Finance and Economics Discussion Series
Divisions of Research & Statistics and Monetary Affairs
Federal Reserve Board, Washington, D.C.

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2015-025

Please cite this paper as:
Goodman, Sarena F., and Alice M. Henriques (2015). "The Effect of Shocks to College Revenues on For-Profit Enrollment: Spillover from the Public Sector," Finance and Economics Discussion Series 2015-025. Washington: Board of Governors of the Federal Reserve System, http://dx.doi.org/10.17016/FEDS.2015.025.

The Effect of Shocks to College Revenues on For-Profit Enrollment:

Spillover from the Public Sector

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April 13, 2015

Abstract

This paper investigates whether declines in public funding for post-secondary institutions have increased for-profit enrollment. The two primary channels through which funding might operate to reallocate students across sectors are price (measured by tuition) and quality (measured by resource constraints). We estimate, on average, that a 10 percent cut in appropriations raises tuition about 1to 2 percent and decreases faculty resources by ½ to 1 percent, creating substantial bottlenecks for prospective students on both price and quality. These cuts, in turn, generate a nearly one percentage point increase in the for-profit market share of "elastic" enrollment (i.e. attendees of community colleges plus for-profit institutions), owing entirely to students who, in a better funding environment, would have attended a public institution. We estimate an elasticity of for-profit enrollment with respect to state and local appropriations of 0.2. Finally, we extend our analysis to show that for every 1 percent increase in flagship tuition generated by funding shortfalls, for-profit attendance increases by 1½ percent.

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1. Introduction

Over the past decade, state appropriations to public colleges have declined considerably, while the total sticker price of a college education has skyrocketed, causing a dramatic shift in funding for higher education. Between 2001 and 2011, real public funding to higher education fell by 11 percent.[2,3] Against this backdrop, enrollment at for-profit colleges rose dramatically, representing almost 30 percent of the overall increase in enrollment over this period. Prior to 2001, the for-profit sector represented just 3 percent of college goers, but by 2011, this sector accounted for more than 10% of the national market.[4]

For-profit institutions generally operate in ways unlike traditional higher education institutions. Courses are designed to accommodate the schedules of part-time and older enrollees who juggle continued education with other work and family responsibilities. As a result, they tend to serve a fairly small portion of enrollment, particularly among recent high school graduates (United States Department of Treasury, 2012). The returns to a for-profit education are in question: students attending these institutions are demonstrably more likely to borrow and much more likely to default on their loans than students attending schools in other sectors, yet they also typically pay more for their education and experience smaller earnings gains. In light of this, the more recent ramp-up of this sector remains unexplained, with the driving forces unknown, and there remains an open question how shocks to tuition and resources at public colleges could have contributed to this phenomenon.

This paper investigates the intersection of growth in the for-profit market with declines in publicly-provided funding for post-secondary education. Motivated by prior findings that for-profit enrollment is positively correlated with cohort size and highly correlated with local labor markets (Turner, 2006; Deming et al, 2012), we posit that the decline in support for public education, exacerbated by a period of economic uncertainty, created supply-side bottlenecks for traditional enrollees. Thus, a change in public funding can be viewed, from the point of view of the enrolling student, as an exogenous shock to the price and quality of her reservation education

[2] Meanwhile, revenue per student at public institutions, which serve the majority of undergraduate enrollees, has held mostly flat over this period, suggesting that resources available to attending students were largely unchanged in an environment of rising prices.

[3] Federal grant and lending programs have become more generous, contributing to this pattern but also improving access to college, more generally.

[4] The staggering growth flattened out only recently, as these institutions have faced increased scrutiny and threat of regulation.

at a public institution. Our analyses focus on demand-side responses to these supply shocks, evaluating attendance choices made by marginal enrollees and the forces driving their decisions.

Our primary strategy links statewide enrollment to public funding. While we find no impact on overall enrollment at low-cost schools, we estimate an elasticity of for-profit enrollment with respect to state and local appropriations of approximately 0.2 Further, we find that a 10 percent decrease in public funding generates a 0.7 percentage point increase in the for-profit market share of "elastic" enrollment, where elastic enrollment includes attendees of community colleges and for-profit institutions.[5]

We begin by investigating plausible channels through which a negative shock to funding could limit educational opportunities in the public sector. We consider potential bottlenecks in the public school system across two broad categories, price and quality. For the price dimension, we examine various tuition concepts, derived from sticker prices the typical student faces and gross tuition revenue collected by institutions. We find that in response to a 10 percent funding cut, the in-state full sticker price of flagship institutions increases by around 1½ percent, and the average sticker price increases by 1 percent. For quality, we focus on capacity constraints that result when schools scale back staffing and admission slots. From the point of view of the enrolling student, such actions reduce the quality of education she has access to. We find funding cuts are associated with very small changes in quality: for a 10 percent cut in appropriations, the share of faculty teaching only part-time increases by a quarter of a percentage point (less than 1 percent of the mean), and the ratio of full-time faculty to the full cohort of students enrolled across the for-profit and public sectors decreases by about one-half percent. Interestingly, we find that the ratio of full-time faculty to just the public student body is unchanged, implying that declines in public school enrollment could have offset reductions in available faculty per student. Finally, we find some evidence that flagship public institutions are comprised of fewer in-state freshmen when funding is cut.

Next we tie funding shocks to shifts in enrollment patterns. We find evidence that, in a flush funding environment, marginal college-goers are absorbed into community colleges. However, when resources are scarce, they are squeezed out of the public sector entirely and into the for-profit sector. We find no evidence of reduced appropriations on overall attendance across

[5] Over the period we study, the standard deviation of real statewide public appropriations is $2.5B, 1¼% of its mean of $1.9B. Mean statewide market share of for-profits over the same period was about 23 percent.

sectors. Altogether, our estimates imply that crowd-out in the public sector is driving a significant portion of the run-up in for-profit enrollment over our period of study, separate from competing phenomena such as the rise of certifications or worker retraining programs. Assuming no spillovers across states, our estimates imply that cuts in public funding could explain over a quarter of the growth in the sector during its peak run-up years.

As a final exercise, we offer a suggestive derivation of the elasticity of enrollment in the for-profit sector with respect to conditions in the public sector. First, we examine the sensitivity of for-profit attendance to funding-driven variation in two of our price measures, flagship tuition (which we argue, owing to its relative responsiveness, is the first line of defense public college systems employ against a funding cut) and average tuition (which is the price faced by a typical public school attendee). Next, since tuition-setting authority varies by state, we take our analysis further and exploit how closely linked our two tuition metrics are to other revenue streams. Under the assumption that more unified systems are presumably more likely to systematically offset appropriations decreases with price increases, we classify states according to how centralized they report their tuition-setting practices to be. To leverage this variation, we interact centralized authority with changes in state funding, so that in theory, our estimated causal effect is determined in part by how responsive we expect our price measures to be to changes in appropriations. Results indicate a cross-price elasticity of for-profit attendance between 1 and 1.5.

The effects of being squeezed out of the public sector are not negligible. Current estimates on the return to education in each sector imply sizable income differentials, with earnings from a community college program edging out those from a for-profit program by about 3 percentage points (Cellini and Chaudhary, 2012). Our findings on the impact of public sector tuition on for-profit enrollment corroborate those from prior studies, finding that students apparently trade off small differences in tuition today for probabilistically large differences in future earnings (Cohodes and Goodman, 2014).

