When Investor Incentives and Consumer Interests Diverge: Private Equity in Higher Education

Charlie Eaton, Sabrina T. Howell & Constantine Yannelis*

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Abstract

This paper studies the role of private equity buyouts in a sector heavily dependent on government subsidy: for-profit postsecondary education. Private equity owners have especially high-powered incentives to maximize profits. In a subsidized industry, this could intensify focus on capturing government aid at the expense of customer outcomes. Employing novel data on 88 private equity deals and 994 schools with private equity ownership, we find that private equity buyouts lead to higher enrollment and profits, but also to lower education inputs, lower graduation rates, higher tuition, higher per-student debt, lower student loan repayment rates, and lower earnings among graduates. Changes to the student body composition do not fully explain our results. In a series of tests exploiting regulatory events and thresholds, we find that private equity-owned schools are better able to capture government aid.

*UC Merced, NYU Stern & NBER, and NYU Stern. Emails: ceaton2@ucmerced.edu, sabrina.howell@nyu.edu, constantine.yannelis@stern.nyu.edu.

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1 Introduction

This paper studies the role of private equity in for-profit higher education. Relative to closely-held private firms or diffusely-held publicly traded firms, private equity-owned firms have particularly high-powered incentives to maximize profits (Jensen 1989).[1] In education, one reason such high-powered incentives might be poorly aligned with student interests is that education is heavily subsidized. Federal grants and federally guaranteed loans comprise around 90 percent of for-profit schools' revenue and have little if any dependence on student outcomes. We find that student outcomes deteriorate after a school is bought by a private equity firm, and reliance on federal aid and guaranteed loans increases.

We isolate a transition from lower- to higher-powered incentives using novel data on 88 private equity deals, which are associated with 596 school-level ownership changes.[2] Descriptive statistics indicate that independent for-profits are in some ways more similar to community colleges than to private equity-owned schools, suggesting that private equity involvement may explain some of the negative attributes associated with for-profits in, for example, Deming, Goldin, and Katz (2012), Cellini and Goldin (2014), Cellini and Turner (2016), and Deming, Yuchtman, Abulafi, Goldin, and Katz (2016). Regressions with school and year fixed effects as well as a matching estimator reveal sharp declines in student graduation rates, loan repayment rates, and labor market earnings after private equity buyouts.

Private equity buyouts can affect student outcomes through two non-mutually exclusive channels. The first is changed operations that are detrimental to student success. The second is a changed student body composition; for example, students may be less-well prepared. Unobserved compositional changes after the buyout are likely, and we do not directly observe value-added. This channel has ambiguous implications for student welfare and depends on school value-added.

[1] This is because private equity managers of buyout funds are compensated through a call option-like share of the profits, employ substantial amounts of leverage, and usually aim to liquidate investments within a short time frame. Private equity funds are financial intermediaries. In exchange for a profit share ("carried interest"), general partners invest third party capital in private firms, with the goal of achieving liquidity through a sale or IPO within the fund's typically ten year time frame. Also see Kaplan and Strömberg (2009) and Metrick and Yasuda (2010).

[2] Private equity-owned school systems acquire or establish an additional 398 schools.

To isolate the effect of operational changes, we hold composition effects fixed using partially treated cohorts. These are students in two-year programs who are already enrolled before a buyout occurs but have one year at the now private equity-owned school. We compare the cohort with partial treatment to the previous one with no treatment. Partially treated cohorts experience more than half the negative effect on graduation rates, and the full effect on repayments rates, that fully treated cohorts experience. Further, any composition mechanism does not act through observable demographic changes.

We next examine evidence for federal aid capture. First, we establish that higher-powered incentives lead to higher profits; in fact, profits triple after a buyout. This concurs with existing work associating private equity buyouts with higher firm value, including Cao and Lerner (2009), Boucly, Sraer, and Thesmar (2011), Guo, Hotchkiss, and Song (2011), and Davis, Haltiwanger, Handley, Jarmin, Lerner, and Miranda (2014). Higher revenue comes in part from increases in tuition. These increases are about half average total tuition at community colleges.[3] Reliance on federal aid also increases after private equity buyouts and approaches the 90 percent of revenue threshold that is the statutory limit. Per-student borrowing and per-student federal grants increase by about 12 and 14 percent of their respective means.

We conduct three explicit tests for federal aid capture. First, we exploit an increase in student loan borrowing limits in 2007. Relative to other institutions, private equity-owned schools respond to the increase by raising tuition faster than other for-profit schools, which induces higher levels of borrowing. Second, private equity-owned schools bunch below federal aid sanction thresholds. Third, publicly traded for-profit school share prices fall precipitously after the announcement of rules aiming to tie federal aid to student labor market performance. This indicates that for-profits' future cash flows depend on their ability to access government aid irrespective of student outcomes. Superior capture of government aid is thus an important channel through which high-powered incentives translate to higher profits. This is a purely rent-seeking phenomenon and is unambiguously not in students' or taxpayers' interest.

[3]Tuition increases by about $1,600, relative to a mean at private equity-owned schools of $17,521 and a mean at community colleges of $3,673.

Rent-seeking opportunities and heightened focus on capturing aid rather than on student outcomes may reflect the fact that the subsidies in higher education detach revenue from customers. It seems likely that these subsidies could be improved to better align incentives. This might be one avenue towards addressing the growth in federally guaranteed student debt – which increased from $241 billion in 2003 to $1.4 trillion in 2018 – and possible accompanying adverse effects, including high levels of default and reduced entrepreneurship.[4]

We find large changes to operations, which may explain the effects we observe on student outcomes and school financials. Operational changes are consistent with evidence that private equity-owned firms are better managed (Kaplan 1989, Muscarella and Vetsuypens 1990, Bloom, Sadun, and Van Reenen 2015). Education inputs decline after the buyout.[5] Enrollment increases by almost 50 percent, which seems to reflect additional marketing and recruiting effort. Private equity-owned schools have twice the share of employees in sales as independent for-profits. Law enforcement actions, most of which are related to misrepresentation and recruiting violations, increase dramatically after private equity buyouts. Aggressive marketing may help explain the apparent disconnect between deteriorating outcomes and increasing enrollment. Such marketing may be effective because education quality is opaque and the target population is socioeconomically disadvantaged; relative to students at community colleges, they are disproportionately very low income, women, African-American, Hispanic, and single parents (Deming, Goldin, and Katz 2012).

Whether additional students enrolled as a result of post-buyout expansion are better or worse off depends on their outside option. A large literature finds that the expected labor market returns to for-profit education are lower than the returns to non-selective community college.[6] If the source of expansion is substitution away from community colleges, the new students are unlikely to be better off. Indeed, we find suggestive evidence that a new private equity-owned school in a

[4]See Looney and Yannelis (2015), Bleemer et al. (2017), Goodman et al. (2017) and Krishnan and Wang (2017).

[5]Observed inputs include the ratio of faculty to students, the absolute number of faculty, the share of spending devoted to instruction, and the absolute dollars spent on instruction.

[6]See Deming et al. (2012), Liu and Belfield (2014), Cellini and Chaudhary (2014), Cellini and Turner (2016), Deming et al. (2016) and Armona, Chakrabarti, and Lovenheim (2017).

commuting zone siphons student enrollment growth from community colleges. This is not surprising, as Cellini, Darolia, and Turner (2017) show that community colleges and for-profit schools are direct substitutes.

The alternative to a causal interpretation of our findings is a selection mechanism, in which private equity firms are skilled at selecting targets on trajectories to higher profits. While private-equity acquisitions of schools are not random, evidence is inconsistent with the results being driven by selection. For all outcomes we examine, we show visual plots of mean outcomes within switcher-schools around the buyout year. These visual event studies reveal sharp breaks around the buyout year for our main outcomes, and there are no pre-trends. This makes a selection mechanism unlikely to explain the effects. As an alternative, we show that new governance may drive the operational changes. University chief executive turnover increases by about 36 percent in the three years following the buyout.

The adverse effects of private equity buyouts are stronger than the effects of being purchased by a publicly traded firm, which in turn are stronger than the effects of being purchased by an independent, for-profit chain. This suggests a hierarchy of incentives, in which the highest-powered incentives are associated with the greatest incentive misalignment. This differs somewhat from Duggan (2000)'s finding that for-profit and not-for-profit hospitals respond similarly to a new financial incentive.

Our findings contrast with Bernstein and Sheen (2016) and Fracassi, Previtero, and Sheen (2017), who show that operational changes induced by private equity ownership improve customer outcomes. They study sectors characterized by high competition, transparent product quality, and immediate market feedback: chain restaurants and chain retail stores. Profit-maximizing incentives may be less well aligned with customer interests in sectors where intensive government subsidy separates revenue from the customer. These sectors typically also feature less competition, opaque product quality, and customer outcomes measurable only many years after payment (Hansmann 1980). Other subsidized sectors with these characteristics, such as healthcare, infrastructure, and

defense, receive large amounts of private equity investment (see Appendix B Figure 1).[7]

At the same time, many institutions in these sectors and in education are not-for-profit. Glaeser and Shleifer (2001) explain how weaker incentives to maximize profits can make not-for-profit status optimal in settings where customers depend on implicit contracts with the firm (also see Shleifer and Summers 1988). This mechanism requires customers to rationally choose not-for-profit firms over for-profit ones. In higher education, severe information frictions, a vulnerable target population, and government subsidy contribute to low price elasticity of demand, making high-powered incentives profitable for some firms but counter to students' and taxpayers' interests.

In Section 2, we discuss the institutional context and data. We present the estimation approaches in Section 3. The effects on student outcomes are in Section 4. We examine the relationship between buyouts and school finances, including the capture of government aid, in Section 5. Finally, operational mechanisms that may explain the effects are in Section 6.

2 Data and Descriptive Statistics

2.1 Institutional Context

For-profit schools ("for-profits") have existed in the U.S since the early 1900s, but enrollment has grown substantially in the past two decades. Between 2010 and 2016, annual total enrollment at for profit schools has been between 1.5 and 2.7 million students, or between 8 percent and 12 percent of total enrollment in all higher education (see Figure 1). In the late 2000s, despite comprising just 10 percent of enrollment, for-profits accounted for about 40 percent of student loan defaults. As mentioned above, for-profits attract more socioeconomically disadvantaged students than community colleges, which are the closest comparison (Deming, Goldin, and Katz 2012, Looney and Yannelis 2015).

[7]Two additional papers offer related insights to ours. Matsa (2011) shows that highly levered supermarket firms (which sometimes become highly levered through private equity buyouts) experience higher inventory stock-outs. Ljungqvist, Persson, and Tag (2016) studies the misalignment between private and social incentives in private equity-backed stock delistings.

For-profits devote far more resources to recruiting than other types of schools. Salespeople can market zero upfront costs to low-income students, despite higher average tuition among for-profits than alternatives. Government investigations have found evidence of deceptive marketing practices among for-profits.[8] An absence of accessible information, the difficulty of assessing returns to education, and long lags between enrollment and job placement impede the transmission of product quality to future sales (Arcidiacono et al. 2016, Bettinger et al. 2012, Wiswall and Zafar 2014). Figure 2 shows that private equity-owned schools have over seven percent of employees in sales functions, much higher than other types of schools.

For-profits garner about 90 percent of their revenue from public sources (CFBP 2012, Kelchen 2017). They are incentivized to target low-income students, who qualify to pay tuition primarily with federal grants and loans and so need not be billed regularly. Tuition is the most important determinant of the amount of federal aid a student may receive. Cellini and Goldin (2014) point out that this incentivizes for-profits to increase tuition above cost. Federal revenue arrives when the student begins school and is largely disconnected from graduation rates and labor market outcomes. The taxpayer bears the cost of student defaults.[9] Thus government aid and loan guarantees create a potential misalignment of incentives between for-profit school owners and customers. We flesh out this point and the institutional context of the for-profit higher education sector in Appendix A Sections 1-3.

2.2 Private Equity in Higher Education

Private equity and formerly private equity-owned schools account for approximately 35 percent of for-profit enrollment. Private equity buyouts can affect target firm operations and finances, and are often accomplished using debt, which increases the target's leverage (Metrick and Yasuda 2010).

[8] Senate (2012), https://www.gao.gov/products/GAO-10-948T

[9] Legislation proposed in the U.S. Congress in November, 2017 would require schools to repay a portion of defaulted student loans. A Wall Street Journal article noted that "This so called skin-in-the-game proposal has been long fought by the powerful higher education lobby." See https://www.wsj.com/articles/house-gop-to-propose-sweeping-changes-to-higher-education-1511956800.

This paper focuses on student outcomes and does not address firm capital structure.[10]

Private equity investments in higher education have been either purchases of independent, private colleges, usually with consolidation intent, or large buyouts of existing chain institutions.[11] Figure 1 shows the private equity-owned share of total enrollment and defaults over time.[12] The right panel of Figure 1 shows that most of the increase in the for-profit share of student loan defaults since 2000 has been among private equity-owned schools. Appendix B Figure 2 shows that on average, private equity-owned schools have higher default rates than any other type of school. Appendix A Section 4 describes the role of private equity in for-profit higher education in detail.

To collect higher education private equity deal data, we researched the parent ownership history of every for-profit college in the U.S. from 1987 through 2016 that was eligible for federal aid (termed "Title IV eligible"). Sources include online-course catalogs in which all Title IV colleges are required to disclose their ownership history, school and private equity firm websites, unpublished private equity investment portfolio documents gathered by the Senate Health, Education, Labor, and Pension (HELP) Committee, 10-K statements for publicly traded firms, and the ThomsonOne database of private equity investment.

We identified 88 private equity buyouts of for-profit college companies before 2016. The left graph in Appendix B Figure 3 shows the number of private equity deals in the for-profit education sector over time. Appendix B Table 1 Panel 1 shows that nearly 80 percent of the 88 deals are known buyouts, while the other 20 percent may be minority stake purchases. For simplicity, we use the term "buyout" in the remainder of the paper. Panel 2 shows that among the 43 deals where we can identify a liquidity event (an "exit"), the average time to exit was 6.8 years. Of these, 22

[10] We do not observe debt.

[11] An example of the first type, which illustrates the broader pattern we find, is TA Associates' buyout of Florida Career College for $53 million in 2004. At the time, Florida Career College had four campuses and 2,500 students. After adding three additional campuses and expanding enrollment to 4,000 students, TA Associates sold its stake in 2007 for $192 million, almost quadrupling its investment. Later in 2007, federal investigators found employees producing fraudulent high school diplomas for applicants and encouraging students to lie about their high school status. See the Chronicle for further information.

[12] Defaults are measured at least three years after graduation, so we terminate both plots in 2011. We include formerly private equity-owned publicly traded schools.

were sales to other private equity firms, and 7 were IPOs. Twenty-seven remain in the private equity firm's portfolio.[13]

2.3 School Characteristics and Student Outcomes

College characteristics and student outcome data come primarily from the Integrated Postsecondary Education Data System (IPEDS). All schools that are Title IV eligible must report to IPEDS.[14] Most variables are reported at the school level according to a unique "UnitID" that remains constant over time and across ownership changes. There are no UnitID mergers in our sample and no UnitIDs disappear after the buyout except for a few known closures. The low attrition rate likely reflects location-specific accreditation. We created a unique identifier, "SystemID", to represent the parent institution, including parent companies of for-profit college chains. This is important because for-profit college companies often operate multiple schools. Variable descriptions, sources, and years available are listed in Appendix B Table 2.

At the SystemID level, the 88 buyouts are associated with 88 SystemID switches of ownership. A parent company purchased in a buyout often owns multiple schools, and after the buyout the parent often purchases additional schools. We have 994 schools, or UnitIDs, that ever come under private equity ownership.[15] Of these, 596 are through ownership changes. They are graphed over time in the right plot of Appendix B Figure 3. In turn, 326 of these are through the private equity deal, and 220 are through subsequent acquisitions by the now-private equity-owned school. The

[13]The private equity firms in our data are roughly representative of the industry. Appendix B Table 1 Panel 4 describes the 118 firms we identify as participating in a private equity deal. We collected data about firm age, experience in other education deals outside our sample (courtesy of Mitch Leventhal), and data on firm performance from Preqin, a commercial private equity data provider. Preqin has data about just 62 of the firms. Within this group, the firms' funds had an average net multiple of 1.6, which is just under Preqin's benchmark for that firm's class (Preqin categorizes firms by investment type and stage). Their internal rates of return were about 15 percent, about 1.5 percentage points higher than their benchmarks'. These data suggest that the firms in our data are not especially high or low performing relative to their peers.

[14]This includes the majority of the higher education sector. Cellini and Goldin (2014) note that Title IV eligible schools made up 73% of the for-profit sector in 2010. Tuition in non-eligible schools is much lower, since students don't have access to federal loans and grants.

[15]The large difference between the number of SystemIDs and UnitIDs is somewhat specific to private equity-owned school systems. The vast majority of SystemIDs in our data have just one UnitID; these are standalone schools such as NYU or UC Merced. Private equity-owned parent companies often own many UnitIDs.

remaining 398 are new schools established by private equity-owned school systems. Only two private equity-owned companies closed prior to 2015, our last full year of data.[16]

Motivating our analysis is the possibility that private equity involvement may explain some of the negative attributes commonly associated with for-profits in, for example, Deming et al. (2016). Independent for-profits resemble community colleges more than private equity-owned schools in some respects. Table 1 Panel 1 summarizes financial data, and Panel 2 summarizes school and student outcome data.[17] The graduation rate (fraction of students who graduate within 150 percent of normal time) averages 48 percent for private equity-owned schools, compared to 55 percent at other for-profits. We do not report IPEDS data on community college graduation rates because they are neither accurate nor comparable.[18] Average loans per borrower among full-time first year students is $7,456 at private equity-owned schools, compared to $5,711 for other for-profits and $3,543 at community colleges.

There are two measures of loan repayment. The first is the two-year cohort default rate (CDR), which is default rates 2 years after exit-year for exiting cohorts (graduates and drop outs). We use this in Figure 1 because it has the longest time series (1992 through 2011). It is, however, known to be subject to manipulation through the use of allowable non-repayment options like deferments and forbearances (ICAS 2012). Comparisons between for-profits and other types of colleges should therefore be made with caution. We use the CDR time series to analyze potential bunching of default rates close to regulatory limits. The second measure is the share of students in repayment. This is the fraction of borrowers from a school who have not defaulted and have repaid at least $1 of their initial balance three years after leaving school (by graduating or dropping out).

[16]Some variables are reported at the OPEID level, which in some cases aggregates UnitIDs. There are a total of 374 switcher OPEIDs. This is smaller because the data for which we use OPEIDs (primarily repayment rates) are available for fewer years.

[17]The data span 1987 through 2016, but some variables are not available until the early 1990s. A year corresponds to the spring term of the academic year, which begins on August 1 and ends July 30. For example, observations for the 2008-2009 academic year are identified as 2009. Observation in Panel 1 are at the SystemID level because financial data are reported to IPEDS through parent UnitIDs for multiple associated UnitIDs (see Jaquette and Parra 2014). Observations in Panel 2 are at the UnitID level.

[18]The U.S. DOE recently revised these measures because they tend to over-count graduation rates at for-profits while substantially undercounting degree completion at community colleges by miscounting transfer students (DOE 2011, Carey 2017). IPEDS community college graduation rates also differ sharply from estimated graduation rates for community college students in other National Center for Education Statistics (NCES) surveys.

Repayment rates are more sensitive than default rates, which measure only the worst-case scenario for repayment outcomes. The repayment rate averages 32 percent among private equity-owned schools, 41 percent at other for-profits, and 47 percent at community colleges.

Earnings data is from the NSLDS College Scorecard database. The source of the data is a link between students and salaried (W-2) and self-employed (Schedule SE) earnings data from Department of the Treasury tax records. Wage outcomes cover only those individuals who (a) borrowed from the federal government and (b) were employees in the Social Security system or were self-employed and filed a tax return. Average and median wages are therefore likely higher than they would be if graduates who are unemployed or out of the labor force were included. Earnings are measured six years after cohort exit at the OPEID level for the 1998, 2000, 2002, 2004, 2006 and 2007 cohorts. For each institution in these years, we have the mean and median wage. Average earnings for graduates of private equity-owned schools is $26,829 (in 2015 dollars). Earnings for graduates of community colleges are slightly higher, while they are slightly lower for graduates of independent for-profits.

Private equity-owned schools are larger, with mean enrollment of 748 students, compared to 387 at other for-profits. They have the lowest share of spending on instruction, the lowest faculty per 100 students, and the highest tuition. Per full-time equivalent student, tuition averages $17,521 at private equity-owned schools relative to $14,210, $3,672, and $10,995 at non-private equity-owned for-profits, community colleges, and nonprofit/state schools, respectively. Community colleges and independent for-profits respectively have 4.4 and 4.5 faculty per 100 full-time equivalent students, while private equity-owned schools have 3.6. Just 44 percent of students at private equity-owned schools are white, compared to 69 percent at community colleges. Per-student Pell Grant revenue indicates the degree to which the student body is low-income. Average per-student Pell Grant revenue at private equity-owned schools is slightly higher than at other for-profits but is almost three times that at community colleges. We also compiled statistics on degrees and major types, though these are not reported for brevity. The most common degree type at a private equity target school (in the year before acquisition) is a

1-year Communications degree (18 percent of degrees awarded).

2.4 Law Enforcement Actions

Law enforcement actions against higher education institutions provide information about college operations. We found 125 instances in which a state or federal agency initiated an investigation.[19] These are described in Appendix B Table 3. The largest number of allegations relate to misrepresentation and false claims. For example, there are 28 cases of job placement statistic misrepresentation, 23 of credentials or accreditation misrepresentation, and 31 of other types of false claims. Violations of sales and recruiting regulations and fraud also feature prominently (44 allegations). Our analysis employs an indicator variable at the school-year level that is one if the school experienced its first law enforcement action that year, because some schools experience multiple allegations. There are 58 such first-time actions. Although private equity-owned school-years comprise just 4 percent of all school-years in our data, they are 58 percent of the first-time actions.

