Impacts of Public 2-year College Spending and Tuition on For-Profit 2-year Colleges

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Abstract

In this paper, I compare the impact of lowering tuition prices versus increasing college quality through spending at public 2-year colleges on nearby for-profit 2-year enrollment. I use tuition caps and freezes as well as state budgets shocks affecting state appropriations as instruments for public 2-year spending and tuition. I find no impact of tuition changes on public 2-year enrollment or for-profit 2-year enrollment. However, I find large positive impacts of 2-year public spending on 2-year public enrollment, and negative impacts of 2-year public spending on nearby 2-year for-profit enrollment.

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1 Introduction

Two-year college students made up nearly 30 percent of students attending college in 2018 (Snyder et al., 2019). Those wanting to attend a 2-year college have to make a choice of what type of institution to attend: public, private nonprofit, or private for-profit. Although there is a wealth of economic studies on higher education, particularly public colleges, only a small portion of the literature focuses on for-profit colleges. The purpose of this paper to estimate the effect 2-year public college spending has on nearby 2-year for-profit colleges. This is important as for-profit colleges have been shown to provide lower quality outcomes, but charge significantly more when compared to their public counterparts (Deming et al., 2012). Furthering this research will provide policymakers with valuable information about how decisions from community colleges affect for-profit colleges.

Although the literature addressing the question of whether for-profits and publics compete is scarce, most studies conclude that the two types of institutions are substitutes (albeit imperfect ones). Cellini (2009) used a regression discontinuity design on school data in California to explore this topic. The author focused on counties that had a bill for increased higher education spending. There were 101 community college bond measures voted on from 1995-2002 that ranged from $8 to $658 million in value. Cellini then compared counties where a bill barely passed with counties where a bill was barely rejected. She found that, in California, increasing public funding resulted in an increase in public 2-year enrollment, and a decrease in the number of for-profit schools per capita. Specifically, she found that the passage of a $100 million bond results in a net loss of two for-profit schools. Since the average size of 1 for-profit in California is about 350 students (Cellini, 2005), her findings suggest that in California, about 700 students shift away from for-profits and into community colleges with the passage of a $100 million bond. Cellini et al. (2016) found that when the Obama administration passed the Gainful Employment regulations, which restricted access to federal student aid at sanctioned for-profit colleges, enrollment at 2-year publics increased. Although these two papers show how increased funding and restrictions set on for-profits affect for-profit and public enrollment, the authors do not evaluate how public spending influences for-profit enrollment specifically. This paper extends the literature by estimating the effect of 2-year public spending and tuition on nearby for-profit enrollment.

I use a similar approach to that used by Deming and Walters (2017), who estimated the effect of spending and tuition at public colleges on public enrollment. As reverse causality is of major concern when estimating the impact of spending and tuition changes on enrollment, Deming and Walters (2017) addressed this issue by using state budget shocks and tuition caps imposed by state legislatures as joint instruments for spending and tuition. Using this identification strategy, they found a positive, statistically significant impact of spending

on enrollment. They went further to estimate the spillover effects of their instruments on private colleges that were in the same county as public colleges. They found limited evidence of spillovers within the county. As opposed to using county to classify which colleges are close, this analysis uses each institution's latitude and longitude coordinates to evaluate which colleges are nearby without regard to county lines. The assumption is that students are attracted to schools that they are physically close to, regardless of whether they reside in the same county as that school. Some community colleges offer lower tuition rates to students that are "in the district" of a particular community college. Depending on the college, a student might be considered in-district if they are in the same county as the college, or in a close-by county defined by the college[1]. I evaluate whether the effect of community college spending and tuition changes on 2-year for-profits is a local effect by estimating the impact of community college spending and tuition changes on 2-year for-profits that are 50 to 100 miles away from that community college.

I find that decreased spending at community colleges not only decreases enrollment at these colleges, but also leads to increased enrollment in nearby for-profit colleges (that are within 25 miles of the community college). Specifically, I find that decreasing spending by 10% in one year at a community will increase enrollment at nearby 2-year for-profits by between 14% and 21% in the subsequent 3 years. I also find that this effect becomes statistically insignificant when I look at the impact of a community college's spending on 2-year for-profits that are within 50 to 100 miles of that community college. Thus, community college spending has a local effect on 2-year for-profits. These results suggest that as the quality of community colleges decreases due to a decrease in spending, students turn to for-profits for education and career advancement. In general, students that choose to attend for-profit colleges are more likely to leave with undesirable consequences, such as high debt or having dropped out (Iloh and Tierney, 2014; Deming et al., 2012).

2 Background

2.1 For-Profit and Public Two-Year Colleges

From fall 1990 to fall 2013, the number of 2-year publics grew less than 2%, whereas Title IV[2] 2-year for-profits saw growth of about 74%[3]. During that same time period, enrollment at public 2-years grew about 33%, whereas enrollment at for-profits grew by about 102%. Deming et al. (2012) found when compared with 2-year and 4-year public colleges, students who attended 2-year or 4-year for-profits were typically older, came

[1] According to data from the Integrated Postsecondary Education Data System (IPEDS), in 2013, 26% of 2-year public colleges offered in-district tuition.

[2] Title IV schools are institutions where students are eligible for federal student aid. There are certain regulations an institution must follow in order to be eligible for this accreditation.

[3] This study focuses on for-profit colleges that are Title IV eligible. Cellini and Goldin (2014) estimates that there are about 670,000 Non-Title IV for-profit college students out of 2.47 million for-profit college students each year.

from less wealthy families, and were less likely to be employed after finishing school. In addition, for-profits were typically more expensive and students tended to leave with more debt. According to Deming et al. (2012), as of 2009, students at for-profits left with more as twice as much debt than those from community colleges. Likewise, for-profit college students were almost three times as likely to default on their loans as community college students.

Cellini (2009) showed that the two institution types overlap considerably in what programs they offer. Table 1, taken from Cellini (2009), shows the average number of programs offered by community colleges and private 2-year colleges in each county. Given this information, the natural question is why do students enroll in for-profit institutions? Iloh and Tierney (2014) surveyed and interviewed 75 students at a for-profit and 62 students at a community college enrolled in nursing or surgical technician associate degree programs. One of the main questions the researchers focused on was why and how do students choose to attend for-profit colleges and community colleges. The main objectives of the public 2-year system is to move students to a 4-year college, and to offer vocational training (Brint et al., 1989). The cost of attendance is usually a lot less when compared with for-profits as community colleges rely on state and local appropriations. One of the primary reasons community college respondents chose community college was because of cost. Many students took comfort in the fact that there were many offerings and majors available at a community college (as compared with a smaller vocational school) as their interests or desires might change throughout their experience. Other factors included in their decision were the ability to transfer to a four-year college, the social life on campus, and the peer-to-peer interaction (Iloh and Tierney, 2014).

Program name	Community College	Private 2-Year College	Difference	t-stat
Administrative and support	26	21	5	0.54
Business	22	24	-2	-0.25
Computers	20	70	-50	-1.95
Construction and contracting	8	7	1	0.52
Finance and insurance	5	10	-5	-1.26
Food and bar	5	2	3	2.53
Health and medicine	24	19	5	0.5
Professional services	15	31	-16	-1.48
Real estate	3	18	-15	-2.80
Teaching	6	5	1	0.56
Technical trades	16	26	-10	-1.00
Transportation	13	15	-2	-0.42
Travel and hospitality	3	2	1	0.56
Humanities and arts	74	15	59	2.94

Table 1: Mean number of programs per county in California 2002 (taken from Cellini (2009)). Data is taken from the Bureau for Private Postsecondary and Vocational Education and the California Community Colleges Chancellor's Office.