The rest of the paper proceeds as follows: Section 2 motivates and reviews our setting and theoretical framework; Section 3 describes our data and estimation strategy; Section 4 estimates the price and quality dimensions along which a funding shock can impact the public sector; Section 5 estimates the effect of public funding cuts on the market for higher education;

Section 6 quantifies the degree of substitutability between a public and for-profit education; and, Section 7 contextualizes our main estimates and concludes.

2. Institutional Background and Conceptual Framework

This section describes in broad terms how colleges are funded. Next we motivate a theoretical framework with a quick overview of the relevant literature and provide a theoretical framework to inform our empirical analysis.

a. Brief Primer on Public College Funding and the Economic Environment

Most states face balanced budget requirements, so that when economic conditions sour, they will likely be constrained in their funding for higher education. This, coupled with rising burdens of state-funded entitlement programs and K-12 education expenses, suggests that higher education institutions have had access to fewer and fewer funds from state sources. To wit, the share of public higher education revenues coming from state and local funding at public four-year institutions fell from almost 60% in 1986 to below 40% in 2009 (United States Department of Treasury, 2012).

Public colleges and universities receive a large portion of their revenues from state and local appropriations and tuition. Thus, an available remedy to keep educational resources constant is to offset funding losses with tuition increases.[6] Indeed, the balance between these two sources has shifted dramatically over the past couple of decades. State and local appropriations represented 30% of public institutions budget in 2012, dropping from 40% in 2003. In contrast, tuition revenues were 25% of total revenue in 2012 compared to 17% in 2003 (United States Government Accountability Office, 2014). The remaining revenue, which generally comes from the Federal government, gifts, and grants, represents a fairly static portion of overall funding over our period of study. The interplay of falling appropriations and rising tuition has been a central topic of debate in higher education.

Our period of study covers a time period during which enrollment and tuition have both skyrocketed, in part because economic conditions over the Great Recession exacerbated

[6] There is variation in the discretion state legislatures have to adjust their tuition as they balance their budgets. We will leverage these differences in our calculations at the end of the paper. See Bell (2008) for a discussion of the interplay between state politics, tuition, and appropriations.

enrollment growth and deeply hampered state colleges' access to public funds, both well beyond trend.[7]

b. How Public Funding Could Influence Enrollment Behavior

There is existing evidence that for-profits schools compete with public sector community colleges for students, with studies focusing separately on the supply and demand sides of the market (Cellini, 2009; Chung, 2012). In addition, a separate strand of research has evinced substantially decreases in attendance rates brought about by larger-than-usual cohorts and prices in the public sector (Bound and Turner, 2007; Fortin, 2005). In turn, students have demonstrably experienced profound and long-lasting consequences associated with crowding in the public sector (i.e. reduced graduation rates as in Bound et al, 2010). Thus it seems plausible that exogenous changes in the available supply of public education may influence marginal attendees to consider another sector entirely, even if returns to that sector are lower or riskier. The recent recession has compounded crowding and reduced public funding at public colleges due to the poor economic environment; much of the crowding has occurred among non-traditional or lower-ability students (Long, 2015). Thus, we hypothesize that over the last decade, a significant portion of for-profit sector attendance was driven by students squeezed out of the public sector. The following discussion highlights formally the price and quality channels through which these relationships result.

Consumers have preferences over the education received in each sector, such that there is imperfect substitutability between the two sectors. The for-profit sector offers a differentiated (i.e. lower-quality or lower-valued, on average) education and can elastically absorb excess demand for education in the public sector. Because there is imperfect substitutability between the two sectors, excess demand for public education can flow to the for-profit sector, where any increase in for-profit enrollment will be smaller than the decline in public enrollment since education in the two sectors is not valued equally. Demand in the public sector depends on the aggregate demand for education and the relative costs and benefits for each student at each type of school. If the marginal rate of substitution (MRS) between the two sectors is close to 1, shocks that occur in the public sector can generate large swings in demand for for-profit education.

[7] Growth in tuition is likely driven by economic conditions (Chakrabarti et al (2012)). This analysis also finds that among states with the largest funding cuts in recent years, there is a strong response of tuition to offset the loss in revenue.

Assume that prices in the for-profit sector are fixed by the market at the beginning of the period so that they do not respond to changes in demand that result from a shock to the public sector in the short run.

Assume a negative funding shock occurs in the public sector. There are two dimensions along which institutions can respond: (1) decreasing quality, or (2) increasing price. When quality decreases, education in the for-profit sector will become relatively attractive, a shift downward in demand for the public sector will be met with an upward shift in demand for the for-profit sector. Alternatively, when the price of public education increases, the public supply curve will shift upward. Again, there will be an upward shift in demand in the for-profit sector. In both cases, the quantity of public education demanded falls and the quantity demanded of for-profit education rises.

The size of the increase in for-profit education demanded will be different under the quality decrease than under a price increase. Both will hinge on the size of the shock to the primary sector, the degree of substitutability between the two sectors, and the relative price of education across sectors. The degree of substitutability will change when quality in the public sector declines. If the price rises in the public sector, the MRS is not affected, but the cross-price elasticity impacts the individual's choice of sector. All else equal, a higher elasticity of substitution will generate a larger increase in the demand for for-profit education.

3. Empirical Framework

This section describes the construction of our key variables and our estimation strategy.

a. Data

We construct two datasets for our analyses. We briefly describe their construction in turn below.

i. Delta Cost Project (DCP) Data

Our primary analysis sample, the "DCP data," is drawn from the Delta Cost Project (DCP) longitudinal data made available on the Department of Education's website.[8] The database includes harmonized institutional data on postsecondary finance, enrollment, and staffing reported to the federal government through a series of mandatory annual surveys of

[8] See http://nces.ed.gov/ipeds/deltacostproject/

higher educational institutions, compiled into IPEDS (Integrated Postsecondary Education Data System). The DCP compiles this publicly available data and attempts to reconcile changes in accounting standards and reporting formats over time to be more useful for longitudinal analysis of enrollment and financing.

The panel covers all reporting institutions for enrollment years 1999 through 2009, such that there are over 10,000 distinct *unitid*s, our institutional identifier, serving as the basis for analysis. Of these, approximately 20 percent identify as public institutions, and 50 percent identify as for-profits. Note that these data do not cover the full extent of the dramatic rise in for-profit enrollment, which lasted a couple of years beyond the reach of the panel until regulatory actions began to constrain continued expansion of the sector. Data are further adjusted for reporting issues and are then collapsed to the state-year level for analysis.

Our key revenue measure is a combination of state and local appropriations at public institutions aggregated to the state-year. We construct an array of outcomes measuring quality and price using enrollment, faculty staffing, and tuition. Unless otherwise noted, enrollment data from the DCP are quantified in terms of full-time equivalent (FTE) students,[9] and financial data are real adjusted to 2013 dollars using the Higher Education Consultants Association (HECA) index.[10]

For each state-year, we also include a cohort measure, derived from intercensal statewide population estimates for 17-year-olds in July of the prior year, a college-aged population measure, derived from intercensal statewide population estimates for 18- to 24-year-olds in July of the current year, and a measure of economic conditions, an academic-year adjusted unemployment rate averaging the Bureau of Labor Statistics statewide data from June-May. Finally, we include state-level aggregated state and local grants and contracts (both operating and non-operating) to proxy for unobserved fluctuations in state budgetary health that could correlate with appropriations revenue and the outcomes we consider.