3 Primary Estimation Approaches

3.1 Visual Event Studies

We use three primary empirical approaches to assess how private equity ownership affects school and student outcomes. The first plots outcome variable means around the year of the buyout. This tests for pre-trends, which sheds light on whether a selection mechanism most likely explains our results. It also demonstrates any raw effect within switcher-schools. We restrict the sample to schools that existed in the year prior to the private equity buyout, so that there is a change of ownership, and do not include schools established by the private equity-owned school systems

[19] We collected data primarily from Republic Report. https://www.republicreport.org/2014/law-enforcement-for-profit-colleges/ .

after the buyouts.[20] After this restriction, there are small variations in sample size across years as schools enter and exit. A school that is not present in a given year for a given variable is recorded as missing.

3.2 Within-school Regressions

To assess whether private equity buyouts are associated with changing student and operational outcomes, we use variants of the following specification:

$$Y_{it} = \alpha_i + \alpha_t + \beta_1 PE_{it} + \gamma \mathbf{X}_{it} + \varepsilon_{it}. \tag{1}$$

Here, i indexes schools and t indexes years. We include school fixed effects (α_i) and year fixed effects (α_t). The sample includes all institutions in our data. We include non-profits because private equity firms have sometimes purchased non-profits and transformed them into for-profits. PE_{it} takes a value of one if the school is private equity-owned in year t.

$\mathbf{X}_{it}$ is a vector of controls, which always includes fixed effects for the highest degree that the school offers and whether the school is selective. For each outcome variable, we also consider a second model with controls for the demographic composition of the student body. These include family income (Pell grants per student in 2015 dollars) and the shares of students who are black, white, and Hispanic. We two-way cluster standard errors by parent company (SystemID) and year in all specifications. This captures potential correlation across schools within the largest deals. Our results are not sensitive to alternative clustering approaches.

3.3 Predictors of Private Equity Acquisition and Matching

In order to develop a matching estimator, we examine which variables predict a school becoming a private equity target. For this exercise, the sample is restricted to independent for-profits. Further, among the target schools, the sample is restricted to the year before the buyout. In a logit model

[20] Financial data are presented at the SystemID level, such that there are 88 observations for each year. Remaining data are presented either at the UnitID or OPEID level.

with year fixed effects, we tested a wide variety of observables at the school and commuting zone (proxy for the local labor market) levels. Variables with predictive power are shown in Appendix B Table 4. Private equity firms target schools in areas with more community colleges and a larger number of total enrolled students, but a smaller number of independent for-profits. This suggests they are identifying areas with large target populations but few competitors. They target schools that have lower recent profit growth but higher profits than the average for-profit school. They also target schools with more students, a higher share of students who are white, and that have lower loan repayment rates. No other variables consistently predict being a target. These include education inputs, enrollment growth at the school and commuting zone level, the proximity of revenue to the 90 percent threshold that is the legal maximum, and other student outcomes.

We deploy variables with predictive power in a nearest-neighbor matching (NNM) estimator.[21] For each private equity-owned school, we match target schools in the pre-buyout year to other for-profits. We assess outcomes two years after the buyout in the matched sample. Therefore, the samples are by construction matched exactly on year. Unlike propensity score matching, which uses the logit estimated probability of treatment, NNM flexibly (i.e., with no functional form assumption) uses the distance between covariate patterns to define "closest" control for a given treated observation. The flexibility requires more data, and the data required grows with each additional matched covariate. Therefore, we match only on the variables that have some predictive power (omitting the outcome variable if it is one of the matching covariates), and adjust for bias in matching on multiple continuous covariates. Appendix B Table 5 shows that the imbalance decreases dramatically after the NNM procedure.

[21] The specific list of variables is: Number of community colleges in the commuting zone, the number of independent for-profits in the commuting zone besides the target, one-year profit growth, log profits, the log number of FTE students, the 3-year loan repayment rate, and the share of students who are white. In the final specification (column 5 of Appendix B Table 4), where all variables are used, the sample size declines and some variables lose significance. We nonetheless match on these, as they appear to have some predictive power.

4 Buyouts and Student Outcomes

This section employs the estimation strategies in Section 3 to examine the relationship between buyouts and measures of student success. A school's graduation rate, defined as the share of students who graduate within 150 percent of the degree's normal time, is one measure of performance. In an experimental setting, Deming et al. (2016) show that employers prefer candidates with degrees associated with higher graduation rates. The graduation rate metric only includes full-time students (which are also the vast majority of students at for-profit colleges), so taking longer to get a degree does not mean that a student is working in the labor force and taking a light course load (see Gilpin and Stoddard 2017). Relatedly, Bound, Lovenheim, and Turner (2007) show that lower graduation rates do not reflect a longer time to degree or greater human capital acquisition (i.e., more credits); instead, longer times to degree are associated with dropping out and worse labor market outcomes.

In Table 2 Panel 1, we show that private equity buyouts lead to a six-percentage point decline in graduation rates, or about 13 percent of the mean across all schools. This relationship is consistent across our baseline model (column 1), the model with composition controls (column 2), and the matching estimator (column 3). The event study plot in Figure 3 confirms the effect and shows that it is quite immediate. This is not surprising; the buyout year is the first affected academic year, and as the majority of programs are one-year programs, operational changes can take effect quickly.

A lower graduation rate is unambiguously detrimental to those students who fail to graduate. It may also harm their peers who do graduate if the degree is perceived as lower quality by employers. Falling graduation rates could be profit maximizing for schools, however. Particularly for one-year programs, the school receives tuition from the government (and the student acquires her debt) when the student has been in class for just one week. If the student drops out, the school no longer bears the instructional, service, and facilities costs associated with her attendance.

Defaulting on student loans is an adverse outcome relative to repaying for the vast majority of borrowers. This is in part because federal student debt is non-dischargeable in bankruptcy, and wages may be garnished. The share of students in repayment, shown in Table 2 Panel 3 columns

4-6, decreases after the buyout by at least three percentage points, relative to a mean across all schools of 53 percent. The matching estimate is larger, at 7.7 percentage points. The visual event study in Figure 3 shows a downward trend after the buyout.

Private equity buyouts lead to 5.8 percent lower within-cohort average earnings six years after enrollment, relative to a mean across all schools of $31,269, in 2015 dollars (Table 2 Panel 2 columns 1-2). Median earnings decline by a similar, albeit slightly smaller amount (columns 3-4). Data limitations prevent us from using the matching estimator.[22] Earnings exhibit strong time trends, both due to increasing wage earnings over the bulk of our sample period and decreasing earnings for graduates following the Great Recession. Therefore, we graph coefficients from a fixed effects regression. Figure 4 shows the coefficients β_j from the following specification:

$$lnWages_{it} = \alpha_i + \alpha_t + \sum_{j=-4}^{3} \beta_j 1[Year = Year_{PE} + j] + \varepsilon_{it} \tag{2}$$

Here, $1[Year = Year_{PE} + j]$ is an indicator of a year before or after the buyout year. The year before the buyout (-1) is the baseline, normalized to zero. We also include school and year fixed effects (α_i and α_t). The sample is all schools, and the control group is all non-private equity-owned schools. The results in Figure 4 contain no pre-trends and indicate a deterioration after the buyout in log earnings.

Beyond changes in operations, which will be discussed in Section 6, private equity firm selection ability or changing student composition could explain the effects on graduation rates, repayment rates, and earnings. A selection mechanism would be a threat to a causal interpretation. It implies that private equity firms choose targets that would have changed in the absence of the buyout. This is most plausible when the target firm is on a trajectory towards the post-buyout outcomes during the pre-buyout years. Instead, the visual event studies presented in this section as well as subsequently when we discuss operational changes are largely devoid of

[22]This is because we only observe six cohorts (as described in Section 3). We would need to match on the year prior to the buyout only for schools where, two years later, we have cohort wage data. There is inadequate data to conduct a match that improves meaningfully on the within-school, composition-controlled regressions.

pre-trends. Further, the matching estimator, based on variables that predict private equity targets, finds similar results to the OLS model. Though we cannot entirely rule out some influence of selection, these two pieces of evidence indicate that a selection mechanism is very unlikely to fully explain the results.

4.1 Student Body Composition

Private equity ownership may change the type of students that enroll. For example, additional students targeted by the expansion may be less well qualified, with poorer labor market potential. This would be a causal effect of the buyouts but has potentially different implications for value-added. In the OLS regressions, the second specification for each outcome includes demographic controls. In no case do these significantly attenuate the results. We also find no effect of private equity buyouts on Pell grants per students. There is a small negative effect on the share of students who are white, but this is not robust to the matching estimator (Appendix B Table 6). As the student body does not become significantly more socioeconomically disadvantaged after the buyout, demographic changes to the student body do not explain the main results.

We hold fixed composition using cohorts that are already enrolled at the school before the private equity acquisition occurs. We restrict the sample to two-year programs at ultimately private equity-owned schools. We compare the cohort that enrolled the year before the first private equity-owned year with the earlier cohort that enrolled two years before. The former cohort had one year of private equity treatment, while the latter had zero. We are able to conduct this test only for graduation and repayment rates.[23] The results are in Table 3. The partially treated cohorts experience a 3.5 percentage point decline in graduation rates, slightly more than half the main effect among fully-treated cohorts. The effect on repayment rates is the same as that among fully-treated cohorts. Thus, a changing student body composition cannot explain the declines in graduation and

[23]There is inadequate earnings data (it only exists for six cohorts spaced three years apart). It is also not possible for student loans, considered below, because they are measured only in the cohort's first year, in which they are either fully treated or not treated at all.

repayment rates.

There may be concern that private equity owners reduce degree offerings, which could explain the immediate fall in graduation rates in the year following the buyout. Students already enrolled in a program might be forced to drop out if the school cuts that degree. The persistently lower graduation rates in the following years might then be explained through composition changes. We test this by identifying for each year the number of degree programs that are cut.[24] Appendix B Figure 4 shows the number of degree cuts by year around the private equity buyout, within schools that switched from independent to private equity-owned. We separately consider one, two, and four-year programs. In no case is there an observable increase in the years following the buyout. Appendix B Table 7 confirms this in regression analysis. Private equity ownership does not lead to cuts to degrees offered, so this cannot explain the immediate decline in graduation rates.

In sum, private equity buyouts are associated with declines in measures of student success, and we have some evidence that the effects do not seem to reflect selection or changing student body composition. Further, in Section 6.2, we will show that additional students enrolled as a result of expansion after buyouts seem to be drawn away from attending community colleges, which will suggest that they are not better off. However, the data do not permit us to explicitly assess value-added.

5 Capturing Government Aid

The central question of this paper is whether high-powered profit maximizing incentives in a setting with information frictions and high levels of government subsidy leads to a focus on capturing subsidy, rather than on student outcomes. As mentioned above, over 90 percent of total revenue at for-profits comes from government sources. In Section 5.1, we establish that as expected, higher-powered incentives to maximize profits lead to higher profits, and we examine

[24] We define a degree cut as a school-year in which there were no graduates of the degree, following a previous year with positive graduates.

aid-related student outcomes. The following three subsections test whether private equity-owned schools better capture government aid.

5.1 Financials

Consistent with existing private equity literature, we find in Table 4 that buyouts lead to dramatic increases in profits. The coefficient of 1.2 implies a 332 percent increase (Panel 1 columns 1-2), while the matching estimate is considerably smaller, at 150 percent. The large effect mirrors the summary statistics; average profits are $6 million among both for-profits and community colleges, while they are $34 million among private equity-owned schools. This industry is in general quite profitable; between 2003 and 2012, profits (gross margins) among U.S. publicly traded for-profit schools averaged 55 percent, compared to 33 percent across across 99 major industries (Eaton et al. 2016).

Private equity ownership also leads to large increases in revenue and expenditure (Table 4 Panel 1 columns 4-9). Visual event studies for profits, revenue, and expenditure are in Figure 5. Higher profits derive primarily from higher revenue, as costs start from a much lower base. Expenditure increases are likely due to increased sales and recruiting effort. Figure 2 shows the share of school employees in sales (left graph) and non-instructional activities (right graph), by school type and ownership between 2012 and 2015 (the fact that data are limited to these years prevents us from using this variable in analysis). These shares at private equity-owned schools dwarf those at other types of institutions.

Schools increase their reliance on federal aid after private equity buyouts. Figure 6 shows the share of school revenue from Title IV sources (most federal grant and loan programs) around the buyout. Before the buyout, target schools receive approximately 60-70 percent of their revenue from Title IV programs. The fraction increases to slightly above 80 percent six years after a buyout. To be eligible for Title IV, this fraction must remain below 90 percent. Figure 6 shows that the variance of the fraction of revenue from Title IV programs also decreases markedly after the buyout. The tight clustering just below the statutory cutoff for aid eligibility suggests that

management more consistently or successfully targets the threshold.

If higher revenue stems from increased capture of government aid, we expect that one source is higher tuition, and in turn that this tuition is funded by higher student loans and grants. We turn to these government aid-related student outcomes in Table 4 Panel 2. Columns 1-2 show that tuition per student increases by over $1,600, relative to a mean across all schools of $9,528 (note tuition at community colleges averages just $3,673).[25] The effect doubles in the matching estimator, to $3,306 (column 3).

Average loans per borrower increase by nearly $600 (in 2015 dollars), or about 12 percent of the mean across all schools of $5,147 (columns 4-5). The matching model yields a larger effect of $833 (column 6). There is an immediate large increase in borrowing in the visual analysis, in Figure 5. Note that less than 10 percent of loans at private equity-owned schools in our data are non-federal, and some of these come from state government. By comparison, 24 percent of loans are non-federal at non-profit schools. We also observe large increases in non-Pell federal grants per student (columns 7-9), of about $800.

Four not mutually exclusive mechanisms could explain higher borrowing. One is that students are poorer and thus need to borrow more conditional on tuition. However, we do not find effects on a proxy for low family income. The second is that the school's degree mix changes after the buyout, such that students enroll in higher cost degrees. However, we do not find significant changes to the degree mix. The third is that the school induces students to take out more loans relative to their out-of-pocket contribution. It is believed that for-profits often urge students to pay less out-of-pocket and more in loans, because the government payments are immediate and guaranteed (Cottom 2017). The fourth possibility is that tuition increases, but the degree mix remains the same. Since tuition increases by more than loans increase, this also seems a viable explanation.

[25]Note that tuition and loan amounts are not directly comparable, as loans are measured for full-time first-year students while tuition is measured across all students on a full-time equivalent basis.

5.2 The Effect of the 2007 Loan Limit Increase

A regulatory change in 2007 in which the government increased student loan borrowing limits created growth options for for-profits. In 2007, Congress raised the Stafford loan limits for all types of students for the first time since 1993. The increase occurred in two stages, with roughly one-third of the increase affecting the 2007–08 academic year, and the rest beginning with the 2008-09 academic year.[26] We examine whether schools already under private equity ownership were more responsive than their counterparts to this opportunity.

We compare private equity-owned institutions to other for-profits using the difference-in-differences specification in Equation 3.

$$L_{it} = \alpha_i + \alpha_t + \beta PE_i * Post2007 + \gamma X_{it} + \varepsilon_{it} \tag{3}$$

The term L_{it} denotes average borrowing or headline tuition in school i in year t. The coefficient of interest is β, which captures the increase in average borrowing at private equity-owned institutions relative to other institutions after the limit increase. If private equity-owned institutions are better at capturing aid, we would expect average loan amounts to rise at a faster rate relative to other institutions, and the coefficients β should be positive and significant. We include school and year fixed effects (α_i and α_t), and school controls X_{it} as in Equation 1. Standard errors are clustered at the SystemID level to address potential serial correlation. The year 2007 is excluded from the analysis, as the two reforms took place in 2007 and 2008 and thus it is somewhat ambiguous when the treatment occurs. The results are not sensitive to including 2007.

The main identifying assumption of the analysis is that, in the absence of the limit increases,

[26]There are two types of caps; for annual borrowing and for total borrowing over the course of the degree. One limit increase took effect in 2007 and another that took effect in 2008. The 2006 Higher Education Reauthorization Act (HERA) HERA took effect in 2007. It increased annual Stafford loan limits for freshmen, sophomores and graduate students, but did not increase aggregate per-student limits. The Ensuring Continued Access to Student Loans Act of 2008 increased annual and aggregate unsubsidized Stafford loan limits for undergrads. Note that these loans are non-dischargeable in bankruptcy. At the time of the legislation the rate was 6.8 percent for unsubsidized Stafford loans, and 3.4 percent for the smaller unsubsidized loans. GAO (2014) found no effect on tuition or loans, in part because the recession had a strong negative effect on private student lending, while Lucca et al. (2016) argue that the loan limits led to increases in tuition, which is consistent with the "Bennett hypothesis" that schools raise tuition to capture federal loans and grants.

private equity-owned schools and other for-profit colleges would have had similar student borrowing trends. This assumption implies parallel trends before 2007. Appendix B Figure 5 restricts the treatment group to institutions that were private equity-owned prior to 2007. Before the 2007 limit increase, there are parallel trends between private equity and non-private equity-owned for-profits, with the latter persistently below the former. Following the increase in borrowing limits, the two series diverge, with a larger increase in average borrowing among private equity-owned schools.

Table 5 presents estimates of equation 3. Consistent with the graphical evidence, the results indicate that following the loan limit increases, average borrowing increased by about $800 at private equity-owned institutions relative to other schools (Panel 1). Columns 1-3 include all schools, while columns 3-6 include only for-profits. Reflecting general increases in borrowing, the year trend is positive. The independent coefficient on being private equity-owned is also positive, as borrowing was higher at private equity-owned schools before the reform.

To further explore the timing of the effects, and to test the validity of the parallel trends assumption underlying the results, we run the following specification, interacting the private equity-ownership treatment with indicators for each year.

$$L_{it} = \alpha_i + \alpha_t + \sum_{j=2002}^{2012} \beta_j PE_i * 1[Year = j] + \gamma X_{it} + \varepsilon_{it} \tag{4}$$

The treatment is restricted to schools that were acquired by a private equity group before 2007. The results are plotted in left panel of Figure 7. The solid line shows point estimates of the coefficients β_j, while the dashed line shows a 95 percent confidence interval. We do not observe any significant differences between the private equity-owned and other for-profit groups before 2007. The coefficients are near and not distinguishable from zero. After 2007, borrowing increases faster at private equity-owned schools, and this difference becomes significant at the .05 level three years after the reform.

It is possible that this increase in borrowing is beneficial to students. Goodman et al. (2017) find that many young borrowers are credit constrained and use student loans as an additional source

of liquidity. However, students are unlikely to benefit from credit expansion if schools raise tuition commensurately. Table 5 Panel 2 presents regression results for tuition. We see sharp increases in tuition that completely offset the increase in borrowing. The right plot in Figure 7 also shows that there was no pre-trend; the timing of the limit increase coincides with the tuition hike.[27]

In sum, we find that private equity-owned schools raise tuition and borrowing at a faster rate following loan limit increases, consistent with these institutions being better at capturing government aid. Their superior ability to capture this strategic opportunity is also evidence of operational changes; in particular, different management that engages in rent-seeking behavior.

5.3 Cohort Default Rate Bunching

A key determinant of federal aid eligibility is a limit on the extent to which students can default, which has been consistently in force for decades. Before 2012, the government's measure of default was the two-year cohort default rate (CDR). This is the fraction of students within a certain repayment cohort who default within two years of entering repayment. Specifically, the policy stated that the share of students who default in the fiscal year after the fiscal year in which they graduated cannot exceed 25 percent for three years in a row and cannot be higher than 40 percent in a single year. After 2012, the policy changed somewhat.[28] School survival depends on not triggering these thresholds. As explained in Section 2.3, it is known that CDRs are vulnerable to manipulation.

We find evidence that private equity-owned institutions are better at avoiding the threshold. Appendix B Figure 6 shows the density of two-year cohort default rates by institution type. We restrict the sample to pre-2012, as the policy changed somewhat in that year. The solid line shows private equity-owned institutions, and the other two lines show independent for-profit and non-

[27] Additionally, Appendix B Table 8 shows that there is no increase in faculty student ratios and graduation rates, suggesting that additional tuition increases are not associated with higher institutional quality.

[28] In 2012, the CDR calculation was changed from a two-year to a three-year window (that is, default is now measured in the second fiscal year after graduation). To partially compensate for this more onerous policy, the 25 percent was changed to 30 percent. The rule change was expected to be detrimental to for-profit colleges (see e.g. http://www.finaid.org/loans/cohortdefaultrates.phtml).

profit schools. The vertical line is the 25 percent two-year CDR threshold. CDRs largely evolve smoothly across the threshold among independent for-profits and other schools. In contrast, there is a sharp drop in the default density right before the threshold at private equity-owned schools, consistent with avoiding the threshold. This helps explain why private equity-owned schools have slightly lower CDRs than other for-profits in Table 1 Panel 2.

5.4 Gainful Employment Announcement

We are interested in the sensitivity of a school's profit to its ability to access federal aid regardless of student outcomes. One approach is to examine whether the school's valuation responds to surprise regulatory events that would affect this access. The Gainful Employment (GE) rule aimed to tie a school's Title IV eligibility to student labor market performance. The rule was announced in 2010, watered down following court cases, and ultimately suspended in 2017. Since private equity-owned schools have illiquid and unobservable value, we turn to publicly traded schools to study the effect of the GE rule. Many of the largest public firms were once private equity-owned, including Devry, EDMC, and Corinthian. Others have been acquired by private equity in public-to-private reverse LBOs, such as Apollo, which owns the University of Phoenix. Details about these events are in Appendix C Table 1.

We find that the market values of publicly traded for-profits fell sharply when the GE rule was announced. Conversely, affected firms experienced positive abnormal returns when the rules were weakened 2011. Appendix C contains detailed explanation of the rule, our estimation approach, and the results. Appendix C Figure 1 shows dramatic changes in abnormal returns around the events, while there are no changes for a group of control firms. Difference-in-differences regressions confirm the effect (Appendix C Table 2). This analysis suggests that a major aspect of for-profit market value is rent-seeking capture of government aid.

In sum, superior federal aid capture is an important channel through which high-powered incentives translate to higher profits. Firm focus on maximizing revenue from subsidies may help

explain why we do not observe improvements in student outcomes accompany buyouts. Greater rent-seeking capture of government aid is unambiguously not in the public interest and is relevant to policy regarding education and public good procurement more generally.

6 Operational Mechanisms

This section explores operational mechanisms that may explain the deterioration in student outcomes observed in Section 4, and the increase in revenue and profits shown in Section 5. Further, we examine whether the effects reflect specific private equity firms (Section 6.5), and whether other types of ownership changes lead to similar effects (Section 6.6).

