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

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Abstract

This paper studies the effect of private equity buyouts in the for-profit postsecondary education sector. Employing novel data on 88 private equity deals and 1,332 school-level ownership changes, 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. We present evidence that neither selection ability of the private equity firms nor changes to the student body composition fully explain our results. An important mechanism for the effects we observe is that private-equity owned schools are better able to capture government aid.

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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 (Kaplan and Strömberg 2009, Metrick and Yasuda 2010).[1] If profit-maximizing incentives are well-aligned with customer interests in the education sector, transitions from independent to private equity ownership should increase the value of education, reduce its cost, or both. If these incentives are poorly aligned, the opposite should occur. One reason incentives might be poorly aligned is that education is heavily subsidized. Federal grants and federally guaranteed loans comprise around 90 percent of for-profit schools' revenue, and are all but disconnected from student outcomes. The combination of high-powered incentives and high subsidy levels may create opportunities for rent-seeking behavior.

We employ novel, hand-collected data on 88 private equity deals and 1,332 school-level ownership changes. We match these to U.S. Department of Education data between 1990 and 2015. Private equity owned schools account for around 35 percent of for-profit enrollment, and most large publicly traded for-profits were once private equity owned. 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, Yuchtman, Abulafi, Goldin, and Katz [2016]. Independent for-profits resemble community colleges more than private equity owned schools in some respects. For example, 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.

To document the relationship between buyouts and outcomes, we use regressions with school and year fixed effects, as well as a matching estimator. We also show visual plots of mean outcomes within switcher-schools around the buyout year. Following a private equity buyout, graduation rates decline by 6 percentage points, relative to a mean of 45 percent. Average annual loans

[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.

increase by 12 percent. The share of students in repayment – who have not defaulted on their federal loans three years after leaving school – falls by 3 percentage points. We have information on earnings for federal borrowers with either salaried wages or reported self-employment. Buyouts lead to 5.8 percent lower earnings six years after the student leaves school.

Operational changes shed light on the mechanism. The ratio of faculty to students declines after the buyout. Law enforcement actions in higher education are overwhelmingly concentrated in private equity-owned schools; private equity owned school-years comprise 4 percent of all school-years in our data, but 58 percent of first-time law enforcement actions against schools. The actions are mostly related to misrepresentation. We also examine financial changes. Private equity buyouts are associated with a more than tripling of school profits. The profit growth is driven by increased revenue from enrollment expansion and tuition increases. Costs also increase, which appears due to greater marketing and recruiting effort. Our finding that profits rise dramatically concurs with existing work associating private equity buyouts with higher productivity and higher firm value (Boucly, Sraer, and Thesmar 2011, Davis, Haltiwanger, Handley, Jarmin, Lerner, and Miranda 2014, Bloom, Sadun, and Van Reenen 2015).[2] One advantage of our setting, in the context of this literature, is that we observe both operational and financial changes.

Private equity firms may be skilled at selecting targets on trajectories to higher profits, which would imply that the above effects are not causal. However, the visual event studies reveal essentially no pre-trends, which is somewhat inconsistent with a selection channel. We also show that CEO turnover increases by about 36 percent in the three years following the buyout. This suggests that private equity owners impose better management, which in turn leads to improved operations.

A second alternative to causality is changing student composition. That is, the school may attract different types of students after the buyout. We test for causality using partially treated cohorts. We consider students in two-year programs who are already enrolled before a private equity acquisition occurs, but have one year at the now private equity owned school. We compare the cohort with partial treatment to the previous one that had no treatment. Partially treated cohorts ex-

[2]Also see Muscarella and Vetsuypens [1990], Kaplan and Schoar [2005], Gottschalg et al. [2007], Cao and Lerner [2009], Guo et al. [2011], Lopez-de Silanes et al. [2015].

perience more than half the negative effect on graduation rates among fully treated cohorts. While we cannot conduct this test for other student outcomes, it allows us to rule out the composition channel for graduation rates.

