# Online Appendix for College on the Cheap: Consequences of Community College Tuition Reductions

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## A Annexation/Campus Data Collection

Data on the dates of annexation was obtained in three ways. The first is through information posted online on community college websites that detailed historical annexations. The second is by using archives of newspapers covering the votes on annexation. The third is by examining patterns of students payment of in-district tuition. For each annexation. The ERC data provides information on whether enrolled students paid in-district tuition. From this data I identified years in which the fraction of students paying in-district tuition jumped substantially in a K-12 district. These changes were then verified using news reports when possible. When possible I also collected the margin of the vote via a newspaper and documented the source for the margin of the vote. For additional information on the source for each annexation and campus building date see this online spreadsheet: http://goo.gl/6sjDvz

In order to assign opening dates for new campuses, I collected information on existing campuses at the five community college taxing districts studied and determined when they were opened using information from the community college websites. I then used latitude and longitude data on campuses and school districts to map campuses to K-12 school districts.

## B Additional years of data

To take advantage of additional variation in community college tuition caused by annexation, I estimate the effect of annexation on enrollment for 1995 to 2012. These results are in Table A1 and include college/year fixed effects. In Column 1, annexation is associated with a slightly smaller

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Table A1: Enrollment, All Years

| | Tuition | Enr. CC | Enr. In Dist | Enr. 4 yr | No Pub. Enr |
|---|---|---|---|---|---|
| Annexation | -1.15*** | 0.038*** | 0.050*** | -0.0016 | -0.035*** |
| | (0.065) | (0.0066) | (0.0079) | (0.013) | (0.012) |
| Year, District FE | X | X | X | X | X |
| Demographics | X | X | X | X | X |
| College/Year FE | X | X | X | X | X |
| Mean of Dep Var | 1.33 | 0.27 | 0.22 | 0.24 | 0.49 |
| N | 388,063 | 388,063 | 388,063 | 388,063 | 388,063 |

This table considers the effect of annexation on immediate college enrollment patterns using data from 1994-2012. The CC column examines enrollment in a community college, 4yr considers enrollment in public universities, In Dist. considers enrollment at the in-district community college, and No Pub. Enr is an indicator for not enrolling in any public colleges or universities. The rows at the bottom indicate inclusion of controls for year and district fixed effects, demographic characteristics including race and gender, and college by year fixed effects. Standard errors are clustered at the K-12 District level and are in parentheses with $^{*}p < .1, ^{**}p < .05, ^{***}p < .01$.

increase in sticker price of tuition. The effect of annexation on community college enrollment is slightly larger with the estimate being 3.8 pp as opposed to 3.2 pp. The effects for enrolling in district and enrolling in no college are also larger than previous estimates but are still highly statistically significant. However, there is still no measured effect of annexation on enrollment at four-year colleges. These results suggest that the findings on enrollment are robust to using additional variation. Specifically, there was one additional community college that had any annexations and five additional annexations from 2006-2012.

# C Hours attempted

Another measure of educational attainment is the number of college credit hours accumulated. The data contain information on the number of credit hours attempted, which I will use as another measure of attainment. Unfortunately the data do not contain information on credit hours passed during the relevant time frame but credit hours attempted serves as a good intermediate indicator of credits accumulated.

Panel A of Table A2 shows that reduced tuition resulting from annexation increased hours attempted at community colleges. After four years, annexation had increased average credits attempted by 2 credit hours. There point estimates on the increases in university credits are positive but are not statistically significant. Unfortunately, the data on credits attempted does not extend

far enough to consider credits attempted at universities after 8 years which would give students more time to transfer from community colleges.

Panel B of Table A2 uses annexation as an instrument for attending a community college. The results have a similar pattern to Panel B of Table A2 but scale the coefficients by the number of students induced to attend community college. Students induced to attend community college as a result of annexation increased the number of credits attempted at community colleges after 6 years by 47.6 and the overall number of credits by 58.9. These results suggest that reduced community college tuition increased community college attendance and the students who attended were engaged nearly enough credit hours for an associate's degree.

Table A2: Hours Attempted

| | 4 yrs at 4yr | 6 yrs at 4yr | 4 yrs at CC | 6 yrs at CC | 6 yrs at All |
|---|---|---|---|---|---|
| Annexation | 0.27 | 0.53 | 2.00*** | 2.15*** | 2.69* |
| | (1.25) | (1.34) | (0.24) | (0.25) | (1.41) |
| | Univ Cr. after 4yr | Univ Cr. after 6yrs | CC Cr. after 4yrs | CC Cr. after 6yrs | CC Cr. after 8yrs |
| Attend CC | 5.98 | 11.8 | 44.1*** | 47.4*** | 59.1** |
| | (26.5) | (27.9) | (5.61) | (6.25) | (24.5) |
| Mean of Dep Var | 24.5 | 28.9 | 14.1 | 16.6 | 45.5 |
| N | 204,448 | 204,448 | 204,448 | 204,448 | 204,448 |

This table considers the sum of hours attempted at community colleges and universities after four and six years. Panel A presents the reduced form effect of annexation on credits attempted and Panel B instruments for community college attendance using annexation. Each column is a separate regression considering the effect in the $X^{th}$ year after high school. The rows at the bottom indicate inclusion of controls for year and district fixed effects, the building of new campuses, demographic characteristics including race and gender, and college by year fixed effects. Standard errors are clustered at the K-12 district level and are in parentheses with $^{*}p < .1, ^{**}p < .05, ^{***}p < .01$.

