 2002 semesters is driven by exits that occurred in spring 2002. In other words, we would not expect students who remained enrolled in the tuition hike semester to be more likely to leave school at higher rates once the subsidy was reinstated.

Next, we examine the impact of the price increase on credits earned by enrolled students (Table 5, Panel B).[24] The price increase led to an insignificant 0.2 (2 percent) decrease in credits earned by senior college students during spring 2002. This point estimate is 23 percent of the size of the estimated impact when we do not condition on reenrollment, suggesting that the price increase primarily reduced senior college students' attainment by inducing students to leave school. In the semesters after spring 2002, enrolled senior students earned 0.3 (3 percent) fewer credits. Compared to senior college students, undocumented student enrolled in community colleges experienced larger reductions in credit accumulation; this difference is marginally significant ($p = 0.083$). Community college students experienced a 0.6 credit (7 percent) decrease in spring 2002 and later semesters. The reductions in attainment that persist after in-state tuition rates were restored to undocumented students could stem from several channels. First, affected undocumented

[24] Separate estimates for senior college students by initial degree program are contained in Appendix Table A.6.

students could respond to the price increase by increasing their non-school work investments (and lowering their course loads). Alternatively, undocumented students who reenroll following the price increase could also be negatively selected, and thus, would have earned fewer credits even in the absence of the policy change and reversal. We find no effect of the price shock on enrolled students' GPA (Table 5, Panel C).[25] Our 95 percent confidence intervals rule out impacts larger than a -0.13 point decrease and a 0.05 point increase in enrolled senior college students' GPAs and a -0.07 point decrease and 0.10 point increase in enrolled community college students' GPAs in spring 2002.

The estimated impacts on credits earned and GPA capture both the effect of the policy change on attainment and effects driven through selection into the sample of enrolled students. We use student fixed-effects models to disentangle these two potentially offsetting impacts. By including a student fixed effect in equation (1), our results will represent within-student variation in outcomes in spring 2002 and later semesters and exclude any contamination due to differential selection into persistence following the price shock. As shown in Appendix Table A.7, estimates impacts on credits earned and GPA from student fixed-effects models are quite similar to those displayed in Table 5, suggesting that the price shock had no effect on undocumented students' grades or credits attempted by senior college students.

We further explore selection into reenrollment in the semester of the price shock by comparing undocumented students who exited college in spring 2002 to those who exited in earlier semesters, with documented noncitizens again serving as a counterfactual. We focus on total credits earned and cumulative GPA in the semester before exit and limit our sample to senior college students, as we find no effect of the price shock on undocumented community college students' exit rates. As shown in Appendix Table A.8, undocumented students induced to leave college by the price shock in spring 2002 had higher cumulative GPAs than those who left college prior to the price shock and had earned significantly more credits. If anything, these results suggest that senior college students that left college due to the price shock were positively selected, on average.

5.4 Heterogeneity by gender and race/ethnicity

Prior research suggests greater sensitivity to tuition supports among female compared to male bachelor's degree-seeking students (e.g., Dynarski, 2008; Angrist, Lang and Oreopoulos, 2009). To determine whether the price increase had larger impacts on female undocumented students' attainment, we estimate equation (1) separately for male and female students. We find no evidence of heterogeneous impacts of the price change

[25] We lose a small number of student by semester observations that are missing GPA (49 senior college students and 14 community college students). We find no relationship between the probability of having a missing GPA in a semester in which the student is classified as being enrolled and the interaction between undocumented status and spring 2002 or post-spring 2002 (available upon request).

on senior college students' outcomes by gender (Table 6). However, among community college students, we find marginally significant heterogeneity in the impact of the price increase on spring 2002 reenrollment. While the price increase did not significantly affect female undocumented students' reenrollment decisions, it led to a 5 percentage point decrease in male students' probability of reenrollment in spring 2002. We can reject the hypothesis that the interaction between undocumented status and Spring 2002 is equal for male and female students with $p = 0.032$.

Next, we test for differences in the impact of the price increase on Hispanic versus non-Hispanic students. Undocumented students in New York City are less likely to be Hispanic than undocumented students elsewhere in the US, therefore, this exercise allows us to determine how generalizable our results are to undocumented students outside of the CUNY system. Again, we estimate equation (1) separately for Hispanic and non-Hispanic students; results are displayed in Table 7. Among both community and senior college students, undocumented Hispanic students' experienced the largest reduction in enrollment and credits earned in spring 2002. In the case of senior college students, differences in the impact of the price increase on credit accumulation between Hispanic and non-Hispanic students are statistically significant ($p = 0.025$).[26]

5.5 Heterogeneity by entry cohort

Finally, we test for heterogeneous impacts of the price increase by entry cohort, separately examining students who entered a CUNY institution in 1999, 2000, and 2001.[27] Earlier cohorts potentially were able to gain experience with college and have a better idea of whether they ultimately would be successful when the price shock hit. Conversely, undocumented students in earlier cohorts may have exhausted more of their personal or family resources, leaving them more vulnerable to the unexpected price shock.

As shown in Table 8, which displays point estimates for the sample of senior college students, we find evidence of heterogeneous responses by the length of time undocumented students had potentially been enrolled when the price shock occurred. The price shock led to a 3 to 7 percentage point (5 to 7 percent) reenrollment decline in spring 2002 enrollment of undocumented students who entered a senior college in 1999 or 2000. However, students in these entry cohorts - who potentially had been enrolled for at least a year when the price shock hit - experienced no lasting declines in reenrollment. The impact of the price shock in the semesters after spring 2002 is small and insignificant. In other words, all of the students in the 1999 and 2000 entry cohorts induced to leave school due to the price shock were inframarginal. For 2001 entrants, the immediate impacts of the price shock was similar to that experienced by earlier cohorts ($p = 0.132$),

[26] In Appendix Table A.9, we display results from models that separate non-Hispanic students into three additional categories: Black, Asian, and White.

[27] We group students by academic rather than calendar year. Thus, students entering a CUNY institution in spring 2000 are classified as entering college in 1999 and students who enter in spring 2001 are classified as 2000 entrants.

resulting in an 8 percentage point (8 percent) reduction in reenrollment. However, unlike undocumented students in earlier entry cohorts, 2001 entrants also experienced lasting declines in enrollment. Specifically, the probability of reenrollment after spring 2001 fell by 7 percentage points (7 percent), suggesting that close to 90 percent of the students induced to leave school by the price shock in the 2001 cohort were marginal, and would have persisted for several more semesters had they not been exposed to the tuition increase. We can reject the equality of post-spring 2002 effects across entry cohorts with $p = 0.013$. We find similar patterns across entry cohorts when examining impacts on credit accumulation. We can't reject the hypothesis that the price shock had similar impacts on credit accumulation in spring 2001 across entry cohorts ($p = 0.224$), and after the in-state tuition subsidy was restored, only 2001 entrants experience lasting reductions in credit accumulation. Finally, we find no evidence of significant impacts on GPA for senior college students in any entry cohort.

In contrast to the patterns we observe in the sample of senior college students, we find no evidence of heterogeneous impacts of the price increase on undocumented community college students' outcomes across different entry cohorts (Table 9). Across all three entry cohorts, impacts on reenrollment are small and insignificant, while impacts on credits earned are significant (or marginally significant) and of a similar magnitude.

To further illustrate differences in the impact of the price shock on short- and longer-run attainment, we estimate "event-study" models in which we replace $Treat_t \times Undoc_i$ and $Post_t \times Undoc_i$ in equation (1) with interactions between $Undoc_i$ and a set of indicators for the semesters before and after the price increase (again, fall 2001 is the omitted category). In this case, we examine impacts on total credits earned (rather than credits earned in a given semester) up to 12 semesters (6 years) after the price shock. We graph these coefficients and 95 percent confidence intervals for senior and community college students separately in Figure 6. The black markers represent point estimates specific to the 2001 cohort, the hollow gray markers represent estimated impacts for 2000 entrants, and the light gray "X" markers represent point estimates for students in the 1999 entering cohort. The shaded areas represent the values contained by the 95 percent confidence intervals for each set of point estimates.

Prior to the price shock, there are no differences in cumulative credits earned between documented and undocumented students in community or senior colleges. As shown in Panel A, undocumented students in the 1999 entry cohort experience a small reduction in cumulative credits in spring 2001, but their credit accumulation is never statistically distinguishable from credits earned by documented students. Undocumented students belonging to the 2000 entry cohort do experience a statistically significant reduction in cumulative credits earned relative to their documented counterparts for several semesters during and following the price shock. However, differences in cumulative credits earned are no longer significant once five semesters after

the tuition hike have passed. Finally, students who entered college in fall 2001 experience immediate and lasting reductions in cumulative credits earned starting in spring 2001. Even 12 semesters later, these students have earned 6 fewer credits in total than their documented peers. As shown in Panel B, we find no evidence of immediate or lasting impacts of the price shock on undocumented community college students' attainment.