The immediacy of the decline in graduation rates appears due to immediate declines in education inputs. We show that schools with large declines in graduation rates in the year after the buyout year are also those with large negative changes in education inputs. We also use regressions that control for the ethnic and family income makeup of the student body. These yield similar or larger effects than our main models, suggesting that a composition channel cannot occur via demographics. Further, education inputs decline even as tuition rises. We cannot rule out the composition channel entirely, but it seems less likely than operational changes to drive our main results.

Private equity ownership leads to enrollment increases. Whether these additional students – regardless of their preparedness – are better or worse off as a result of the buyout depends on their outside option. For example, additional students may be made better off if in their counterfactual environment they would have had no post-secondary education. We explore this by asking whether additional students are drawn from community colleges. A large literature finds that the expected labor market returns to for-profit education are lower than the returns to non-selective community college (Deming, Goldin, and Katz 2012, Liu and Belfield 2014, Cellini and Chaudhary 2014, Darolia et al. 2015, Cellini and Turner 2016, Deming et al. 2016 Armona, Chakrabarti, and Lovenheim 2017). If the source of buyout-driven enrollment expansion is substitution away from community colleges, then the new students are unlikely to be better off. Indeed, we find evidence of substitution away from community colleges towards private equity entrants within commuting zones. This is not surprising, as Cellini, Darolia, and Turner [2017] show that community colleges and for-profit schools are direct substitutes.

Having presented some evidence in favor of causality, we wish to understand how high-powered incentives affect target schools. We focus on the role of government subsidy, because it is the main source of for-profit revenue. First, we exploit the 2007 increase in student loan borrowing limits. Relative to other institutions, private equity owned schools responded to the increase by raising

tuition faster than other schools, which induced higher levels of borrowing. Relatedly, Cellini and Goldin [2014] show that for-profit schools respond to federal student aid increases by raising tuition. Second, private equity owned schools are better at bunching 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. Thus superior capture of government aid, a purely rent-seeking phenomenon, is an important channel through which high-powered incentives translate to higher profits. This is unambiguously not in the interest of students or taxpayers.

To our knowledge, this paper offers the first analysis of how private equity affects customer outcomes in a heavily subsidized industry.[3] Our conclusions 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. Incentives may be less well aligned with customer interests in sectors with intensive government subsidy, which typically also feature less competition, opaque product quality, and customer outcomes measurable only many years after payment (Hansmann 1980). These sectors, particularly healthcare, infrastructure, defense, and education, receive large amounts of private equity investment (see Appendix B Figure 1).

At the same time, many institutions in these sectors are non-profit. Glaeser and Shleifer [2001] explain how weaker incentives to maximize profits can make non-profit status optimal for entrepreneurs in settings where customers are dependent on implicit contracts with the firm (also see Shleifer and Summers 1988). This mechanism depends on customers choosing non-profit firms over for-profit ones. In higher education, federally guaranteed loans and other subsidies contribute to low customer price elasticity, making high-powered incentives profitable for some firms but counter to students' and taxpayers' interests.

[3]Relatedly, Ljungqvist, Persson, and Tag [2016] study the misalignment between private and social incentives in private equity-backed stock delistings.

More broadly, this paper relates to the literature on the private provision of government goods and services, which has focused on the developing world (Reinikka and Svensson 2004, Khwaja and Mian 2005). Profit-maximizing incentives can improve efficiency, but in the face of information frictions, government subsidy may create an opportunity for rent seeking behavior, which is detrimental to efficiency and growth (Laffont and Tirole 1991, Hart, Shleifer, and Vishny 1997). There is little empirical evidence from the developed world, where higher quality institutions could imply minimal rent seeking.[4] Our setting offers a useful initial approach to this question, because it isolates the transition from lower- to higher-powered incentives in a sector where the majority of revenue is from government sources.

2 Data and descriptive statistics

This section begins by summarizing the for-profit higher education sector. Then it discusses the role of private equity and the deals used in analysis. Third, it introduces data on college characteristics, and presents summary statistics. Finally, it describes data on law enforcement actions.