6.1 Education Inputs

One possible mechanism is that education quality declines. Though we do not observe education quality directly, we show that measures of education inputs fall after private equity buyouts in Table 6. The number of faculty per 100 full time students falls by 0.45 (Panel 1 columns 1-2), relative to a mean of 5.3 across all schools, and 3.6 among private equity-owned schools. There is also an absolute decline in the number of faculty (Panel 1 columns 4-5). The share of expenditure devoted to instruction declines by about three percentage points (Panel 2 columns 1-2), relative to a mean across all schools of 48 percent. Similarly, absolute instruction spending declines (Panel 2 columns 4-5). Visual event studies are in Figure 8. For all the education input variables, the matching estimates are imprecise, but their magnitudes are in all cases in the same direction as the main estimates, and much larger for faculty per 100 students and instruction spending. Their lack of statistical significance may reflect the smaller samples for these variables.

The decline in education inputs is consistent with case studies in a U.S. Senate report on private equity-owned for-profits (Senate 2012). In Appendix A Section 4, we summarize the report's evidence that reductions in student support following buyouts had negative impacts on educational quality with implications for student outcomes. Our own interviews with two former high level for-

profit college managers also support this mechanism. For example, a former high-level manager with Florida Career College said that after a 2012 buyout, "they started decimating faculty and student services." Relatedly, Bound, Lovenheim, and Turner (2010) argue that lower institutional resources per student have contributed more than compositional changes to the overall decline in college graduation rates, and find that declines in the faculty to student ratio account for over three-quarters of graduation rate reductions in their sample.

Following Bound et al. (2010), we seek to link education inputs to graduation rate declines. The effects we find on graduation rates – highlighted by the partially treated cohort analysis – are very immediate. If immediate education quality declines are associated with immediate graduation rate declines within a school, this would support the hypothesis that operational changes are responsible for deteriorating outcomes. We examine whether changes in graduation rates in the year after the buyout year are correlated with changes in education inputs in the same year. Appendix B Figures 7 and 8 reveal a strong positive relationship; those schools that decrease their faculty-to-student ratios experience graduation rate declines, while schools that increase their faculty-to-student ratios experience graduation rate increases. Regression analysis in Appendix B Table 9 supports the graphical evidence. The results indicate that the negative effect of private equity on graduation rates in the year after the buyout is much larger for schools with large negative changes in their faculty to student ratios.[29]

Tuition hikes could also explain the fall in graduation rates. However, there is evidence that students are quite price inelastic. They are insensitive to tuition changes because the size of their loan package is not salient at the time of borrowing, and they have not reason to be sensitive to grant amounts (e.g. Bleemer et al. 2017). Indeed, we find no relationship between changes in tuition and graduation rates immediately around the buyout year (Appendix B Figure 9). Instead, tuition increases are likely the more proximate cause of the loan increases.

[29]However, the interaction between PE and an indicator for change in faculty being below 25th percentile is not significant (column 3). For instruction share of spending the magnitude of the coefficient is much larger among schools with large negative changes (columns 4 and 5), though both are noisy. The interaction specification yields a large coefficient of -.06, significant at the .1 level, suggesting that schools with relatively large, immediate cuts in instruction spending share (<-.018) experience about twice the decline in graduation rates as other private equity-owned schools.

6.2 Enrollment

Revenue increases come not only from higher tuition, but also substantial enrollment growth. The number of full-time equivalent enrolled students increases by 48 percent (Table 7 columns 1-3). The visual event study reveals large and steady increases starting in the second year after the buyout (Figure 8). It may initially seem inconsistent that education quality and student outcomes decline yet demand for the school increases. Our evidence on sales staff and law enforcement actions, which are primarily related to misrepresentation and recruiting violations (results in Section 6.3), suggests that schools benefit from the opacity of education quality, and are able to attract more students with improved sales and marketing operations.

The negative effects of private equity buyouts on education quality and student outcomes indicate that they are extremely unlikely to make existing student types (i.e., that would have enrolled before the buyout) weakly better off. However, whether additional students – regardless of their preparedness – are better or worse off as a result of the buyout depends on their outside option. At one extreme, new students may be drawn from a population that would not attend college otherwise. These students may benefit, as those who graduate may experience higher earnings and better labor market opportunities relative to having no higher education at all. At the other extreme, private equity-owned schools may draw students away from other institutions. The closest substitutes are independent for-profits and community colleges. A rich education economics literature finds strong evidence that (a) community colleges are an available substitute to for-profits, and (b) the returns to for-profit education are zero or negative relative to community college education.[30] Therefore, if new students at private equity-owned schools would otherwise attend community colleges, this would be some evidence that they are not better off. To the degree that federal sources finance substitution to higher-tuition schools, the buyouts are also negative from the taxpayer's perspective.

We examine evidence for substitution at the commuting zone (CZ) level, which roughly

[30] See Jacobson et al. 2005, Jepsen et al. 2014, Liu and Belfield (2014), Cellini and Chaudhary (2014), Darolia et al. (2015), Deming et al. (2016), Cellini and Turner (2016), Armona et al. (2017), and Cellini, Darolia, and Turner (2017). These papers are summarized in Appendix A Section 2.

corresponds to a local labor market. We regress the change in all community college enrollment (Δ^{96-16}Enrollment) within a CZ on the change in private equity (Δ^{96-16}PE Enrollment) in that CZ.[31] The results are in Table 8. If there is no substitution, we expect a coefficient of zero. Conversely, if there is full substitution, we expect a coefficient of -1. In column 1, the point estimate is -.67. The second row shows the results from an F-test that the coefficient is equal to -1; it reveals that we cannot reject full substitution away from community colleges. The second column repeats the analysis using full-time enrollment and finds similar results.

Appendix B Figure 10 shows graphical evidence corresponding to Table 8. There is a strong negative relationship between community college and private equity backed for-profit enrollment between 1996 and 2016. Appendix B Figure 11 takes an event study approach within CZs. It shows increasing community college enrollment over time before the entry of a private equity-owned school, with a flat line thereafter. This supports the hypothesis that the new private equity-owned school siphons student enrollment growth from community colleges.[32]

Placebo tests are in columns 3 and 4 of Table 8. We do not expect substitution from high quality institutions to private equity-owned schools. We define high quality institutions as those institutions where more than 50 percent of students graduate within 150 percent of the usual time. There is no effect for higher quality institutions, which is confirmed in Appendix B Figure 12. Thus, the effects in columns 1 and 2 are not driven by general population or other sources of enrollment growth.

Cuts in state appropriations also predict growth in private equity acquisitions of for-profit colleges, which is consistent with private equity schools targeting geographic areas where students might otherwise attend community colleges. Cuts in state appropriations may lead to overcrowding at community colleges, leading students to seek alternatives. Figure 9 shows the

[31] There were 709 commuting zones in the United States in 2000. We have a lower number in our sample, as some commuting zones do not have colleges in the sample.

[32] One possibility is that private equity backed schools draw the worst students away from local community colleges. If this is the case, we would expect to see an improvement in education outcomes at community colleges after private equity entry. To explore this possibility, we examine graduate rates at community colleges in commuting zones following a private equity buyout. We find no significant effect on graduate rates at community colleges. Results are available upon request.

relationship between private equity acquisitions and state funding of higher education. There is a sharp negative relationship between growth of private equity owned schools and growth of state appropriations. These results are consistent with the targeting analysis (Section 3.3), which found that private equity firms tend to target schools in commuting zones with a higher number of community colleges; they likely expect that superior marketing will enable them to siphon enrollment away from community colleges.

6.3 Law Enforcement Actions

The chances of a school having its first law enforcement action increases dramatically after a private equity buyout. The dependent variable in columns 4-5 of Table 7 is one if the school experienced its first action in a given year. The coefficient is .0003, significant at the .01 level, relative to a mean of .004.[33] A visual comparison is in Appendix B Figure 13. There may be concern about endogeneity in the law enforcement actions, many of which occurred between 2010 and 2014; perhaps the federal government targeted private equity-owned schools for political reasons. Such politicization is less likely at the state level, where cases typically originate directly from student complaints. We therefore limit the law enforcement actions to those brought by state attorneys general in column 6. The effect persists, though it is attenuated.

The law enforcement actions at private equity schools are primarily related to recruiting violations, including predatory and misleading marketing, and the use of excessive commissions or quotas for salespeople. The rapidly increasing enrollment and greater resources devoted to sales among private equity-owned schools suggest that they may be disproportionately responsible for the predatory recruiting tactics discussed in Section 2.1.

[33] We have only 58 such instances (of which private equity-owned schools were responsible for 41), so there are insufficient observations for the matching estimator.

6.4 Governance

Private equity investors often change governance in their portfolio companies (Cornelli and Karakas 2008, Kaplan and Strömberg 2009, Bloom et al. 2015). Gompers, Kaplan, and Mukharlyamov (2016) find that 31 percent of private equity investors recruit their own senior management teams before investing, which then replace the pre-buyout management team. We expect that private equity buyouts may affect operations through changes in management.

We test this hypothesis in Appendix B Table 10. The dependent variable is an indicator for whether a school's Chief Executive changes within three years of the buyout. College Chief Executives are defined in IPEDS. They are typically university presidents or other senior academic officials. We define a Chief Executive change as an indicator of whether the last name of the Chief Executive listed in IPEDS changes from the previous year. Our most conservative model uses school and year fixed effects, controls for composition, and limits the sample to for-profits. This model (column 6) finds a 3.8 percentage point effect. The sample mean is 10.5 percent, indicating that private equity buyouts, using the more conservative estimates, increase CEO turnover buy around 36 percent. This is consistent with private equity firms changing management by bringing in new executives. Therefore, different management is one channel for changing operations.

6.5 Private Equity Firm Variation

We also examined how the private equity firms behind the deals may affect outcomes. First, we find very similar results to the main model when we include lead private equity firm fixed effects. Second, we examined whether our effects vary by private equity firm characteristics, such as having a specialty in education, or being especially high- or low-performing. We found no variation in the effects by these measures.[34] Third, we omit the largest three deals. We define "large" as the number of schools (UnitIDs) purchased in the deal and subsequently acquired by the private equity-owned

[34]The results of both these exercise are not reported but available on request.

school system.[35] The results are generally as strong as our main specification, both in magnitude and statistical significance.

6.6 PE Compared to Other Ownership Changes

A final exercise examines whether the effects we observe are limited to private equity, or whether similar changes occur following other ownership changes. We consider transitions from independent to publicly traded firm ownership, and from independent to chain ownership. We define a "chain" as any parent company (SystemID) that is neither publicly traded nor private equity-owned and that owns at least two schools (UnitIDs). These ownership changes, as well as PE buyouts, are included as separate indicator variables in versions of Equation 1.

The results for all our primary outcome variables are in Table 9. The effects of private equity buyouts are larger and more precisely estimated than either of the other two ownership types for graduation rates, repayment rates, earnings, loans, faculty to student ratios, and enrollment. Transitions to publicly traded ownership have similar coefficient magnitudes in many cases but are usually not statistically significant. However, they are larger and equally significant for tuition and profits (Panel 2 columns 1 and 4). Effects for transitions to chain ownership are generally much smaller and insignificant, except for earnings and enrollment, where they are significant but smaller than the effects of private equity buyouts (Panel 1 column 3 and Panel 2 column 3).[36]

These results suggest a hierarchy of incentives and outcomes. Private equity ownership yields the highest-powered incentives and leads to the most adverse student outcomes. Publicly traded schools likely have higher-powered incentives to maximize profits than independent for-profits. Indeed, transitions to public ownership yield much higher tuition and profits. In turn, chains may have more sophisticated corporate structures and arms-length owners than stand-alone, independent schools. We see weaker but still negative effects on student outcomes, and increases

[35] These are Empire Beauty Schools, which ultimately consisted of 82 schools, Corinthian (63 schools), and EDMC (49 schools).

[36] We cannot assess the effect of transitions to chain ownership on profits because profits are observed only at the firm (SystemID) level.

in enrollment, after a chain acquisition.

7 Conclusion

Independent for-profit schools were originally based on an implicit contract: In exchange for federal grant and loan inputs, the school would increase the human capital of its students. This relates to the implicit contracts discussed in Shleifer and Summers (1988). They argue that hostile takeovers increase firm market value because they enable a transfer of rents from stakeholders (e.g., employees) to shareholders, and that such redistribution can destroy value from a social perspective. The stakeholder in our setting is the customer – students and the government. From the private equity investor's perspective, it may be ex-post optimal to renege on the implicit contract. In fact, students and the government differ from employees in ways that may increase the appeal of reneging; students typically purchase a degree only once, and the government has largely not been a demanding counter-party. New shareholders can maximize value by reducing quality and increasing cost.

Indeed, we find that private equity buyouts lead to expanded enrollment and increased profits, but also to higher tuition, lower education inputs, lower graduation rates, higher student borrowing, lower repayment rates, and lower wage earnings. We also use regulatory changes to show that private equity-owned schools raise tuition following credit expansions faster than other schools, which leads to increased levels of debt. Further, we show that changed operations appear to lead to the detrimental effects on student outcomes.

We cannot directly assess the welfare effects of buyouts as we do not observe school value-added and buyouts are not randomly assigned, but the sum of the evidence points to high-powered incentives to maximize profit in the education industry operating counter to customers' interest. We demonstrate that an important channel for the better performance of private equity-owned schools is superior capture of government aid, suggesting that intensive government subsidy leads to the misalignment of incentives. Future research in multiple sectors is needed to understand how

high-powered incentives interact with other potentially relevant characteristics, such as product opacity.

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Table 1: Descriptive Statistics by Institution Type

Panel 1: Firm-year variables

	Nonprofit, State	**Community**	**For profit, not PE**	**PE owned**
N (firm/institution-year obs)	47,834	23,929	8,254	438
	Mean (Std Dev)	**Mean (Std Dev)**	**Mean (Std Dev)**	**Mean (Std Dev)**
Profits (mill 2015$)	40	6	6	34
	(102)	(16)	(34)	(63)
Revenue (mill 2015$)	156	48	22	123
	(318)	(80)	(113)	(184)
Expenditure (mill 2015$)	112	41	15	85
	(215)	(65)	(78)	(127)

Panel 2: School-year variables

	Nonprofit, State	**Community**	**For profit, not PE**	**PE owned**
N (school-year obs)	55,103	29,678	34,286	4,540
	Mean (Std Dev)	**Mean (Std Dev)**	**Mean (Std Dev)**	**Mean (Std Dev)**
Publicly traded	0.00	0.00	0.14	0.000
	(0.000)	(0.00)	(0.35)	(0.00)
Selective admissions	0.68	0.089	0.092	0.077
	(0.467)	(0.29)	(0.29)	(0.27)
Highest degree offered**	1.12	2.12	2.32	2.01
	(0.40)	(0.33)	(0.75)	(0.723)
Graduation rate	0.52		0.55	0.48
	(0.21)		(0.25)	(0.21)

Continued on following page

Panel 2 continued: School-year variables

	Nonprofit, State	Community	For profit, not PE	PE owned
	Mean (Std Dev)	Mean (Std Dev)	Mean (Std Dev)	Mean (Std Dev)
Repayment rate (3 year)†	0.66	0.47	0.41	0.32
	(0.17)	(0.121)	(0.16)	(0.13)
Ave earnings after school (2015 $)	37,667	28,321	24,275	26,829
	(11,117)	(4,920)	(7,959)	(8,219)
Full-time faculty per 100 students±	6.28	4.38	4.48	3.62
	(4.653)	(4.26)	(4.1)	(2.66)
Full-time faculty	261	109	16.8	24.8
	(465)	(110)	(32.2)	(45)
Share spending on instruction	0.47	0.54	0.41	0.36
	(0.14)	(0.13)	(0.24)	(0.15)
Spending on instruction (mill 2015 $)	71.4	19.5	2.31	4.55
	(219)	(26.9)	(6.01)	(7.37)
Students‡	3,885	3,148	387	748
	(5,656)	(3,866)	(1,232)	(1,413)
1st law enforcement action	0.00	0.00	0.00	0.004
	(0.007)	(0.006)	(0.018)	(0.061)
Share students white	0.67	0.69	0.51	0.44
	(0.28)	(0.25)	(0.32)	(0.26)
Loan per borrower (2015 $)	5,179	3,543	5,711	7,456
	(2,320)	(1,911)	(2,822)	(2,719)
Tuition revenue per student (2015$)	10,995	3,673	14,210	17,521
	(7,110)	(3,883)	(7,678)	(7,303)
Pell grants per student (2015 $)	1,350	1,725	4,109	4,609
	(1,682)	(1,292)	(3,193)	(3,104)
Federal grants per student (2015$)	1,980	2,335	6,115	5,814
	(2,183)	(2,219)	(5,816)	(5,152)

Note: Panel 1 of this table compares institution types at the firm (SystemID) level. Panel 2 compares institution types at the school (UnitID) level. ‡Full-time equivalent (applies to all below). *Grad rate at 150pct normal time for programs of 2 years or less duration. ±Full time faculty. †Share of students in repayment after three years (have paid back at least $1 in principal). **Highest degree offered is 1 for 4-year degrees and higher, 2 for 2-year degrees, and 3 for less-than-2-year degrees and certificates.

Table 2: Private Equity Ownership and Student Outcomes

Panel 1

Dependent variable:	Graduation rate (share graduate in 150% normal time)			Repayment rate (3 year)		
	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)
PE buyout	-.06***	-.059***	-.071**	-.033**	-.031*	-.077***
	(.012)	(.012)	(.031)	(.012)	(.011)	(.011)
Composition controls‡	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-
School Fixed Effects	Y	Y	-	Y	Y	-
Year Fixed Effects	Y	Y	-	Y	Y	-
N	56965	56839	3458	19746	19746	12663
R^2	0.8	0.81	-	0.96	0.96	-

Panel 2

Dependent variable:	Log mean earnings		Log 50th pctile earnings	
	(1)	(2)	(3)	(4)
PE buyout	-.056**	-.046**	-.052**	-.041*
	(.013)	(.012)	(.017)	(.016)
Composition controls‡	N	Y	N	Y
School type controls†	Y	Y	Y	Y
School Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
N	16861	16861	16861	16861
R^2	0.97	0.97	0.96	0.97

Note: These panels show regression estimates (OLS) of the effect of private equity ownership on student outcomes, at the school (UnitID)-year level. $^{\pm}$Nearest-neighbor matching is done within the sample of independent for-profit schools. The dependent variable is measured the year after the treated school's buyout. Matching is exactly on the year before the treated school's buyout, and then on characteristics (see Section 3.3. ‡We control for the share of students who are white, black, and Hispanic, as well as the average amount of federal Pell grants per student, a proxy for low-income students. †Indicators for having selective admissions, public ownership, and fixed effects for highest degree offered. The latter includes less than 2-year (certificate), 2-year, or 4-year. Standard errors two-way clustered by SystemID and year. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table 3: Cohort Partial Treatment Effect of Private Equity Ownership on Student Outcomes

Dependent variable:	Graduation rate (share graduate in 150% normal time)	Repayment rate (3 year)
	(1)	(2)
PE buyout (partially treated cohort)	-.035**	-.035**
	(.013)	(.014)
School type controls†	Y	Y
School Fixed Effects	Y	Y
Year Fixed Effects	Y	Y
N	737	644
R^2	0.78	.87

Note: These panels show regression estimates (OLS) of the partial treatment effect of private equity ownership on student outcomes, at the school (UnitID)-year level. We limit the sample to two cohorts in two-year programs: the cohort that enrolled in the year before the first private equity-owned year, and the cohort that enrolled two years before the first private equity-owned year. The variable "PE owned" is one for the former cohort, which had one year of private equity treatment, and zero for the earlier cohort, which had no private equity treatment. †Indicators for having selective admissions and public ownership. Standard errors two-way clustered by SystemID and year. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table 4: Private Equity Ownership and Financial Outcomes

Panel 1

Dependent variable:	Log profits			Log total revenue			Log total expenditure		
	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PE buyout	1.2***	1.1***	.4*	.96***	.93***	.5***	.9***	.87***	.6***
	(.22)	(.22)	(.22)	(.12)	(.12)	(.15)	(.14)	(.14)	(.17)
Composition controls‡	N	Y	-	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-	Y	Y	-
School Fixed Effects	Y	Y	-	Y	Y	-	Y	Y	-
Year Fixed Effects	Y	Y	-	Y	Y	-	Y	Y	-
N	80119	80119	10804	80119	80119	11948	80119	80119	11948
R^2	0.83	0.83	-	0.97	0.97	-	0.97	0.97	-

Panel 2

Dependent variable:	Tuition per student			Average loan per borrower			Federal grants per student		
	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PE buyout	1610**	1637***	3306***	586***	592***	833**	837***	784***	1267*
	(607)	(565)	(1039)	(185)	(185)	(374)	(176)	(219)	(746)
Composition controls‡	N	Y	-	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-	Y	Y	-
School Fixed Effects	Y	Y	-	Y	Y	-	Y	Y	-
Year Fixed Effects	Y	Y	-	Y	Y	-	Y	Y	-
N	102354	102354	5193	75022	75022	11482	86412	86412	12333
R^2	0.82	0.84	-	0.65	0.65	-	.53	.55	-

Note: This table shows estimates of the effect of private equity ownership on financials (panel 1) and on government aid-related student outcomes (panel 2). Dependent variables are in millions of 2015$ in panel 1, and 2015$ in panel 2. $^{\pm}$Nearest-neighbor matching is done as in previous tables. Observations are at the firm (SystemID)-year level in panel 1, and the school (UnitID)-year level in panel 2. ‡We control for the share of students who are white, black, and Hispanic , and the average amount of federal Pell grants per student, a proxy for low-income students. †These are indicators for having selective admissions, public ownership, and are fixed effects for highest degree offered. The latter includes less than 2-year (certificate), 2-year, or 4-year. Standard errors two-way clustered by SystemID and year. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table 5: Effect of Loan Limit Increase

Panel 1: Borrowing

Dependent Variable: Average loan per borrower (2015$)