# D Placebo Standard Errors

To provide an alternate measure of the probability of these estimates arising from chance, I conduct a placebo exercise. Using data from community college enrollments in 1996 I predicted whether a college ever expanded its taxing district using the fraction of male students, fraction of Hispanic students, fraction of students in technical programs, and the log number of students. The four

colleges that had the highest likelihood of annexation and as such make up the "placebo data" were Dallas Community College, Tarrant County College, Tyler Junior College, and Collin County Community College. These four colleges were mapped to the four colleges that did experience annexations prior to 2006.[1] Within matched colleges, each K-12 district in the placebo data was randomly assigned to a K-12 district in the actual data and was given the annexation dates (if any) of the district in the actual data. This assignment rule ensures the same number of treated K-12 districts and timing of simulated annexations as were contained in the original data.[2] Then the reduced form regression of the effect of annexation on community college enrollment was performed and the results were stored. This process was repeated 500 times.

In the case of enrollment in community college, there were no placebo regressions in which a larger effect was estimated. This presents strong evidence that annexation and the attendant decreases in tuition did increase community college enrollment. In contrast, the estimated effect of annexation on enrollment in a four-year college was in the $46^{th}$ percentile of estimates of the placebo exercise. The estimate of the effect of annexation on enrollment at a four-year college from Table 6 was statistically insignificant, and the placebo exercise confirms that the enrollment in universities was not affected.

# E Failed Annexations

I consider the effect of holding an annexation vote that does not pass. This occurs in Table A3 where an indicator for a failed annexation is used in Equation 1. The sample is slightly different and includes the already included K-12 school districts and the districts that voted on annexation.[3] If places that consider annexation would experience growth in community college enrollment irrespective of annexation, then municipalities that held votes that failed would see an increase in enrollment. However, Table A3 show districts in which there were failed bids for annexation did not see a change in their enrollment patterns. This is further evidence that the timing of annexation votes does not seem to be correlated with underlying changes in the the propensity to go to community college. This evidence further strengthens the claim that annexation and the reduced tuition associated with annexation is driving the findings, not selection based on which districts consider annexation.

[1] This was done to make sure that the matched college had a greater or equal number of school districts that were in the taxing district as the college that actually experienced the expansion. Inherently this matched schools of roughly similar sizes. Dallas was matched with Lone Star College, Tarrant County College with Austin Community College, Tyler Junior College with Amarillo College, and Collin County Community College with Hill College.

[2] There are more control K-12 districts in the placebo data than in the original data because the four placebo community college districts had more K-12 districts than their actually-treated counterparts.

[3] All years are included and mirror Table A1 because the majority of the identified failed annexations occurred in later years. Only Houston Community College, Lone Star College, and Austin Community College saw failed annexations so Amarillo and Hill College are not included in estimation.

Table A3: Failed Annexations

| | Enr CC | Enr 4yr | Enr No Public | Enr In Dist. |
|---|---|---|---|---|
| Failed Annexation | -0.00610 | -0.00729 | 0.0157 | -0.00463 |
| | (0.0108) | (0.00657) | (0.0105) | (0.0103) |
| Year and District FE | X | X | X | X |
| Demographics | X | X | X | X |
| College/Year FE | X | X | X | X |
| Observations | 326,507 | 326,507 | 326,507 | 326,507 |

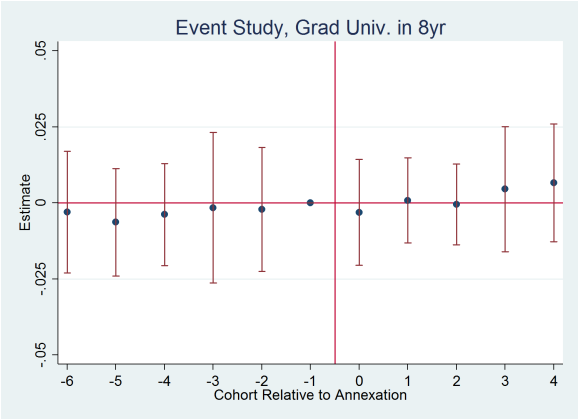
This table considers failed annexations on immediate college enrollment patterns using data from 1994-2012 for Houston Community College, Austin Community College, and Lone Star College. The CC column examines enrollment in a community college, 4yr considers enrollment in public universities, In Dist. considers enrollment at the in-district community college, and Enr None is an indicator for not enrolling in any public colleges or universities. The rows at the bottom indicate inclusion of controls for year and district fixed effects, demographic characteristics including race and gender, and college by year fixed effects. Standard errors are clustered at the K-12 District level and are in parentheses with $^{*}p < .1, ^{**}p < .05, ^{***}p < .01$.