[9] We rely on fall enrollment counts, which is somewhat at odds with concerns raised in earlier work that for-profit attendance derived from fall enrollment may miss a considerable amount of students attending less conventional and short programs (Deming, Goldin, and Katz, 2012) A 12-month FTE enrollment measure is only available in our sample beginning in 2004, missing a sizable portion of our period of study. Moreover, the less conventional students they describe are not the subject of our analysis, which seeks to investigate the paths of for-profit enrollees who, in a better funding environment, would have attended public schools and thus likely would have enrolled in the fall.

[10] The HECA index is a specially-prepared price index generated by the association of public colleges intended to track changes in the costs of inputs purchased by colleges.

There are two aspects of the college-going decision that cannot be fully captured by our DCP analyses. The first is where students are from (their state of residence prior to college enrollment). Our analysis relies on information about the state in which an institution is located; therefore, our measurement omits a potentially-important choice margin – geography – that many college-going students have at their disposal. Also, due to reporting inconsistencies over time, when investigating for-profit enrollment market share, we consider FTE enrollment numbers. Doing so potentially dilutes the impact of public funding on enrollment choice since overall measures include continuing students who are likely less responsive than freshmen and could confound counterfactual public enrollees with non-conventional college-goers and graduate students. This is likely less a concern for the for-profit enrollment analysis as these students are less likely to move across state lines to attend a for-profit institution. The data discussed next will help mitigate some of these concerns.

ii. Freshmen Migration Data

We supplement our findings from the DCP analysis with freshmen migration data to better understand the geographical allocation of students. In even years, the IPEDS survey collects additional information from each reporting institution on freshmen state of residence. Using data from survey years from 2004-2010, we link counts of fall-enrolling freshmen by state of residence and sector of institution attended to statewide appropriations, grants, and contracts revenue, constructed to match the measures from the DCP. This dataset enables us to identify in broad terms how an enrollee's home state funding environment affects the sector and state in which she attends college, and whether competitive flagship institutions vary the composition of their enrolling class between in-state and out-of-state in response to changes in state funding.

All financial data are real adjusted to 2013 dollars using the HECA index. For each state-year, we include state cohort and unemployment rate information.

b. Estimation

Throughout our analyses, our primary estimating equation is:

$$y_{st} = \alpha + \beta_1 \times \ln(appropriations)_{st} + \beta_2 \times \ln(grants)_{st} + \boldsymbol{X_{st}\theta} + t + \gamma_s + \varepsilon_{st} \quad (1)$$

where y_{st} is our outcome of interest[11] (for instance, a measure of for-profit enrollment) for state *s* in year *t*, $appropriations_{st}$ is the total of state and local appropriations, $grants_{st}$ is the total of state and local grants and contracts, operating and nonoperating,[12] $\mathbf{X_{st}}$ represents our population and unemployment rate controls, t is a linear time trend set to zero in the 1999 enrollment year, and γ_s is a state effect. Our primary coefficient of interest is β_1 such that, when *y* is "ln(for-profit enrollment)," our estimate represents the percent change in tuition owing to a 1 percent change in appropriations. The inclusion of state effects and a time trend identify β_1 from variation of funding within a state, abstracting from national economic trend growth in college funding and enrollment, pricing, and funding.

For a causal interpretation of the estimates, one must assume variation in state funding is exogenous to the outcomes we consider. Following Fortin (2005), for each outcome, we present three versions of equation (1): the first with a linear time trend only, the second adds a quadratic time trend, and the third combines a time trend with orthogonalized year effects. All models follow this progression. Standard errors are clustered at the state level.

4. Impact of State Funding on the Supply of Education

The potential for spillover effects on the for-profit sectors hinges on funding cuts having a detrimental effect on the baseline education at a public college. We begin our analyses by investigating price and quality dimensions along which a funding shock can impact the public sector. We posit that, all else equal, public college systems have two broad ways to adjust their ledger for a shortfall in state funds: (1) increase price or (2) reduce quality. We begin by documenting how funding shortages might induce these negative intermediate outcomes, from the perspective of a potential enrollee.

a. Tuition

College price (at large research universities) is historically insensitive to cohort size (Bound and Turner, 2007). This suggests tuition does not respond to changes in demand for education. If this is the case and we estimate tuition increases in an environment of changing funding, changes

[11] The functional form of the outcome variable follows a consistent rule of thumb: share variables are denoted as percent of 100 and are estimated in levels, while count variables are expressed in logarithms.
[12] Following the literature (e.g. Fortin (2005), Bound and Turner (2007), Jaquette and Curs (2014)), we estimate models with log revenues as the primary explanatory variable.

in price are likely to be driven by a supply-side factor, rather than a tertiary variable from the demand-side.

We estimate equation (1) over several concepts of tuition. The first is enrollment-weighted tuition at community colleges – i.e. gross community college tuition paid (either by or on behalf of students) divided by the number of community college attendees. To the extent community colleges and for-profits compete for students, changes in the average price a student must pay to attend a community college will have the most direct influence on her enrollment decision.

This measure best targets our population of interest but conflates several educational decisions likely affected by price changes. First, in a low pricing environment, some community college going public students may instead elect a four-year public college, and in a high pricing environment, students along this margin may attend a community college and extensive margin students may opt out of schooling (or the sector) entirely; in all cases, student entry and exit will conflate our enrollment weights across pricing environments. Second, unlike four-year colleges where tuition is fixed by level and intensity of enrollment, community college students can elect the number of credits to pursue, subject to the cost of a credit. Community college students have been shown to strategically respond to the amount of credits they pursue in a semester when the price of a class changes (Marx and Turner, 2015), and a model of economic behavior does not deliver an unambiguous prediction for the direction of that effect. Thus, our first measure reflects an additional choice on the part of an attending student, the amount of education to consume, which we cannot distinguish from the true price.

We offer a second measure – the flagship sticker price (i.e. tuition and fees) for in-state students – which most cleanly reflects a state's pricing environment. Compared to any other measure, flagship tuition is not influenced by enrollment mix and most accurately reflects the true intensity of enrollment; however it also does not precisely capture the typical sticker price faced by our population of interest (unless the flagship price moves in lockstep with the rest of publicly provided higher education in a state).

The third and fourth measures – enrollment-weighted average sticker price and enrollment-weighted average tuition – link the pricing environment in the second measure to tuition revenue in the first measure. Note that reported sticker prices at community colleges are benchmarked to a fixed number of credits in order to be apples-to-apples with four-year institutions. Because of

this, we might anticipate a tighter link between average tuition and appropriations than between average sticker prices and appropriations.

All measures of tuition are inversely related to public funding (Table 2). Unsurprisingly, a funding decrease drastically affects tuition collected at community colleges and sticker prices at flagship institutions. In response to a 10 percent funding cut, the price of a public education rises 2 and 1½ percent, respectively. In addition, we see a slightly muted but still positive impact of a funding cut, on the order of 1 percent, on each of the full pricing environment and tuition revenue measures.

b. Resource Reductions

Resource reductions can occur through two channels: a drop in expenditure per student or competitive institutions in the system can attempt to increase the ratio of out-of-state students to in-state students. Since public tuitions are higher for out-of-state students than for in-state students, all else equal, an out-of-state student generates more revenue for an institution than an in-state student. Varying the composition of in- and out-of-state students is one margin cash-strapped, selective schools have at their disposal to make up for funding shortfalls, resulting in a reduction of admissions slots available to in-state students. Both channels constrain capacity from the perspective of an in-state enrollee. Unless we detect very large effects on the latter channel, we expect the first to more directly constrain the marginal student we describe in our model.