	(1)	(2)	(3)	(4)	(5)	(6)
PE owned·Post 2007	824.5***	790.7***	786.0***	591.2***	663.3***	656.4***
	(116.0)	(131.8)	(131.4)	(120.8)	(144.0)	(261.4)
PE owned	1501.9***			800.2***		
	(97.88)			(97.93)		
Post 2007	2477.2***			2557.6***		
	(23.43)			(47.83)		
Controls	N	N	Y	N	N	Y
Sample	All	All	All	For-Profits	For-Profits	For-Profits
School Fixed Effects	N	Y	Y	N	Y	Y
Year Fixed Effects	N	Y	Y	N	Y	Y
N	66,252	66,252	66,252	26,598	26,598	26,598
R^2	.342	.681	.681	.305	.613	.613

Panel 2: Tuition

Dependent Variable: Average tuition (2015$)

	(1)	(2)	(3)	(4)	(5)	(6)
PE owned·Post 2007	1305.3***	1606.7***	1645.1***	816.1**	717.9*	733.1*
	(311.5)	(343.7)	(346.3)	(321.3)	(382.5)	(386.5)
PE owned	4665.7***			1754.7***		
	(292.7)			(297.6)		
Post 2007	3197.1***			5707.7***		
	(51.68)			(98.72)		
Controls	N	N	Y	N	N	Y
Sample	All	All	All	For-Profits	For-Profits	For-Profits
School Fixed Effects	N	Y	Y	N	Y	Y
Year Fixed Effects	N	Y	Y	N	Y	Y
N	61,501	61,501	61,501	12,534	12,534	12,534
R^2	.254	.831	.819	.195	.622	.620

Note: This table shows the difference-in-difference estimate of the effect of the 2007 loan limit increase on borrowing, in panel 1, and tuition, in panel 2. Standard errors are clustered at the system level. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table 6: Private Equity Ownership and Education Inputs

Panel 1

Dependent variable:	Faculty per 100 students			Number of Faculty		
	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)
PE buyout	-.45**	-.36*	-.9	-21***	-19***	-2.9
	(.19)	(.18)	(1.5)	(4.4)	(4.3)	(8.7)
Composition controls‡	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-
School Fixed Effects	Y	Y	-	Y	Y	-
Year Fixed Effects	Y	Y	-	Y	Y	-
N	62432	62432	5352	62432	62432	5352
R^2	0.83	0.83	-	.95	.95	-

Panel 2

Dependent variable:	Instruction spending share			Instruction spending (mill 2015$)		
	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)
PE buyout	-.03*	-.029*	-.02	-8***	-7.2***	-.21
	(.017)	(.016)	(.038)	(1.7)	(1.5)	(1.7)
Composition controls‡	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-
School Fixed Effects	Y	Y	-	Y	Y	-
Year Fixed Effects	Y	Y	-	Y	Y	-
N	97401	97401	5191	97401	97401	5191
R^2	0.75	0.75	-	.94	.94	-

Note: This table shows regression estimates (OLS) of the effect of private equity ownership on measures of education inputs. Observations are at the school (UnitID)-year level. $^{\pm}$Nearest-neighbor matching is done within the sample of independent for-profit schools. The dependent variable is measured the year after the treated school's buyout. Matching is exactly on the year before the treated school's buyout, and then on characteristics (see Section 3.3). ‡We control for the share of students who are white, black, and Hispanic , and the average amount of federal Pell grants per student, a proxy for low-income students. †These are indicators for having selective admissions, public ownership, and are fixed effects for highest degree offered. The latter includes less than 2-year (certificate), 2-year, or 4-year. Standard errors two-way clustered by SystemID and year. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table 7: Private Equity Ownership and Operational Outcomes

Dependent variable:	Log number of FTE students			1st law enforcement action		1st AG law enf. action
	OLS		NNM$^{\pm}$			
	(1)	(2)	(3)	(4)	(5)	(6)
PE owned	.39***	.37***	.34**	.0031***	.0031***	.0012*
	(.057)	(.055)	(.14)	(.00074)	(.00073)	(.00065)
Composition controls‡	N	Y	-	N	Y	N
School type controls†	Y	Y	-	Y	Y	Y
School Fixed Effects	Y	Y	-	Y	Y	Y
Year Fixed Effects	Y	Y	-	Y	Y	Y
N	123052	123052	13062	123052	123052	123052
R^2	0.97	0.97	-	0.14	0.14	.078

Note: This table shows regression estimates (OLS) of the effect of private equity ownership on school operational outcomes. Observations are at the school (UnitID)-year level. $^{\pm}$Nearest-neighbor matching is done within the sample of independent for-profit schools. The dependent variable is measured the year after the treated school's buyout. Matching is exactly on the year before the treated school's buyout, and then on characteristics (see Section 3.3). ‡We control for the share of students who are white, black, and Hispanic , and the average amount of federal Pell grants per student, a proxy for low-income students. †These are indicators for having selective admissions, public ownership, and are fixed effects for highest degree offered. The latter includes less than 2-year (certificate), 2-year, or 4-year. Standard errors two-way clustered by SystemID and year. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table 8: Relationship Between Entry and Community College Enrollment

	Community Colleges		High Quality Schools	
	Δ^{96-16} Enrollment	Δ^{96-16} FTE	Δ^{96-16} Enrollment	Δ^{96-16} FTE
	(1)	(2)	(3)	(4)
Δ^{96-16} PE Enrollment	-0.67**		1.09	
	(0.3)		(0.90)	
Δ^{96-16} PE FTE		-1.121**		0.9
		(0.49)		(0.7)
P-Value (=-1)	.27	.81	.0036	.002
Observations	451	451	301	301
R^2	.03	.03	.10	.09

Note: This table shows the relationship between changes in private equity-owned and community college enrollment at the commuting zone level between 1996 and 2016. Columns 1 and 3 include all enrollment, while columns 2 and 4 include only full time enrollment. Columns 3 and 4 are placebo tests, which replace community college enrollment with enrollment at institutions that graduate more than half of their students with 150% of the normal time ("high quality schools"). We also show the p-value from an F-test that the coefficient equals 1, which is consistent with full substitution. Community colleges are defined as public institutions granting two year or lower degrees. Huber-White robust standard errors are presented in parentheses. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table 9: Private Equity Ownership Compared to other Ownership Changes

Panel 1

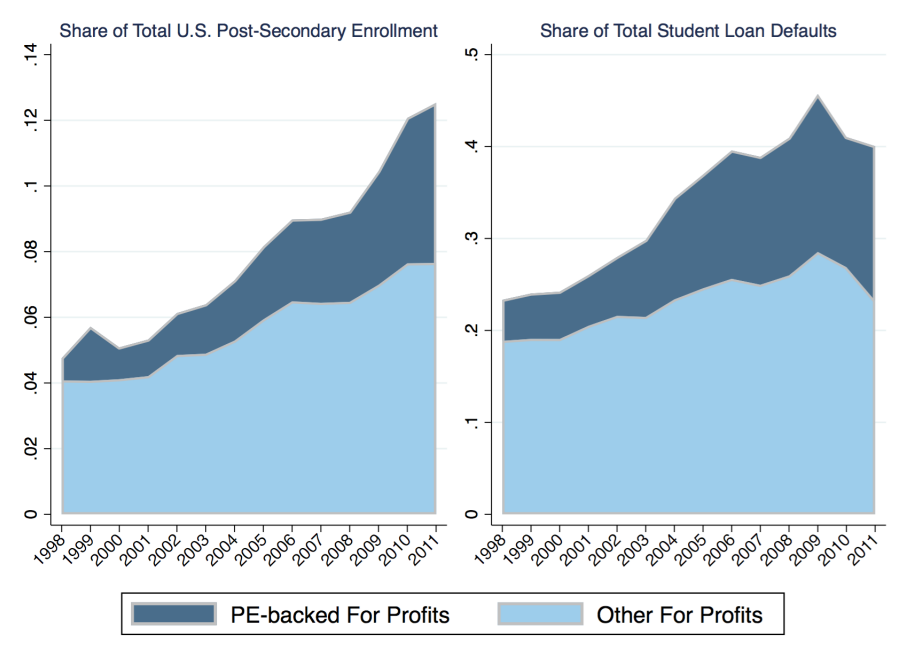
Dependent variable:	Graduation rate	Repayment rate (3 year)	Log mean earnings	Average loan per borrower
	(1)	(2)	(3)	(4)
PE buyout	-.06***	-.022***	-.048**	564***
	(.012)	(.0051)	(.015)	(185)
Bought by publicly traded firm	-.028	-.024*	-.052	543
	(.021)	(.012)	(.028)	(1061)
Bought by chain*	-.033	-.015*	-.032**	471
	(.019)	(.0069)	(.01)	(320)
School type controls†	Y	Y	Y	Y
School Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
N	56965	31888	23322	77497
R^2	.8	.97	.96	.67

Panel 2

Dependent variable:	Tuition per student (2015$)	Faculty per 100 students	Log number of FTE students	Log profits (mill 2015$)
	(1)	(2)	(3)	(4)
PE buyout	1632**	-.45**	.38***	1.2***
	(616)	(.19)	(.056)	(.22)
Bought by publicly traded firm	1729**	-.49	.14*	1.4***
	(772)	(.38)	(.073)	(.32)
Bought by chain*	-265	-.053	.17***	
	(499)	(.28)	(.05)	
School type controls†	Y	Y	Y	Y
School Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
N	102354	62432	123052	80260
R^2	.82	.83	.97	.83

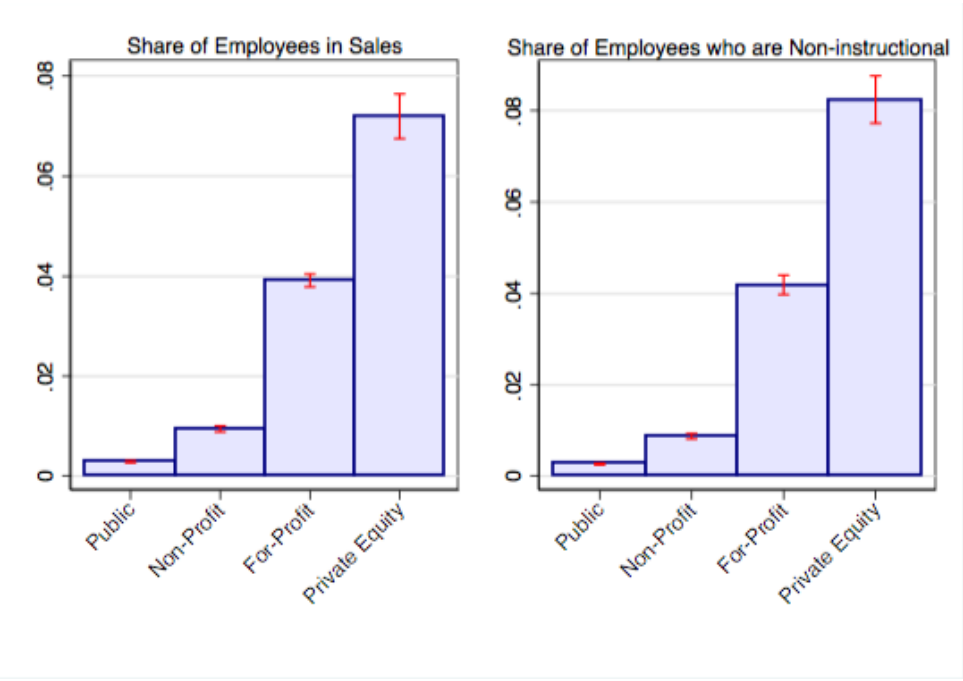
Note: This table shows regression estimates (OLS) of the effect of ownership type on primary outcomes. Observations are at the school (UnitID)-year level, except for profits which are at the parent (SystemID) level. *We define a "chain" as any parent company (SystemID) that is neither publicly traded nor private equity-owned and that owns at least two schools (UnitIDs). Standard errors two-way clustered by SystemID and year. †Defined as in previous tables. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Figure 1: For Profit Schools Share of Loan Defaults and Enrollment



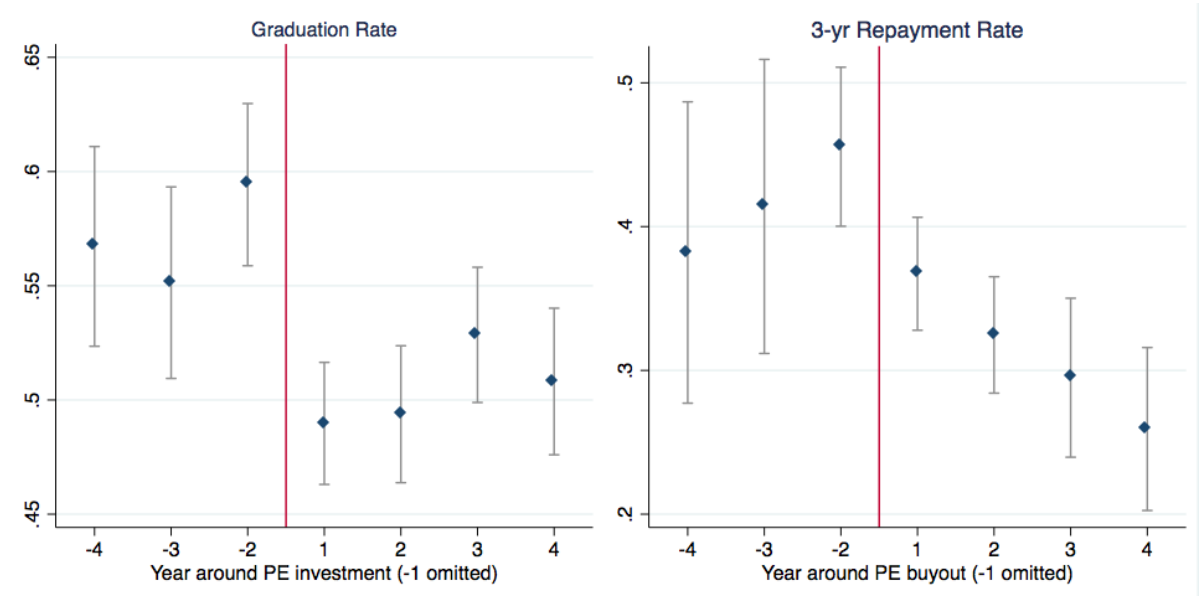
Note: The left graph shows the for-profit share of total US postsecondary enrollment by whether a school was every private equity-owned. The right graph shows the share of total student loan defaults within two years of entering repayment, by whether a school was every private equity-owned.

Figure 2: Employees in Sales and Non-Instructional Activities



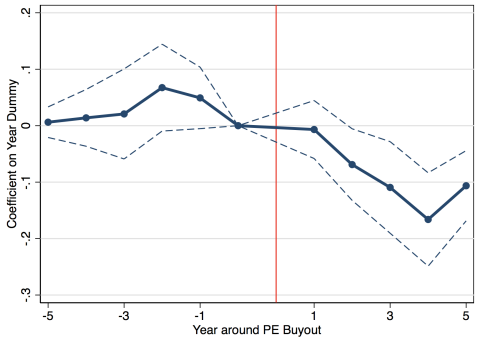
Note: The figure above shows the share of employees who do sales and non non-instructional activities by institution type. Data on sales and non-instructional staff comes from IPEDS.

Figure 3: Graduation and Repayment Rate Event Studies



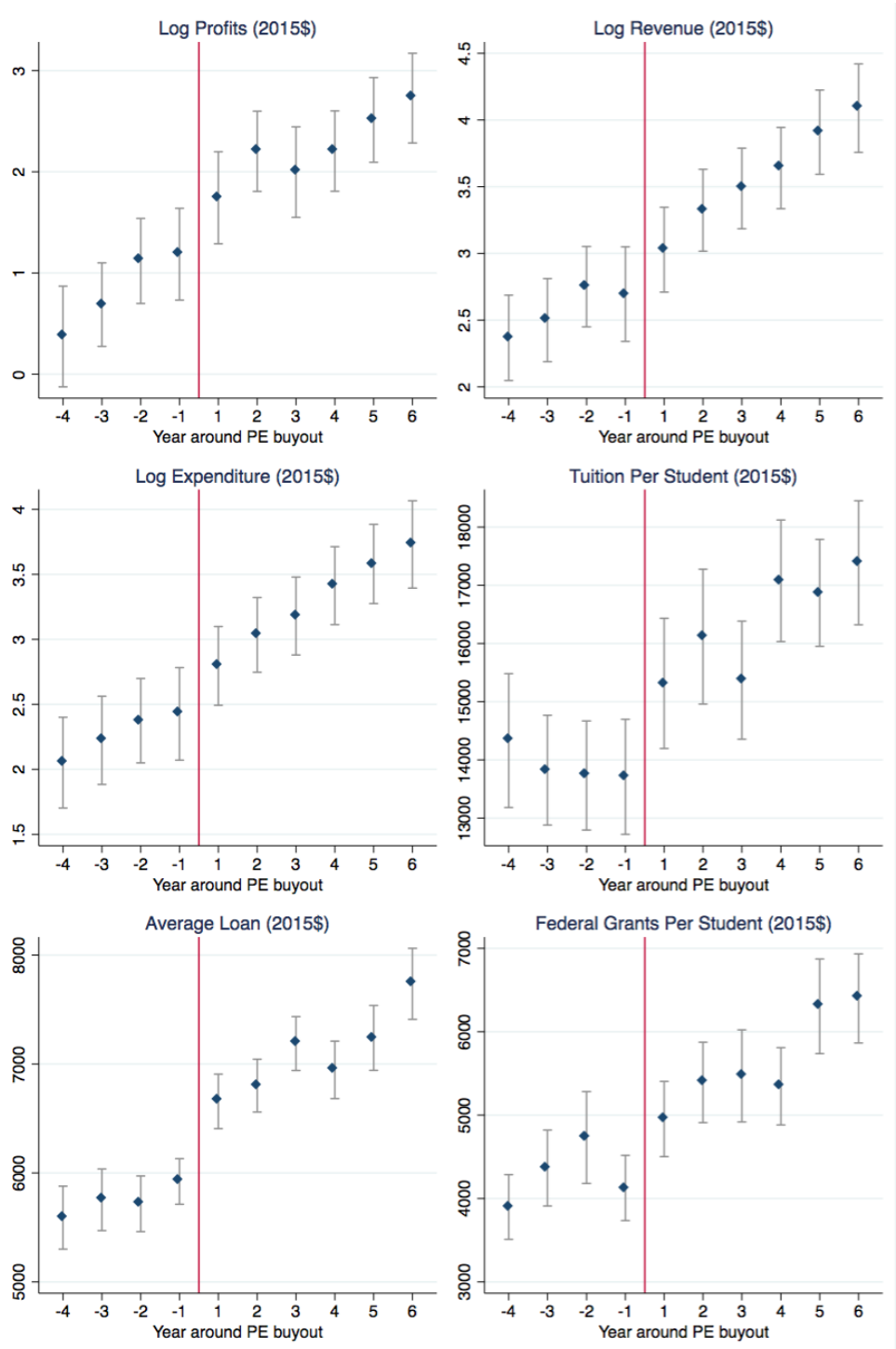
Note: The figures above show, within the sample of school systems bought by PE, the means of variables in the years around the ownership change. The level of observation is the school, or UnitID level (N=697). We omit partially treated cohorts. For 4-year schools, this consists of the cohorts enrolled starting in the three years preceding the buyout year. For 2-year schools, this consists of the cohort enrolled the year before the buyout year. There are no observations for repayment rates in years -5 or 5 (there is generally less coverage in the data). 95% confidence intervals shown.

Figure 4: Earnings Event Study (Time Demeaned)



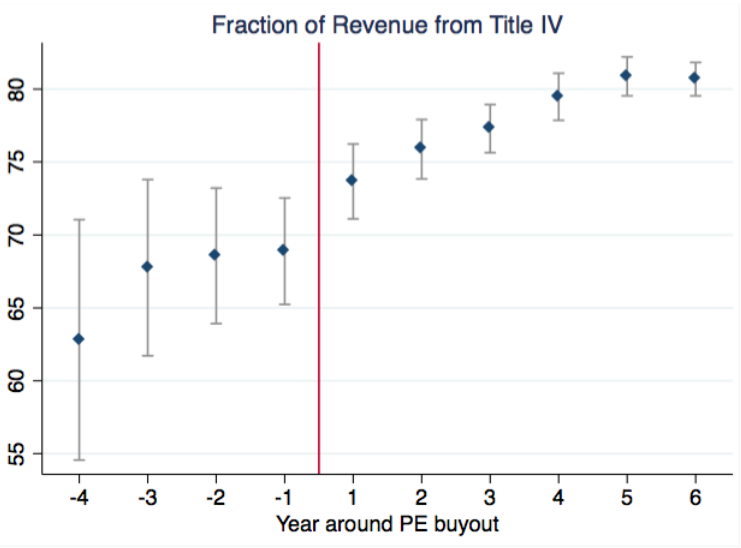
Note: The figure above shows the coefficient on a time dummy around the private equity buyout, where the dependent variable (y-axis) is log earnings. The year before the buyout (-1) is the baseline, normalized to zero. The estimating equation is Equation 2. The dashed lines denote a 95% confidence interval. This data is at the school, or UnitID level (N=697). We restrict the observations to schools that existed in the year prior to the buyout.

Figure 5: Financials Event Studies



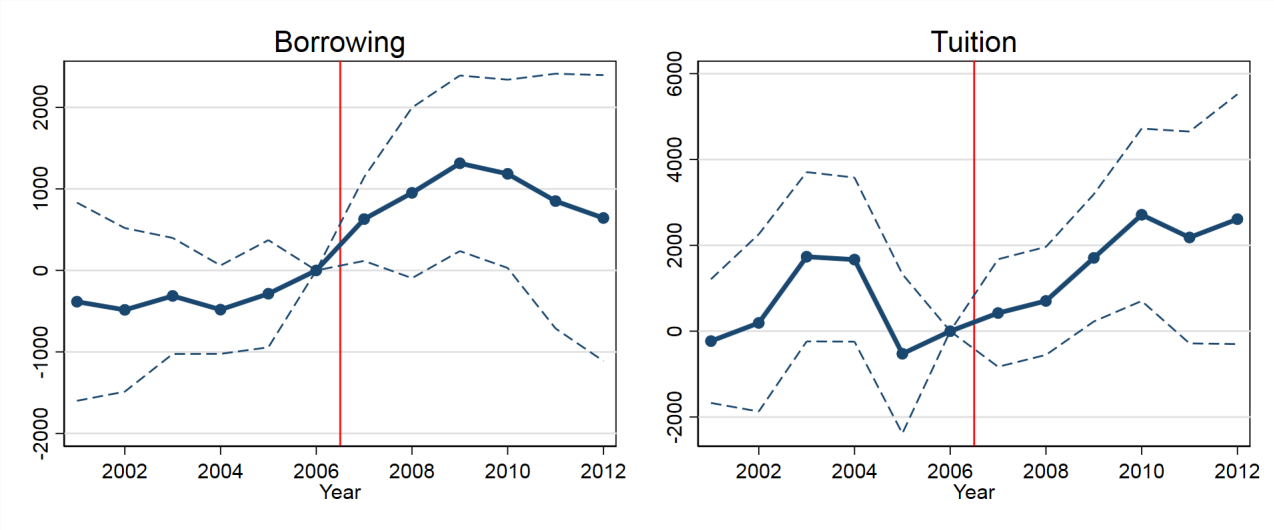
Note: The figures above show, within the sample of school systems bought by PE, the means of variables in the years around the ownership change. The level of observation is the ultimate parent company, or SystemID level (N=88 in each year) for the financial variables. It is at the school, or UnitID level for the other variables, for which we restrict the observations to schools that existed in the year prior to the buyout (N=697). We restrict the observations to schools that existed in the year prior to the buyout. 95% confidence intervals shown.