For-profits tend to be smaller, more expensive, and have the primary objective of providing vocational

training (Cellini, 2009). Although community colleges and 2-year for-profits offer many of the same programs, for-profits often act quickly to rising demand and offer certain programs more quickly than their public counterparts. The main source of revenue for Title IV for-profits is tuition (usually financed through federal grants and loans) (Deming et al., 2013). Many students who enrolled in a for-profit college considered enrolling in a community college, but found it too difficult due to institutional constraints. These institutional constraints include ambiguous admissions information, waitlists, and limited space for new students. Many of the for-profit respondents were older and had a family. They found for-profit college appealing as school fit their schedule. In addition, many respondents stated that it was important to be in a shorter term program, as they did not have to take as many remedial and general courses. Although the cost of attendance at the for-profit was significantly higher, many students believed that their debt burden was justified as they felt they had stronger opportunities in the labor market[4] (Iloh and Tierney, 2014). In addition to results found by Cellini (2009) and Cellini et al. (2016), Goodman and Henriques (2015) added to the literature by showing how state appropriations affected total for-profit enrollment in that state.

The authors found that a 10% cut in appropriations was related to a 2% rise in for-profit enrollment. This, however, cannot be claimed as a true causal estimate; the magnitude of the estimate is likely biased upward. We would expect that appropriations would have a positive impact on public enrollment and a negative impact on for-profit enrollment, but the reverse (of public and for-profit enrollment having impacts on appropriations) is also likely true. For example, state and local legislature might choose to allocate more appropriations to public colleges that expect to increase enrollment in their near future. As evidenced in figure A1 when regressing 2-year public enrollment on lagged, lead, and current appropriations, I find that there are significant pre-trends of appropriations on enrollment[5]. This suggests that reverse causality is an issue when estimating these impacts.

2.2 The Rise and Fall of For-Profits

As seen in figure 1, the number of students enrolled in for-profits rose steadily and quickly until 2010, but has fallen at about the same rate since then. Most of this fall in the number of for-profit colleges, and thus for-profit students, can be attributed to the Department of Education's "Gainful Employment" regulations. Under the Obama administration, the Department of Education put forth regulations to restrict access to federal student aid to for-profit schools where the average debt to earnings ratio of graduating students was high (US Department of Education, 2010). Since 2010, more than 2,000 for-profits and career colleges have closed (Green, 2019).

More recently, discussions about for-profit colleges reemerged as the Department of Education, under

[4]This may have resulted from a number of reasons. Some reported that they associated higher costs with better quality.

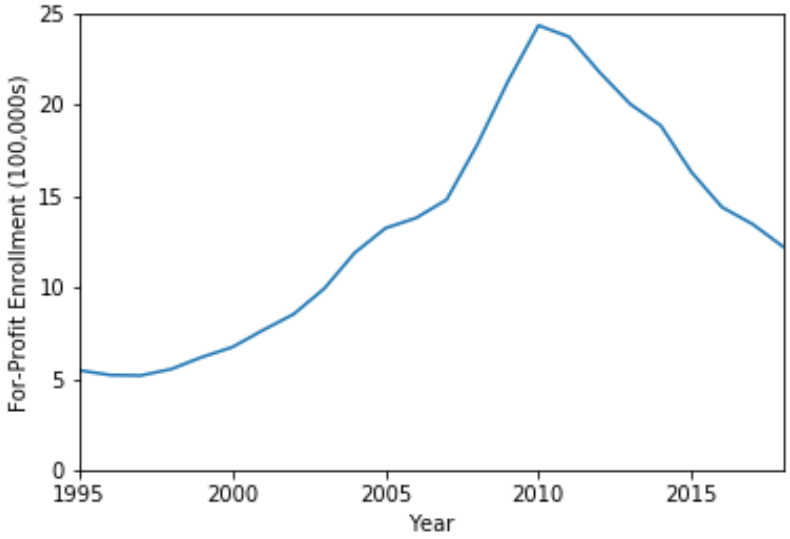


Figure 1: The number of students enrolled in private for-profit colleges increased greatly from 1995 to 2010. Since 2010, for-profit enrollment has declined, possibly due to stricter regulations imposed by the Obama administration (Snyder et al., 2019).

the Trump administration, began rolling back some these regulations (Green, 2019). In her first two years of office, Betsy DeVos, former Secretary of Education, delayed critical parts of the rule arguing that transparency was better than regulation. Instead of having colleges meet specific criteria, the Department pushed for expanding an existing database, the College Scoreboard, to provide information such as tuition and fees, student debt, and earnings prospects. These changes were set to be in effect in July 2020.

2.3 Impact of Spending for Public Colleges

Table 3 shows that state appropriations dropped from $4,830 per student in 2000 to $2,929 per student in 2013 [6]. These reductions have been associated with drops in spending at 2-year publics. Spending cuts may decrease enrollment and degree completion at colleges as it could decrease the quality of instruction, increase class sizes, and decrease the number of course offerings (Bettinger and Long, 2009; Bahr, 2014). Deming and Walters (2017) studied how changes in spending and tuition affected enrollment and completion rates at public colleges. Reverse causality is of major concern when estimating the impact of spending and tuition changes on enrollment. In anticipation of rising demand for public education, colleges might choose to increase their spending. Similarly, colleges might also change tuition prices in response to changes in demand (Deming and Walters, 2017). Deming and Walters (2017) addressed this issue by using state budget

Others stated that they felt the for-profit had more local connections.

[5] In other words, the coefficients on lead appropriations when regressing enrollment on appropriations are positive.

[6] Financial data is in terms of 2015 dollars using the Higher Education Cost Adjustment (HECA)

shocks and tuition caps as joint instruments for spending and tuition. When a state is on a constrained budget, they might not be able to award the amount requested by public colleges. This budget shock affects colleges differently. A college that is heavily reliant on state appropriations for their revenue would be more affected by a budget shock than a college that is relatively less reliant on state appropriations. The authors argued that when a college is faced with a budget shock, the college can choose to either cut spending, increase tuition, or both in order to decrease revenue loss. In addition to budget shocks, state legislatures can impose tuition caps. Since a tuition cap would disallow tuition to be set above a certain level, a college may be forced to cut spending in order to offset the loss in revenue from a capped tuition.

Using these instruments (budget shock and tuition cap) in a two-stage least squares approach, the authors showed that for public colleges, a 10% increase in spending increased current enrollment by about 3%. The increased spending not only had an impact on enrollment in the current year, but also subsequent years. Increased spending in one year was also found to increase enrollment 8% in the next year, 8.4% two years after, and 8.3% three years after[7]. As spending increases enrollment at 2-year publics, we might also see a crowd-out effect where nearby for-profits have a decrease in enrollment. Increasing spending at public colleges induces more individuals to attend these public colleges instead of for-profits. Snyder et al. (2019) found that in 2019, nearly 99 percent of 2-year publics had open admissions, meaning that if a student met certain criteria, usually if they had obtained a GED or graduated from high school, they were allowed to enroll. Spending could make attending a public college more attractive as waitlists could become shorter, more courses could be offered, and more services could be available to the students.