Faculty hiring and other staffing decisions are easily quantifiable and possibly affected by the amount of revenue schools have to spend. Further, it is one dimension which can directly affect the quality of education provided by an institution. We consider five measures of faculty resources available to students. The first is the total number of full-time faculty members. The second is the total number of part-time faculty members. Part-time hires are cheaper than full-time faculty, but of course come at the expense of faculty hours available to students. Still, adding part-time staff, unless it is at the expense of full-time staff, is not necessarily going to reduce expenses, so the impact of a funding reduction on part-time hires is theoretically ambiguous. The third measure – the fraction of all public school faculty who are part-time – relates these concepts, and of the three, most directly captures constraint. Struggling institutions might substitute part-time for full-time staff, either by physically replacing expensive faculty

members with cheaper ones, or more conceptually, by retaining current staff but reducing their hours to part-time. In either case, theory unambiguously predicts the third measure to be negatively correlated with funding.

We next construct two measures of faculty resources per student. The first scales full-time faculty by the number of students enrolled in the public sector. While in some sense, this is most directly what we are after, any resource measure scaled by the size of the public student body is obviously confounded by compositional shifts in enrollment across sectors. Our second measure is a broader calculation and scales faculty by students in both the for-profit and public sectors. This metric is hypothetical and designed to approximate the faculty-student ratio students might face absent a for-profit sector, but obviously captures some students who might not enroll at all absent such a sector. The true ratio of interest lies between these two measures.

Finally, using the information available in the freshmen enrollment sample, we investigate the extent to which flagship institutions, which generally have admissions discretion, vary the composition of their student body in response to different funding environments. Most students can become state residents by their second year of school, so from the institution's perspective, only an out-of-state freshman is more revenue-generating than any other student. Jacquette and Curs (2014) find that the elasticity of non-resident freshmen enrollment to state appropriations is negative and significant at public research institutions. When institutions focus on increasing out-of-state enrollment, in-state students might lose admissions slots, so from their point-of-view, the school will become more selective.

We estimate each faculty outcome following equation (1) over the DCP sample and flagship admissions over the freshmen migration sample (Table 3). Full-time faculty counts are positively associated with funding shocks, whereas part-time faculty counts are negatively associated, though neither are statistically interpretable (columns 1-6). As expected, the fraction of public school faculty members who are part-time employees is inversely tied to such shocks (columns 7-9). The point estimates suggest that the share of faculty on part-time status increases about three-tenths of a percentage point from a 10 percent decline in public funds.

Faculty-student ratios using the hypothetical concept, public faculty compared to all enrollees in low-cost schools as a measure of potential load on faculty, average around 0.046 in our data, such that there is 1 full-time faculty member for every 22 'potential public school' students. The estimated effects in the last three columns of Table 3 suggest that a 1 percent

increase in funding elevates this ratio to 0.048 (columns 13-15), such that there would then be 1 full-time faculty member for every 21 students, nearly a 5 percent increase. The estimates on the more narrow measure, including only students enrolled in public institutions, an actual faculty-student ratio, are indistinguishable from zero (columns 10-12).

Taken together, our results demonstrate that faculty resource reductions are an important byproduct of state appropriations cuts, the effects of which would likely be amplified without a for-profit sector to absorb some students.

Finally, we find some evidence that public four-year institutions vary their composition (columns 13-16), such that a 1 percent increase in funding produces a larger share of in-state students on the order of 0.1 percentage point, a small percent of the mean.[13] On average, 79 percent of the freshmen class at a four-year are from the state in which the school is located. The effects we detect are likely not large enough to constrain resources at open admissions public schools.

5. Impact on the Demand for Education

In the previous section, we established a clear relationship between state funding and the price and quality of a public sector education. Thus, one large ancillary impact of a decline in state funding is to constrain educational opportunities for marginal college-goers. This section investigates how funding shocks relate to enrollment patterns, and investigates the extent to which these constraints operate to squeeze students out of the public sector and into for-profit institutions.

a. Attendance at Public Institutions

We begin our analysis of enrollment by estimating the overall effect of appropriations reductions on public attendance. This tells us broadly whether crowd-out is indeed occurring. Then, since many first-time students exist on the margin between a four-year and a two-year public school, we examine how public funding could generate reallocation between community colleges (which are relatively cheap and open admissions) and four-years (which are relatively expensive and competitive admissions) among freshmen in particular.

[13] These findings are consistent with Jacquette and Curs (2014), as they do not find a significant elasticity of resident freshmen enrollment to appropriations, implying the share of in-state freshmen would be positively correlated with appropriations.

We consider several measures of freshmen enrollment at public schools: total public freshmen, flagship freshmen, and community college freshmen. We estimate equation (1) with these outcomes over the DCP sample, and in the analysis of freshman enrollment, we replace the college-aged population with the 18-year-old population to measure cohort. Table 4 reports the results.

Public funding is directly related to attendance at public institutions (columns 1-3), holding cohort size constant, such that drops in funding reduce overall public attendance. In other words, as expected, the public sector shrinks as funds wane. Moreover, we detect a clear crowd-out effect among freshmen (columns 4-6), and specifically in community colleges (columns 10-12), such that statewide reductions in appropriations alter considerably many students' educational plans. Finally, note that there is interesting within-sector nuance in how the two funding streams affect attendance: holding cohort size constant, appropriations reductions shrink community college attendance, but do not significantly affect college-going at flagships. On the other hand, grants seem to act to increase capacity somewhat at flagships, seemingly drawing in students on the margin of four-years and two-years.

Building on prior literature (Bound and Turner, 2007), we find that as cohorts grow, the size of the public sector expands. The sector is reasonably elastic and accommodates excess students brought on by larger-than-usual populations, even holding funding constant. Looking within the sector, the size of the freshman class enrolled at more-competitive flagships (columns 7-9) does not appear to expand with the cohort, given fixed levels of statewide funding. Instead, the expansion we recovered in the first three columns appears to mainly occur in the more supply-elastic community college sector.

Altogether, the results suggest that in a flush funding environment, marginal college-goers are absorbed into community colleges, but when resources are scarce, they are squeezed out of the public sector entirely.

b. Sectoral Reallocation

We have shown that declines in funding increase the price and lower the quality of a public sector education, and that in response, the public sector shrinks. Now we investigate how overall enrollment and enrollment across sectors vary with these funds. In conjunction with our findings

thus far, and the theoretical discussion in Section 2, we expect the for-profit sector to grow as funds flowing to public schools wane.

We first estimate (1) for total enrollment at low-cost institutions, the sum of full-time enrollees at all public colleges and full-time enrollees at for-profit schools. Next we consider three measures of *y* to capture for-profit attendance resulting from funding shocks to the public sector:

(a) the share of enrollees at "demand-elastic" institutions (public one- and two-years and for-profits) who attend a for-profit school,

(b) the share of enrollees at "low-cost" institutions (all public and for-profits) who attend a for-profit school, and

(c) log enrollment at for-profit institutions.