Figure 6: Distance from 90/10 Threshold



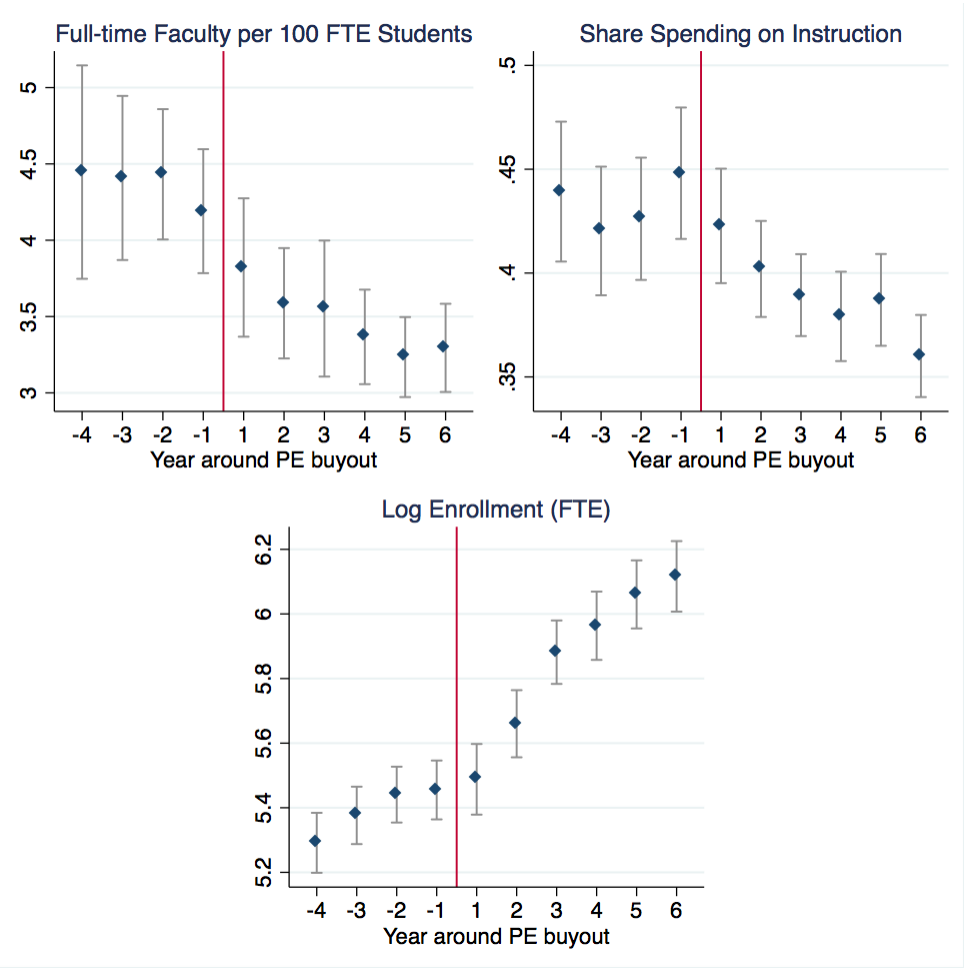
Note: The figure above show, within the sample of school systems bought by PE, the means fraction of school revenue from Title IV programs in the years around the ownership change. The level of observation is the ultimate parent company, or SystemID level (N=88 in each year) for the financial variables. It is at the school, or UnitID level for the other variables, for which we restrict the observations to schools that existed in the year prior to the buyout (N=697). We restrict the observations to schools that existed in the year prior to the buyout. 95% confidence intervals shown. The data source for fraction of school revenue from Title IV sources from from the Department of Education FSA Proprietary School 90/10 Revenue Percentages. Data is available from 2007 to 2016.

Figure 7: Loan Limit Increase Diff-in-diff Coefficients over Time



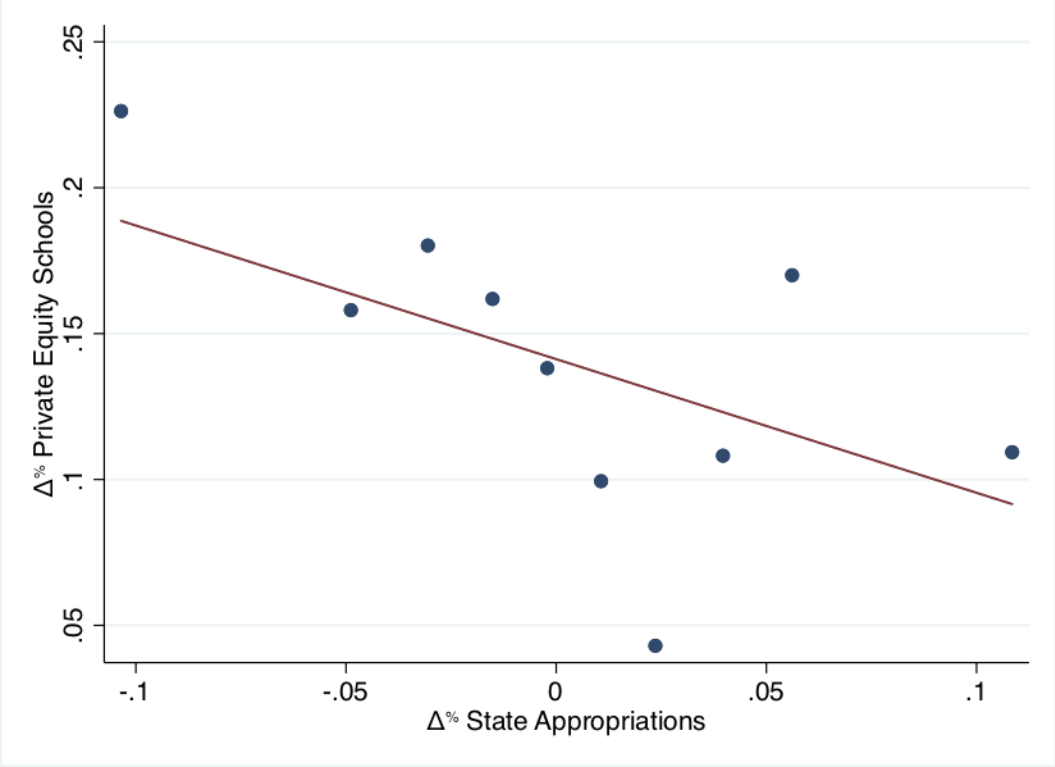
Note: The figure above shows coefficients β_j from the following specification $L_{it} = \alpha_i + \alpha_t + \sum_{j=2001}^{2015} \beta_j PE_i * 1[Year = j] + \gamma X_{it} + \varepsilon_{it}$. The dashed lines show 95% confidence intervals. Results are enrollment weighted. The vertical line is positioned before 2007, when student borrowing limits were increased. Standard errors are clustered at the school system level.

Figure 8: Operations Event Studies



Note: The figures above show, within the sample of school systems bought by PE, the means of variables in the years around the ownership change. The level of observation is the ultimate parent company, or SystemID level (N=88 in each year) for the financial variables. It is at the school, or UnitID level for the other variables, for which we restrict the observations to schools that existed in the year prior to the buyout (N=697). We restrict the observations to schools that existed in the year prior to the buyout. 95% confidence intervals shown.

Figure 9: State Appropriates and Private Equity Backed Schools



Note: The figure above shows the mean percentage change in private equity owned for-profits by the mean percentage change in state appropriations, at the state level in ten bins sorted by the mean change in state appropriations. Observations are weighted by the number of schools in a state. Data comes from IPEDS.

When Investor Incentives and Consumer Interests Diverge:

Private Equity in Higher Education

Online Appendix

Charlie Eaton, Sabrina T. Howell & Constantine Yannelis

July 12, 2018

Appendix A: Institutional Context

This Appendix first briefly describes the history and defining characteristics of the for-profit higher education sector. Then, in Section 2, we provide evidence from existing literature that returns to for-profit education are likely worse – and definitely no better than – similarly selective public community colleges. We explain how the federal student loan and grant programs create misaligned incentives in Section 3. Finally, in Section 4, we discuss the role of private equity in for-profit higher education.

A.1 History and defining features of for-profit higher education

For-profit colleges are incentivized to target prospective students whose low incomes qualify them to pay tuition primarily with federal grants and loans. Schools receive federal grants and loans when the student enters school, and revenue is largely disconnected from graduation rates and labor market outcomes. The taxpayer bears the cost of student defaults.[1] An absence of

[1]Legislation proposed in the U.S. Congress in November, 2017 would require schools to repay a portion of defaulted student loans. A Wall Street Journal article noted that "This so called skin-in-the-game proposal has

accessible information, the difficulty of assessing returns to education, and long lags between enrollment and job placement impede low product quality from translating into reduced future sales (Arcidiacono et al. 2016, Bettinger et al. 2012, Wiswall and Zafar 2014). Thus government aid and loan guarantees create a potential misalignment of incentives between for-profit school owners and customers.

Proprietary, or for-profit, schools have existed in the U.S since the early 1900s. For much of the 20th century, they offered primarily technical and business skills, such as typing. They were also mostly independent (i.e. single-unit businesses) and privately held. In 1981, for profit enrollment was just 0.2 percent of total enrollment. Consolidation and increases in external equity financing began in the 1980s, with substantial private equity involvement. Substantial growth accompanied these changes; between 1990 and 1995, for-profit enrollment was between 0.35 and 0.82 million, or 2-5 percent of total enrollment. The largest for-profits today are publicly traded, and all had private equity investment at one time (see Table C.1). The sector has continued to grow. Between 2010 and 2016, annual total enrollment at for profit schools has been between 1.5 and 2.7 million students, or between 8 percent and 11 percent of total enrollment in all higher education.

While the sector is heterogenous, compared to their nonprofit and public counterparts, for-profits have smaller and leaner physical plants, have far more students in online learning programs, have few non-instructional services like athletics, typically have no research activities, hire most faculty on short-term contracts, and spend more on career counseling (Lang and Weinstein 2013).[2] In lieu of large humanities programs, for-profits focus on teaching specific, often vocational, skills designed to meet specific job descriptions, such as hair stylist or IT specialist. To minimize costs, successful for-profits typically offer structured, focused programs of study with few electives. The material is standardized and replicated across a company's campuses and online programs. This approach has been quite successful; chains and online institutions were responsible for almost 90

been long fought by the powerful higher education lobby." See https://www.wsj.com/articles/house-gop-to-propose-sweeping-changes-to-higher-education-1511956800.

[2]While the sector is dominated by a few large chains, such as the University of Phoenix, there are many small schools providing niche vocational certificates for jobs such as dog grooming (Deming et al., 2012). Just over half of the degrees awarded by for-profits are certificates, but for-profits offer undergraduate, doctorate, and many other degrees.

percent of the growth of the for-profit sector in the 2000s (Deming, Goldin, and Katz 2012).

Resources are focused on sales and marketing. Deming et al. (2012) cite evidence that at large national for-profit chains, sales and marketing expenditure comprised 24 percent of revenue in 2009, making the average cost of acquiring a new customer $4,000. In contrast, sales and marketing comprises about 10 of revenue in healthcare, and 8 percent in financial services.[3] A U.S. Senate staff report found that in 2010, 30 representative for-profit schools employed about one recruiter for every 53 students, ten times the number of career services staff and 2.5 times the number of support services staff (Senate 2012). Recruiters' compensation was closely tied to new enrollments. The report found that public for-profits spend 23 percent of their revenue on marketing and recruiting, and cited evidence of large-scale student deception about completion rates, placement rates, and other statistics. The report concluded that the lack of student support "may help to explain why more than half a million students who enrolled in 2008-9 left without a degree or Certificate by mid-2010." A 2010 GAO investigation sent undercover agents to apply to for-profits. They found deceptive marketing at all targeted schools, and applicants "were encouraged by college personnel to falsify their financial aid forms to qualify for federal aid" at 26 percent of schools.[4]

The student body at for-profit schools is quite different than that at other schools, even the closest comparison, public community colleges. Deming, Goldin, and Katz (2012) compare for-profit schools to community colleges, public, and nonprofit institutions. They note that on average, students at for-profits come from lower-income families and are more likely to be single parents than students in community colleges (two-year public schools). Other evidence that students at for-profit schools are disproportionately less well-prepared, and more likely to be ethnic minorities, is in Chung (2012). Similarly, Looney and Yannelis (2015) show that for-profit borrowers tend to be poorer, older, and have worse labor post-school market outcomes.[5]

[3] See http://deloitte.wsj.com/cmo/2017/01/24/who-has-the-biggest-marketing-budgets/

[4] https://www.gao.gov/products/GAO-10-948T

[5] For example, among dependent borrowers, median family income of students at for-profit schools was $30,000, compared to $48,000 at 2-year and nonselective 4-year schools. In 2011, only 37 percent of borrowers at for profit schools were dependents, compared to 50 percent(70 percent) at 2-year (nonselective 4-year) institutions. Deming et al. (2012) find that for-profits leave students with higher unemployment, lower earnings, and higher loan default

The 2000s saw a dramatic increase in student loan volumes and defaults. After 2008, high rates of student defaults and the new political environment led to increased scrutiny and regulatory oversight of for-profit colleges. Enrollment growth slowed, and the large chains saw substantial declines in new student volumes. The Obama Administration sought to implement tighter controls over eligibility for federal student aid, and together with local law enforcement, began to aggressively pursue for-profit higher education companies for various types of fraud.

A.2 Returns to For-Profit Education

Significant information and market frictions exist in the higher education sector (Bettinger et al. (2012); Wiswall and Zafar (2014)). Importantly, students may not be well-informed about which programs are optimal for them, leaving aside deceptive recruiting practices (Lang and Weinstein 2013).Programs are difficult to compare to each other, and prospective students rarely have visibility into previous cohorts' outcomes. Also, students targeted by for-profits are among the most stressed and disadvantaged portions of the population, making them more prone to manipulative advertising than other groups; 29 percent are single parents, compared to 12 percent at community colleges, and their family income is about half that of students at community colleges (Deming, Goldin, and Katz 2012, Schilbach, Schofield, and Mullainathan 2016).

Despite these differences, Cellini, Darolia, and Turner (2017) show that community colleges, which have open enrollment (i.e. are not selective or capacity constrained), are substitutes to for-profit schools. These public institutions devote far fewer resources to advertising as is shown in the main text, and thus do not compete in a meaningful way for students.

There is accumulating causal evidence that relative to their substitutes – public community colleges – the returns to for-profit education are zero or negative. Deming et al. (2016) assess

rates than comparable students who graduated from other types of schools. Looney and Yannelis (2015) find that for the cohort of students that left school in 2011, over 20 percent were unemployed two years later, and median earnings were about $20,000. The former is higher, and the latter is lower, than for any other institution type, and furthermore increased (decreased) more relative to 2000 than for any other institution type. The five-year cohort default rate in 2011 was 47 percent, compared to 38 percent (27 percent) at 2-year (nonselective 4-year) institutions.

employer perceptions of higher education institutions using an experiment in which they sent resumes with different types of degrees to job openings. They found that applicants with business BAs from large online for-profit schools were roughly 22 percent less likely to be contacted than the same applicants with similar degrees from nonselective public schools. Within health jobs, this discrepancy was 57 percent. Having a for-profit associates degree made a person no more likely to be contacted than the same resume with no postsecondary degree at all. Deming et al. (2016) conclude that "employers appear to view for-profit postsecondary credentials as a negative signal of applicant quality, particularly when objective measures of quality such as a licensing exam are unavailable." In a similar experiment in which resumes were randomly sent to employers, Darolia et al. (2015) found that employers did not prefer applicants with a for-profit degree to those with no college at all. Further, they found that employers seemed to slightly prefer (albeit not significantly) applicants with public community college degrees over those with comparable for-profit degrees.

Using administrative data from the National Student Clearinghouse between 2000 and 2012, Liu and Belfield (2014) find large wage penalties when community college students transfer to a for-profit college rather than a nonprofit college. They use transcript and other data to control for selection into for-profits. Cellini and Chaudhary (2014) use data from the NLSY97 to show that for-profit graduates are not more likely to be employed than comparable people with only high school degrees; though they find a positive effect on earnings (of about 4 percent per year), this is contingent on program completion, which many enrollees do not accomplish. The upper bound on their findings are substantially lower than the returns that other studies have calculated to public community colleges (e.g. Jacobson et al. 2005, Jepsen et al. 2014).[6]

Cellini and Turner (2016) address the selection problem by examining within-student wages before and after attending college, using administrative data on about 1.4 million students. They find that despite much higher tuition, for-profit students experience smaller earnings increases

[6]In contrast to the above studies, Lang and Weinstein (2013) find no difference in returns to certificate programs across for-profits and non-profits. They compare labor market outcomes for completers and non-completers across institution types, arguing that if this difference is similar, lower earnings for for-profit graduates are likely explained by the more disadvantaged student body at for-profit schools.

than students at comparable public community colleges. The vast majority of for-profit students experience both lower earnings and higher debt after college than they did before college. Finally, Armona et al. (2017) assess the effect of attending a for-profit college relative to a local public college or university using an instrumental variables strategy. They combine local labor market shocks with local school supply to instrument for enrollment in a for-profit relative to a community college. They find that students at for profits are less likely to be employed, have lower earnings, and have higher debt and higher default rates than students at public counterparts.

A.3 Federal Student Loans and Grants

For-profit higher education companies depend heavily on federal student loans and grants; the largest chains get over 80 percent of their revenue from federal sources. This fraction would be even higher if it were not for the 90-10 rules, and a statutory limit that 90 percent of revenue can come from Title IV loan and grant programs, which exclude veteran and military benefits. When these sources are included, many for-profits exceed the 90 percent threshold (Kelchen 2017). Maintaining Title IV eligibility is crucial for most higher education institutions, and it requires maintaining accreditation with one of a number of private accrediting agencies, and meeting certain standards, notably limits on the share of students that default over a three-year period.

Federal student loan programs were established in the 1960s and 1970s, and were targeted to upper middle class students attending higher tuition private colleges (Shireman, 2017). Government budget rules made it difficult for the federal government to lend directly to students without having to report the loans as adding to the deficit. Congress therefore subsidized the provision of federal loans by private lenders by legislating that the U.S. Department of Education would provide guarantees to private lenders (Berman and Stivers, 2016). That is, the federal government would cover bank losses when students fail to repay loans. The federal government also created the Student Loan Marketing Association, commonly known as Sallie Mae, in 1973. Sallie Mae raised capital to buy and offer student loans by securitizing loans and selling those

securities to investors.

The banking industry aggressively lobbied for the expansion of the guaranteed student loan program during the 1980s (Wilson 1987, Berman and Stivers 2016, Shireman, 2017). This was accomplished in 1991, when unsubsidized Stafford loans were introduced. These were unsubsidized because the federal government would not pay interest accrued while the borrower was in school, but would guarantee against non-repayment. The limit for total borrowing with both subsidized and unsubsidized Stafford loans doubled from about $30,000 to over $70,000 (in 2015 dollars).[7]

The Federal Credit Reform Act of 1990 had changed federal accounting rule and made it possible for the federal government to directly lend to students at a much lower cost (Berman and Stivers 2016). However, the government opted to maintain the more costly guarantee subsidies from the federal government to private lenders, so that Sallie Mae and commercial banks would receive support to provide most of the expanded federal student loan programs.

Private lenders and for-profit colleges receiving the loans now had direct incentives to promote the expansion of student borrowing. This was achieved though regular increases in borrowing caps, higher interest rates, and restrictions on borrowers' ability to discharge debt in bankruptcy. The result was a large increase in federally guaranteed student debt disbursements from about $20 billion per year during the 1980s to $120 billion at the peak in 2011. Per student annual borrowing flows increased more than three-fold from a little less than $2,000 per student in the 1980s to over $7,000 in 2011.[8]

Looney and Yannelis (2015) find evidence that the massive increases in student loan defaults between 2000 and 2011 was concentrated in for-profit schools, and arose in part because of their growth. Federal loans to undergraduate borrowers at for-profit schools increased from $3.6 billion in 2000 to $18 billion in 2011. Borrowers entering repayment at for-profit schools increased from just over 200,000 individuals in 2000 to about 900,000 in 2011.

Today, Title IV programs consist of Stafford loans, Perkins loans, PLUS loans for parents,

[7] See Financial Aid for more information.

[8] Per full time enrolled student. Available at the College Board.

Pell Grants, and work study programs. The amount of federal aid a student may receive depends on family-specific factors as well as the cost of attendance, of which the most important element is tuition. Cellini and Goldin (2014) point out that this creates an incentive for for-profit schools to increase tuition above cost. They evaluate whether for-profits increase tuition in response to increases in federal loan subsidies, and find some evidence for federal aid capture. Using administrative data from California between 1989 and 2003, Cellini (2010) finds that increases in federal and state grants and loans is strongly correlated with for-profit school entry, particularly in high poverty counties.[9]

Pell Grants are need-based awards that depend on a student's family income, the cost of school attendance, and the length and type of program.[10] The average Pell grant is about $3,724 per year, and the maximum is $5,775.[11] In 2008-09, for-profits enrolled 12 percent of students but accounted for 24 percent of Pell grant disbursement, and 26 percent of federal student loan disbursements (Deming et al. 2012).