6 Longer-Run Outcomes and Degree Receipt

In the previous section, we should that only senior college students belonging to the 2001 entry cohort experienced persistent declines in attainment following the price shock. We build upon these patterns to estimate impacts of the tuition hike on undocumented senior college students' long-run attainment, including cumulative credits earned and degree receipt eight years after entry. To do so, we compare differences in the outcomes of undocumented students who entered college in 1999 relative to cohorts that entered in 2000 and 2001, again using differences in documented noncitizens outcomes across entry cohorts to generate a counterfactual:

$$Y_{isc} = \alpha_{2000} Undoc_i \times \mathbf{1}\left[cohort = 2000\right] + \alpha_{2001} Undoc_i \times \mathbf{1}\left[cohort = 2001\right] + \boldsymbol{\eta}\mathbf{X_i} + \psi_{sc} + \nu_{isc} \qquad (2)$$

Here, Y_{ics} is cumulative credits, associate's degree receipt, and bachelor's degree receipt eight years after entry for student i who initially enrolled in college s in year y. $Undoc_i$ indicates whether a student is undocumented. The interaction between $Undoc_i$ and indicators for belonging to the 2000 or 2001 entry cohort which represents the treatment we are interested in estimating, with corresponding coefficients α_{2000} and α_{2001}. The vector $\mathbf{X_i}$ includes the same set of controls as in our main equation and we include school by cohort fixed effects, ψ_{sc}. Each observation represents a unique student and standard errors are clustered at the school by cohort level. We limit our sample to senior college students; results pertaining to community college students are reported in Appendix Tables A.10 and A.11.

Our identifying assumption rules out unobservable differences between students entering college in 1999 and those entering in 2000 and 2001 that vary with documentation status and affect long-run attainment. Although this assumption is fundamentally untestable, we can test whether there are differences in observable characteristics along these dimensions. Table 10 displays these results. We find no evidence of statistically significant or large changes in the observable characteristics of students by entry cohort that vary by undocumented status and entry. Finally, this approach relies on the assumption that undocumented students who entered a senior college in 1999 were only affected by the price shock in the short-run. If some students in

this entry cohort also experienced declines in their long-run attainment, this approach will provide a lower bound of the true impacts of the price shock on long-run attainment.

Table 11 provides estimates from equation (2) for three samples: Panel A for all senior college students; Panel B for senior college students who initially entered college in a bachelor's degree program, and Panel C for those that initially entered an associate's degree program. Consistent with the results displayed in Panel A of Figure (6), only undocumented students who entered college in fall 2001 accumulated fewer credits over the long-run. Relative to undocumented students who entered college in 1999, 2001 entrants earned 7 fewer credits (a 9 percent decrease). These impacts are driven by bachelor's degree seeking students, who earned 8 fewer credits (a 10 percent decrease).

The second through fourth columns present estimated impacts on degree receipt within eight years of entry. Column 2 present estimated impacts of the price shock on receipt of any degree (including certificates), while columns 3 and 4 focus on receipt of associate of arts or science (AA/AS) and bachelor of arts or science (BA/BS) degrees. Again, only undocumented students who entered college in fall 2001 experienced a reduction in attainment over the long-run. However, these impacts are substantial and include a 10 percentage point (22 percent) reduction in receipt of any degree and a marginally significant 9 percentage point (22 percent) reduction in bachelor's degree receipt. Looking separately at these impacts by initial degree program, impacts on bachelor's degree receipt are driven by bachelor's degree-seeking students, who experienced a 12 percentage point (23 percent) reduction. Associate's degree-seeking senior college students in the 2001 entry cohort were 12 percentage points (46 percent) less likely to earn an associate's degree within eight years of entry.

7 Conclusions

Our results suggest that the CUNY decision to temporarily remove in-state tuition benefits lowered undocumented students' short-run attainment. Senior college students were less likely to reenroll while community college students took fewer credits. Senior college students who entered college the semester prior to the price shock experienced the largest reductions in credit accumulation and degree receipt.

The one semester policy change represented an approximately $1,800 tuition increase for a full-time senior college student (a 123 percent increase). During the semester of the price shock, senior college students' reenrollment rates fell by 6.5 percentage points, which translates into an 8 percent decrease from the fall 2001 reenrollment rate. The magnitude of this effect is at the upper end of recent estimates from Goldrick-Rab et al. (2012) who find that a $1,000 increase in financial aid to Pell-eligible students increases their persistence rates by roughly 2 to 4 percentage points.

Furthermore, undocumented students who entered a senior college the semester before the price shock also experienced reductions in long-run attainment, including a 9 percent decrease in cumulative credits earned and a 22 percent decrease in degree receipt eight years after entry. The latter effect implies a price elasticity of degree receipt equal to -0.18. Although we find evidence that the tuition increase led to a reduction in community college students' credit accumulation in spring 2002, we find no evidence of long-run reductions in their attainment. It is possible that the one-semester $300 price increase (which represented only a 23 percent tuition hike) did not have lasting impacts on community college students' ability to regain their the credits lost in spring 2002 and graduate. Finally, we find no evidence that the tuition hike affected undocumented students' grades.

While our findings suggest that the $1,800 in-state tuition subsidy substantially increases educational attainment for the highly constrained population we examine, the benefit-to-cost ratio of this subsidy is very difficult to calculate. On the benefits side, a major question concerns the labor returns to a college diploma for undocumented youth who currently have no permanent legal authority to live and work in the country. Even students who are enrolled in the DACA program have only temporary authorization and it is unclear whether this program will become permanent legislation. While returns to a year of college have been estimated at roughly 10 percent for an average student (e.g., Card, 1999; Kane and Rouse 1995), the returns for undocumented college graduates may be substantially lower. Though the policy regime may change in the near future, the benefits of increasing the college attainment of undocumented are likely to accrue in non-market realms. For instance, undocumented youth who obtain college diplomas may be more civically engaged, clearly not as voters, but as consumers and participants in the informal civic and political context (e.g., Dee 2004; Milligan, Moretti and Oreopoulos 2004). In addition, assuming these undocumented youth are not deported, many are likely to have children who will be U.S. citizens and who will benefit from having college-educated parents (e.g., Currie and Moretti 2003). In sum, the subsidy is likely to be welfare-enhancing, yet the most substantial private benefits are uncertain given the lack of work authorization.

References

Abrego, Leisy Janet. 2006. "I Can't Go to College Because I Don't Have Papers": Incorporation Patterns of Latino Undocumented Youth. *Latino Studies*, 4(3): 212–231.

American Community Survey. 2010. 2006-2010 American Community Survey 5-Year Estimates, Selected Characteristics of the Native and Foreign-Born Populations, New York City (Place). `http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_10_5YR_S0501&prodType=table`, accessed September 1, 2014.

Angrist, Joshua, Daniel Lang, and Philip Oreopoulos. 2009. Incentives and Services for College Achievement: Evidence from a Randomized Trial. *American Economic Journal: Applied Economics*, 1(1): 136–163.

Angrist, Joshua, David Autor, Sally Hudson, and Amanda Pallais. 2014. Leveling Up: Early Results from a Randomized Evaluation of Post-Secondary Aid. NBER Working Paper 20800.

Angrist, Joshua, Philip Oreopoulos, and Tyler Williams. forthcoming. When Opportunity Knocks, Who Answers? New Evidence on College Achievement Awards. *Journal of Human Resources*.

Bailey, Martha J., and Susan M. Dynarski. 2011. Inequality in Postsecondary Education. In *Wither Opportunity*, ed. Greg J. Duncan and Richard J. Murnane, 117–132. New York, NY: Russell Sage.

Barrow, Lisa, Lashawn Richburg-Hayes, Cecilia Elena Rouse, and Thomas Brock. forthcoming. Paying for Performance: The Education Impacts of a Community College Scholarship Program for Low-income Adults. *Journal of Labor Economics*.

Bettinger, Eric. 2004. How Financial Aid Affects Persistence. In *College Choices: The Economics of Where to Go, When to Go, and How to Pay For It*, ed. Caroline M. Hoxby. Chicago, IL: University of Chicago Press.

Bound, John, Michael F. Lovenheim, and Sarah Turner. 2010. Why Have College Completion Rates Declined? An Analysis of Changing Student Preparation and Collegiate Resources. *American Economic Journal: Applied Economics*, 2(3): 129–157.

Card, David. 1999. The Causal Effect of Education on Earnings. In *Handbook of Labor Economics*Vol. 3A, , ed. Orley Ashenfelter and David Card, 1801–1863. Amsterdam and New York: North-Holland.

Castleman, Benjamin L., and Bridget Terry Long. 2013. Looking Beyond Enrollment: The Causal Effect of Need-based Grants on College Access, Persistence, and Graduation. NBER working paper 19306.

Chin, Aimee, and Chinhui Juhn. 2011. Does Reducing College Costs Improve Educational Outcomes for Undocumented Immigrants? Evidence from State Laws Permitting Undocumented Immigrants to Pay In-State tuition at State Colleges and Universities. In *Latinos and the Economy: Integration and Impact in Schools, Labor Markets, and Beyond*, ed. David L. Leal and Stephen J. Trejo. New York, NY: Springer.

Conger, Dylan, and Colin Chellman. 2013. Undocumented College Students in the United States: In-State Tuition Not Enough to Ensure Four-Year Degree Completion. *Education Finance and Policy*, 8(3): 364–377.

Contreras, Frances. 2009. Sin Papeles y Rompiendo Barreras: Latino Students and the Challenges of Persisting in College. *Harvard Educational Review*, 79(4): 601–631.

Currie, Janet, and Enrico Moretti. 2003. Mother's Education and the Intergenerational Transmission of Human Capital: Evidence from College Openings. *Quarterly Journal of Economics*, 118(4): 1495–1532.

Darolia, Rajeev, and Stephanie Potochnick. 2014. Dreams Deferred? The Educational and Financial Implications of In-State-Resident Tuition Policies for Latino Undocumented Immigrants. Paper presented at the Association for Education Finance and Policy annual meeting, San Antonio, TX.

Dee, Thomas S. 2004. Are there Civic Returns to Education? *Journal of Public Economics*, 88: 1697–1720.

Deming, David, and Susan Dynarski. 2010. Into College, Out of Poverty? Policies to increase Postsecondary Attainment of the Poor. In *Targeting Investments in Children: Fighting Poverty When Resources are Limited*, ed. Phillip Levine and David Zimmerman. Chicago, IL: University of Chicago Press.