In understanding shocks to market share, we consider the coefficient on appropriations using the first outcome measure to be the primary parameter of interest. This parameter pertains most closely to the pool of potential for-profit enrollees, since most college-goers are likely not on the margin of choosing between a four-year public school and a for-profit institution. Still, this measure is an upper-bound when there is "infra-marginal" switching between the four- and two-year publics in response to funding changes. Thus, the second outcome offers a lower bound for the effect of funds on for-profit enrollment allocation across all low-cost institutions. The third outcome is broad and unbounded but affected by potentially endogenous determinants of college-going as it does not take into account the sector's relative market size when quantifying growth. Thus large percentage changes in for-profit attendance captured by this measure could reflect a very small sector at time zero and vice versa. Note that any changes in higher education market conditions our analyses omit that differentially affect for-profit college attendance (such as marketing campaigns targeting low-wage employees) will result in our overestimating the true parameter of interest. Table 5 reports the results.

First, we demonstrate we cannot detect an effect of appropriations on college attendance, demonstrating that overall college-going is not influenced by state funding, even though, as we have shown, public enrollment is (columns 1-3). Next, across the board, it appears changes in public funding are inversely related to for-profit enrollment; estimated β's are all negative and statistically significant at conventional levels. Our estimates for the increased market share of the for-profit sector range from 0.3 percentage point to 0.7 percentage point, given a 10 percent drop

in funding (columns 4-9). In these first sets of regressions, the impact of the college-aged cohort is positive, though not statistically significant. This is the direction we would expect and expands the literature investigating the impact of cohort size on enrollment. It supports a crowd-out story at public institutions, where excess enrollment cannot be accommodated and flows to for-profit schools, a more easily accessed sector and one which is less constrained.

Turning to columns 10-12, for-profit enrollment is negatively associated with increases in log revenues with about 2-3 percent increase in enrollment at for-profits in a state from a 10 percent drop in public funding in that state.

c. Robustness

i. State-specific Time Trends

There is wide between-state variation in both funding and the concentration of the for-profit sector. As a robustness check, we also estimate models with state-specific time trends. The results from this check are consistent with what we see in our primary results for the elasticity model (columns 7-9), but the coefficients are about half the magnitude of Table 5 for the share models (columns 1-6). The decline in coefficients in the share models is likely due to large variation in the concentration and behavior of the for-profit sector across states. Still the point estimates are quite similar in the log-log model, with the most comprehensive model estimating a marginally significant coefficient only slightly smaller than found in Table 5. These models can overwhelm our statistical power due to the state-level analysis over just 11 years of data in each case. Upon inspection, there is little variation in for-profit market share once we impose state-specific trends, which coincides with other work suggesting that proprietary institutions are self-propagating once they draw a critical mass of students to fund their existence (Cellini, 2009). Thus, it becomes difficult to obtain statistically significant results due to loss of power.

ii. American Recovery and Reinvestment Act of 2009 (ARRA)

As part of ARRA, the Federal government created the State Fiscal Stabilization Fund (SFSF), which allocated $48.6 billion to help alleviate substantial budget shortfalls states faced during the recession. Funds were allocated based on states' relative college-aged and overall populations, and in general, were to be used to restore state support to the budgeted amount for the 2008 or 2009 Fiscal Year. States were given discretion as to how to allocate their ARRA funds across Fiscal Years 2009, 2010, 2011, and potentially 2012. ARRA funds comprised

between 2 and 3 percent of higher education revenue in 2010 and 2011. For the purposes of our analysis, the ARRA funding can be viewed as an exogenous shock to public funding that could potentially contaminate our analysis of funds available to institutions in enrollment years 2009 and 2010 if not measured correctly.[14]

Our analyses rely on institutionally-reported financial information. In the survey forms, colleges are instructed to report all ARRA funds in a catch-all "other revenue" category. Upon review,[15] there appears to be considerable noncompliance with reporting guidance and classification inconsistencies across institutions. In fact, many institutions seem to classify SFSF funds as either state grants or state appropriations, which we believe reflects the fact that these funds are first disbursed to state governments and then disseminated amongst institutions at the discretion of the state. (Some, but fewer, institutions also appear to classify ARRA funds under federal funding categories.) Thus, we presume ARRA revenue is largely captured by the measures we consider. To investigate the robustness of our results, we re-estimate our models on for-profit outcomes, first by restricting our sample to non-ARRA years, and second by using a broad measure of public funds, where we include all federal, state, and local appropriations, grants, and contracts, excluding Pell Grants.[16] Results hold up in both circumstances, allowing us to conclude that the potential exclusion of ARRA funds is likely not driving our main results (Table 6).

iii. Geographic Allocation

The enrollment analyses link student enrollment decisions to funding conditions in their state of attendance. This presumes most students are geographically constrained in their educational decisions, such that a drop in a state school system's available funding primarily operates by squeezing students into other sectors within that same state. Ideally, we would have preferred to

[14] Very little of the funds were distributed to institutions in Fiscal Year 2009. See http://www.deltacostproject.org/sites/default/files/products/Trends2011_Final_090711.pdf

[15] The Department of Education publishes state reports detailing the distribution of education stabilization funds to public institutions of higher education which can be compared with institutional-level revenue data from IPEDS. See http://www2.ed.gov/programs/statestabilization/annual-reports.html for reports.

[16] In addition, our results are similar with another data source (not shown). SHEEO publishes appropriations and ARRA figures collected from states' higher education authorities. See http://www.sheeo.org/sites/default/files/publications/State%20and%20US%20Nominal%20All%20Data%20FY%2013%20-%205-7-14.xlsx and http://www.sheeo.org/sites/default/files/publications/SHEF_FY13_04292014.pdf. The SHEEO data better accounts for ARRA revenue but cannot separate ARRA funds from state and local grants and contracts.

evaluate whether changes in public funding within a state's public school system potentially limit the opportunities of students within that state. According to the Digest of Education Statistics, about 20% of freshmen attend school in a state other than their home state.[17] Thus, there exists a potentially important geographic channel through which the allocation of students could adjust in response to changes in funding. If on the whole, college-goers do not appear to pursue education in another state in response to funding cuts, funding conditions in the student's state of attendance are a reasonable proxy for funding conditions in a student's state of residence, which is an important check of our main identifying assumption that students are fairly geographically constrained with respect to the funding conditions in their home state.

Here we investigate how initial college-going decisions are affected by shifts in public funding. In other words, we estimate the enrollment response to funding conditions in a student's home state.[18] We focus on freshmen college-goers since migration is best measured for this group. State of residence, by which migration is measured, is not a meaningful concept after the first year of school.[19] Compared to non-freshmen enrollees – i.e. retained students, transferring students, or returning older students who might be less mobile and/or are pursuing a particular program of study – an incoming freshman's attendance decision is likely most sensitive to school resources.

We estimate equation (1) with the fraction of students from state *s* attending a public school in state *s* on the left-hand side, using the number of 18-year-olds in a state as our cohort measure to best capture at-risk freshmen. The coefficients suggest that a very small portion of students – an amount indistinguishable from zero – geographically respond to changes in funding in their home state (Table 7). Notably, geographic allocation does appear quite sensitive to fluctuations in cohort size, evidence that, holding funding fixed, large-than-usual cohorts crowd some students out of the public sector in their home state.

[17] See http://nces.ed.gov/programs/digest/d10/tables/dt10_232.asp

[18] Our sector analyses will link student enrollment decisions to funding conditions in their state of attendance: if student attendance decisions are instead driven by funding conditions in their state of residence, and that is a distinct concept from the state in which they attend school, we will need account for that in our analyses.