A.4 Private Equity in Higher Education

A private equity buyout usually affects the target firm's finances, its operations, or both. The key financial innovation of the typical leveraged buyout is to pay for much of the acquisition with debt issued by the target firm. That is, the acquired company is the borrower, and the borrowed funds pay for its acquisition. Beyond changing in the target's capital structure, usually dramatically increasing its leverage (which theory has suggested can help discipline managers (Bloom et al. (2015)), private equity firms also impose transaction and monitoring fees on the target. Metrick and Yasuda (2010) find that that these fees can represent as much as 90 percent of compensation

[9] In the aftermath of the 2008 financial crisis, Sallie Mae and the major consumer banks found themselves unable to raise adequate capital from securities markets to fund federal student loans. The Obama administration responded by eliminating the provision of federal student loans through private lenders. Instead, the Department of Education would provide loans directly to students. It used savings from this change to fund a significant expansion of Pell Grants (Shireman, 2017).

[10] The Department of Education has more information on the Pell grant program.

[11] See theCollege Board for more information.

to the private equity firm, suggesting that they could be material costs to the target firm. They are, however, difficult to observe (Metrick and Yasuda 2011).

In operations, Bloom et al. (2015) directly measure management practices and find that private equity owned firms have better management, equaled only by public firms and family firms run by external CEOs. In manufacturing, Davis et al. (2014) find that private equity owned firms expand productive plants and shutter underperforming ones. Bernstein and Sheen (2016) also find evidence of better operations in private equity owned restaurants, in part through better worker training and incentive alignment.

The left graph in Figure B.3 shows the number of private equity deals in the for-profit education sector over time, while right graphs shows new private equity ownership at the school (UnitID) level. Private equity investments in higher education have generally taken one of two forms. One is the purchase of independent (small, private) colleges, usually with consolidation intent. The second is the large buyout of an existing chain institution; the biggest have taken public companies private. For example, in 2007 KKR and SAC Capital took Laureate Education private for $3.8 billion.[12]

An example of the first type of investment, and which illustrates the broader pattern we find in the data, is TA Associates' buyout of Florida Career College for $53 million in 2004. At the time, Florida Career College had four campuses and 2,500 students. After adding three additional campuses and expanding enrollment to 4,000 students, TA Associates sold its stake in 2007 for $192 million, almost quadrupling its investment. Later in 2007, federal investigators found employees producing fraudulent high school diplomas for applicants, and encouraging students to lie about their high school status.[13]

Florida Career also illustrates how private equity pressures for rapid growth in operating margins can lead to declines in graduation rates. After TA Associates exited, Florida Career

[12]For other evidence on publicly traded and privately owned schools, see Eaton et al. (2016). Other examples include Goldman Sachs taking Education Management Corp (EDMC) private in 2006 for $3.4 billion, and various investors, including Vistria Group, taking Apollo Education Group (University of Phoenix) private in 2017 for $1.1 billion.

[13]See the Chronicle for further information.

Colleges along with Midwest Career Colleges was acquired by Greenhill Capital Partners and Abrams Capital. Initially, the company took steps to address compliance issues. In an email interview with the authors, however, a high-level manager said: "When presenting annual results to investors, I told Managing Partner of PE firm [sic] that I wanted to address all the compliance and regulatory achievements. He laughed and said 'they don't care about that. All they want to know is how much money you made them.'" In this context, investors again changed the senior management of Florida and Midwest Career in 2012. After these changes in executive leadership, "they started decimating faculty and student services and opening doors to all students regardless of ability" according to the former high-level manager.

Similar changes occurred after private equity buyouts of existing chains such as the KKR acquisition of Laureate. A 3,000 page investigative report by the U.S. Senate Health, Labor, Education, and Pension Committee in 2012 examined complaint data from most of 10 firms for which it published case studies on firm behavior after buyouts. Student complaints consistently point to a heavy reliance on part-time instructors with minimal certification and high instructional staff turnover rates. After the buyout of Concorde Career Colleges by Liberty Partners in 2006, for example, the entire 2010 class of licensed vocational nursing students at one campus filed a complaint with administrators. In their complaint, the students wrote that: "instructors [were] late to start class ... [by] 20-40 minutes," lectures were "vague" and "lack[ed] structure," instructors were "ill prepared" and spent time "searching for lost papers or tests or equipment" (Senate, 2012, 374)

A student in a separate March 11, 2010 complaint letter complained that the Concorde's San Bernardino campus had cycled through three Directors of Nursing and two Assistant Directors during the student's first year at the school. Annual faculty turnover across all Concorde campuses was 42 percent in 2008 and 35 percent in the first 9 months of 2009 (Senate, 2012, 374).

With backing from Warburg Pincus, Bridgepoint Education made similar changes after acquiring Ashford University and University of the Rockies. Bridgepoint transformed its schools into exclusively online campuses with 96 percent of faculty working only part-time.(Senate,

2012, 310) With 39 percent of its expenditures going to marketing and recruitment, enrollment at Bridgepoint grew to a high of 77,119 students in 2010 (Senate, 2012, 299). Deceptive recruiting practices at Bridgepoint may have in turn harmed graduation rates, after-school earnings, and student debt repayment. Brent Park, a former recruiter for Bridgepoint submitted written testimony to a Department of Education rulemaking process in which he wrote: "If we don't have a degree they want, we are supposed to convince them that one of ours will work for them anyway" (Senate, 2012, 305) Consistent with Park's account of Bridgepoint recruitment practices, four students submitted complaints that they were deceived about financial aid and whether the program in which they enrolled would actually provide adequate certification for teaching or dental licenses (Senate, 2012, 306).

Private equity has played a role in a large fraction of for-profit higher education by enrollment. Since the late 1990s, private equity schools have contributed to a large portion of the growth in enrollment. Private equity owned schools have also contributed significantly to the increase in defaults. In the late 2000s, despite being only approximately 10 percent of enrollments, for-profits schools accounting approximately 40 percent of student loan defaults. Most of this increase is attributable to the growth in the default share at private equity backed for-profits. The share of defaults has remained relatively flat at non private equity backed for profit schools.

Education-related deals comprise between 2 and 3 percent of total private equity deal volume and number (Appendix Figure B.1). However, other sectors with similar issues of incentive alignment are remarkably large shares of the industry. Appendix Figure B.1 shows that healthcare, infrastructure, and defense have at different times comprised significant shares of total private equity deals. For example, since 2010, health-related deals have comprised about 40 percent of total private equity deal value and volume, and infrastructure has comprised about 14 percent of deal value, and 23 percent of deal volume. These sectors also feature intensive government subsidy, opaque outcomes that are distant in time from payment for service, and diffuse customers who may not have the ability to "vote with their feet".

Private equity ownership may increase profitability through operational changes, or may yield

returns to investors through financial engineering. We do not observe debt, and are in any event interested in student outcomes, so we focus on operations. Profit growth in higher education, as in many industries, comes from increasing scale (enrolling more students) and increasing margins (the gap between costs and revenues). This differs markedly from most nonprofit higher education institutions, which are primarily concerned with increasing prestige and attracting those students most likely to succeed in labor markets (Hentschke 2010). It also differs from public institutions, which are typically capacity constrained by state and local funding limits (Hentschke 2010).

Appendix B: Additional Tables and Figures

Table B.1: Private Equity Deal Data

Panel 1: Private equity deal data (PE firm deal level)

	N	Mean	Std Dev	Min	Median	Max
Total deals (first PE buyout or investment in school or chain)	88					
Bought controlling stake	88	0.78	0.41	0.00	1.00	1.00
Deal value (2016$)	35	38.9	64.4	0.38	10.6	311
Years to liquidity event, if exited	43	6.83	4.42	0.1	6.00	20.01

Panel 2: Private equity deal and exit types

Deal type		**Exit Type**	
Growth/Buyout	34	IPO	7
LBO	28	Sale to other PE firm(s)	22
VC	13	Sale to public company	8
Mezzanine	1	Sale to private company	3
Other/Unknown	10	Still in portfolio (as of 10/2017)	27
		Exit status unknown	20

Panel 3: Top acquirers

Top PE firms (by deal frequency)		**School-Level Acquisitions**	
	N		N
Quad Partners	6	Total acquisitions/investments	205
TA Associates	4	Top PE-owned acquirers (by frequency)	
Significant Federation	5	Corinthian Colleges	36
Summit Partners	2	Education Affiliates	20
TL Ventures	2	Delta Career Education Systems	13
Primus	2	Lincoln Educational Services Corporation	11
Leeds Equity Advisors	2	National Business College	8
Liberty Partners	2	Forefront Education	8

Panel 4: Private equity firm data

	N	Mean	Std. Dev.	Min	Median	Max
Total firms (firms identified as participating in PE event)	118					
Firm age at investment	60	14.4	10.8	0	11.5	43
Firm has other education investment experience*	118	0.35	0.48	0	0	1
Number other education deals*	118	2.1	3.76	0	0	13
Median net multiple of firm's funds†	62	1.59	0.99	0.51	1.52	7.47
Median net multiple of firm's funds divided by fund type benchmark†	60	0.96	0.46	0.3	0.92	2.93
Median net IRR of firm's funds†	59	14.9	22.0	-27.2	14	167
Median net IRR of firm's funds less fund type benchmark†	59	1.53	22.0	-34.7	0.2	154.8
Modal quartile of firm's fund performance†	60	2.55	1.16	1	2	4

Note: *Source for education experience is Mitch Leventhal. †Source for return info is Preqin, so only firms matched to Preqin have returns data. The benchmarks are calculated by Preqin using their whole database, and are by fund type (e.g. VC, buyout).. Panel 5 shows the top private equity-backed acquirers of other schools. There are 205 instances of ownership change to private equity backing. The top acquirers, or private equity-owned school systems that bought new schools within the scope of the data, are summarized.

Table B.2: Variable Descriptions

Variable name	Unit of Analysis	Years covered	Source	Description
		Panel 1: Operations		
Highest degree offered	UnitID	1987-2015	IPEDS	Indicator for whether the highest degree offered is a 4-year degree or higher, a 2-year degree, or a less-than-2-year certificate or degree.
Selective admissions	UnitID	1987-2015	IPEDS	An indicator for whether the school has any selective admissions requirements.
Number of students	UnitID	1987-2015	IPEDS	The number of fall semester fulltime equivalent students.*
Number of undergraduates	UnitID	1987-2015	IPEDS	The total number of fall semester undergraduate students, both full time and part time
Faculty per 100 students	UnitID	1987-2015	IPEDS	The number of fulltime faculty per 100 students
1st law enforcement action	UnitID	1987-2015	Authors	Indicator for the school experiencing its first law enforcement action in year
		Panel 2: Demographics		
Share students black	UnitID	1987-2015	IPEDS	Share of fall semester undergraduates who are black.
Share students white	UnitID	1987-2015	IPEDS	Share of fall semester undergraduate who are white.
Total Pell grant revenue per student (mill 2015$)	UnitID	2000-2015	IPEDS	Total revenue from Pell grants awarded to fultime first-year students per fulltime first-year student
		Panel 3: Outcomes		
Graduation rate, all levels	UnitID	1995-2010	IPEDS	The graduation rate after 150 percent of normal time to degree.$^{\pm}$
Average loan per borrower (2015$)	UnitID	2000-2015	IPEDS	Dollars borrowed per borrower among fulltime, first-year undergraduate student.
Cohort default rate (2 year)	OPEID	1990-2011	NSLDS	The default rate of the exiting cohort of borrowers 2 years after the cohort leaves school by either graduating or dropping out.
Loan repayment rate (3 year)	OPEID	2007-2011	NSLDS	The share of borrowers who have not defaulted and have repaid at least $1 dollar of principal on their loans 3 years after exiting school either by graduating or dropping out.
Wages 6 years after graduation	OPEID	1998-2007	College Score Card	Average income of exiting student cohort 6 years after the cohort leaves school by either graduating or dropping out.

Panel 4: Financials				
Profits	SystemID	1987-2015	IPEDS	Operating profits calculated as total revenue minus total education and operating costs
Total revenue (mill 2015$)	SystemID	1987-2015	IPEDS	Total revenue
Total expenditure (mill 2015$)	SystemID	1987-2015	IPEDS	Total education and operating costs
Net tuition revenue (mill 2015$)	UnitID	1987-2015	IPEDS	Total revenue from tuition, including tuition paid for by federal and state grant aid programs.
Panel 5: Ownership and identifiers				
PE		1987-2015	Authors	Indicator for whether a parent company of a college or system was under private equity ownership at the beginning of the academic year.
Public		1987-2015	Authors	Indicator for whether a parent company of a college or system was publicly traded at the beginning of the academic year.**
UnitID		1987-2015	IPEDS	Unique identification number assigned to postsecondary institutions surveyed in IPEDS.
SystemID		1987-2015	Authors	A unique identifier created by the authors for the parent system of postsecondary institutions including parent companies of for-profit college chains.
OPEID		1990-2015	NSLDS	Reporting unit in the National Student Loan Data System ††
Year		1987-2015	IPEDS	Year in which the spring term ends. For example, the 2001/2002 academic year is referred to as 2002.

Note: *Each part time student is included in this count as a fraction of a full time based on IPEDS specificied formulas. ±For 4-year, 2-year, and less-than-2-year degrees and certificates. We include this by year of the cohort's first enrollment. **This is not mutually exclusive from private equity ownership such as in cases where private equity owners take a company public or acquire substantial shares in a publicly traded company without taking it private. ††OPEIDs commonly encompass more than one college owned by a for-profit parent company.

Table B.3: Law Enforcement Actions

Total law enforcement actions linked to IPEDS data		125	
Allegation		**Prosecuting Agency**	
Violated rules about recruiting/marketing*	44	State AG	56
Student loan fraud	35	DOJ	24
False Claims	31	DOE	23
Misrepresented job placement statistics	28	FBI	5
Misrepresented credentials/accreditation	23	FTC	4
Embezzlement	7	SEC	4
Fraudulent High School Diplomas	5	CFPB	3
Illegal Funds	4	Other	6
Real estate fraud	1		
	PE-owned	**Not PE-owned**	
Total school-year observations	13,137	309,242	
Number of instances in which school experienced its first law enforcement action	34	24	

Note: *For example, there are regulations limiting incentive compensation to sales force.

Table B.4: Private equity targeting

Dependent variable: Indicator for school being bought by PE in following year

	(1)	(2)	(3)	(4)
Community colleges in CZ	.022**			.0043
	(.0093)			(.015)
Independent for-profits in CZ	-.014***			-.018**
	(.0044)			(.0072)
Log FTE students in CZ	.12*			.46***
	(.065)			(.11)
Profit growth (last year)	-.00013*		-.00014**	-.000016
	(.000076)		(.000068)	(.00022)
Log profits	.093***		.051*	.27***
	(.032)		(.028)	(.052)
Log FTE students	.65***		.7***	.24***
	(.046)		(.042)	(.073)
3-yr repayment rate		-4.9***		-4***
		(.4)		(.55)
Share students white			.26*	.59**
			(.15)	(.29)
Year f.e.	Y	Y	Y	Y
N	28250	14846	35388	11472
Pseudo R^2	.15	.092	.14	.14

Note: This table shows estimates from logit regressions in which the dependent variable is an indicator for the school-year immediately preceding a private equity buyout. All other years for target schools are excluded from the sample. Further, the sample is limited to for-profit, non-publicly traded schools.

Table B.5: Nearest-neighbor matching covariate balance

Panel 1: Balance after matching

	Control			Treated				
	N	Mean	S.d.	N	Mean	S.d.	Diff	2-tailed p-value
Community colleges in CZ	268	8.50	8.96	268	8.58	8.95	-0.08	0.92
Independent for-profits in CZ	268	23.61	22.24	268	23.77	22.34	-0.16	0.93
Profit growth (last year)	268	3.25	36.21	268	0.79	5.72	2.46	0.27
Log profits	268	13.78	1.34	268	13.85	1.36	-0.07	0.54
Share students white	268	0.53	0.27	268	0.52	0.27	0.01	0.78
3-yr repayment rate	268	0.36	0.14	268	0.36	0.15	0.01	0.58
Log FTE students in CZ	268	6.72	0.98	268	6.74	0.95	-0.02	0.82

Panel 2: Balance before matching

	Control			Treated				
	N	Mean	S.d.	N	Mean	S.d.	Diff	2-tailed p-value
Community colleges in CZ	41469	9.22	12.07	606	10.62	12.15	-1.40	0.00
Independent for-profits in CZ	41469	25.69	34.25	606	25.95	27.92	-0.25	0.86
Profit growth (last year)	49335	621.09	99315.54	623	-12.57	307.59	633.66	0.87
Log profits	48440	14.45	2.40	588	14.22	1.71	0.23	0.02
Log FTE students	55055	4.66	1.27	631	5.48	1.18	-0.82	0.00
Share students white	52874	0.53	0.33	602	0.52	0.28	0.01	0.54
3-yr repayment rate	16558	0.43	0.15	360	0.36	0.14	0.07	0.00
Log FTE students in CZ	41463	6.46	1.42	606	6.74	1.10	-0.28	0.00

Note: This table reports covariate balance after nearest-neighbor matching, using the matching for log FTE students. The sample is limited to for-profit, non-publicly traded schools. Further, among PE targets, the sample is limited to the year prior to the buyout. CZ refers to commuting zone.

Table B.6: Private Equity Ownership and Demographic Outcomes

Dependent variable:	Share students white		Pell grants per FTE student		Percent students on federal grants	
		NNM$^{\pm}$		NNM$^{\pm}$		NNM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)
PE owned	-.05***	.0029	-161	261	.015	.005
	(.0072)	(.016)	(269)	(292)	(.013)	(.023)
Composition controls‡	N	-	N	-	N	-
School type controls†	Y	-	Y	-	Y	-
School Fixed Effects	Y	-	Y	-	Y	-
Year Fixed Effects	Y	-	Y	-	Y	-
N	123052	13034	123052	11906	87739	12502
R^2	0.92	-	.61	-	.75	-

Note: This table shows regression estimates (OLS) of the effect of private equity ownership on school operational outcomes. Observations are at the school (UnitID)-year level. $^{\pm}$Nearest-neighbor matching is done within the sample of independent for-profit schools. The dependent variable is measured the year after the treated school's buyout. Matching is exactly on the year before the treated school's buyout, and then on characteristics (see Section **??**). ‡We control for the share of students who are white, black, and Hispanic , and the average amount of federal Pell grants per student, a proxy for low-income students. †These are indicators for having selective admissions, public ownership, and are fixed effects for highest degree offered. The latter includes less than 2-year (certificate), 2-year, or 4-year. Standard errors two-way clustered by SystemID and year. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table B.7: Effect of Buyouts on Degree Cuts in First Two Years after Buyout

Dependent Variable: Degree cuts			
	(1)	(2)	(3)
PE owned	.00085	-.012	-.014
	(.071)	(.034)	(.012)
Controls	Y	Y	Y
School Fixed Effects	Y	Y	Y
Year Fixed Effects	Y	Y	Y
R^2	2399	2399	2399
Observations	.37	.39	.42

Note: This table shows the relationship between private equity buyouts and degree cuts. A degree cut is the removal of a degree from the school's offerings. There are a total of 230 possible degree offerings. We restrict the sample to PE targets, and to no more than two years after the buyout. Standard errors are double-clustered at the system and year levels. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table B.8: Effect of State Appropriations on Private Equity

	Dependent Variable: $\Delta^{\%}$Private Equity Schools	
	(1)	(2)
$\Delta^{\%}$ State Appropriations	-.502**	-0.489**
	(.220)	(0.213)
Controls	N	Y
Year Fixed Effects	Y	Y
Observations	915	915

Note: This table shows the relationship between the percentage change in private equity schools and state appropriations, at the state level. Controls include the state unemployment rate. Observations are weighted by the number of schools in a state. Data comes from IPEDS. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table B.9: Effect of 2007 Loan Limit Increase on Graduation Rates and Faculty by PE status

	Dependent Variable: FT Faculty per 100 Students		
	(1)	(2)	(3)
PE owned·Post 2007	-2.547	-0.913***	-2.285
	(1.770)	(0.169)	(1.862)
Controls	N	Y	Y
Sample	All	All	For-Profits
School Fixed Effects	Y	Y	Y
Year Fixed Effects	Y	Y	Y
Observations	45,923	45,923	7,550

Note: This table shows the difference-in-difference estimate of the effect of the 2007 loan limit increase on full time faculty. Standard errors are clustered at the system level. Coefficients marked with $*$, $**$,$***$, denote $p < .1$, $p < .05$, $p < .01$, respectively.