DiNapoli, Thomas P., and Kenneth B. Bleiwas. 2014. Update: The New York State DREAM Act. `http://osc.state.ny.us/osdc/rpt11-2014.pdf`, accessed January 18, 2015.

Dynarski, Susan. 2008. Building the Stock of College-Educated Labor. *Journal of Human Resources*, 43(3): 576–610.

Flores, Stella M. 2010. State Dream Acts: The Effect of In-State Resident Tuition Policies and Undocumented Latino Students. *Review of Higher Education*, 33(2): 239–283.

Goldrick-Rab, Sara, Douglas N. Harris, Robert Kelchen, and James Benson. 2012. Need-Based Financial Aid and College Persistence: Experimental Evidence from Wisconsin. Working paper.

Gonzales, Roberto G. 2011. Learning to be Illegal: Undocumented Youth and Shifting Legal Contexts in the Transition to Adulthood. *American Sociological Review*, 76(4): 602–619.

Hemelt, Steven W., and David E. Marcotte. 2011. The Impact of Tuition Increases on Enrollment at Public Colleges and Universities. *Educational Evaluation and Policy Analysis*, 33(4): 435–457.

Kane, Thomas J., and Cecilia Elena Rouse. 1995. Labor-Market Returns to Two- and Four-Year College. *American Economic Review*, 85(3): 600–614.

Kao, Grace, and Marta Tienda. 1995. Optimism and Achievement: The Educational Performance of Immigrant Youth. *Social Science Quarterly*, 76(1): 1–19.

Kaushal, Neeraj. 2008. In-state Tuition for the Undocumented: Education Effects on Mexican Young Adults. *Journal of Policy Analysis and Management*, 27(4): 771–792.

Marx, Benjamin M., and Lesley J. Turner. 2015. Borrowing Trouble? Student Loans, the Cost of Borrowing, and Implications for the Effectiveness of Need-Based Grant Aid. NBER working paper 20850.

Milligan, Kevin, Enrico Moretti, and Philip Oreopoulos. 2004. Does Education Improve Citizenship? Evidence from the United States and the United Kingdom. *Journal of Public Economics*, 88(9-10): 1667–1695.

Muñoz, Susana María, and Marta María Maldonado. 2012. Counterstories of College Persistence by Undocumented Mexicana Students: Navigating Race, Class, Gender, and Legal Status. *International Journal of Qualitative Studies in Education*, 25(3): 293–315.

Passel, Jeffrey, and D'Vera Cohn. 2010. Unauthorized Immigrant Population: National and State Trends. `www.pewhispanic.org/2011/02/01/unauthorized-immigrant-population-brnational-and-state-trends-2010/`, accessed: September 23, 2014. Washington, DC: Pew Hispanic Center.

Passel, Jeffrey S., and Mark Hugo Lopez. 2012. Up to 1.7 Million Unauthorized Immigrant Youth May Benefit from New Deportation Rules. `http://www.pewhispanic.org/2012/08/14/up-to-1-7-million-unauthorized-immigrant-youth-may-benefit-from-new-deportation-rules/`, accessed: December 15, 2014. Washington, DC: Pew Hispanic Center.

Patel, Reshma, and Timothy Rudd. 2012. Can Scholarships Alone Help Students Succeed? Lessons from Two New York City Community Colleges. New York and Oakland: MDRC.

Perez, William. 2009. *We ARE Americans: Untold Stories of Undocumented Students in Pursuit of the American Dream.* Sterling, VA: Stylus Publishing.

Rincón, Alejandra. 2008. *Undocumented Immigrants and Higher Education: ¡Si Se Puede!* El Paso, TX: LFB Scholarly Publishing LLC.

Schwartz, Amy Ellen, and Leanna Stiefel. 2006. Is There a Nativity Gap? Achievement of New York City Elementary and Middle School Immigrant Students. *Education Finance and Policy*, 1(1): 17–49.

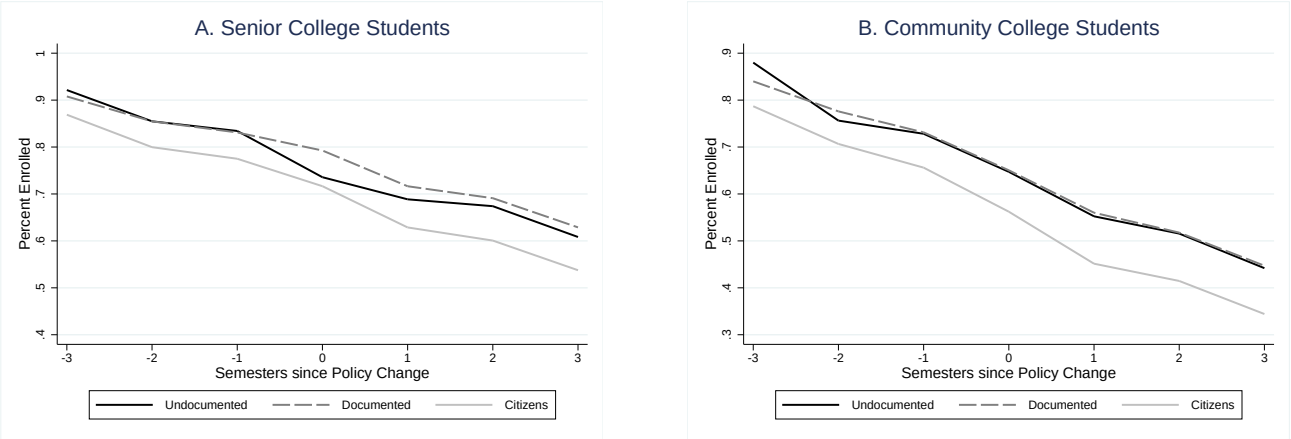
Scott-Clayton, Judith. 2011. On Money and Motivation: A Quasi-Experimental Analysis of Financial Incentives for College Achievement. *Journal of Human Resources*, 46(3): 614–46.

Stinebrickner, Ralph, and Todd Stinebrickner. 2008. The Effect of Credit Constraints on the College Drop-Out Decision: A Direct Approach Using a New Panel Study. *American Economic Review*, 98(5): 2163–2184.

Watson, Tara. 2014. Inside the Refrigerator: Immigration Enforcement and Chilling Effects in Medicaid Participation. *American Economic Journal: Economic Policy*, 6(3): 313–338.

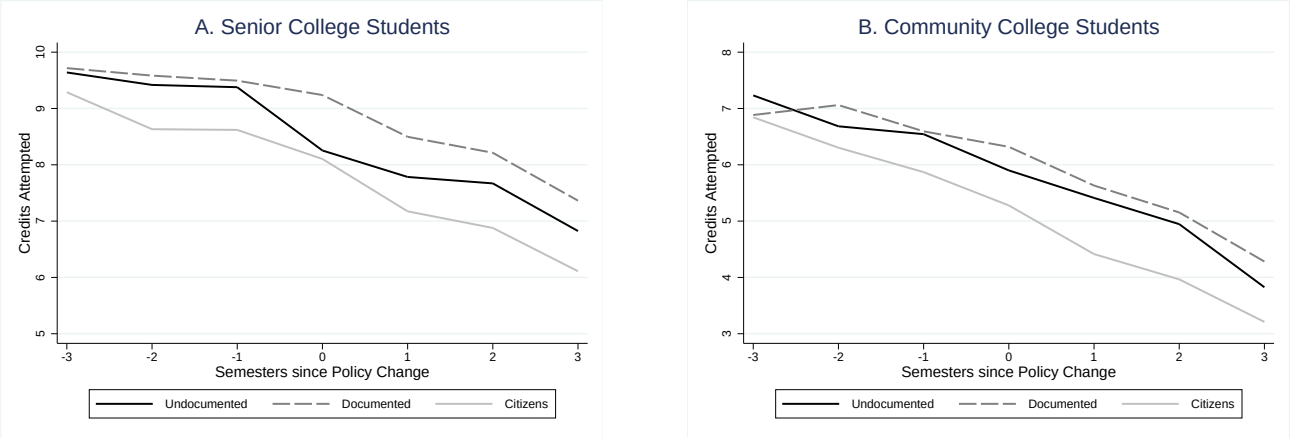
Figures and Tables

Figure 1: Trends in Reenrollment by Citizenship and Documentation



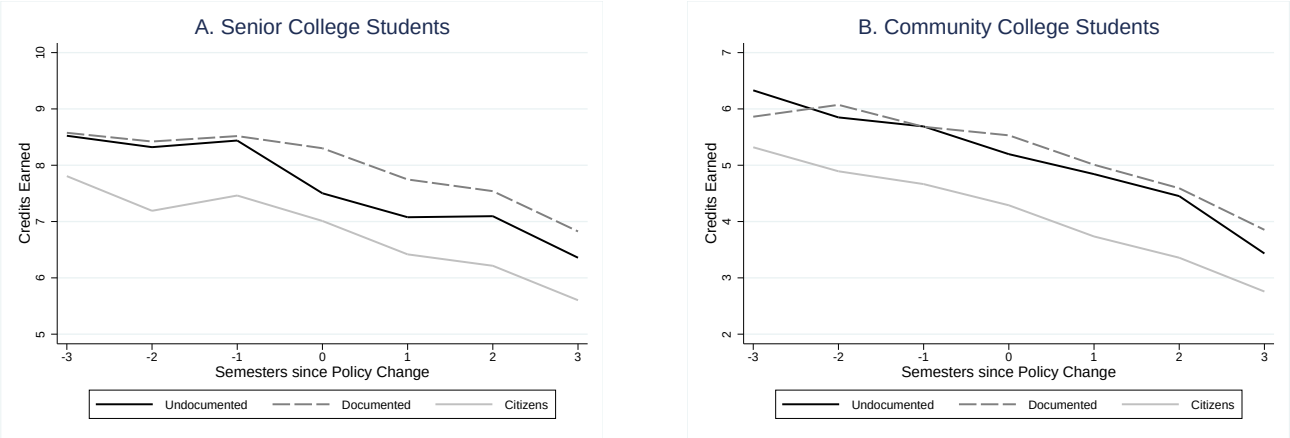
Source: CUNY administrative data. *Notes:* Sample includes first-time CUNY undergraduate degree-seeking students belonging to the Fall 1999 through Fall 2002 entering cohorts who earned a high school diploma or GED from New York State. Each line in Panels A and B represents the share of students in the specified group who were enrolled in the specified semester. Spring 2002 is represented by "0". The sample in Panel A is limited to students who initially enrolled in a senior college. The sample in Panel B is limited to students who initially enrolled in a community college. See text for definitions of documented and undocumented noncitizens. Student by semester observations following degree receipt are dropped.