3 Data

Higher education data is taken from the Delta Cost Project (DCP) at American Institutes for Research. The DCP has compiled data from the Integrated Postsecondary Education Data System (IPEDS). IPEDS conducts annual surveys of higher education institutions (such as colleges, universities, and technical and vocational institutions). Institutions that administer federal student financial aid are required to participate in IPEDS. IPEDS collects institution-level data that includes: student enrollment, degree completion, revenue, expenditures, state appropriations, and institutional characteristics. All financial variables are in 2015 dollars (using the HECA index). Table 2 shows the list of variables (and their descriptions) used in this study. Table 3 shows a summary of the IPEDS data for 2000 and 2013. State unemployment rates taken from the Bureau of Labor Statistics as well as state-level data from the Census and the American Community Survey were matched to the DCP data. Tuition cap and freeze data for 2-year public colleges

[7]These increases are non-additive

were taken from Deming and Walters (2017).

Variable	Variable Description
Log (Public) Enrollment$_{i,t}$	The log of enrollment for community college i in year t
Log (Private For-Profit) Enrollment$_{i,t}$	The log of total enrollment for 2-year for-profit colleges within 25 miles of community college i in year t
Log Spending$_{i,t}$	The log of spending per student for community college i in year t
Log Tuition$_{i,t}$	The log of tuition and fees for community college i in year t
Z$_{i,t}$	Budget shock variable for community college i in year t (as defined in the Methods section)
TuitCap$_{i,t}$	Indicator for whether tuition cap is imposed on community college i in year t
TuitMax$_{i,t}$	Max tuition increase allowed for community college i in year t

Table 2: Mean number of programs per county in California 2002 (taken from Cellini (2009)). Data is taken from the Bureau for Private Postsecondary and Vocational Education and the California Community Colleges Chancellor's Office.

	2-year public		2-year private for-profit	
	2000	2013	2000	2013
Institution count	933	909	538	726
Tuition and fees	2627	3704	11426	14825
Enrollment	5426	7254	295	537
Spending	12411	8990	10678	13511
State appropriations	4830	2929	-	-

Table 3: Summary statistics for 2-year public and for-profit colleges in 2000 and 2013. Spending and state appropriations are in per student terms. Financial data is in terms of 2015 dollars using the Higher Education Cost Adjustment (HECA)

Students attending public 2-year institutions attend school 8 miles (at the median) from their home, whereas students attending private for-profit two year institutions attend school 11 miles (at the median) from their home (The National Center for Education Statistics 2011). Based of these statistics, the assumption I make is that students who want to attend 2-year college choose a college that is near their home. Thus, if these two institution-types were to compete for students, they would likely be within the same geographic location. I test for this by evaluating the effect of community college spending and tuition changes on nearby 2-year for-profit colleges as well as on 2-year for-profits that are farther away.

As shown in the literature, public per-student spending has a positive impact on public college enrollment (Deming and Walters, 2017). In section 4.2, I use a similar approach to that used by Deming and Walters (2017) to show that public spending not only increases public college enrollment, but also decreases enrollment at nearby 2-year for-profits. In this study, I evaluate the effect spending at each public 2-year institution has on the for-profit institutions that are proximate. Specifically, I look at the enrollment at the

for-profits that are within 25 miles of public 2-years[8].

4 Methods and Results

4.1 Instruments

As previously discussed, when faced with a budget cut a public institution can choose to either reduce spending or increase tuition, or employ both methods. This budget shock should have a greater impact on public institutions that rely more heavily on state appropriations as a source of revenue. State legislative budget decisions are usually made across the board, thus when one institution experiences a budget cut, most institutions in that state also experience a budget cut (Parmley et al., 2009). An ideal instrument would take into account both an institution's reliance on state appropriations, as well as the magnitude of state appropriations an institution receives in a given year. $Z_{i,t}$, or the budget shock instrument employed in Deming and Walters (2017), addresses these two points:

$$Z_{i,t} = \frac{Approps_{i,90}}{Rev_{i,90}} \times \frac{Approps_{s(i),t}}{Pop_{s(i),t}}$$

where $Approps_{i,90}$ is the revenue from state appropriations for institution i in 1990, $Approps_{s(i),t}$ is the revenue from state appropriations of state $s(i)$ where institution i resides in time t, $Rev_{i,90}$ is institution i's total revenue in 1990, and $Pop_{s(i),t}$ is the college aged population (aged 18 to 24) in state $s(i)$. The first term in $Z_{i,t}$ gives institution i's reliance on state appropriations as a source of revenue in 1990[9]. This is often called the exposure share in the literature. Using each institution's historical reliance on appropriations shuts down variation coming from endogenous institutional responses (Deming and Walters, 2017). The second term is state appropriations per college-age student in the state $s(i)$ where institution i is located, which gives the magnitude of state appropriations. This is added to shut down variation from individual institutions. There might be an issue of just using appropriations to individual institutions as policymakers might allocate appropriations to certain institutions that are expected to have increases in enrollment in the near future. This budget shock instrument, Z, is an example of a Bartik-like instrument (Bartik, 1991). One would expect that an increase in Z would lead to an increase in spending if tuition is kept constant. Likewise, an increase in Z should lead to a decrease in tuition if spending is kept constant.

[8] According to the CIRP Freshman Survey, the median distance for a community college enrollee from their home to college was 8 miles (Hillman and Weichman, 2016). Appendix also contains analysis using for-profits within 20, 30, and 50 miles of public 2-years.

[9] 1990 is a natural choice for baseline year as it is the first year that data on our instruments is available. As shown in Deming and Walters (2017), any year can be used as a baseline without changing the results very much.

State legislatures can also impose tuition caps. Tuition caps can be broken down further into two variables: $TuitCap_{i,t}$ and $TuitMax_{i,t}$. $TuitCap_{i,t}$ is binary variable measuring if a state legislature has put a cap or freeze on tuition prices. $TuitMax_{i,t}$ is the maximum percentage a college can raise their tuition in year t. If there is a freeze, then this value is equal to 0 and $TuitCap_{i,t}$ is equal to 1. If there is no freeze or cap, $TuitCap_{i,t}$ and $TuitMax_{i,t}$ are both equal to 0. Thus, $TuitCap_{i,t}$ will measure the impact of having any type of tuition cap, whether it be a tuition freeze or cap. The combination of these two variables will show us the impact of the existence and intensity of tuition caps on our variable of choice. One would expect $TuitCap$ would have a negative effect on tuition and spending at public institutions; whereas $TuitMax$ would have a positive effect on tuition and spending at public institutions.

Deming and Walters (2017) used these three instruments, $TuitCap$, $TuitMax$, and Z, to evaluate the (causal) impact of changes in tuition and spending on enrollment and degree completion for public institutions. I use these three instruments to evaluate the effect of changes in tuition and spending at public institutions on enrollment at nearby for-profit institutions.

4.2 Two-Stage Least Squares Model

I use a two-stage least squares approach. In each stage, I employ a first difference[10] approach. Thus, the first stage is:

$$\Delta X_{i,t} = \phi_{s(i)} + \omega_t + \Delta W'_{s(i),t}\lambda + \pi_1 \Delta Z_{i,t} + \pi_2 \Delta TuitCap_{i,t} + \pi_3 \Delta TuitMax_{i,t} + u_{i,t}$$

where $\Delta F_{i,t} = F_{i,t} - F_{i,t-1}$ for $F \in \{X, Z, W', TuitCap, TuitMax\}$, $X_{i,t}$ is log spending or log tuition, $W_{s(i),t}$ is a control matrix that contains time variant covariates of state s where i resides, including unemployment, share of male individuals, share of black individuals, average log income, state population, percent of individuals in state $s(i)$ with some college, and percent of individuals in state $s(i)$ with a bachelor's degree or above. ω_t and $\phi_{s(i)}$ are year and state fixed effects.