Table B.10: Effect on Graduation Rates by Changes in Education Inputs (Faculty per student, and Instruction Share of Spending)

Dependent Variable: Graduation rate in first year after buyout yerar

Sample:	$\Delta^{Faculty}_{t-1,t} <$ 25 pctile	$\Delta^{Faculty}_{t-1,t} >$ 25 pctile	Interaction between PE and $\Delta^{Faculty}_{t-1,t} <$ 25 pctile	$\Delta^{InstructShare}_{t-1,t} <$ 25 pctile	$\Delta^{InstructShare}_{t-1,t} >$ 25 pctile	Interaction between PE and $\Delta^{InstructShare}_{t-1,t} <$ 25 pctile
	(1)	(2)	(3)	(4)	(5)	(6)
PE	-.13***	-.089**	-.07**	-.074	-.047	-.047
	(.038)	(.031)	(.029)	(.059)	(.035)	(.032)
1|<25th pctile			-.0036			.00017
			(.0023)			(.0022)
PE·1|<25th pctile			-.019			-.06*
			(.036)			(.033)
School Fixed Effects	Y	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
Observations	5596	24021	30894	6638	20778	28215
R^2	.82	.89	.86	.86	.89	.86

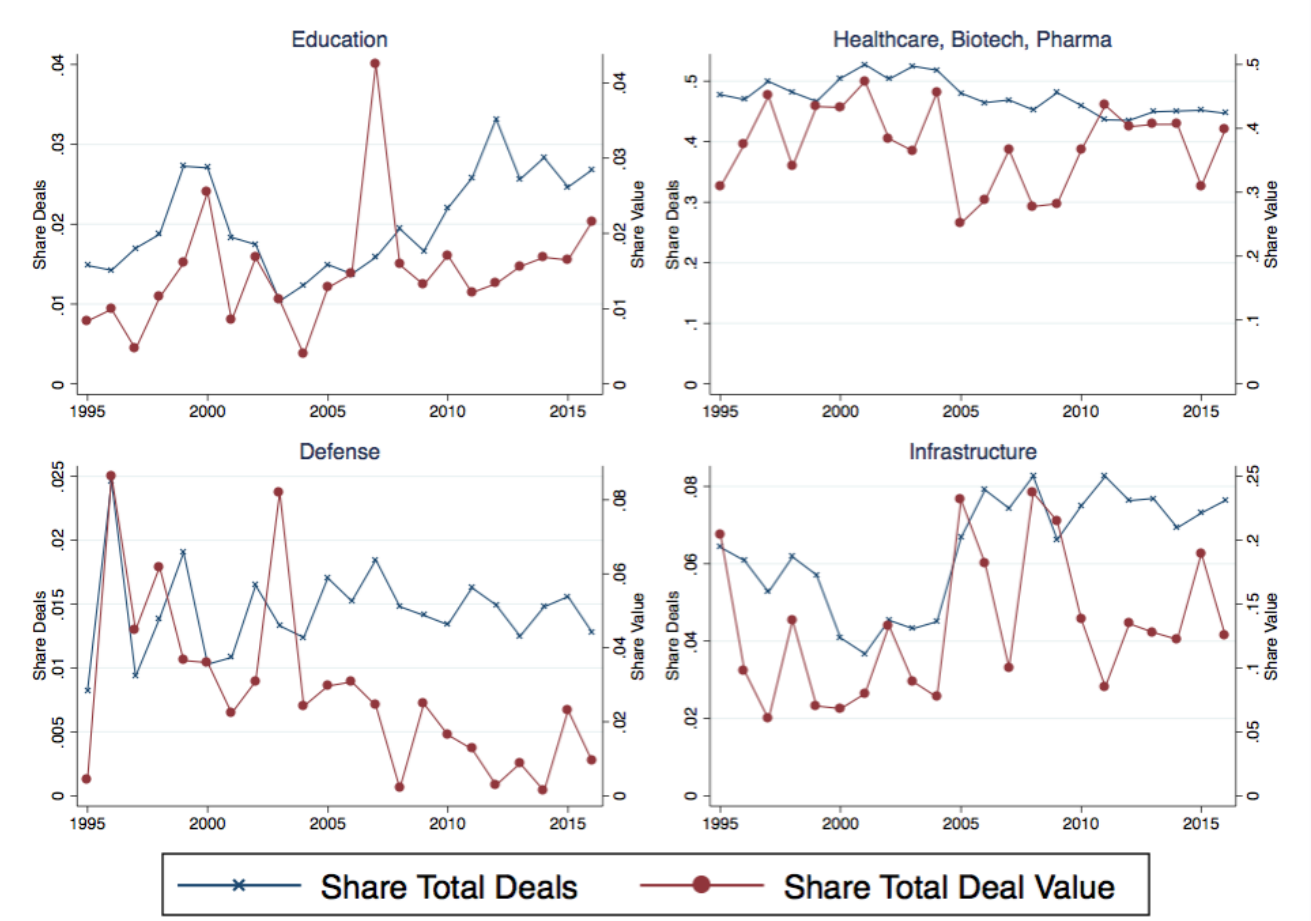
Note to Table B.10: This table shows whether the effect of private equity buyouts on graduation rates in the first year after the buyout (i.e., the immediate effect) is larger among schools where there is a larger immediate decline in education inputs. We consider only the year after the buyout, to focus on drivers of the immediate decline in graduation rates. We use two types of education inputs: FTE faculty per 100 students (columns 1-3) and the instruction share of total spending (columns 4-6). The first two columns for each split the sample below and above the 25th percentile for the change in education input between the year before and the year after the buyout. The third column interacts an indicator for whether the change in education input is below the 25th percentile with the PE indicator. Letting t represent the first affected buyout year, the estimating equation for this interaction model is $Y_{i,t} = \alpha_i + \alpha_t + \beta_1 PE_{i,t} \cdot \left(\Delta_{t-1,t}^{EducInput} < 25th\ pctile\right) + \beta_2 PE_{i,t} + \beta_3 \left(\Delta_{t-1,t}^{EducInput} < 25th\ pctile\right) + \gamma \mathbf{X}_{it} + \varepsilon_{it}$. Here, $\Delta_{t-1,t}^{EducInput} < 25pctile$ indicates that the change in education input between $t-1$ and t is less than its 25th percentile. The 25th percentile is -.4 for faculty, and -.018 for instruction spending share. *Standard errors are clustered at the system level. Coefficients marked with $*$, $**$, $***$ denote p < .1, p < .05, p < .01, respectively.

Table B.11: Management Changes

Dependent Variable: Change in school CEO within first three years after buyout						
	(1)	(2)	(3)	(4)	(5)	(6)
PE owned	.081***	.029**	.024*	.079***	.044***	.038***
	(.019)	(.014)	(.014)	(.019)	(.014)	(.014)
Composition controls	No	No	Yes	No	No	Yes
School Fixed Effects	No	Yes	Yes	No	Yes	Yes
Year Fixed Effects	No	No	Yes	No	No	Yes
Sample	All	All	All	For-profit	For-profit	For-profit
Observations	201546	201546	180350	74827	74827	71903
R^2	.015	.21	.21	.036	.24	.24

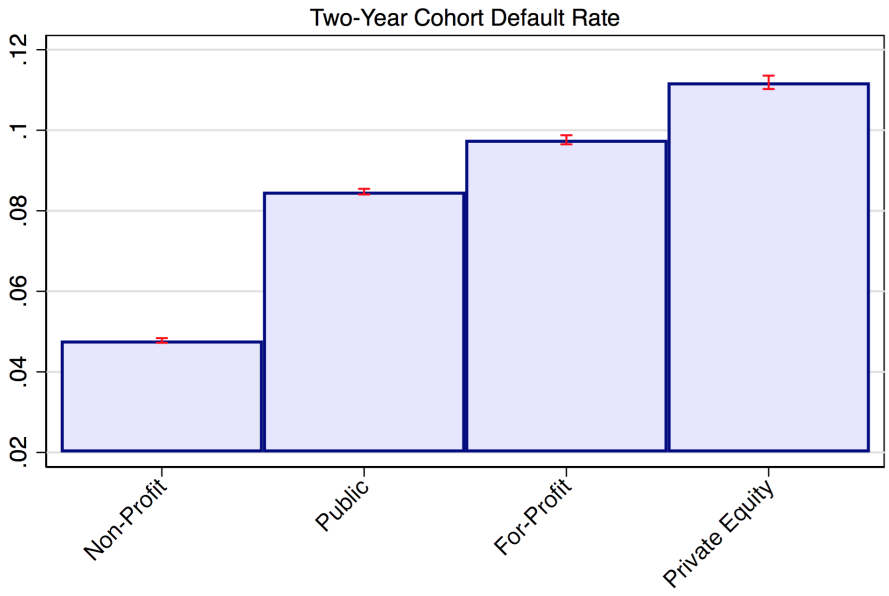
Note: This table shows the effect of a private equity buyout on the chances that the CEO changes. All regressions control for size (number of students). *Standard errors are clustered at the system level. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Figure B.1: Share of private equity investment in government subsidy-intensive sectors as share of overall private equity investment, 1995-2016



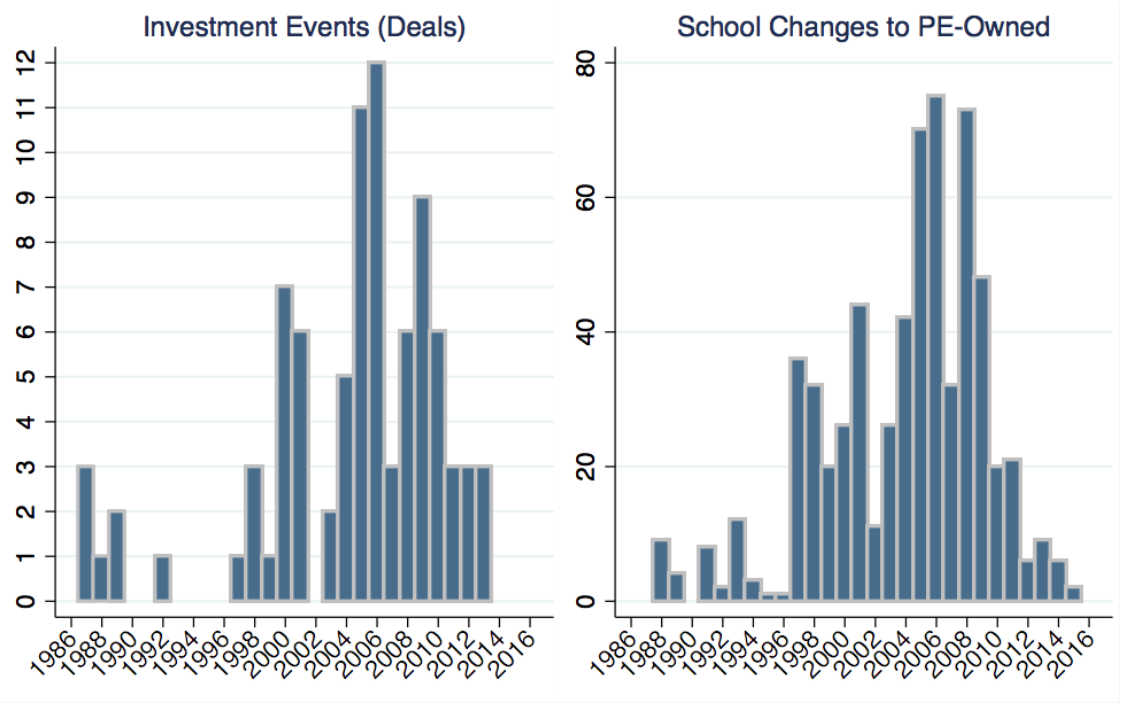
Note: All global private equity transactions included. Total value was $716 billion in 2016, up from just $19 billion in 1995. Source: CIQ.

Figure B.2: Default Rate by School Type



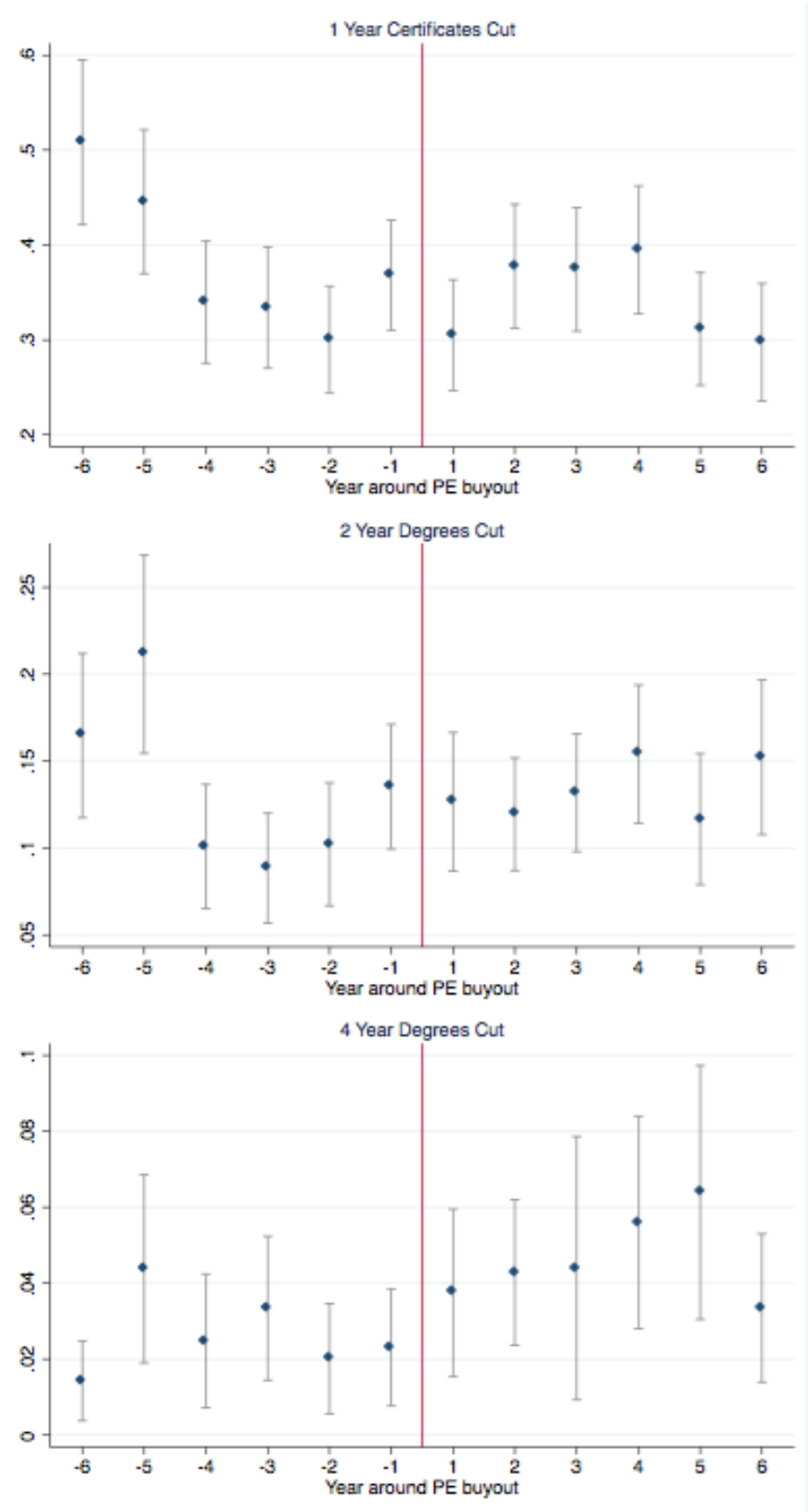
Note: This graph shows the average two-year cohort default rate by school type. "For-profit" includes all for-profits that are not private equity owned. "Public" includes all state schools and community colleges.

Figure B.3: Private Equity Deals and School Ownership



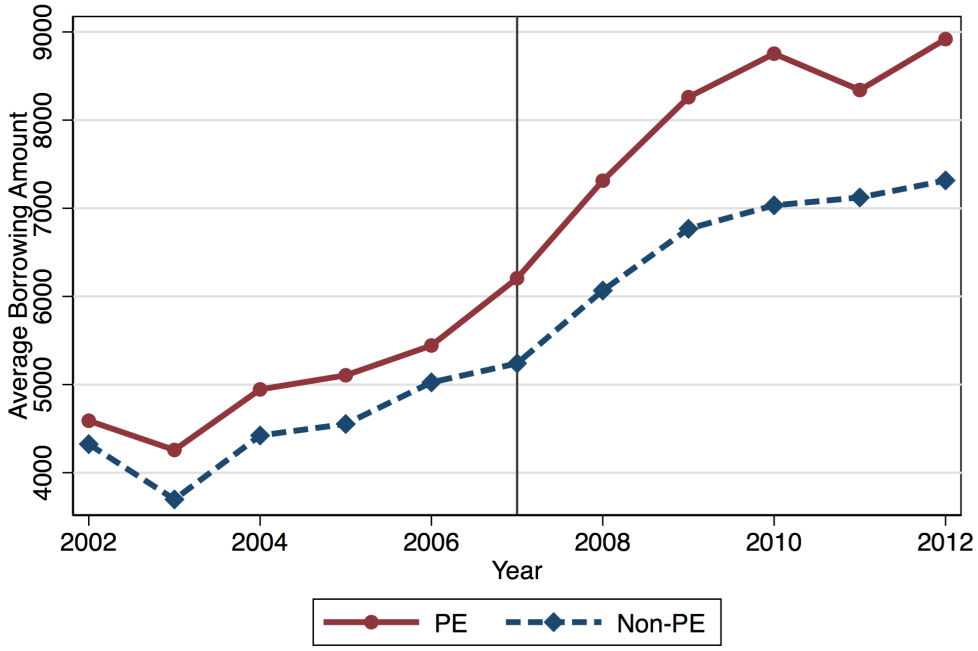
Note: The left-hand figure shows the 88 PE deals (mostly buyouts) in our data; these are PE firm investments in schools or chains of schools. The middle figure shows school (UnitID)-level ownership changes to PE. The right-hand figure shows the total number of schools under PE ownership. Data collected by the authors.

Figure B.4: Degree Cuts Around Buyouts



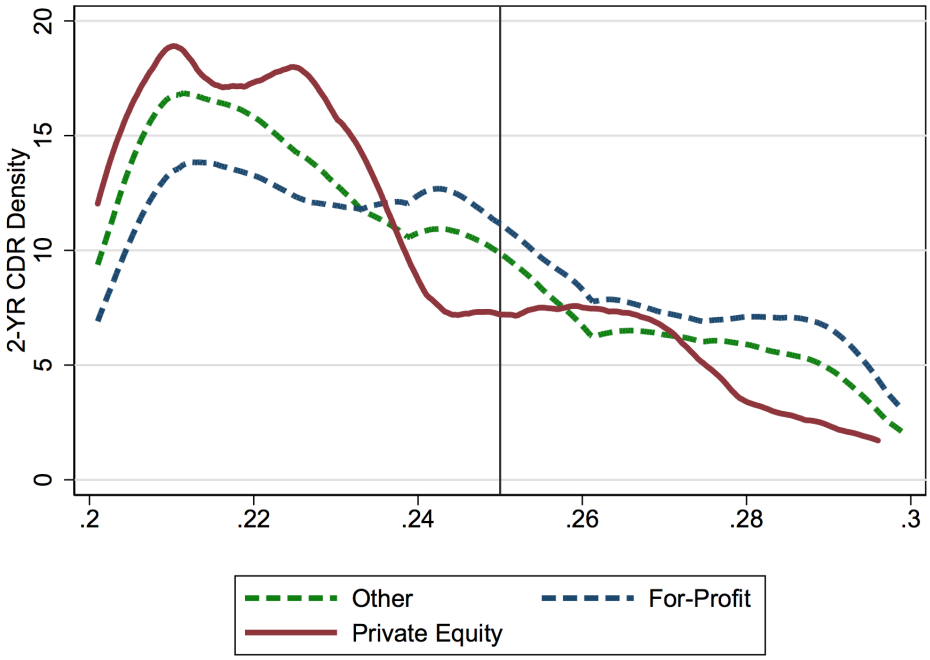
Note: These plots show the number of degree cuts by year around private equity buyouts, within schools that switched from independent to private equity-owned. A degree cut is the removal of a degree from the school's offerings. There are a total of 230 possible degree offerings.

Figure B.5: Borrowing at Private Equity Institutions



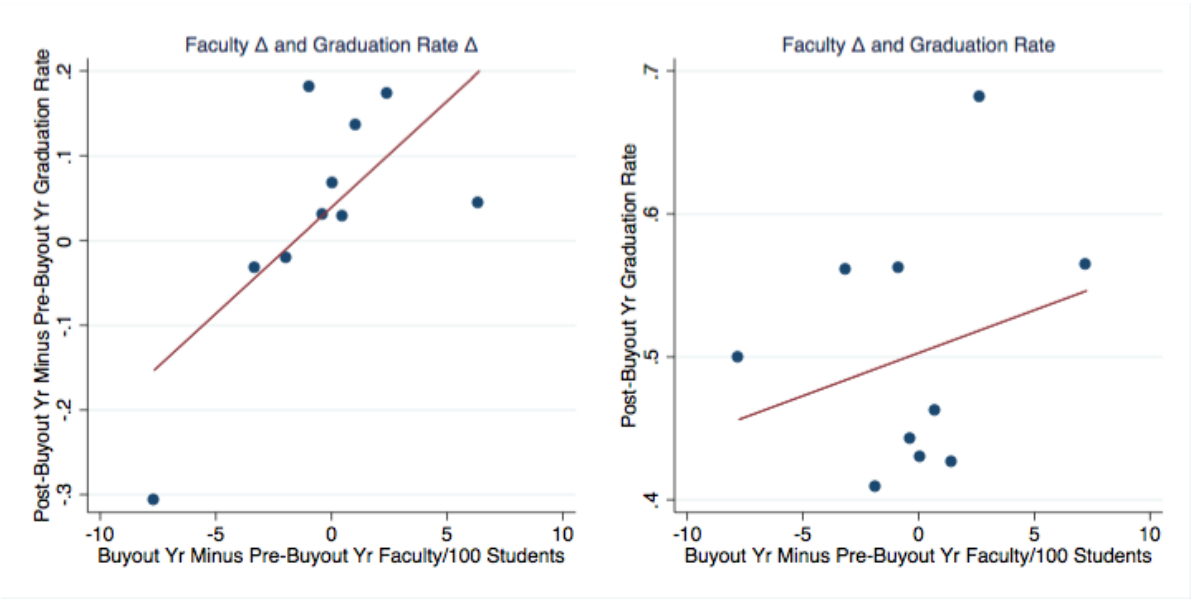
Note: This figure shows borrowing at PE-owned schools bought before 2007, and borrowing at other for-profits. The vertical line shows 2007, when student borrowing limits were increased.