2.1 Institutional context

Here we briefly summarize the for-profit higher education sector. Appendix A Sections 1-3 contain detailed institutional context about the for-profit higher education sector, labor market returns to for-profit education, and how the federal student loan and grant programs create misaligned incentives.

For-profit schools 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). For-profits typically offer structured, fo-

[4]The private sector provides a large fraction of government goods. For example, between 2010 and 2015, about 25 percent of U.S. government spending occurred through private sector procurement; this does not include spending such as Medicare reimbursements to healthcare and drug providers or government grants and loan guarantees for education. See http://www.oecd-ilibrary.org/governance/government-at-a-glance-2015_gov_glance-2015-en.

cused programs of study with few electives. The material is standardized and replicated across a firm's campuses and online programs. Students at for-profit schools tend to be more socioeconomically disadvantaged than students at community colleges, which are the closest comparison (Deming, Goldin, and Katz 2012). 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 (see Figure 2).

For-profit schools garner about 90 percent of their revenue from public sources (Kelchen 2017). They are incentivized to target low-income students, who qualify to pay tuition primarily with federal grants and loans and thus 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 creates an incentive for for-profit schools to increase tuition above cost. Federal revenue arrives when the student enters school and is largely disconnected from graduation rates and labor market outcomes. The taxpayer bears the cost of student defaults.[5] 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). Thus government aid and loan guarantees create a potential misalignment of incentives between for-profit school owners and customers.

2.2 Private equity in higher education

Private equity buyouts typically affect the target firm's finances, its operations, or both (Metrick and Yasuda 2010). This paper focuses on operations, as we are primarily interested in student outcomes and cannot observe firm debt. Appendix A Section 4 describes the role of private equity in for-profit higher education in detail; here we again summarize the key points.

[5]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.

Private equity investments in higher education have been either purchases of independent (small, private) colleges, usually with consolidation intent, or large buyouts of existing chain institutions. 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.[6]

Since the late 1990s, private equity owned schools have contributed to the growth in for-profit enrollment. Figure 1 shows the share of private equity schools in total enrollment and defaults over time (defaults are measured at least three years after graduation, so we terminate both plots in 2011). In the late 2000s, despite having just 10 percent of enrollment, for-profit schools accounted for about 40 percent of student loan defaults. The right panel of Figure 1 shows that most of this increase is attributable to the growth in the default share at private equity owned for-profits. The share of defaults has remained relatively flat at non-private equity owned for-profit schools.

The higher education private equity deal data that we have collected are summarized in Appendix B Table 1. 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 prior to 2016. The left graph in Appendix B Figure 2 shows the number of private equity deals in the for-profit education sector over time, while the right graph shows new private equity ownership at the school (UnitID)

[6] See the Chronicle for further information.

level. Appendix B Table 1 Panel 1 shows that nearly 80 percent of the 88 deals are known buyouts, while the other 20 percent may involve a minority stake. For simplicity, we use the term "buyout" in the remainder of the paper to refer to both "buyout or minority investment." Panel 2 shows that among the 43 deals where we can identify an exit, or liquidity event, the average time to exit was 6.8 years. Of these, 22 were sales to other private equity firms, and 7 were IPOs. We identified 27 that are still in the private equity firm's portfolio.

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.

2.3 School characteristics and student outcomes

Data on college characteristics and student outcomes comes primarily from the Integrated Postsecondary Education Data System (IPEDS). All schools that are Title IV eligible must report to IPEDS.[7] Most variables are reported at the school level according to a unique "UnitID", which remains constant over time and across ownership changes. We created a unique identifier that we call "SystemID" to represent the parent system of postsecondary institutions, 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.

[7]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.