[19] This all said, of for-profit full-time undergraduates, 17.5% are freshmen, compared to 23% of public full-time undergraduates; as a result, estimates from these analyses likely overstate the extent to which geographic responses to public funding offset sectoral shifts. See http://nces.ed.gov/programs/digest/d10/tables/dt10_203.asp and http://nces.ed.gov/programs/digest/d13/tables/dt13_326.30.asp to derive freshmen share of fall enrollees (in 2008)).

6. Cross-price Elasticity of Demand for a For-Profit Education

Our analyses thus far provide suggestive evidence on channels through which funding cuts are likely to operate to reallocate students across sectors, but they do not directly link changes in supply-side metrics to demand. In this section, we attempt to quantify the causal impact of our most responsive channel – price at public institutions – on for-profit attendance. The framework we consider follows two stage least squares (2SLS) setup, where we allow appropriations funding to serve as an instrument for our endogenous measure, price.

First stage:

$$ln(tuition)_{st} = \alpha_1 + \alpha_2 \times ln(appropriations)_{st} + \boldsymbol{X_{st}\theta} + t + \gamma_s + \varepsilon_{st}$$

Second stage:

$$ln(for-profit\ enrollment)_{st} = \beta_1 + \beta_2 \times ln(\widehat{tuition})_{st} + \boldsymbol{X_{st}\theta} + t + \gamma_s + \mu_{st}$$

We consider both the enrollment-weighted posted tuition at all public schools and the sticker price at flagships as our endogenous price measures with β_2 as our key parameter. Based on our inspection of the underlying data, we observe potential time trends within states in their pricing, even after we remove national trends. Therefore we present alternative specifications that include state-specific time trends and year effects. For ease of interpretation, we consider the impact of tuition on for-profit enrollment growth, which was robust to the inclusion of such trends. Taken at face value, our estimates suggest that for every funding-induced percent increase in tuition, there will be a commensurate enrollment increase of around 1.5 percent in the for-profit sector (Table 8).

Note that our work throughout this paper would imply that the exclusion restriction we need to identify causality in this setting is violated. Other intermediate supply-side outcomes respond to funding changes and could potentially affect demand for for-profit education, and thus will be contained in μ_{st}. Thus this exercise is merely a suggestive derivation of a cross-price elasticity of demand, ignoring the other channels.

Still, it seems plausible that a tuition increase is the first-best response to a funding cut: for a number of reasons, it is conceivable that states and schools would rather shift the burden of educational financing to the federal government and families than damage their educational quality. Taking this further, we leverage additional variation in tuition-setting flexibility, which

will proxy for the extent to which states must offset appropriations cuts with quality reductions. In other words, if we isolate state systems that can systematically adjust tuition, we are less concerned that the 2SLS estimates are confounded by other key intermediate outcomes of a funding cut.

Every few years, state legislatures report on the primary body responsible for setting public tuition in a state. [20] Using this information, we classify states into two groups according to how centralized they report their tuition-setting practices to be, under the assumption that more uniform systems are more likely to systematically offset appropriations decreases with price increases. We interact centralized authority with changes in state funding, so the first stage equation becomes:

$$ln(tuition)_{st} =$$

$$\alpha_1 + \alpha_2 \times ln(appropriations)_{st} + \alpha_3 \times ln(appropriations)_{st} \times central + \boldsymbol{X_{st}\theta} + t + \gamma_s + \varepsilon_{st}$$

The estimated effect is thus partly determined by how responsive we expect tuition to be to changes in funding in states with centralized tuition-setting practices. In the first stage estimate, we find a significant, negative impact of centralized tuition on the relationship between funding and tuition, as expected. Results from the 2SLS estimation are slightly strengthened compared to the previous models and qualitatively similar (Tables 8).[21] Results indicate a cross-price elasticity of for-profit attendance between 1 and 1.5.

7. Discussion and Conclusion

We find that funding cuts produce substantial bottlenecks for prospective students due to both price and quality. These cuts serve to squeeze students out of the public sector and into the for-profit sector, contributing substantially to the run-up in for-profit enrollment experienced between 2000 and 2010. In fact, had prior trends continued apace, we estimate that cuts to public funding over this period could explain about 10 percent of the unexplained increase in the national market share of the for-profit sector of the same time period. Moreover, we find tuition to be a particularly important channel, both in its responsiveness to funding cuts and its causal

[20] This information is gathered through surveys fielded by the SHEEO. Additional information can be found at http://www.sheeo.org/resources/publications/state-tuition-fees-and-financial-assistance-policies.

[21] Due to potential concerns with endogeneity of appropriations for non-centralized tuition setting states, we re-estimated the 2SLS results only using state-year observations that had centralized practices. Results are consistent with what we report here.

role in reallocating students across sectors. Our estimates suggest that for every 1 percent increase in flagship tuition induced by funding cuts, for-profit attendance increases by 1.5 percent.

Almost half of the growth in for-profit attendance during our period of study occurred between the 2007-08 and 2009-2010 academic years (see Figure 1). In the mean state over those two years, the sector expanded by 3 percentage points, and real state appropriations fell by 11 percent. In our analysis, we found that every 10 percent cut in appropriations causes a 0.7 percent increase in for-profit market share. Thus, we would anticipate a 0.8 percentage point increase owing to recessionary funding cuts. In other words, state appropriations cuts can explain over a quarter of the growth in the for-profit sector over its primary run-up years.

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Table 1: Descriptive Statistics

Delta Cost Project data			
	N	mean	sd
For-profit Allocation			
forprofit/(forprofit+cc)	*550*	20.4	12.8
forprofit/(forprofit+public)	*550*	8.0	7.3
forprofit enrollment	*550*	21,284	40,764
Public Allocation			
enrollment in public schools	*550*	185,995	213,530
freshmen enrollment in public schools	*550*	30,324	29,182
flagship freshmen	*550*	4,813	3,374
community college freshmen	*550*	12,427	14,373
Faculty Resources			
full-time faculty	*550*	8,556	8,261
part-time faculty	*550*	7,118	8,792
share of faculty that are part-time	*550*	41.0	10.3
faculty/(forprofit+public)	*550*	0.047	0.010
faculty/public	*550*	0.050	0.009
Tuition			
flagship sticker price (real$)	*550*	6,726	2,412
enrollment-weighted tuition (real$)	*550*	6,743	2,587
enrollment-weighted community college tuition price (real$)	*550*	3,730	1,419
enrollment-weighted sticker price	*550*	4,935	1,844
Revenue and Controls			
appropriations (billions real$)	*550*	1.62	2.01
grants (billions real$)	*550*	0.36	0.48
unemployment rate	*550*	5.2	1.8
college-aged population	*550*	575,987	642,486
18-year-old cohort	*550*	83,632	92,780
Freshmen Migration Data			
$(public_{stay\_in\_state})/(for\text{-}profit+public)$	*204*	78.8	10.9
$(flagship_{in\_state})/(flagship)$	*204*	71.3	15.9
appropriations (billions real$)	*204*	1.53	1.99
grants (billions real$)	*204*	0.31	0.44
ur	*204*	6.1	2.2
cohort	*204*	85,011	97,340