I initially evaluate how tuition and spending changes affect public 2-year institution enrollment. Using a first difference approach for the second stage yields:

$$\Delta Y_{i,t} = \Phi_{s(i)} + \Omega_t + \Delta W'_{s(i),t}\Lambda + \beta_1 \Delta \log \widehat{spending}_{i,t} + \beta_2 \Delta \log \widehat{tuition}_{i,t} + \varepsilon_{i,t} \tag{1}$$

where $\Delta F_{i,t} = F_{i,t} - F_{i,t-1}$ for $F \in \{Y, W', \log \widehat{spending}, \log \widehat{tuition}\}$, $Y_{i,t}$ is log enrollment for public

[10]Recall that using a first difference (changes) approach will yield the same results as using a fixed effects (levels) approach when there are two time periods. However, the two approaches are different when there are more than two time periods. First difference will be used in this analysis as it requires less restrictive assumptions for causal estimation. I have also used a fixed effects model. Results are in the appendix.

institution i in state $s(i)$, and Ω_t and $\Phi_{s(i)}$ are year and state fixed effects. This is the same model used by Deming and Walters (2017).

Table 4 shows the effect of our instruments, budget shock, TuitCap, and TuitMax, on Log Spending and Log Tuition. The results imply that a $1,000 increase in the budget shock variable increases spending by 5.8%. A tuition cap increases spending by 0.9%. Although Deming and Walters (2017) found the coefficient for tuition cap to be positive, they did not find it statistically significant at the 0.10 level, whereas I find it to be statistically significant at the 0.01 level. This result is counterintuitive as one would expect a tuition cap to lead to spending cuts. Additionally, a $1,000 increase in the budget shock instrument decreases tuition by 9.8%. A tuition cap decreases tuition by 4.5%. A 10 percentage point increase in max tuition increases tuition by 4.6%. Deming and Walters (2017) found similar results when including all public institutions. The last column contains the coefficients for log spending and log tuition using the second stage equation. The coefficient for log spending is positive and the coefficient for log tuition is negative as we would expect, but both are not statistically significant. Table A10 in the appendix shows the results when using a "levels" model with institution fixed effects as opposed to a first differences model. Although we do not find evidence of spending and tuition affecting current public enrollment, we can see if spending and tuition have lagged effects on enrollment.

	First stage		Second stage
	Log Spending	Log Tuition	Log Enrollment
	(1)	(2)	(3)
Z	0.058***	-0.098***	
	(0.01)	(0.01)	
TuitCap	0.009**	-0.045***	
	(0.00)	(0.01)	
TuitMax	-0.058	0.457***	
	(0.04)	(0.10)	
Log Spending			0.404
			(0.33)
Log Tuition			-0.063
			(0.13)

Table 4: 2SLS - Evaluating the impact of lagged log spending and log tuition on log public enrollment. Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

Table 5 shows how log enrollment changes for up to three years after changes in tuition and spending occur. We see that a 10 percent increase in spending in year t increases enrollment by about 8.9% in year $T+1$, and 11.3% in year $T+2$. One might expect that tuition changes would have an effect on enrollment; however, I find that the coefficients for tuition are not statistically significant. Some previous studies have found little to no impact of tuition on public college enrollment (Hemelt and Marcotte, 2011; Jackson and Weathersby, 1975; Deming and Walters, 2017). Tuition changes might not have large effects on enrollment as

many students fund their education using student loans, scholarships, and funds from parents. Additionally, if prices were to increase, an already enrolled student would incur switching costs if they were to transfer to another college. Thus, students are possibly not very sensitive to incremental changes in tuition each semester.

Spending, on the other hand, may attract or retain students by increasing college quality. This could be through the addition of course offerings, an increase in resources available to the students (resources aimed at helping students succeed), and the addition of professors and instructors to reduce class sizes or improve the average quality of instruction. Deming and Walters (2017) find similar results when looking at public 2-years, namely that a 10 percent increase in spending in year t increases enrollment by about 10% in years $T+1$, $T+2$, and $T+3$, and that tuition has no statistically significant impact on enrollment. The small differences in my findings compared to theirs could be a result of using slightly different datasets. Deming and Walters (2017) used the IPEDS data while I use the Delta Cost Project data, which aggregates some institutions that have multiple campuses into one single unit in the IPEDS data. The advantage of using data from Delta Cost Project is that it makes IPEDS data longitudinally consistent.

	Current year	T+1	T+2	T+3
Log Spending	0.404	0.887**	1.134***	0.501
	(0.33)	(0.35)	(0.42)	(0.37)
Log Tuition	-0.063	0.107	0.108	-0.219
	(0.13)	(0.14)	(0.18)	(0.18)

Table 5: 2SLS - Evaluating the impact of lagged log spending and log tuition on log public enrollment. Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

4.3 Assessing the Validity of the Instruments

It is recommended to perform valid regression-based tests of shock orthogonality (falsification) tests (Borusyak et al., 2018). These tests can also be used on the instruments that are not Bartik-like instruments. The key exclusion restriction required for this approach is that the instruments are conditionally uncorrelated with potential enrollment. We can test for pre-trends in enrollment with respect to changes in the instrument using the following reduced form equation:

$$Y_{i,t} = \alpha_i + \mu_t + W'_{s(i),t}\theta + \sum_{l=-L}^{L} [\rho_l^Z Z_{i,t-l} + \rho_l^C TuitCap_{i,t-l} + \rho_l^M TuitMax_{i,t-l}] + \nu_{i,t} \quad (2)$$

The only difference between equation 1 and 2 is that I use institution fixed effects (α_i) instead of state fixed effects, and I include lags and leads of my instruments. Statistically significant coefficients for the lead variables would suggest pre-trends. Figure 2 shows the results of this regression. For the budget shock

instrument, I find no evidence of any pre-trend relationships with log enrollment. Specifically, I fail to reject the null hypothesis that the four pre-trend coefficients are jointly equal to zero ($p = 0.70$). I likewise find no evidence of a pre-trend relationship between TuitCap and log enrollment ($p = 0.89$) as well as between TuitMax and log enrollment ($p = 0.61$). Thus, figure 2 shows that the instruments are not related to pre-trends in log enrollment.

Another concern is that a school's historical reliance on appropriations (in 1990) will impact the number of 2-year for-profits nearby in later years. Areas with high reliance on appropriations might see a lot more for-profits enter the market when these areas receive less support over time (which has been the trend in most states at least since 2000). Although this is a concern, figure 3 shows that there is no apparent relationship with the average historical reliance on appropriations in a state in 1990 and the percent change in 2-year for-profits in 2013. More formally, the correlation between the historical reliance and percent change in number of 2-year for-profit colleges is only 0.1529.