# F Educational Attainment

In addition to graduation effects at community colleges, I consider the effect of community college attendance on graduation from universities. This is seen in Table A4 which mirrors Table 8. Panel A reports the reduced form where there is no significant effect on bachelor's degree receipt. Panel B presents the results of the instrumental variables strategy outlined in equations 4 and 5. The point estimates are imprecise but the magnitude can still be instructive. The estimates indicate that 17% of students induced to attend community college receive a bachelor's degree. The estimates in Panel B are similar to the cross sectional relationship between attending a community college and ultimate bachelor's degree outcomes presented in Panel C. Taken as a whole these estimates suggest that students induced to attend community college as a result of annexation graduate with a bachelor's degree at roughly the same rates as average students who attend community college. Figure 1 presents the event study figure for graduation from a university similar to Figure 4 in the main body of the paper.

Table A5 explores the heterogeneity of the effect of annexation on bachelor's degree receipt within 8 years. Despite African American students being initially diverted from community college enrollment, they do not experience a decline in bachelor's degree attainment. In fact, the point estimate is positive, though statistically imprecise.

Figure 1: Grad 4yr, 8 yrs




These figure plots the coefficients of a regression that compares differences in student outcomes between annexed districts and districts that were already part of the taxing district. The outcome considered is receiving a bachelor's degree within 8 years. The results are split by cohort relative to the annexation event occurring. The horizontal axis represents the cohort relative to annexation. For instance, 0 represents the cohort that first experienced annexation. -6 includes all cohorts 6 years or more before annexation. 4 includes all cohorts 5 years or more after annexation. The regression that produces these differences also controls for demographic characteristics, year fixed effects, K-12 district fixed effects, college-by-year fixed effects, as well as the building of a new campus.

Table A4: Community College Effect on Educational Attainment

| | Grad 4yr in 4yrs | Grad 4yr in 6yrs | Grad 4y in 8yrs |
|---|---|---|---|
| **A. Reduced Form** | | | |
| Annexation | 0.00029 | 0.0033 | 0.0078 |
| | (0.0037) | (0.0075) | (0.0069) |
| **B. IV** | | | |
| Attend CC | 0.0064 | 0.073 | 0.17 |
| | (0.079) | (0.15) | (0.13) |
| **C. Cross Section** | | | |
| Attend CC | 0.022*** | 0.084*** | 0.12*** |
| | (0.0039) | (0.0083) | (0.0082) |
| Mean of Dep Var | 0.077 | 0.21 | 0.25 |
| N | 204,448 | 204,448 | 204,448 |
| Year and District FE | X | X | X |
| Demographics | X | X | X |
| College/Year FE | X | X | X |

This table considers the effect of community college attendance on educational attainment from 1994-2005. Panel A considers the reduced form effect of annexation on graduation outcomes and Panel B instruments for community college attendance within the first year after high school graduation using an indicator for annexation. Panel C performs the same analysis using OLS on the same data. The rows at the bottom indicate inclusion of controls for year and district fixed effects, new campuses, demographic characteristics including race and gender, and college by year fixed effects. Standard errors are clustered at the K-12 district level and are in parentheses with $^{*}p < .1,^{**}p < .05,^{***}p < .01$.

Table A5: Heterogeneity

| | Grad 4yr in 8 yrs |
|---|---|
| **A. Econ. Dis.** | |
| Annexation | 0.011 |
| | (0.0080) |
| Annex*Econ Dis. | -0.0091 |
| | (0.012) |
| **B. Race** | |
| Annexation | 0.013 |
| | (0.0080) |
| Annex*Black | 0.0037 |
| | (0.0065) |
| Annex*Hispanic | -0.013** |
| | (0.0062) |
| **C. Gender** | |
| Annexation | 0.0091 |
| | (0.0055) |
| Annex*Male | -0.0025 |
| | (0.0062) |
| Year, District FE | X |
| College/Year FE | X |
| Mean of Dep Var | 0.25 |
| N | 204,448 |

This table considers the effect of annexation separately by different student characteristics. Each column represents a new outcome. Panel A contains results that fully interact the model with indicators fully for economic disadvantage. Panel B contains results that fully interact the model with indicators fully for race. Panel C contains results that fully interact the model with indicators for gender. The rows at the bottom indicate inclusion of controls for year and district fixed effects, an indicator for new campuses, and college by year fixed effects. All results use high school graduates from 1994-2005. Standard errors are clustered at the K-12 district level and are in parentheses with $^{*}p < .1,^{**}p < .05,^{***}p < .01$.