Table 2: Effects of Public Funds on Tuition

	log(enrollment-weighted tuition at community colleges)			log(flagship sticker price)			log(enrollment-weighted sticker price)			log(enrollment-weighted tuition)		
log(appropriations)	-0.227**	-0.219**	-0.222**	-0.159**	-0.154**	-0.134**	-0.103+	-0.099+	-0.074+	-0.125**	-0.123**	-0.110**
	(0.034)	(0.043)	(0.043)	(0.053)	(0.045)	(0.039)	(0.057)	(0.051)	(0.041)	(0.021)	(0.020)	(0.023)
log(grants)	-0.013	-0.032	-0.035	-0.019	-0.033+	-0.021	-0.01	-0.02	-0.002	0.012	0.008	0.016
	(0.027)	(0.033)	(0.038)	(0.015)	(0.018)	(0.022)	(0.016)	(0.017)	(0.019)	(0.025)	(0.028)	(0.032)
UR	-0.001	0.003	0.000	-0.002	0.002	0.010	-0.004	-0.002	0.010	-0.004	-0.003	0.004
	(0.004)	(0.005)	(0.010)	(0.003)	(0.004)	(0.009)	(0.003)	(0.004)	(0.007)	(0.002)	(0.003)	(0.007)
log(18-24 year olds)	0.061	-0.075	-0.055	0.100	0.000	-0.020	0.013	-0.060	-0.096	-0.018	-0.050	-0.063
	(0.152)	(0.163)	(0.166)	(0.193)	(0.226)	(0.228)	(0.158)	(0.189)	(0.186)	(0.126)	(0.143)	(0.143)
trend	X	X	X	X	X	X	X	X	X	X	X	X
trend squared		X			X			X			X	
year effects			X			X			X			X
constant	12.178**	14.058**	14.127**	10.912**	12.303**	12.135**	10.402**	11.421**	11.195**	11.163**	11.613**	11.505**
	(2.095)	(2.308)	(2.443)	(2.507)	(2.998)	(3.070)	(2.118)	(2.496)	(2.538)	(1.520)	(1.871)	(1.900)
r2_a	0.942	0.943	0.942	0.949	0.949	0.950	0.947	0.947	0.949	0.963	0.963	0.963
N	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*

Notes: Each column reports coefficients from an OLS regression, where the outcome of interest is denoted by the column header. All regressions include state effects. Year effects orthogonalized to trend. The estimation sample is all 50 states, academic years 2000-2010 (inclusive). Enrollment-weighted tuition is derived by aggregating gross tuition and fees revenue (i.e. tuition and fees collected from the student plus scholarships applied to tuition and fees) from each institution to the state-year and dividing by aggregate FTE enrollment. The sticker price is the lowest of in-state and in-district sticker prices for tuition and fees reported by the school to the Department of Education, weighted by distribution of enrollment within a state-year where relevant. Standard errors clustered at state level. +, *, and ** reflect significance at the 10%, 5%, and 1% levels, respectively.

Table 3. Effects of Public Funds on Resources

	log(full-time faculty)			log(part-time faculty)			% faculty who are part-time			public full-time faculty:students in public sector			public full-time faculty:students in public and for-profit sectors			flagship composition		
log(appropriations)	0.025	0.024	0.026	-0.135	-0.111	-0.108+	-3.204+	-2.645*	-2.661*	0.000	0.000	0.000	0.002+	0.002+	0.002	8.184**	8.184**	8.226**
	(0.024)	(0.022)	(0.027)	(0.096)	(0.073)	(0.062)	(1.667)	(1.134)	(1.116)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(2.855)	(2.860)	(2.892)
log(grants)	0.037*	0.041+	-0.003	0.040	-0.018	-0.080	0.083	-1.301	-1.797	0.002+	0.003+	0.001	0.002*	0.002*	0.001	2.448	2.445	2.342
	(0.017)	(0.023)	(0.024)	(0.042)	(0.048)	(0.053)	(0.987)	(1.163)	(1.301)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(1.773)	(1.792)	(1.917)
UR	0.003	0.002	0.001	0.008	0.022**	0.019	0.129	0.461*	0.405	-0.000**	-0.001**	-0.001	-0.000**	-0.001**	0.000	0.402	0.394	0.437
	(0.003)	(0.004)	(0.006)	(0.007)	(0.008)	(0.023)	(0.161)	(0.185)	(0.443)	0.000	0.000	0.000	0.000	0.000	0.000	(0.914)	(1.098)	(1.195)
log(18-24 year olds)	-0.102	-0.074	0.011	0.832	0.419	0.546	12.864	2.996	4.103	-0.022**	-0.017+	-0.014	-0.022**	-0.018*	-0.016+			
	(0.203)	(0.234)	(0.234)	(0.636)	(0.649)	(0.653)	(8.415)	(9.659)	(9.462)	(0.008)	(0.009)	(0.009)	(0.008)	(0.009)	(0.008)			
log(18 year olds)																-1.889	-1.882	-1.838
																(3.922)	(3.996)	(3.995)
trend	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
trend squared		X			X			X			X			X			X	
year effects			X			X			X			X			X			X
constant	8.616**	8.221*	8.037*	-0.599	5.124	4.974	-61.976	74.757	75.731	0.299**	0.231+	0.231+	0.247*	0.197	0.195	-122.051**	-121.725**	-124.930**
	(2.7)	(3.2)	(3.2)	(7.3)	(7.5)	(8.2)	(114.8)	(131.9)	(139.8)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(36.8)	(38.4)	(37.1)
r2_a	0.988	0.988	0.991	0.967	0.967	0.970	0.873	0.879	0.879	0.758	0.759	0.814	0.814	0.814	0.856	0.407	0.404	0.401
N	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*204*	*204*	*204*

Notes: Each column reports coefficients from an OLS regression, where the outcome of interest is denoted by the column header. All regressions include state effects. Year effects orthogonalized to trend. The estimation sample is all 50 states, generally over academic years 2000-2010 (inclusive). Three rightmost columns pertain to freshmen only, over even years 2004-2010. Standard errors clustered at state level. +, *, and ** reflect significance at the 10%, 5%, and 1% levels, respectively.

Table 4: Effects of Public Funds on Public Enrollment

	log(public enrollment)			log(public freshmen)			log(flagship freshmen)			log(community college freshmen)		
log(appropriations)	0.020	0.024*	0.026*	0.042*	0.044**	0.048**	0.018	0.019	0.019	0.114+	0.126*	0.148*
	(0.015)	(0.011)	(0.011)	(0.017)	(0.016)	(0.016)	(0.023)	(0.021)	(0.024)	(0.062)	(0.053)	(0.062)
log(grants)	-0.009	-0.019	-0.021+	0.006	-0.003	-0.004	0.035*	0.029+	0.03	-0.029	-0.079*	-0.075+
	(0.011)	(0.012)	(0.012)	(0.011)	(0.013)	(0.015)	(0.014)	(0.017)	(0.020)	(0.027)	(0.036)	(0.042)
UR	0.013**	0.015**	0.011**	0.011**	0.013**	0.010*	-0.001	0.001	0.003	0.034**	0.043**	0.049**
	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.005)	(0.003)	(0.003)	(0.008)	(0.006)	(0.008)	(0.017)
log(18-24 year olds)	0.353**	0.284**	0.300**									
	(0.085)	(0.088)	(0.090)									
log(18 year olds)				0.681**	0.671**	0.727**	0.164	0.157	0.137	1.204**	1.144**	1.241**
				(0.137)	(0.137)	(0.143)	(0.136)	(0.134)	(0.142)	(0.338)	(0.324)	(0.325)
trend	X	X	X	X	X	X	X	X	X	X	X	X
trend squared		X			X			X			X	
year effects			X			X			X			X
constant	6.771**	7.732**	7.638**	1.386	1.612	1.04	5.410**	5.550**	5.836**	-6.311	-5.066	-6.56
	(0.932)	(1.000)	(1.035)	(1.618)	(1.621)	(1.745)	(1.613)	(1.617)	(1.744)	(4.603)	(4.323)	(4.661)
r2_a	0.999	0.999	0.999	0.997	0.997	0.997	0.986	0.986	0.986	0.987	0.987	0.987
N	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*

Notes: Each column reports coefficients from an OLS regression, where the outcome of interest is denoted by the column header. All regressions include state effects. Year effects orthogonalized to trend. The estimation sample is all 50 states, over academic years 2000-2010 (inclusive). Standard errors clustered at state level. +, *, and ** reflect significance at the 10%, 5%, and 1% levels, respectively.