4.4 Tuition and Spending Changes on For-Profit Institution Enrollment

In order to evaluate the effect of tuition and spending at public 2-year institutions on for-profit enrollment, I alter the second stage to be the following:

$$\Delta Y_{c(i),t} = \Phi_i + \Omega_t + \Delta W'_{s(i),t}\Lambda + \beta_1 \Delta \log \widehat{spending}_{i,t} + \beta_2 \Delta \log \widehat{tuition}_{i,t} + \varepsilon_{i,t} \tag{3}$$

Notice that the only difference from equation 1 is the dependent variable, $Y_{c(i),t}$ which is the total enrollment at 2-year for profit institutions with a 25 mile radius of the 2-year public college i at time t. If there are n for-profit institutions within the specified distance of a public 2-year college, $Y_{c(i),t}$ would be the log of the aggregated enrollment for the n nearby for-profit institutions.

Table 6 shows the impact of spending and tuition at a public 2-year college on log enrollment for 2-year for-profit colleges within 25 miles of the public 2-year institution. A 10% decrease in spending (about a \$1,000 decrease in spending per student) at a public 2-year college from year $T-1$ to year T results in a 21% increase in enrollment in year $T+1$, a 14% increase in year $T+2$, and a 19% increase in year $T+3$ of nearby for-profit enrollment. A 21% increase would translate to about a 430 person[11] increase in nearby for-profit enrollment. These effects seem to die down after 4 years (point estimates shrink and are not statistically significant at the .05 level). Similar values, which can be found in the appendix, result when updating this distance to anywhere between 20 and 50 miles.

A 10% increase in public college spending amounts to about a \$942 increase in spending per student.

[11] The mean number of for-profit enrollment such that a community college is within 25 miles is 2,061 students

	Current year	T+1	T+2	T+3	T+4
Log Spending	-0.994	-2.093**	-1.428*	-1.939**	-1.350
	(0.82)	(0.90)	(0.80)	(0.90)	(1.08)
Log Tuition	0.517	-0.621	-0.087	-0.396	0.479
	(0.48)	(0.46)	(0.50)	(0.40)	(0.51)

Table 6: 2SLS - Evaluating the impact of lagged log spending and log tuition from public 2-year colleges on log 2-year for profit enrollment using DCP data from 1990-2013. (Summing the enrollment for private for-profit colleges within 25 miles of a public 2-year college). Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$.

Using the average enrollment at 2-year publics, this amounts to a $5,810,938 increase in spending for an institution. Using the coefficients estimated in my model, a $5,810,938 increase in spending in year t would result in an increase in public 2-year enrollment of 250 in the current year, an increase of 547 in year $t+1$, an increase of 700 in year $t+2$, and an increase of 399 in year $t+3$. Likewise, this increase in spending would result in a decrease of for-profit 2-year enrollment of 204 in the current year, a decrease of 431 in year $t+1$, a decrease of 294 in year $t+2$, and a decrease of 400 in year $t+3$. These results, along with the results from the impact of increasing spending per student by $942 on public 2-year colleges, can be seen in table 7. Furthermore, a 10% decrease in public college spending would result in approximately 3% to 6% of community college students crowding into 2-year for-profits.

	Current year	T+1	T+2	T+3
Public 2-year Enrollment	250	547	700	399
For-Profit 2-year Enrollment	-204	-431	-294	-400

Table 7: Average magnitude of changes of enrollment at public and for profit 2-years when public 2-year colleges increase spending by 10%.

I have shown that there is evidence that spending at community colleges has a negative impact on nearby 2-year for-profit colleges. If this is indeed a local effect, we should see less of an effect, or no effect at all when we expand the radius. Table 8 shows the results when using log enrollment of 2-year for-profits that are 50 to 100 miles away from a public 2-year college. The coefficients for spending are not statistically significant (even at the 0.10 level) and are often wrong-signed, giving credence to the claim that there is a local effect of spending at community colleges on nearby 2-year for-profit colleges, and that the effect diminishes or disappears when focusing on for-profits that are farther away.

4.5 Robustness Checks

Some argue that the data for private colleges prior to 2000 is inconsistent and thus not accurate (Deming and Walters, 2017). This is due to some private institutions not being required to report some of their

	Current year	T+1	T+2	T+3
Log Spending	0.833	-0.691	1.024	1.292
	(0.76)	(0.70)	(0.84)	(0.92)
Log Tuition	0.645*	-0.308	-0.004	0.238
	(0.34)	(0.29)	(0.35)	(0.34)

Table 8: 2SLS - Evaluating the impact of lagged log spending and log tuition from public 2-year colleges on log 2-year for profit enrollment using DCP data from 2000-2013. (Summing the enrollment for private for-profit colleges that are 50-100 miles away from a public 2-year college). Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

financial information. Table 9 presents the results when I restrict the model to the years 2000-2013, which are similar to the results using the years 1990-2013.

	Current year	T+1	T+2	T+3
Log Spending	-0.754	-1.354**	-1.675***	-2.187**
	(0.65)	(0.66)	(0.59)	(0.89)
Log Tuition	0.809*	-0.403	-0.145	-0.354
	(0.43)	(0.39)	(0.42)	(0.35)

Table 9: 2SLS - Evaluating the impact of lagged log spending and log tuition from public 2-year colleges on log 2-year for profit enrollment using DCP data from 2000-2013. (Summing the enrollment for private for-profit colleges within 25 miles of a public 2-year college). Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

Some for-profit colleges cater to students that might not physically attend classes on campus. These colleges would hypothetically be less affected by changes in decisions from local community colleges. Excluding these for-profit colleges should result in larger effect sizes. Further restricting my sample to colleges where more than 33% of the students are not exclusively distance learners (using only years 2000-2013) yields the results in Table 10. These results suggest that for-profits that compete for local students are more affected than for-profits that cater more to distance learners.

	Current year	T+1	T+2	T+3
Log Spending	-1.000	-1.700**	-1.876***	-2.243***
	(0.65)	(0.70)	(0.59)	(0.87)
Log Tuition	0.546	-0.602	-0.543	-0.380
	(0.41)	(0.40)	(0.41)	(0.33)

Table 10: 2SLS - Evaluating the impact of lagged log spending and log tuition from public 2-year colleges on log 2-year for profit enrollment using DCP data from 2000-2013. (Summing the enrollment for private for-profit colleges within 25 miles of a public 2-year college). Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

If we use OLS instead of 2SLS to examine the effect of spending and tuition on enrollment, we get the results seen in Table 11. Notice that the point estimates differ slightly from the original results; however, the same basic pattern emerges. There are large negative impacts of public spending changes on for-profit

	Current year	T+1	T+2	T+3
Log Spending	-0.023	-0.031**	-0.035**	-0.033*
	(0.01)	(0.02)	(0.02)	(0.02)
Log Tuition	-0.015	0.021	0.021	0.029
	(0.02)	(0.03)	(0.02)	(0.02)

Table 11: OLS - Evaluating the impact of lagged log spending and log tuition from public 2-year colleges on log 2-year for profit enrollment using DCP data from 2000-2013. (Summing the enrollment for private for-profit colleges within 25 miles of a public 2-year college). Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

enrollment. All of the coefficients for log spending in the OLS regression are of smaller magnitude than their 2SLS counterparts; however, they are of the same sign. One reason for this may be that the effect of spending (on nearby for-profits) varies across community colleges. If colleges that have a higher potential effect of spending actually have lower spending, than OLS coefficients will be less than 2SLS coefficients (Card, 1993).