Figure 2: Trends in Credits Attempted by Citizenship and Documentation



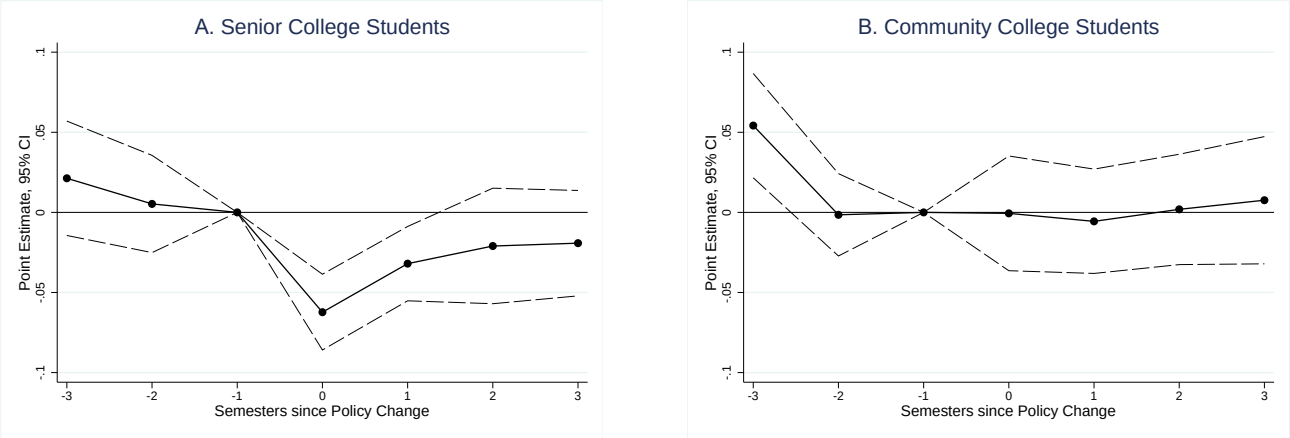
Source: CUNY administrative data. *Notes:* Sample includes first-time CUNY undergraduate degree-seeking students who belonged to the Fall 1999 through Fall 2002 entering cohorts and earned a high school diploma or GED from New York State. Each line in Panels A and B represents average credits attempted by students in the specified group and semester. Spring 2002 is represented by "0". The sample in Panel A is limited to students who initially enrolled in a senior college. The sample in Panel B is limited to students who initially enrolled in a community college. See text for definitions of documented and undocumented noncitizens. Student by semester observations following degree receipt are dropped.

Figure 3: Trends in Credits Earned by Citizenship and Documentation



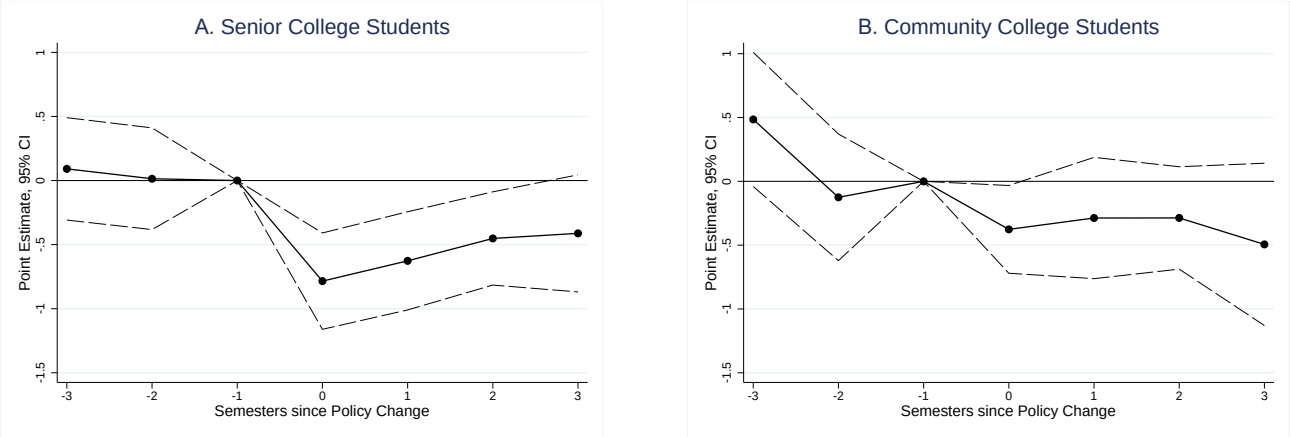
Source: CUNY administrative data. *Notes:* Sample includes first-time CUNY undergraduate degree-seeking students who belonged to the Fall 1999 through Fall 2002 entering cohorts and earned a high school diploma or GED from New York State. Each line in Panels A and B represents average credits earned by students in the specified group and semester. Spring 2002 is represented by "0". The sample in Panel A is limited to students who initially enrolled in a senior college. The sample in Panel B is limited to students who initially enrolled in a community college. See text for definitions of documented and undocumented noncitizens. Student by semester observations following degree receipt are dropped.

Figure 4: Estimated Impacts of the Price Shock on Reenrollment by Semester



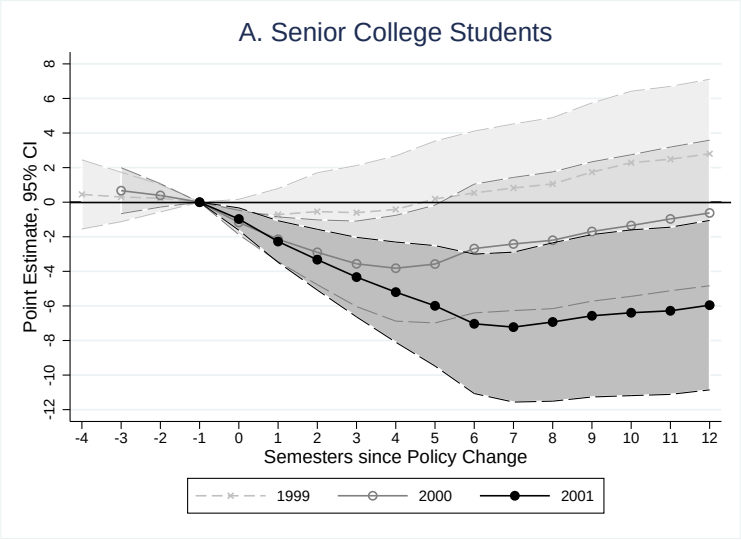
Source: CUNY administrative data. *Notes:* Sample includes first-time CUNY noncitizen undergraduate degree-seeking students belonging to the Fall 1999 through Fall 2002 entering cohorts who earned a high school diploma or GED from New York State. Each marker in Panels A and B represents the point estimate from a modified version of equation (1), where an indicator for undocumented status is interacted with indicators for semesters before/after spring 2002 (with fall 2001 serving as the omitted category). Spring 2002 is represented by "0". The thin dashed line represents the corresponding 95 percent confidence interval. The sample in Panel A is limited to students who initially enrolled in a senior college. The sample in Panel B is limited to students who initially enrolled in a community college. See text for definitions of documented and undocumented noncitizens. Student by semester observations following degree receipt are dropped.

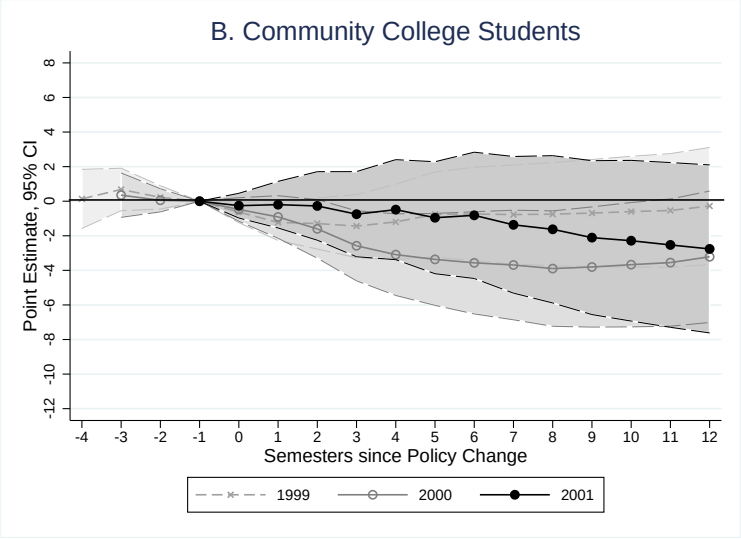
Figure 5: Estimated Impacts of the Price Shock on Credits Earned by Semester



Source: CUNY administrative data. *Notes:* Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who belonged to the Fall 1999 through Fall 2002 entering cohorts and earned a high school diploma or GED from New York State. Each marker in Panels C and D represents the point estimate from a modified version of equation (1), where an indicator for undocumented status is interacted with indicators for semesters before/after spring 2002 (with fall 2001 serving as the omitted category). Spring 2002 is represented by "0". The thin dashed line represents the corresponding 95 percent confidence interval. The sample in Panel A is limited to students who initially enrolled in a senior college. The sample in Panel B is limited to students who initially enrolled in a community college. See text for definitions of documented and undocumented noncitizens. Student by semester observations following degree receipt are dropped.