Figure B.6: Density of Cohort Default Rates by Institution Type



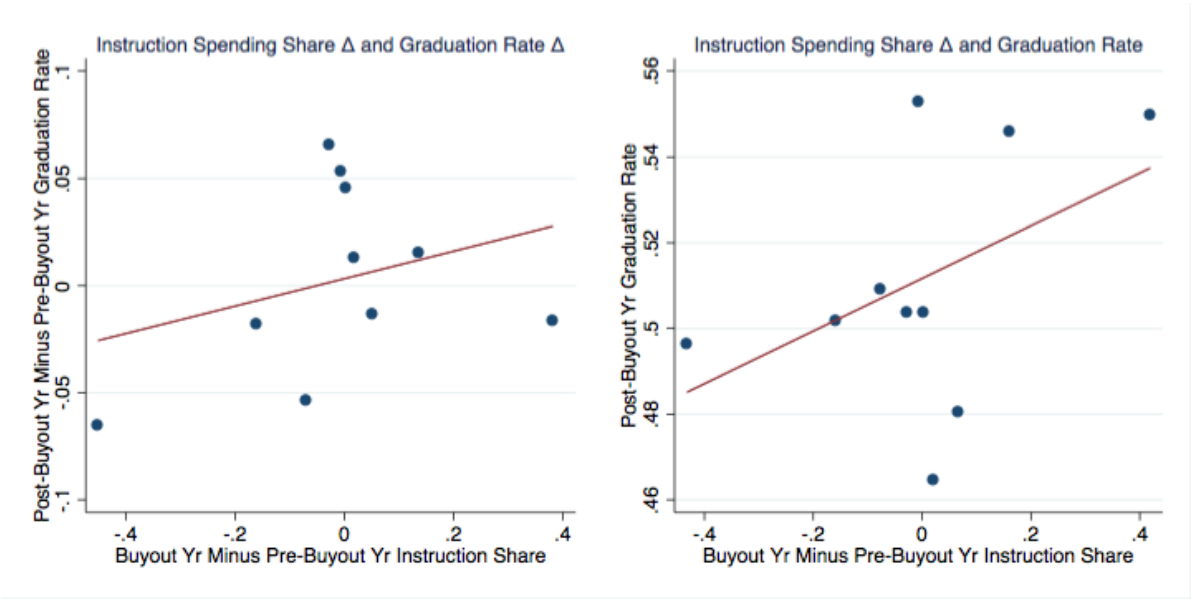
Note: This figure shows the density of two year cohort default rates, broken down by institution type.

Figure B.7: Graduation rates and changes in faculty/student ratio in year following buyout



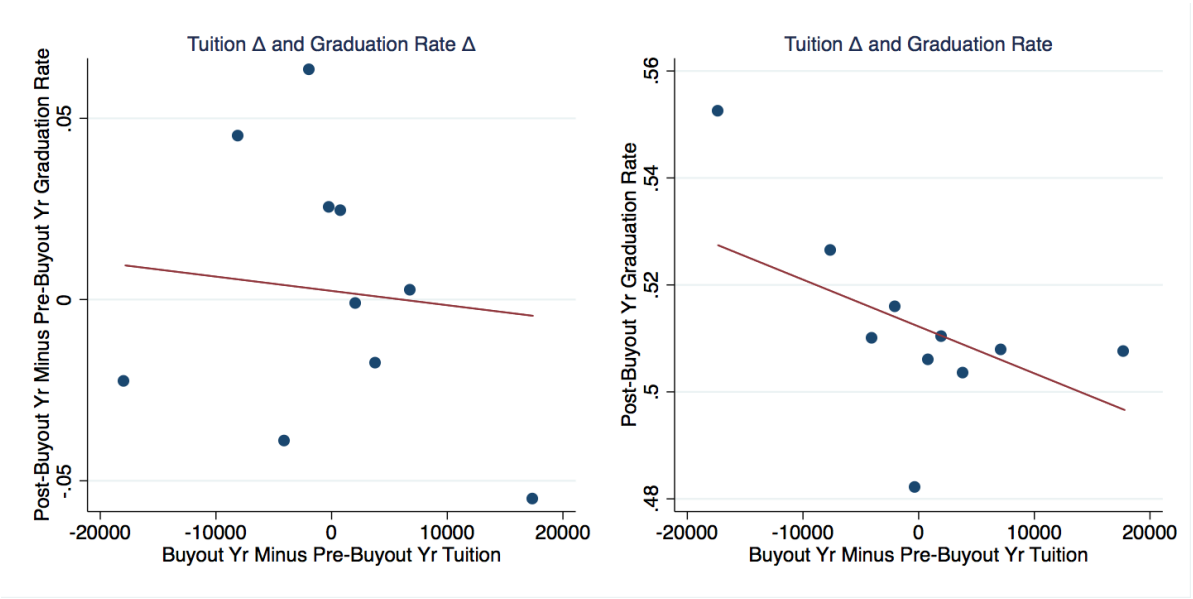
Note: These figures show 10 quantile binscatters relating changes in FTE faculty per 100 students to graduation rates. The x-axis shows the change in faculty-to-student ratio between the year before and the year after the buyout, so a negative number means the school reduced its faculty-to-student ratio. In the left figure, the y-axis shows the change in graduation rates, while in the right figure, the y-axis shows absolute graduation rates.

Figure B.8: Graduation rates and changes in the instruction share of spending in year following buyout



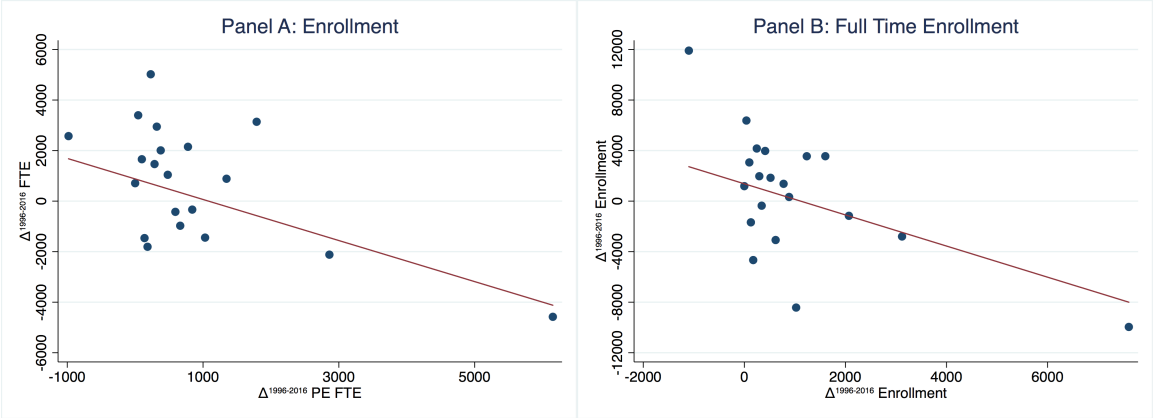
Note: These figures show 10 quantile binscatters relating changes in the instruction share of total spending to graduation rates. The x-axis shows the change in the instruction share of spending between the year before and the year after the buyout, so a negative number means the school reduced its instruction share of spending. In the left figure, the y-axis shows the change in graduation rates, while in the right figure, the y-axis shows absolute graduation rates.

Figure B.9: Changes in graduation rates and tuition in year following buyout



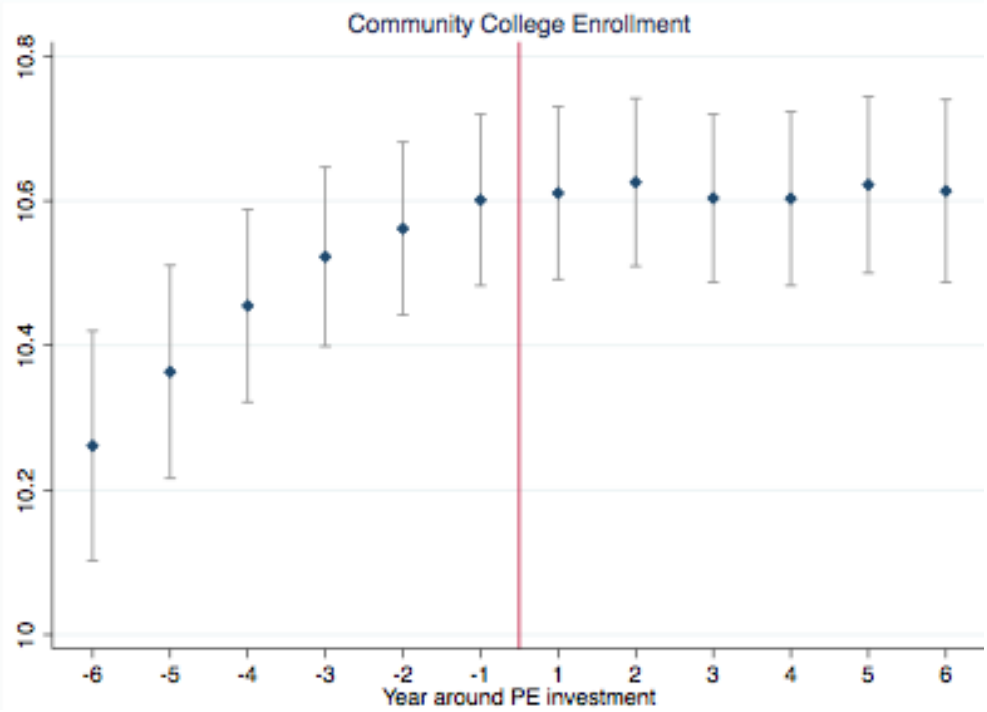
Note: These figures show 10 quantile binscatters relating changes in tuition to graduation rates. The x-axis shows the change in the instruction share of spending between the year before and the year after the buyout, so a negative number means the school reduced its instruction share of spending. In the left figure, the y-axis shows the change in graduation rates, while in the right figure, the y-axis shows absolute graduation rates.

Figure B.10: Private Equity Schools and Community College Enrollment



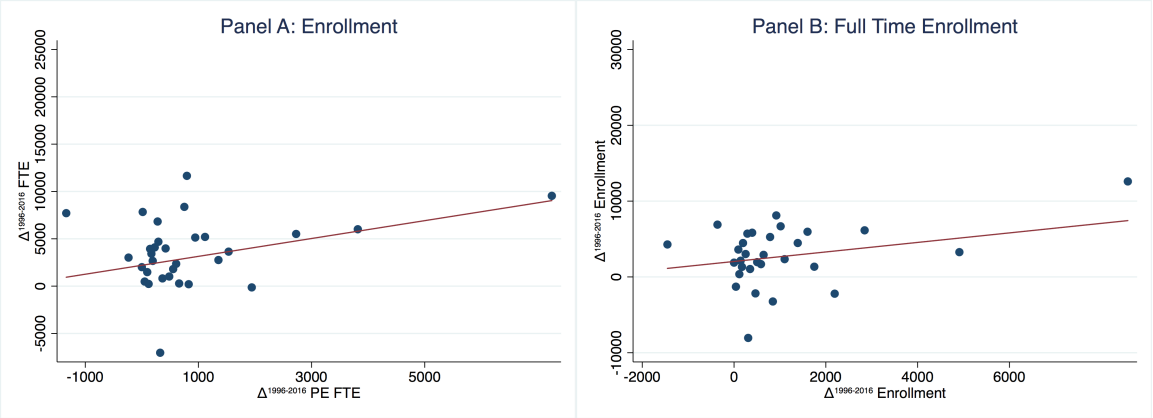
Note: These graphs collapse the mean change in community college enrollment and full-time enrollment in twenty bins ranked by the mean change in private equity-owned school enrollment. The figure on the left (right) shows the cross sectional relationship between the change in enrollment (full-time enrollment) at community colleges and private equity owned for-profits between 1996 and 2016. Community colleges are defined as public institutions granting two year or lower degrees.

Figure B.11: Private Equity School Entry and Community College Enrollment



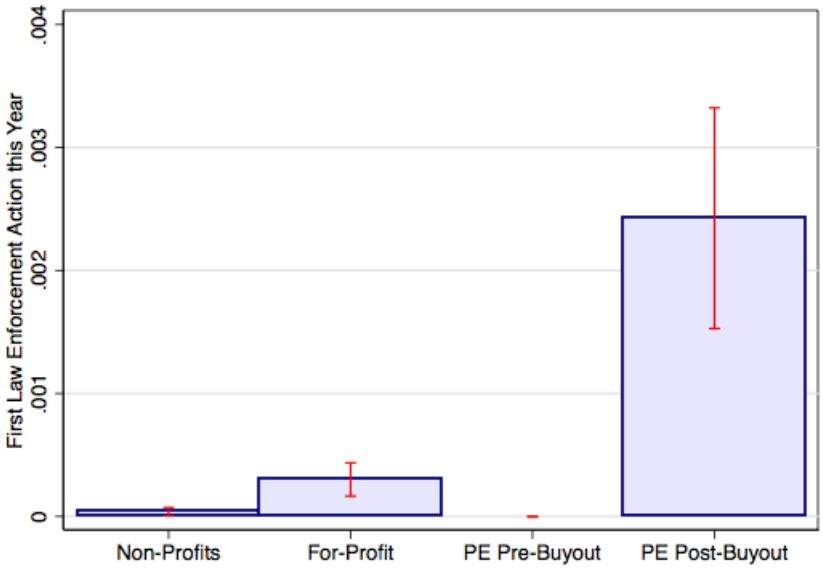
Note: This figure shows log enrollment in community colleges before and after the entry of a private equity backed for-profit college. Community colleges are defined as public institutions that grant two year or lower degrees.

Figure B.12: Private Equity Schools and High Quality College Enrollment



Note: The figure on the left shows the cross sectional relationship between the change in enrollment at high quality colleges and private equity owned for-profits between 1996 and 2016. The figure on the left shows the cross sectional relationship between the change in full time enrollment at high quality colleges and private equity owned for-profits between 1996 and 2016. High quality colleges are defined as institutions where more than half of students graduate within 150% of normal time.

Figure B.13: Law Enforcement Actions by School Type



Note: This figure shows the chances in a given year that a school has its first law enforcement action.

Appendix C: Gainful Employment Announcement

In this section, we present evidence that the market value of for-profit postsecondary schools is tightly connected to their ability to access federal aid regardless of student outcomes. We exploit four events comprising the introduction, watering down and eventual end of the Gainful Employment (GE) rule, which aimed to tie a school's access to federal grants and federally guaranteed loans to student labor market performance. Consistent with for-profit schools capturing government aid, we find that the market values of publicly traded for-profits fell sharply when the GE rule was announced. Conversely, affected firms experienced positive abnormal returns when the rules were weakened and ultimately vacated.

This analysis uses data on publicly traded firms. While this approach may seem somewhat disconnected from the paper's focus on private equity, in fact it serves to highlight the role of private equity in building the modern for-profit higher education sector. Currently, the largest purveyors of for-profit higher education are publicly traded, and all of the major public companies has at some point been private equity-owned. We document this in Table C.1. All received private equity investment prior to going public, except for Strayer University, which was taken private in a reverse LBO in 2001. The results in Section 4 revealed that the behavior of these formerly private equity owned, publicly traded schools is more similar to private equity owned, privately held schools than to other for-profits. Therefore, this section is both an extension of the private equity analysis, and also demonstrates the relationship between federal aid access and future cash flows for all for-profits with higher powered incentives than either independent, privately held for profits or community colleges and other nonprofit institutions.

First announced on July 26, 2010, the GE rule would have required graduates to meet debt-to-earnings requirements in order for the college to remain eligible for federal aid.[14] The goal was to eliminate programs in which students took on debt that was unmanageable relative to their

[14]Specifically, to remain Title IV-eligible, all for-profit and certificate programs would have had to pass at least one of three metrics: 1) at least 35 percent of former students must be in active repayment, defined as reducing their loan annually by at least $1; 2) annual loan payments could not exceed 30 percent of a typical graduate's discretionary income; or 3) annual loan payments could not exceed 12 percent of a typical graduate's total earnings. See IFAP and US News for more information.

expected labor market outcomes. Following the initial announcement, the rules were revised on June 2, 2011. This change substantially weakened the original rules.[15] In 2017, the rules were suspended altogether.[16]

Cumulative abnormal returns follow Campbell et al. (1997)and Acemoglu et al. (2016). The abnormal return for stock i at date t is given by

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \tag{1}$$

where R_{it} is the return of stock i at date t, and R_{mt} is the market return. The terms $\hat{\alpha_i}$ and $\hat{\beta}_i$ are estimated from the following equation

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{2}$$

Equation 2 is estimated for the 250 day trading period from 270 days prior to the event period.[17] The abnormal return in Equation 1 is calculated for each day of the event window, which encompasses the 20 trading days before to the 20 trading days after the event date. Firms are excluded if they are in the data for fewer than 150 days of the estimation window or fewer than 20 days of the event window.

Cumulative abnormal returns (CAR) are then calculated as

$$CAR[0, n] = \sum_{t=0}^{n} AR_{it}, \tag{3}$$

where n is the day following the start of the analysis period, 20 trading days prior to the event date. We compare fifteen firms that own for-profit institutions with GE data available between 2010 and

[15]Under the 2010 rules, if a school failed three tests, the school would immediately lose access to federal grants and loans. Under the new rules, if schools failed three tests three times in a four year span, access to federal grant and loans programs would be cut. The tests are that (1) at least 35 percent of students are paying down their loans, (2) graduates on average are spending less than 12 percent of their total income on loan payments and (3) graduates on average must be spending less than 30 percent of their discretionary income on loan payments. See the announcement for more information.

[16]See the Washington Post for more information.

[17]This estimation period is chosen to prevent the estimation period from influencing market returns and the expected return calculation.

2015. Control firms for the event studies are publicly traded firms with the same first three-digit NAICS as those in the treatment sample. Thus, the control firms are those with NAICS codes with 611 (Educational Services) and 812 (Personal Services) as the first three digits, which includes 48 controls firms in total.

Figure C.1 shows the CAR results. Each panel shows CAR values before and after a regulatory event. Time denotes days, and prices are measured at the close of each trading day. The left hand panel shows the announcement of the GE rules on July 26, 2010.[18] There is a sharp drop in CAR for exposed firms. In contrast, we see no discernible pattern for education firms unaffected by the GE rules. The right hand panel in Figure C.1 shows the jump in CAR following the June 2, 2011 rule weakening. Again we see no response for the control group.

Table C.2 presents results analogous to those in Figure C.1. We use variants of the following specification

$$CAR_{it} = \alpha_i + \alpha_t + \delta FP_i * Post_t + \varepsilon_{it}, \tag{4}$$

where CAR_{it} are the cumulative abnormal returns for firm *i* on day *t*. We include firm effects α_i, which absorb time invariant firm specific factors. Trading day fixed effects α_t absorb market-wide factors. The coefficient of interest is δ, which gives us the differential effect of the treatment group, firms owning for-profit colleges, relative to the control group following the announcement.

The first three columns of Table C.2 show results for the initial announcement of GE rules. The first column presents difference-in-differences estimates using post and treatment dummies, the second column adds date fixed effects, while the third column includes both sets of fixed effects. Consistent with the graphical evidence, we see a sharp drop in CAR, and the effect is statistically significant at the .05 level or higher in all specifications. Columns (4) through (6) repeats the analysis for the announcement of the new less restrictive GE rules. The estimates regarding the GE rules being softened are also consistent with the graphical results.

In sum, this analysis provides additional evidence that a major aspect of for-profit market value

[18] See the announcement for more information.

is rent-seeking capture of government aid, which is unambiguously not in students' or taxpayers' interests. We focus here on publicly traded for-profits, which likely have higher-powered incentives than independent, privately held for-profit schools. Also, the largest of these public firms were once private equity owned. Our result does not in itself imply that private equity buyouts do not improve education quality. However, in combination with the other evidence in Section 5 (loan limit increase and CDR bunching), it indicates that superior rent-seeking federal aid capture is an important channel through which high-powered incentives translate to higher profits.

Table C.1: Major Publicly Traded Higher Education Institutions

	First private equity investment/buyout	IPO date	Private equity reverse LBO date (public to private)	Second IPO date	Share of for-profit enrollment in 2010
EDMC	1986	1996	2006	2009	2.7%
Devry	1987	1991			2.8%
Corinthian	1995†	1999			2.1%
Capella	1995	2006			1.6%
Strayer		1996	2001		2.2%
Apollo (U. of Phoenix)		2000	2017		20.2%
Grand Canyon	2004	2008			1.4%
Laureate	2007	2017			1.8%

Note: This table lists the largest for profit higher education institutions ever publicly traded. †PE-financed acquisition of 15 campuses.

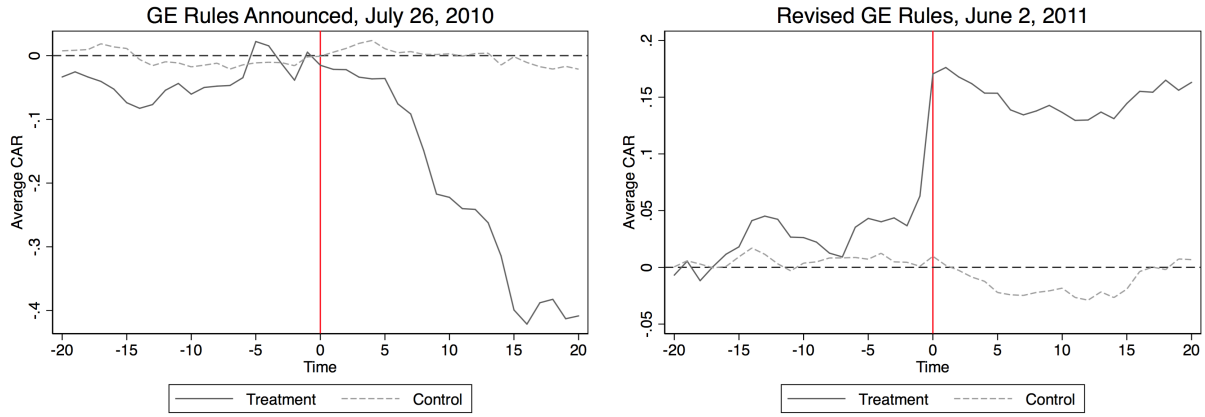
Table C.2: Gainful Employment Event Studies

Panel 1

Event:	GE Rules Announced			GE Rules Held		
Dependent Variable: Cumulative Abnormal Returns						
	(1)	(2)	(3)	(4)	(5)	(6)
FP X Post	-0.186***	-0.186***	-0.186***	0.135***	0.135***	0.135***
	(0.0340)	(0.0344)	(0.0348)	(0.0245)	(0.0248)	(0.0251)
FP	-0.0321**	-0.0321**		0.0264	0.0264	
	(0.0146)	(0.0148)		(0.0198)	(0.0200)	
Post	0.00455			-0.0192		
	(0.0181)			(0.0134)		
Firm Fixed Effects	No	No	Yes	No	No	Yes
Date Fixed Effects	No	Yes	Yes	No	Yes	Yes
Observations	1845	1845	1845	2050	2050	2050

Note: *Average Cumulative Abnormal Returns for the stocks are calculated around 60-day event windows, $CAR[0,n] = \sum_{t=0}^{n} AR_{it}$. Standard errors are clustered at the firm level. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Figure C.1: Gainful Employment Rules and Cumulative Abnormal Returns



Note: The figure above shows cumulative abnormal returns for treatment and control schools. Average Cumulative Abnormal Returns for the stocks are calculated around 60-day event windows.

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Online Appendix