5 Discussion

I find that changes in spending at public 2-years not only positively impact their own enrollment, but also negatively impact enrollment of nearby for-profit institutions. My results are similar to what Deming and Walters (2017) found, which is that increasing spending at 2-year public colleges by 10% results in an increase in enrollment by close to 10% in the subsequent three years (I found a 8.9% to 11.3% increase in enrollment in subsequent years). Cellini (2009) concentrated on the closure of for-profits in California and found that a $100 million passage of a bond resulted in about 2 nearby for-profits closing (due to lack of students). I instead focus on for-profit enrollment as the variable of interest, and thus can more accurately describe the effects of community college spending on nearby for-profits (as there may be some for-profits that close due to increases in spending from community colleges, but most will likely just see a decrease in their enrollment and will not shut down). Specifically, if spending at a community college increased by 10%, that would result in a reduction of between 200 and 400 students from nearby 2-year for-profits. This would amount to about 37%-75% of the size of one 2-year for-profit institution given that the average size of a 2-year for-profit in 2013 was 537 students.

I have focused on total spending in this analysis. One concern involves the components that makeup a change in spending. In other words, if spending changes, what specific areas of spending change? Total spending covers scholarship aid, core academic spending, administrative spending, and capital costs such as operation and maintenance. Deming and Walters (2017) found that increasing spending at public 2-years did not have a statistically significant effect on financial aid but did have a positive statistically significant

effect on core academic spending. Thus, increases in enrollment due to increases in financial aid driven by spending is not a likely mechanism. They found that a 10% increase in total spending resulted in about a 9.6% increase in instructional spending, an 11.8% increase in academic support spending, and a 10.8% increase in student services spending. Thus, it is more likely that we are seeing increases in enrollment because of increases in core academic spending[12] as core academic spending increases when total spending increases.

essential education activities of the institution. Core expenses include expenses for instruction, research, public service, academic support, student services, institutional support, scholarships and fellowships (GASB) or net grant aid to students (FASB) and other expenses.

My results give credence to the claim that individuals view public 2-years and for-profits as substitutes, albeit imperfect ones. Thus, as Cellini (2009) and Goodman and Henriques (2015) have shown, for-profits and public 2-years compete in the same market. Furthermore, my results show that as spending at a public 2-year decreases by 10%, this results in an increase of nearby for-profit enrollment by between 14 and 21 percent in the next 3 years. As state appropriations for public colleges continue to decrease, we would expect spending to also decrease. This is further evidence that increasing public funding may crowd out private for-profits. This is likely due to spending impacting class size, increasing course offerings, decreasing waitlists, providing more amenities and offering more guidance (Deming and Walters, 2017; Bettinger and Long, 2009; Bahr, 2014).

My results support that which Deming and Walters (2017) has found, namely the importance of increasing spending at public institutions. Spending would likely increase enrollment and degree attainment at public institutions. In addition, this support of public institutions would decrease enrollment at for-profit schools. This support would also lead to more students attending public institutions instead of for-profits, which could mean they would leave college with less debt and have a greater likelihood of finding a job (Deming et al., 2013; Lang and Weinstein, 2012; Turner, 2011).

6 Conclusion

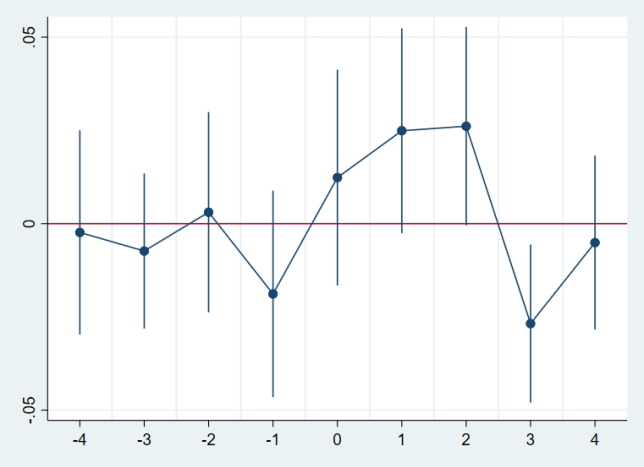
In this study, I use the latitude and longitude of colleges in order to find for-profits colleges that are within 25 miles of a community college. I then analyze the impacts of tuition and spending at community colleges on nearby 2-year for-profit colleges. In order to estimate these causal effects, I exploit the variation in exposure to budget shocks as well as tuition caps on community colleges that come from state legislatures. First, I find that changes in tuition have no impact on nearby for-profit enrollment. I also find that a 10%

[12]Core academic spending is defined as spending on instruction, research, public service, academic support, student services, institutional support, scholarships and fellowships and other similar spending.

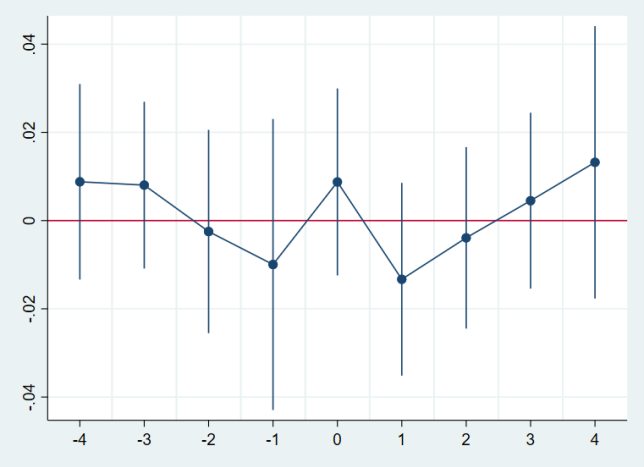
decrease in spending at a community college increases nearby for-profit enrollment by between 14% to 21% in subsequent years. This is a local effect as when I expand my analysis to look at the effect of spending at a community college on 2-year for-profits that are within 50 to 100 miles of that community college, these effects become statistically insignificant.

I find that enrollment at both community colleges and nearby for-profit colleges is more sensitive to changes in spending than to changes in tuition. This suggests that increased public aid for higher education will have larger enrollment effects when the the funds are used to improve the academic environment at institutions rather than lowering the tuition of students. In terms of analysis, my approach focuses on estimating local effects from community colleges. Future studies and policy analyses should use a similar approach as performing analyses at an aggregated level may show lower or even no effects even when there are indeed effects at the local level.

Impact of Budget Shock instrument on Log Enrollment



Impact of Having a Tuition Cap on Log Enrollment



Impact of Maximum Tuition Cap on Log Enrollment

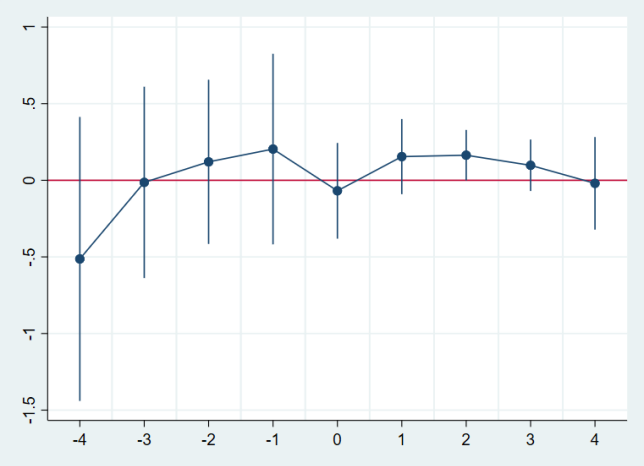


Figure 2: The plots above show the estimates and 95 percent confidence intervals for coefficients of the regression of log enrollment as public colleges on the lags and leads of budget shock instrument, an indicator of whether there is a tuition cap in place, and the maximum percentage increase allowed when a cap is in place. Time $t = 0$ is the base period and estimates the impact of each shock on enrollment. Positive time periods estimates the lagged impacts, and negative time periods estimates the lead impacts of each shock on enrollment. This regression model is defined in equation 2. Standard errors are clustered at the institution level.