Figure 6: Cumulative Credits Earned by Semesters Since Entry and Entry Cohort





Source: CUNY administrative data. *Notes:* Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who belonged to the Fall 1999 through Fall 2002 entering cohorts and earned a high school diploma or GED from New York State. Spring 2002 is represented by "0". Each marker represents the point estimate from a modified version of equation (1), where an indicator for undocumented status is interacted with indicators for semesters before/after spring 2002 (with fall 2001 serving as the omitted category) and the sample is limited to students who entered college in the specified semester. The thin dashed line and shaded area represents corresponding 95 percent confidence intervals. The sample in Panel A (B) is limited to students who initially enrolled in a senior (community) college.

Table 1: Characteristics of Students by Citizenship and Documentation Status at Entry

	(1) Citizens	Noncitizens		Tests of equality (p-value)		
		(2) Documented	(3) Undocumented	Citizen vs. noncitizens	Documented vs. undoc.	All three groups
Age	19	20	20	<0.001	0.505	<0.001
Female	0.58	0.58	0.59	0.470	0.678	0.707
Race/ethnicity:						
Asian/Pacific Islander	0.08	0.25	0.23	<0.001	0.030	<0.001
Black	0.30	0.28	0.34	<0.001	<0.001	<0.001
Hispanic	0.33	0.28	0.28	<0.001	0.856	<0.001
White	0.29	0.18	0.15	<0.001	<0.001	<0.001
Single parent	0.03	0.03	0.02	0.194	0.136	0.149
Disabled	0.03	0.02	0.02	<0.001	0.148	<0.001
Foreign-born	0.08	1	1			
Permanent resident	--	0.93	--	--	--	--
Visa-holder	--	0.07	--	--	--	--
Refugee	--	<0.01	--	--	--	--
Need any remediation	0.50	0.60	0.58	<0.001	0.075	<0.001
High school type:						
NYC public	0.65	0.77	0.75	<0.001	0.008	<0.001
NYC private	0.15	0.04	0.03	<0.001	0.650	<0.001
GED	0.15	0.17	0.19	<0.001	0.066	<0.001
High school GPA (0-100)	76	77	77	<0.001	0.078	<0.001
Missing high school GPA	0.05	0.04	0.05	0.002	0.001	<0.001
Bachelor's degree program	0.37	0.35	0.30	<0.001	<0.001	<0.001
Initial institution selectivity:						
Very competitive	0.06	0.07	0.05	<0.001	<0.001	<0.001
Competitive	0.29	0.25	0.23	<0.001	0.057	<0.001
Less/noncompetitive	0.25	0.23	0.20	<0.001	0.009	<0.001
Nonselective	0.40	0.45	0.52	<0.001	<0.001	<0.001
Observations	43,159	16,107	1,808			

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts. High school GPA refers to the CUNY college admissions average, which is a standardized measure of students' high school grade point averages on a scale of 0 to 100. College competitiveness level according to the Barron's Profile of American Colleges.

Table 2: The Impact of the Tuition Increase on Undocumented Students' Attainment

	(1) Senior college students	(2) Community college students
A. Reenrollment		
Undocumented ˣ spring 2002	-0.065	-0.012
	(0.012)**	(0.015)
Undocumented ˣ post-spring 2002	-0.029	-0.006
	(0.013)*	(0.013)
Test of equality (*p*- value)	0.005	0.561
Fall 2001 undocumented mean	0.83	0.73
Impact in % change: spring 2002	-8%	-2%
Impact in % change: post-spring 2002	-3%	-1%
Observations	61,481	51,090
B. Credits attempted		
Undocumented ˣ spring 2002	-0.913	-0.426
	(0.176)**	(0.145)**
Undocumented ˣ post-spring 2002	-0.547	-0.327
	(0.180)**	(0.192)+
Test of equality (*p*- value)	0.033	0.558
Fall 2001 undocumented mean	9.4	6.5
Impact in % change: spring 2002	-10%	-7%
Impact in % change: post-spring 2002	-6%	-5%
Observations	61,481	51,090
B. Credits earned		
Undocumented ˣ spring 2002	-0.763	-0.435
	(0.159)**	(0.125)**
Undocumented ˣ post-spring 2002	-0.511	-0.368
	(0.156)**	(0.160)*
Test of equality (*p*- value)	0.165	0.627
Fall 2001 undocumented mean	8.4	5.7
Impact in % change: spring 2002	-9%	-8%
Impact in % change: post-spring 2002	-6%	-6%
Observations	61,481	51,090

Source: CUNY administrative data. *Note*s: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. Reported coefficients are interactions between an indicator for whether a student is an undocumented noncitizen at college entry and Spring 2002 and undocumented status with post-Spring 2002. All regressions also include controls for age at entry, high school GPA (set to zero if missing), an indicator for whether a student's high school GPA is missing, indicators for race/ethnicity (Black, Hispanic, or White) and gender, an indicator for initial degree program (associate's versus bachelor's degree), indicators for whether the student was a single parent, needed remediation, was undocumented, or was disabled at entry, semester fixed effects, institution by cohort fixed effects, and cohort-specific time trends. The sample of senior college students includes those who initially enrolled in Baruch, Brooklyn, City, Hunter, John Jay, Queens, Lehman, City College of Technology, Staten Island, or York Colleges. The sample of community college students include those who initially enrolled in Borough of Manhattan, Bronx, Hostos, Kingsborough, LaGuardia, or Queensborough Community Colleges. Student by semester observations are dropped following degree receipt.

Table 3: Robustness of Estimated Impacts on Reenrollment

	(1) Student fixed effects	(2) Larger window (+/- 4 semesters)	(3) Smaller window (+/- 2 semesters)
A. Senior college students			
Undocumented x spring 2002	-0.058	-0.064	-0.060
	(0.013)**	(0.012)**	(0.011)**
Undocumented x post-spring 2002	-0.019	-0.024	-0.024
	(0.015)	(0.014)+	(0.014)+
Test of equality (*p*-value)	0.007	0.006	0.006
Fall 2001 undocumented mean	0.83	0.83	0.83
Impact in % change: spring 2002	-7%	-8%	-7%
Impact in % change: post-spring 2002	-2%	-3%	-3%
Observations	61,481	73,768	45,777
B. Community college students			
Undocumented x spring 2002	-0.011	-0.009	0.003
	(0.018)	(0.015)	(0.017)
Undocumented x post-spring 2002	-0.005	0.004	0.008
	(0.016)	(0.014)	(0.015)
Test of equality (*p*-value)	0.578	0.288	0.662
Fall 2001 undocumented mean	0.73	0.73	0.73
Impact in % change: spring 2002	-2%	-1%	0.4%
Impact in % change: post-spring 2002	-1%	1%	1%
Observations	51,090	61,711	38,077

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** $p<0.01$, * $p<0.05$, + $p<0.1$. See Table 2 notes for additional control variables and definitions of senior and community college samples. Student fixed effects models also include student fixed effects. The column (2) sample is limited to students who were enrolled in the fall 2001 semester. The column (3) sample includes student by semester observations from four semesters before and after the policy change while the column (4) sample excludes student by semester observations more than two semesters before/after the policy change. Student by semester observations are dropped following degree receipt.

Table 4: Robustness of Estimated Impacts on Credits Earned

	(1) Student fixed effects	(2) Larger window (+/- 4 semesters)	(3) Smaller window (+/- 2 semesters)
A. Senior college students			
Undocumented × spring 2002	-0.673	-0.738	-0.737
	(0.170)**	(0.166)**	(0.165)**
Undocumented × post-spring 2002	-0.378	-0.412	-0.497
	(0.187)*	(0.156)*	(0.161)**
Test of equality (*p* -value)	0.141	0.141	0.212
Fall 2001 undocumented mean	8.4	8.4	8.4
Impact in % change: spring 2002	-8%	-9%	-9%
Impact in % change: post-spring 2002	-5%	-5%	-6%
Observations	61,481	73,768	45,777
B. Community college students			
Undocumented × spring 2002	-0.479	-0.439	-0.285
	(0.147)**	(0.130)**	(0.162)+
Undocumented × post-spring 2002	-0.399	-0.269	-0.139
	(0.186)*	(0.159)	(0.190)
Test of equality (*p* -value)	0.568	0.568	0.31
Fall 2001 undocumented mean	5.7	5.7	5.7
Impact in % change: spring 2002	-8%	-8%	-5%
Impact in % change: post-spring 2002	-7%	-5%	-2%
Observations	51,090	61,711	38,077

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** $p<0.01$, * $p<0.05$, + $p<0.1$. See Table 3 notes for description of specifications. Student by semester observations are dropped following degree receipt.