Table 5: Effects of Public Funds on For-Profit Enrollment

	log(overall enrollment)			(for-profit enrollment)/ (for-profit enrollment + community college enrollment)			(for-profit enrollment)/ (for-profit enrollment + public enrollment)			log(for-profit enrollment)		
log(appropriations)	-0.011	-0.009	-0.005	-6.907**	-6.982**	-7.113**	-3.156*	-3.250**	-3.154*	-0.231**	-0.207**	-0.196**
	(0.022)	(0.020)	(0.024)	(1.611)	(1.484)	(1.616)	(1.249)	(1.096)	(1.292)	(0.073)	(0.054)	(0.060)
log(grants)	-0.014	-0.018	-0.02	-0.48	-0.295	-0.486	-0.41	-0.177	-0.174	-0.019	-0.077	-0.083
	(0.011)	(0.014)	(0.015)	(0.763)	(1.102)	(1.332)	(0.355)	(0.603)	(0.716)	(0.055)	(0.069)	(0.081)
UR	0.015**	0.015**	0.011*	-0.082	-0.126	-0.317	0.093	0.037	0.014	0.021*	0.035**	0.027
	(0.002)	(0.002)	(0.004)	(0.144)	(0.178)	(0.426)	(0.071)	(0.096)	(0.223)	(0.009)	(0.011)	(0.022)
log(18-24 year olds)	0.467*	0.440+	0.454*	2.915	4.235	4.443	5.554	7.22	7.191	0.281	-0.13	-0.120
	(0.193)	(0.226)	(0.224)	(13.963)	(15.075)	(14.854)	(10.188)	(11.692)	(11.566)	(0.652)	(0.672)	(0.672)
trend	X	X	X	X	X	X	X	X	X	X	X	X
trend squared		X			X			X			X	
year effects			X			X			X			X
constant	6.110*	6.480+	6.368+	131.014	112.717	121.738	7.089	-15.997	-15.481	9.927	15.632+	15.993
	(2.721)	(3.231)	(3.358)	(193.249)	(211.708)	(219.708)	(148.773)	(170.843)	(176.715)	(8.564)	(9.244)	(9.608)
r2_a	0.996	0.996	0.996	0.872	0.871	0.870	0.825	0.825	0.822	0.972	0.973	0.972
N	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*	*550*

Notes: Each column reports coefficients from an OLS regression, where the outcome of interest is denoted by the column header. All regressions include state effects. Year effects orthogonalized to trend. The estimation sample is all 50 states, over academic years 2000-2010 (inclusive). Standard errors clustered at state level. +, *, and ** reflect significance at the 10%, 5%, and 1% levels, respectively.
Overall enrollment includes all students enrolled at any public institution or for-profit institutions

Table 6: Effects of Public Funds on For-Profit Enrollment, Robustness

	(for-profit enrollment)/ (for-profit enrollment + community college enrollment)			(for-profit enrollment)/ (for-profit enrollment + public enrollment)			Log(For-Profit Enrollment)		
State-Specific Time Trends									
log(appropriations)	-3.282	-3.084	-3.331	-1.661+	-1.702*	-1.409	-0.235*	-0.203*	-0.173+
	(2.276)	(2.388)	(2.467)	(0.860)	(0.795)	(0.998)	(0.092)	(0.086)	(0.100)
log(grants)	-0.882	-1.276	-1.804	-0.511	-0.43	-0.583	-0.027	-0.09	-0.117
	(0.852)	(1.213)	(1.333)	(0.369)	(0.418)	(0.439)	(0.055)	(0.070)	(0.078)
Excluding FY2010									
log(appropriations)	-7.133**	-7.168**	-7.308**	-3.027*	-3.097**	-3.012*	-0.254**	-0.227**	-0.212**
	(1.541)	(1.426)	(1.533)	(1.139)	(1.005)	(1.149)	(0.090)	(0.063)	(0.067)
log(grants)	-0.557	-0.472	-0.644	-0.318	-0.148	-0.155	-0.024	-0.087	-0.086
	(0.774)	(1.149)	(1.353)	(0.361)	(0.588)	(0.684)	(0.053)	(0.064)	(0.076)
Broad Revenue Concept									
log(federal, state, and local spending, excluding Pell Grants)	-9.418*	-9.505*	-10.650*	-4.649*	-4.540+	-4.532	-0.523**	-0.575**	-0.603*
	(3.580)	(3.693)	(4.854)	(2.136)	(2.287)	(3.052)	(0.194)	(0.209)	(0.259)
trend	X	X	X	X	X	X	X	X	X
trend squared		X			X			X	
year effects			X			X			X

Notes: Each panel reports coefficients from an OLS regression, where the outcome of interest is denoted by the column header, and the bold panel header denotes an additional restriction imposed on the estimating equation, sample, and revenue measure, respectively. All regressions include state effects and state-year controls for unemployment rate and log(college-aged cohort). Year effects orthogonalized to trend (except in the top panel). The estimation sample is all 50 states, over academic years 2000-2010 (inclusive), except where noted. Standard errors clustered at state level. +, *, and ** reflect significance at the 10%, 5%, and 1% levels, respectively.

Table 7: LATE Estimates of Funding-Driven Price Effects on For-Profit Enrollment

	flagship sticker price	enrollment-weighted sticker price
baseline (trend specification)		
log(tuition)	1.448**	2.237*
	(0.393)	(0.879)
First-stage F statistic	9.2	3.3
state-specific time trends		
log(tuition)	1.234**	1.175*
	(0.465)	(0.461)
First-stage F statistic	16.2	11.2
state-specific time trends and year effects		
log(tuition)	1.367+	1.229+
	(0.729)	(0.693)
First-stage F statistic	40.6	25.2
accounting for centralization		
log(tuition)	1.437*	1.283+
	(0.735)	(0.712)
First-stage F statistic	19.7	13.5

Notes: Each panel reports coefficients from the second stage of a 2SLS regression, where the outcome of interest is log(for-profit enrollment), the endogenous tuition concept is denoted by the column header, and the instrument is log(appropriations). The bottom of each panel reports the first-stage F statistic. The bold panel header denotes an additional restriction imposed on the estimating equation. All regressions include state effects and state-year controls for unemployment rate, log(college-aged cohort) and log(state and local grants and contracts). The estimation sample is all 50 states, over academic years 2000-2010 (inclusive). Standard errors clustered at state level. +, *, and ** reflect significance at the 10%, 5%, and 1% levels, respectively.

Figure 1. Fall Enrollment in Degree-Granting Institutions