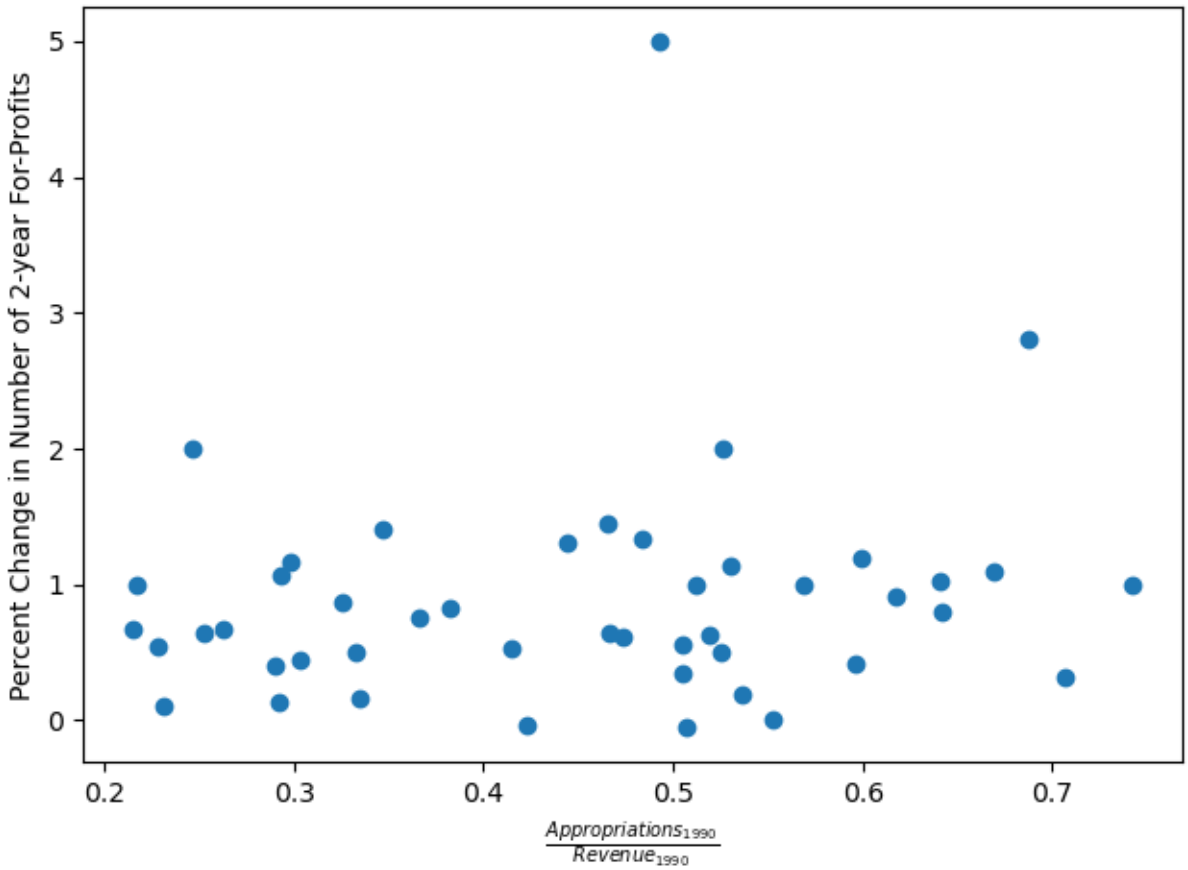


Figure 3: Average 2-year public historical reliance on appropriations in 1990 plotted against the percent change in the number of 2-year for-profits for each state in 2013.

References

Bahr, P. R. (2014). The labor market return in earnings to community college credits and credentials in california. *Ann Arbor, Michigan: Center for the Study of Higher and Postsecondary Education, University of Michigan. Working Paper*.

Bartik, T. J. (1991). Who benefits from state and local economic development policies?

Bettinger, E. P. and Long, B. T. (2009). Addressing the needs of underprepared students in higher education does college remediation work? *Journal of Human resources*, 44(3):736–771.

Borusyak, K., Hull, P., and Jaravel, X. (2018). Quasi-experimental shift-share research designs. Technical report, National Bureau of Economic Research.

Brint, S. G., Karabel, J., et al. (1989). *The diverted dream: Community colleges and the promise of educational opportunity in America, 1900-1985*. Oxford University Press on Demand.

Card, D. (1993). Using geographic variation in college proximity to estimate the return to schooling. *NBER working paper*, (w4483).

Cellini, S. R. (2005). Community colleges and proprietary schools: A comparison of sub-baccalaureate institutions.

Cellini, S. R. (2009). Crowded colleges and college crowd-out: The impact of public subsidies on the two-year college market. *American Economic Journal: Economic Policy*, 1(2):1–30.

Cellini, S. R., Darolia, R., and Turner, L. J. (2016). Where do students go when for-profit colleges lose federal aid? Technical report, National Bureau of Economic Research.

Cellini, S. R. and Goldin, C. (2014). Does federal student aid raise tuition? new evidence on for-profit colleges. *American Economic Journal: Economic Policy*, 6(4):174–206.

Deming, D., Goldin, C., and Katz, L. (2013). For-profit colleges. *The Future of Children*, pages 137–163.

Deming, D. J., Goldin, C., and Katz, L. F. (2012). The for-profit postsecondary school sector: Nimble critters or agile predators? *Journal of Economic Perspectives*, 26(1):139–64.

Deming, D. J. and Walters, C. R. (2017). The impact of price caps and spending cuts on us postsecondary attainment. Technical report, National Bureau of Economic Research.

Goodman, S. F. and Henriques, A. M. (2015). The effect of shocks to college revenues on for-profit enrollment: Spillover from the public sector. *Finance and Economics Discussion Series 2015-025*.

Green, E. L. (2019). Devos repeals obama-era rule cracking down on for-profit colleges. *The New York Times*.

Hemelt, S. W. and Marcotte, D. E. (2011). The impact of tuition increases on enrollment at public colleges and universities. *Educational Evaluation and Policy Analysis*, 33(4):435–457.

Hillman, N. and Weichman, T. (2016). Education deserts: The continued significance of "place" in the twenty-first century. *Viewpoints: Voices from the Field*.

Iloh, C. and Tierney, W. G. (2014). Understanding for-profit college and community college choice through rational choice. *Teachers College Record*, 116(8):1–34.

Jackson, G. A. and Weathersby, G. B. (1975). Individual demand for higher education: A review and analysis of recent empirical studies. *The Journal of Higher Education*, 46(6):623–652.

Lang, K. and Weinstein, R. (2012). Evaluating student outcomes at for-profit colleges. Technical report, National Bureau of Economic Research.

Parmley, K., Bell, A., L'Orange, H., and Lingenfelter, P. (2009). State budgeting for higher education in the united states. *Report, State Higher Education Executive Officers*.

Snyder, T. D., De Brey, C., and Dillow, S. A. (2019). Digest of education statistics 2018. *National Center for Education Statistics*.

Turner, N. (2011). Do students profit from for-profit education? estimating the returns to postsecondary education with tax data. *US Department of the Treasury*.