Table 5: The Impact of the Tuition Increase on the Attainment of Enrolled Undocumented Students

	(1) Senior college students	(2) Community college students
A. Pr (*enrolled* $_t$) | *enrolled* $_{t-1}$		
Undocumented x spring 2002	-0.065	-0.018
	(0.014)**	(0.019)
Undocumented x post-spring 2002	-0.007	0.002
	(0.011)	(0.012)
Test of equality (*p*- value)	<0.001	0.289
Fall 2001 undocumented mean	0.90	0.85
Impact in % change: spring 2002	-7%	-2%
Impact in % change: post-spring 2002	-1%	0.2%
Observations	47,747	33,513
B. Credits earned | *enrolled*		
Undocumented x Spring 2002 or later	-0.175	-0.592
	(0.172)	(0.171)**
Undocumented x Post-Spring 2002	-0.322	-0.558
	(0.174)+	(0.216)*
Test of equality (*p*- value)	0.473	0.874
Fall 2001 undocumented mean	10.3	8.1
Impact in % Change - Spring 2002	-2%	-7%
Impact in % Change - Post-Spring 2002	-3%	-7%
Observations	45,866	31,155
C. GPA | *enrolled*		
Undocumented x Spring 2002	-0.041	0.014
	(0.045)	(0.045)
Undocumented x Post-Spring 2002	-0.025	-0.007
	(0.032)	(0.030)
Test of equality (*p*- value)	0.624	0.685
Fall 2001 undocumented mean	2.57	2.40
Impact in % Change - Spring 2002	-2%	1%
Impact in % Change - Post-Spring 2002	-1%	-0.3%
Observations	45,817	31,141

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Table 2 notes for additional control variables and definitions of senior and community college samples. Student by semester observations are dropped following degree receipt. Panel A sample conditions on enrollment in semester $t-1$. Panels B and C samples condition on enrollment in semester t.

Table 6: Heterogeneity in the Impact of the Tuition Increase by Gender

	Senior college students			Community college students		
	(1) Female	(2) Male	Test of eq. (*p*- value)	(3) Female	(4) Male	Test of eq. (*p*- value)
A. Reenrollment						
Undocumented x spring 2002	-0.073	-0.054	0.447	0.011	-0.046	0.032
	(0.016)**	(0.018)**		(0.018)	(0.023)+	
Undocumented x post-spring 2002	-0.035	-0.020	0.515	0.012	-0.032	0.113
	(0.016)*	(0.019)		(0.015)	(0.023)	
Fall 2001 undocumented mean	0.84	0.83		0.75	0.70	
Observations	35,290	26,191		30,379	20,711	
B. Credits earned						
Undocumented x spring 2002	-0.881	-0.591	0.422	-0.385	-0.518	0.731
	(0.209)**	(0.280)*		(0.184)*	(0.277)+	
Undocumented x post-spring 2002	-0.548	-0.457	0.757	-0.352	-0.393	0.911
	(0.172)**	(0.262)+		(0.214)	(0.281)	
Fall 2001 undocumented mean	8.9	7.9		6.4	4.7	
Observations	35,290	26,191		30,379	20,711	

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Table 2 notes for description of control variables and specification.

Table 7: Heterogeneity in the Impact of the Tuition Increase by Race/Ethnicity

	Senior college students			Community college students		
	(1) Hispanic	(2) Non-hispanic	Test of eq. (*p*- value)	(1) Hispanic	(2) Non-hispanic	Test of eq. (*p*- value)
A. Reenrollment						
Undocumented x spring 2002	-0.083 (0.024)**	-0.058 (0.015)**	0.414	-0.031 (0.028)	-0.004 (0.015)	0.333
Undocumented x post-spring 2002	0.002 (0.031)	-0.037 (0.015)*	0.280	-0.019 (0.028)	-0.001 (0.017)	0.606
Fall 2001 undocumented mean	0.83	0.84		0.71	0.74	
Observations	13,189	48,292		19,049	32,041	
B. Credits earned						
Undocumented x spring 2002	-1.384 (0.318)**	-0.541 (0.189)**	0.025	-0.596 (0.324)+	-0.330 (0.145)*	0.487
Undocumented x post-spring 2002	-0.583 (0.346)+	-0.482 (0.176)**	0.799	-0.952 (0.274)**	-0.033 (0.244)	0.911
Fall 2001 undocumented mean	8.1	8.6		5.1	5.9	
Observations	13,189	48,292		19,049	32,041	

Source: CUNY administrative data. *Note*s: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Table 2 notes for description of control variables and specification.

Table 8: Heterogeneity in the Impact of the Tuition Increase by Entry Year: Senior College Students

	(1) 1999	(2) 2000	(3) 2001	Test of eq. (*p*- value)
A. Reenrollment				
Undocumented x spring 2002	-0.033	-0.073	-0.084	0.132
	(0.020)	(0.020)**	(0.018)**	
Undocumented x post-spring 2002	-0.002	-0.009	-0.073	0.013
	(0.022)	(0.022)	(0.018)**	
Test of equality (*p*- value)	0.119	0.011	0.549	
Fall 2001 undocumented mean	0.680	0.79	1.00	
Impact in % change: spring 2002	-5%	-9%	-8%	
Impact in % change: post-spring 2002	-0.3%	-1%	-7%	
Observations	21,586	24,539	15,356	
B. Credits earned				
Undocumented x spring 2002	-0.452	-0.937	-0.928	0.224
	(0.216)*	(0.216)**	(0.354)*	
Undocumented x post-spring 2002	0.181	-0.546	-1.072	<0.001
	(0.271)	(0.283)+	(0.155)**	
Test of equality (*p*- value):	0.071	0.19	0.642	
Fall 2001 undocumented mean	7.0	8.0	10.0	
Impact in % change: spring 2002	-6%	-12%	-9%	
Impact in % change: post-spring 2002	3%	-7%	-11%	
Observations	21,586	24,539	15,356	

Source: CUNY administrative data. *Note*s: Sample includes first-time CUNY noncitizen undergraduate degree-seeking senior college students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 senior college entering cohorts. Each column within a panel represents a separate regression. Clustered standard errors by student in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Table 2 notes for description of control variables and specification.

Table 9: Heterogeneity in the Impact of the Tuition Increase by Entry Year: Community College Students

	(1) 1999	(2) 2000	(3) 2001	Test of eq. (*p*- value)
A. Reenrollment				
Undocumented x spring 2002	-0.017	-0.011	-0.011	0.979
	(0.028)	(0.030)	(0.013)	
Undocumented x post-spring 2002	-0.002	-0.008	-0.014	0.921
	(0.027)	(0.020)	(0.015)	
Test of equality (*p*- value)	0.314	0.887	0.814	
Fall 2001 undocumented mean	0.53	0.70	1.00	
Impact in % change: spring 2002	-3%	-2%	-1%	
Impact in % change: post-spring 2002	-0.4%	-1%	-1%	
Observations	21,737	19,831	9,522	
B. Credits earned				
Undocumented x spring 2002	-0.581	-0.575	-0.492	0.975
	(0.194)*	(0.283)+	(0.379)	
Undocumented x post-spring 2002	-0.213	-0.744	-0.387	0.306
	(0.300)	(0.208)**	(0.533)	
Test of equality (*p*- value)	0.234	0.417	0.691	
Fall 2001 undocumented mean	4.9	6.1	6.2	
Impact in % change: spring 2002	-12%	-9%	-8%	
Impact in % change: post-spring 2002	-4%	-12%	-6%	
Observations	21,737	19,831	9,522	

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking community college students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts. Students classified as Native American are dropped. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. Brackets contain *p*-values from test of equality of treatment variables by race/ethnicity categories. See Table 2 notes for description of control variables and specification. All control variables are fully interacted with indicators for whether a student is Hispanic.

Table 10: Changes in Observed Characteristics between Affected and Unaffected Undocumented Entry Cohorts: Senior College Students

	Undocumented × 2000 entrant	Undocumented × 2001 entrant
Dependent var:		
Age	0.035	0.328
	(0.196)	(0.250)
Female	0.025	0.061
	(0.049)	(0.041)
Black	0.001	0.025
	(0.042)	(0.046)
Hispanic	0.045	0.019
	(0.035)	(0.037)
White	-0.031	-0.043
	(0.047)	(0.048)
Single Parent	-0.006	0.003
	(0.005)	(0.010)
Needs remediation	-0.023	-0.028
	(0.039)	(0.037)
Disabled	-0.018	-0.026
	(0.019)	(0.018)
High school GPA	0.843	0.657
	(0.828)	(0.681)
Missing hs GPA	-0.005	-0.004
	(0.009)	(0.007)
NYC public high school	0.019	0.036
	(0.035)	(0.028)
GED	-0.026	-0.000
	(0.018)	(0.014)
Test of joint sig. (p- val.)	0.731	0.274
Observations	9,798	

Source: CUNY administrative data. *Note*s: Sample includes first-time CUNY noncitizen undergraduate degree-seeking senior college students from New York belonging to the Fall 1999 through Fall 2001 or Fall 2002 through Fall 2005 entering cohorts. Each cell displays the coefficient on the interaction between undocumented status and belong to a cohort that entered between Spring 2002. All models include controls for undocumented status, entry cohort, and cohort linear time trends, allowed to vary by documentation status. Clustered standard errors (institution by cohort) in parentheses.