7 Appendix

7.1 For-Profit Enrollment (20 miles)

First and second stages of Deming and Walters including only public 2 years that have at least one for profit institution within **20 miles** of its campus.

	First stage		Second stage
	Log Spending	Log Tuition	Log Enrollment
	(1)	(2)	(3)
Z	0.057***	-0.059***	
	(0.01)	(0.02)	
TuitCap	0.011*	-0.045***	
	(0.01)	(0.01)	
TuitMax	-0.048	0.588***	
	(0.06)	(0.14)	
Log Spending			0.703**
			(0.28)
Log Tuition			0.016
			(0.12)

Table A1: 2SLS - Evaluating the impact of lagged log spending and log tuition on log public enrollment. Only public colleges that have a for-profit college within 20 miles of its campus are included. Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

	Current year	T+1	T+2	T+3
Log Spending	0.703**	1.015***	0.773**	0.873**
	(0.28)	(0.33)	(0.32)	(0.34)
Log Tuition	0.016	0.212	0.082	0.136
	(0.12)	(0.14)	(0.14)	(0.15)

Table A2: 2SLS - Evaluating the impact of lagged log spending and log tuition on log public enrollment. Only public colleges that have a for-profit college within 20 miles of its campus are included. Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

Adding the enrollment of for-profit institutions within 20 miles of a public 2-year institution.

	Current year	T+1	T+2	T+3
Log Spending	-1.244	-1.619*	-1.294	-1.856**
	(0.90)	(0.87)	(0.84)	(0.89)
Log Tuition	0.065	-0.294	0.062	-0.271
	(0.58)	(0.59)	(0.55)	(0.40)

Table A3: 2SLS - Evaluating the impact of lagged log spending and log tuition on log for profit enrollment. (Summing the enrollment for private FP colleges within 20 miles of a public 2-year college). Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

7.2 For-Profit Enrollment (30 miles)

First and second stages of Deming and Walters including only public 2 years that have at least one for profit institution within **30 miles** of its campus.

	First stage		Second stage
	Log Spending	Log Tuition	Log Enrollment
	(1)	(2)	(3)
Z	0.058***	-0.073***	
	(0.01)	(0.02)	
TuitCap	0.010*	-0.045***	
	(0.01)	(0.01)	
TuitMax	-0.058	0.579***	
	(0.05)	(0.11)	
Log Spending			0.638**
			(0.27)
Log Tuition			0.001
			(0.10)

Table A4: 2SLS - Evaluating the impact of lagged log spending and log tuition on log public enrollment. Only public colleges that have a for-profit college within 30 miles of its campus are included. Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

	Current year	T+1	T+2	T+3
Log Spending	0.575**	1.055***	0.885**	0.876***
	(0.26)	(0.33)	(0.34)	(0.33)
Log Tuition	-0.041	0.223*	0.177	0.163
	(0.10)	(0.13)	(0.14)	(0.13)

Table A5: 2SLS - Evaluating the impact of lagged log spending and log tuition on log public enrollment. Only public colleges that have a for-profit college within 30 miles of its campus are included. Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

Adding the enrollment of for-profit institutions within 30 miles of a public 2-year institution.

	Current year	T+1	T+2	T+3
Log Spending	-0.718	-1.657**	-2.018**	-1.652*
	(0.74)	(0.80)	(0.91)	(0.90)
Log Tuition	0.215	-0.568	-0.705	-0.405
	(0.44)	(0.43)	(0.51)	(0.43)

Table A6: 2SLS - Evaluating the impact of lagged log spending and log tuition on log for profit enrollment. (Summing the enrollment for private FP colleges within 30 miles of a public 2-year college). Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

7.3 For-Profit Enrollment (50 miles)

First and second stages of Deming and Walters including only public 2 years that have at least one for profit institution within **50 miles** of its campus.

	First stage		Second stage
	Log Spending	Log Tuition	Log Enrollment
	(1)	(2)	(3)
Z	0.051***	-0.090***	
	(0.01)	(0.02)	
TuitCap	0.009**	-0.044***	
	(0.00)	(0.00)	
TuitMax	-0.048	0.572***	
	(0.04)	(0.09)	
Log Spending			0.334
			(0.30)
Log Tuition			-0.071
			(0.10)

Table A7: 2SLS - Evaluating the impact of lagged log spending and log tuition on log public enrollment. Only public colleges that have a for-profit college within 50 miles of its campus are included. Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

	Current year	T+1	T+2	T+3
Log Spending	0.334	1.030***	0.859**	0.765**
	(0.30)	(0.39)	(0.40)	(0.39)
Log Tuition	-0.071	0.136	0.053	0.005
	(0.10)	(0.12)	(0.13)	(0.13)

Table A8: 2SLS - Evaluating the impact of lagged log spending and log tuition on log public enrollment. Only public colleges that have a for-profit college within 50 miles of its campus are included. Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

Adding the enrollment of for-profit institutions within 50 miles of a public 2-year institution.

	Current year	T+1	T+2	T+3
Log Spending	-0.609	-3.610***	-3.753***	-1.758*
	(0.77)	(1.33)	(1.45)	(0.93)
Log Tuition	0.388	-1.044**	-1.138**	-0.243
	(0.35)	(0.45)	(0.51)	(0.31)

Table A9: 2SLS - Evaluating the impact of lagged log spending and log tuition on log for profit enrollment. (Summing the enrollment for private FP colleges within 50 miles of a public 2-year college). Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

	First stage		Second stage
	Log Spending	Log Tuition	Log Enrollment
	(1)	(2)	(3)
Z	0.136***	-0.069***	
	(0.02)	(0.02)	
TuitCap	-0.026**	-0.043***	
	(0.01)	(0.01)	
TuitMax	0.406***	0.070	
	(0.10)	(0.30)	
Log Spending			0.379***
			(0.14)
Log Tuition			0.183
			(0.17)

Table A10: 2SLS - Evaluating the impact of log spending and log tuition on log for profit enrollment using a "levels" model. Standard errors are clustered by institution. $^{*}p < 0.10;^{**}p < 0.05;^{***}p < 0.01$

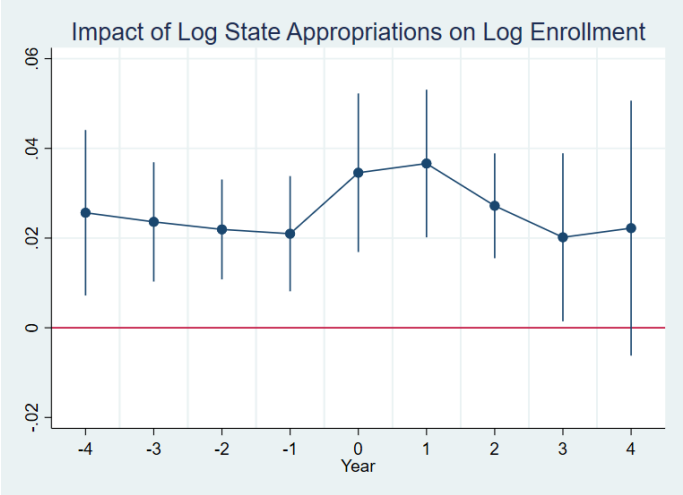


Figure A1: The plots above show the estimates and 95 percent confidence intervals for coefficients of the regression of log enrollment on the lags and leads of log state appropriations. Standard errors are clustered at the institution level.