Table 11: Impacts of the Tuition Increase on Cumulative Credits Earned and Degree Receipt: Senior College Students

	1. Cumulative credits earned	Degree Receipt: 2. Any degree	3. AA/AS	4. BA/BS
A. All senior college students				
Undocumented x 2000 entrant	-2.37	-0.030	-0.001	-0.020
	(3.69)	(0.047)	(0.026)	(0.041)
Undocumented x 2001 entrant	-7.01	-0.104	-0.042	-0.086
	(3.08)*	(0.047)*	(0.028)	(0.043)+
Undocumented mean (1999)	73.9	0.48	0.13	0.40
Impact in % change: 2000 cohort	-3%	-6%	-1%	-5%
Impact in % change: 2001 cohort	-9%	-22%	-32%	-22%
Observations	9,798	9,798	9,798	9,798
B. Bachelor's degree-seeking				
Undocumented x 2000 entrant	-5.07	-0.017	0.011	-0.026
	(4.78)	(0.062)	(0.018)	(0.063)
Undocumented x 2001 entrant	-8.28	-0.099	0.009	-0.119
	(4.47)+	(0.064)	(0.016)	(0.064)+
Undocumented mean (1999)	84.4	0.55	0.04	0.52
Impact in % change: 2000 cohort	-6%	-3%	28%	-5%
Impact in % change: 2001 cohort	-10%	-18%	23%	-23%
Observations	6,190	6,190	6,190	6,190
C. Associate's degree-seeking				
Undocumented x 2000 entrant	2.24	-0.045	-0.003	-0.018
	(4.67)	(0.052)	(0.044)	(0.040)
Undocumented x 2001 entrant	-5.78	-0.109	-0.119	-0.038
	(3.69)	(0.050)*	(0.044)*	(0.030)
Undocumented mean (1999)	58.8	0.39	0.26	0.22
Impact in % change: 2000 cohort	4%	-12%	-1%	-8%
Impact in % change: 2001 cohort	-10%	-28%	-46%	-17%
Observations	3,608	3,608	3,608	3,608

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking senior college students who earned a high school diploma or GED from New York State and belonged to the Fall 1999 through Fall 2001 entering cohorts. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. Reported coefficients are interactions between an indicator for whether a student is an undocumented noncitizen and belonging to either the 2000 or 2001 entry cohort. See Table 2 notes for description of additional control variables.

Appendix A Additional Figures and Tables

Table A.1: Characteristics of Students by Citizenship and Documentation Status at Entry: Senior College Students

	(1) Citizens	Noncitizens		Tests of equality (p-value)		
		(2) Documented	(3) Undocumented	Citizen vs. noncitizens	Documented vs. undoc.	All three groups
Age	19	19	19	0.01	0.835	0.035
Female	0.58	0.57	0.58	0.509	0.619	0.711
Race/ethnicity:						
Asian/Pacific Islander	0.10	0.30	0.26	<0.001	0.004	<0.001
Black	0.28	0.26	0.33	0.007	<0.001	<0.001
Hispanic	0.29	0.21	0.25	<0.001	0.002	<0.001
White	0.33	0.23	0.16	<0.001	<0.001	<0.001
Single parent	0.02	0.01	0.01	0.128	0.633	0.283
Disabled	0.03	0.01	0.02	<0.001	0.293	<0.001
Foreign-born	0.08	1	1			
Permanent resident	--	0.94	--			
Visa-holder	--	0.06	--			
Refugee	--	0	--			
Need any remediation	0.33	0.42	0.38	<0.001	0.039	<0.001
High school type:						
NYC public	0.69	0.86	0.85	<0.001	0.179	<0.001
NYC private	0.18	0.05	0.04	<0.001	0.446	<0.001
GED	0.06	0.07	0.06	<0.001	0.741	<0.001
High school GPA (0-100)	78	80	80	<0.001	0.488	<0.001
Missing high school GPA	0.02	0.02	0.02	<0.001	0.663	<0.001
Bachelor's degree program	0.61	0.63	0.62	0.002	0.395	0.005
Initial institution selectivity:						
Very competitive	0.09	0.13	0.1	<0.001	0.038	<0.001
Competitive	0.48	0.45	0.47	<0.001	0.208	<0.001
Less/noncompetitive	0.43	0.42	0.42	0.119	0.835	0.291
Observations	25,999	8,919	876			

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY undergraduate degree-seeking students belonging to the Fall 1999 through Fall 2002 entering cohorts who initially enrolled in a senior college. See Table 1 notes for additional details.

Table A.2: Characteristics of Students by Citizenship and Documentation Status at Entry: Community College Students

	(1) Citizens	Noncitizens		Tests of equality (p-value)		
		(2) Documented	(3) Undocumented	Citizen vs. noncitizens	Documented vs. undoc.	All three groups
Age	21	21	21	<0.001	0.377	<0.001
Female	0.59	0.60	0.60	0.107	0.931	0.273
Race/ethnicity:						
Asian/Pacific Islander	0.06	0.19	0.20	<0.001	0.270	<0.001
Black	0.33	0.31	0.35	<0.001	0.012	<0.001
Hispanic	0.38	0.38	0.31	0.036	<0.001	<0.001
White	0.22	0.13	0.14	<0.001	0.353	<0.001
Single parent	0.04	0.04	0.03	0.065	0.053	0.032
Disabled	0.04	0.02	0.03	<0.001	0.480	<0.001
Foreign-born	0.09	1	1			
Permanent resident	--	0.93	--	--	--	--
Visa-holder	--	0.07	--	--	--	--
Refugee	--	<0.01	--	--	--	--
Need any remediation	0.76	0.83	0.77	<0.001	<0.001	<0.001
High school type:						
NYC public	0.60	0.66	0.65	<0.001	0.477	<0.001
NYC private	0.10	0.02	0.02	<0.001	0.287	<0.001
GED	0.28	0.30	0.30	<0.001	0.772	<0.001
High school GPA (0-100)	72	74	75	<0.001	<0.001	<0.001
Missing high school GPA	0.08	0.06	0.09	0.005	0.011	0.001
Observations	17,160	7,188	932			

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY undergraduate degree-seeking students belonging to the Fall 1999 through Fall 2002 entering cohorts who initially enrolled in a community college. See Table 1 notes for additional details.

Table A.3: Heterogeneity in the Impact of the Tuition Increase on Attainment by Initial Degree Program: Senior College Students

	(1) Bachelor's degree-seeking	(2) Associate's degree-seeking	Test of eq. (p-value)
A. Reenrollment			
Undocumented x spring 2002	-0.071	-0.054	0.455
	(0.014)**	(0.020)*	
Undocumented x post-spring 2002	-0.042	0.001	0.087
	(0.015)**	(0.022)	
Test of equality (p-value)	0.007	0.070	
Fall 2001 undocumented mean	0.88	0.77	
Impact in % change: spring 2002	-8%	-7%	
Impact in % change: post-spring 2002	-5%	0.1%	
Observations	38,674	22,807	
B. Credits attempted			
Undocumented x spring 2002	-0.912	-0.914	0.995
	(0.226)**	(0.299)**	
Undocumented x post-spring 2002	-0.494	-0.637	0.724
	(0.213)*	(0.346)+	
Test of equality (p-value)	0.048	0.273	
Fall 2001 undocumented mean	10.5	7.5	
Impact in % change: spring 2002	-9%	-12%	
Impact in % change: post-spring 2002	-5%	-8%	
Observations	38,674	22,807	
B. Credits earned			
Undocumented x spring 2002	-0.862	-0.603	0.414
	(0.228)**	(0.221)*	
Undocumented x post-spring 2002	-0.469	-0.586	0.731
	(0.180)*	(0.297)+	
Test of equality (p-value)	0.077	0.950	
Fall 2001 undocumented mean	9.6	6.6	
Impact in % change: spring 2002	-9%	-9%	
Impact in % change: post-spring 2002	-5%	-9%	
Observations	38,674	22,807	

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students from New York belonging to the Fall 1999 through Fall 2002 entering cohorts who initially enrolled in Baruch, Brooklyn, City, Hunter, John Jay, Queens, Lehman, City College of Technology, Staten Island, or York Colleges. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. Reported coefficients are interactions between an indicator for whether a student is an undocumented noncitizen at college entry and Spring 2002 and undocumented status with post-Spring 2002. See Table 2 notes for additional details.

Table A.4: Robustness of Estimated Impacts on Attainment to Excluding BMCC

	(1) Community college students
A. Reenrollment	
Undocumented x spring 2002	-0.008
	(0.022)
Undocumented x post-spring 2002	0.0003
	(0.017)
Test of equality (*p*- value)	0.512
Fall 2001 undocumented mean	0.73
Impact in % change: spring 2002	-1%
Impact in % change: post-spring 2002	0.04%
Observations	35,723
B. Credits earned	
Undocumented x spring 2002	-0.478
	(0.169)**
Undocumented x post-spring 2002	-0.392
	(0.191)+
Test of equality (*p*- value)	0.644
Fall 2001 undocumented mean	5.8
Impact in % change: spring 2002	-8%
Impact in % change: post-spring 2002	-7%
Observations	35,723

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts, excluding BMCC students. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Table 2 notes for additional details.

Table A.5: Robustness of Estimated Impacts on Attainment of Enrolled Students to Excluding BMCC

	(1) Community college students
A. Pr (*enrolled* $_t$) | *enrolled* $_{t-1}$	
Undocumented x spring 2002	0.001
	(0.031)
Undocumented x post-spring 2002	0.029
	(0.016)+
Test of equality (*p*- value)	0.283
Fall 2001 undocumented mean	0.77
Impact in % change: spring 2002	0.1%
Impact in % change: post-spring 2002	4%
Observations	19,948
B. Credits earned | *enrolled*	
Undocumented x Spring 2002 or later	-0.595
	(0.241)*
Undocumented x Post-Spring 2002	-0.643
	(0.239)*
Test of equality (*p*- value)	0.858
Fall 2001 undocumented mean	8.3
Impact in % Change - Spring 2002	-7%
Impact in % Change - Post-Spring 2002	-8%
Observations	21,745
C. GPA | *enrolled*	
Undocumented x Spring 2002	-0.013
	(0.057)
Undocumented x Post-Spring 2002	-0.003
	(0.039)
Test of equality (*p*- value)	0.848
Fall 2001 undocumented mean	2.33
Impact in % Change - Spring 2002	-1%
Impact in % Change - Post-Spring 2002	-0.1%
Observations	21,737

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts, excluding BMCC students. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Table 5 notes for additional details.

Table A.6: Heterogeneity in the Impact of the Tuition Increase on Attainment of Enrolled Students by Initial Degree Program: Senior College Students

	(1) Bachelor's degree-seeking	(2) Associate's degree-seeking	Test of eq. (p-value)
A. Pr (enrolled $_t$) | enrolled $_{t-1}$			
Undocumented x spring 2002	-0.067	-0.061	0.836
	(0.015)**	(0.027)*	
Undocumented x post-spring 2002	-0.013	0.010	0.341
	(0.011)	(0.022)	
Test of equality (p-value)	0.002	0.02	
Fall 2001 undocumented mean	0.92	0.88	
Impact in % Change - Spring 2002	-7%	-7%	
Impact in % Change - Post-Spring 2002	-1%	1%	
Observations	32,165	15,582	
B. Credits earned | enrolled			
Undocumented x spring 2002	-0.148	-0.284	0.689
	(0.234)	(0.226)	
Undocumented x post-spring 2002	-0.093	-0.916	0.029
	(0.153)	(0.352)*	
Test of equality (p-value)	0.834	0.022	
Fall 2001 undocumented mean	11	8.8	
Impact in % Change - Spring 2002	-1%	-3%	
Impact in % Change - Post-Spring 2002	-1%	-10%	
Observations	31,275	14,591	
C. GPA | enrolled			
Undocumented x spring 2002	-0.064	0.014	0.317
	(0.059)	(0.054)	
Undocumented x post-spring 2002	-0.039	0.012	0.369
	(0.042)	(0.038)	
Test of equality (p-value)	0.547	0.959	
Fall 2001 undocumented mean	2.68	2.36	
Impact in % Change - Spring 2002	-2%	1%	
Impact in % Change - Post-Spring 2002	-1%	1%	
Observations	31,242	14,575	

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts who initially enrolled in Baruch, Brooklyn, City, Hunter, John Jay, Queens, Lehman, City College of Technology, Staten Island, or York Colleges. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Table 2 notes for additional control variables. Student by semester observations are dropped following degree receipt. Panel A sample conditions on enrollment in semester $t-1$. Panels B and C samples condition on enrollment in semester t.

Table A.7: The Impact of the Tuition Increase on the Attainment of Enrolled Undocumented Students: Student Fixed-Effects Models

	(1) Senior college students	(2) Community college students
A. Credits earned | enrolled		
Undocumented ˣ Spring 2002 or later	-0.223	-0.647
	(0.178)	(0.149)**
Undocumented ˣ Post-Spring 2002	-0.295	-0.630
	(0.194)	(0.230)*
Test of equality (*p*- value)	0.747	0.936
Fall 2001 undocumented mean	10.3	8.1
Impact in % Change - Spring 2002	-2%	-8%
Impact in % Change - Post-Spring 2002	-3%	-8%
Observations	45,866	31,155
B. GPA | enrolled		
Undocumented ˣ Spring 2002	-0.018	0.035
	(0.041)	(0.038)
Undocumented ˣ Post-Spring 2002	0.010	0.005
	(0.034)	(0.043)
Test of equality (*p*- value)	0.347	0.629
Fall 2001 undocumented mean	2.57	2.40
Impact in % Change - Spring 2002	-1%	1%
Impact in % Change - Post-Spring 2002	0.4%	0.2%
Observations	45,817	31,141

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts and were enrolled in semester t. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Table 2 notes for additional control variables and definitions of senior and community college samples. All regressions include student fixed-effects. Student by semester observations are dropped following degree receipt.

Table A.8: Selection into Exit in Spring 2002: Senior College Students

	(1) Cumulative GPA	(2) Cumulative credits earned
Undocumented x spring 2002	0.208	2.493
	(0.145)	(1.180)*
Fall 2001 undocumented mean	1.99	18
Impact in % change: spring 2002	10%	14%
Observations	4,291	4,291

Source: CUNY administrative data. *Note*s: Sample includes first-time CUNY noncitizen undergraduate degree-seeking senior college students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts and exited from college in semester t. Dependent variable is cumulative GPA or cumulative credits earned at the time of exit. Each column represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. See Table 2 notes for additional control variables. Student by semester observations are dropped following degree receipt.

Table A.9: Heterogeneity in the Impact of the Tuition Increase by Race/Ethnicity

	Senior college students				Community College Students			
	1. Asian	2. Black	3. Hisp.	4. White	5. Asian	6. Black	7. Hisp.	8. White
A. Reenrollment								
Undocumented x spring 2002	-0.064	-0.055	-0.083	-0.037	0.015	0.007	-0.031	-0.063
	(0.021)**	(0.023)*	(0.024)**	(0.032)	(0.027)	(0.022)	(0.028)	(0.026)*
			[0.757]				[0.066]	
Undocumented x post-spring 2002	-0.005	-0.026	0.002	-0.057	-0.005	0.017	-0.019	-0.031
	(0.020)	(0.023)	(0.031)	(0.029)+	(0.029)	(0.023)	(0.028)	(0.032)
			[0.438]				[0.647]	
Fall 2001 undocumented mean	0.88	0.77	0.83	0.91	0.76	0.73	0.71	0.72
Observations	18,194	16,605	13,189	13,455	9,590	15,795	19,049	6,550
B. Credits earned								
Undocumented x spring 2002	-0.407	-0.604	-1.384	-0.439	-0.218	-0.307	-0.596	-0.460
	(0.306)	(0.284)*	(0.318)**	(0.392)	(0.308)	(0.204)	(0.324)+	(0.509)
			[0.102]				[0.855]	
Undocumented x post-spring 2002	-0.650	-0.238	-0.583	-0.418	0.096	-0.091	-0.952	0.048
	(0.302)*	(0.305)	(0.346)+	(0.357)	(0.337)	(0.286)	(0.274)**	(0.387)
			[0.837]				[0.134]	
Fall 2001 undocumented mean	9.3	7.6	8.1	9.6	5.8	5.9	5.1	6.3
Observations	18,194	16,605	13,189	13,455	9,590	15,795	19,049	6,550

Source: CUNY administrative data. *Note*s: Sample includes first-time CUNY noncitizen undergraduate degree-seeking students who earned a high school diploma or GED from New York State belonging to the Fall 1999 through Fall 2002 entering cohorts. Students classified as Native American are excluded due to their small group size. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. Brackets contain p-values from test of equality of treatment variables by race/ethnicity. See Table 2 notes for description of control variables and specification.

Table A.10: Changes in Observed Characteristics between Affected and Unaffected Undocumented Entry Cohorts: Community College Students

	Undocumented × 2000 entrant	Undocumented × 2001 entrant
Dependent var:		
Age	-0.345	-0.085
	(0.347)	(0.420)
Female	0.021	-0.027
	(0.043)	(0.042)
Black	-0.002	0.028
	(0.052)	(0.052)
Hispanic	0.033	0.008
	(0.063)	(0.068)
White	-0.042	-0.071
	(0.021)+	(0.030)*
Single Parent	-0.022	-0.034
	(0.013)+	(0.013)*
Needs remediation	0.006	0.002
	(0.029)	(0.036)
Disabled	-0.017	-0.022
	(0.014)	(0.013)+
High school GPA	-2.154	-3.032
	(2.190)	(1.783)+
Missing hs GPA	0.020	0.035
	(0.030)	(0.024)
NYC public high school	-0.017	0.005
	(0.045)	(0.047)
GED	-0.006	0.009
	(0.042)	(0.045)
Test of joint sig. (*p*-val.)	<0.001	<0.001
Observations	8,120	

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking community college students from New York belonging to the Fall 1999 through Fall 2001 or Fall 2002 through Fall 2005 entering cohorts. Each cell displays the coefficient on the interaction between undocumented status and belong to a cohort that entered between Spring 2002. All models include controls for undocumented status, entry cohort, and cohort linear time trends, allowed to vary by documentation status. Clustered standard errors (institution by cohort) in parentheses.

Table A.11: Impacts of the Tuition Increase on Cumulative Credits Earned and Degree Receipt: Community College Students

	1. Cumulative credits earned	Degree Receipt: 2. Any degree	3. AA/AS	4. BA/BS
Undocumented x 2000 entrant	-1.86	-0.041	-0.018	-0.016
	(2.65)	(0.031)	(0.025)	(0.026)
Undocumented x 2001 entrant	-0.30	0.0001	0.018	-0.029
	(2.64)	(0.031)	(0.027)	(0.027)
Undocumented mean (1999)	50.0	0.37	0.33	0.12
Impact in % change: 2000 cohort	-4%	-11%	-5%	-13%
Impact in % change: 2001 cohort	-1%	0.03%	5%	-24%
Observations	8,120	8,120	8,120	8,120

Source: CUNY administrative data. *Notes*: Sample includes first-time CUNY noncitizen undergraduate degree-seeking community college students who earned a high school diploma or GED from New York State and belonged to the Fall 1999 through Fall 2001 entering cohorts. Each column within a panel represents a separate regression. Clustered standard errors (institution by cohort) in parentheses; ** p<0.01, * p<0.05, + p<0.1. Reported coefficients are interactions between an indicator for whether a student is an undocumented noncitizen and belonging to either the 2000 or 2001 entry cohort. See Table 2 notes for description of additional control variables.