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 private equity owned parent companies often purchase additional schools. We have 1,332 schools, or UnitIDs, that ever come under private equity ownership.[8] Of these, 697 are through ownership changes. In turn, 422 of these are through the PE deal, and 275 are through subsequent acquisitions by the now-private equity owned school. The remaining 635 UnitIDs, are newly established by private equity owned school systems. Only two private equity owned companies closed prior to 2015, our last full year of data.[9]

We report means and standard deviations in Table 1 for four ownership categories: 1) state and non-profit schools that offer 4-year degrees or higher, 2) community colleges that offer 2-year degrees and lower, 3) for-profit colleges of all degree levels that are not backed by private equity, and 4) private equity-owned for-profit colleges. The data span 1987 through 2016, but some variables are not available until the early 1990s.[10] Financial data is in Table 1 Panel 1, at the SystemID level.[11] Annual profits at private equity-owned schools average $34 million, compared to $6 million at both other for-profits and community colleges.

Panel 2 of Table 1 summarizes college characteristics and student outcomes at the school, or UnitID level. 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. Community college graduation rates are lower, but these are not comparable. 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). Average loans per borrower among full-time first year

[8]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.

[9]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 and default rates) are available for fewer years.

[10]In our data, 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.

[11]Observation in this panel are at the SystemID level, because financial data are reported to IPEDS through parent UnitIDs for multiple associated UnitIDs (see Jaquette and Parra 2014).

students is $7,456 at private equity-owned schools, compared to $5,711 for other for-profits and $3,543 at community colleges.

NSLDS provides data on default rates 2 years after exit-year for exiting cohorts (graduates and drop outs) from 1992 through 2011. The DOE moved from a 2-year cohort default rate (CDR) to a 3-year CDR in 2012 because of concerns that 2-year CDRs were more subject to manipulation by for-profits (The Institute for College Access & Success 2012). It is known more broadly that CDR rates are vulnerable to manipulation through the use of allowable non-repayment options like deferments and forbearances. Comparisons between for-profits and other types of colleges should therefore be made with caution. We use the 2-year CDR time series to analyze potential bunching of default rates close to regulatory limits.

A more reliable measure of default 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 either graduating or dropping out. Repayment rates are also more sensitive than default rates, which measure only the worst-case scenario for repayment outcomes. Repayment rates are 32 percent among private equity owned schools compared to 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 linkage between federally aided students and earnings data from Department of the Treasury tax records. All national salaried (W-2) and self-employed (Schedule SE) earnings are included. Thus 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. They are therefore likely higher than they would be if "zeros" for 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, private equity owned school tuition averages $17,521 relative to $14,210, $3,672, and $10,995 at non-private equity owned for-profits, community colleges, and nonprofit/state schools, respectively.

Just 44 percent of students at private equity owned schools are white, compared to, for example, 69 percent at community colleges. Per-student Pell Grant revenue is a measure of how low-income the student body is. Average per-student Pell Grant revenue at private equity-owned schools only slightly higher than other for-profits, but is almost three times that at community colleges.

2.4 Law enforcement actions

Law enforcement actions against higher education institutions provide information about college operations. We collected data primarily from Republic Report.[12] The actions range from 2007 to 2016, but the vast majority are post-2010, when the Obama Administration increased oversight over for-profit colleges. We found 125 instances in which a state or federal agency initiated an investigation. 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). There are 35 allegations of student loan fraud, 5 cases of fraudulent high school diplomas, and 11 cases of embezzlement and illegal use of funds.

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 (including all institution types), they are 58 percent of the first-time actions.

[12] https://www.republicreport.org/2014/law-enforcement-for-profit-colleges/ .

3 The effects of private equity ownership

This section first explains the primary empirical approaches we use to assess how private equity ownership affects school and student outcomes. The results are in Section 3.2, organized by category of outcome. We use a number of other empirical strategies in Sections 4 and 5, where we explore causality, sources of additional enrollment, and the mechanism of government aid capture.

3.1 Estimation approaches

Here we present three estimation approaches: visual event studies, within-school regressions, and a matching estimator.

3.1.1 Visual event studies

Our first approach is to plot outcome variable means around the year of the buyout. We restrict the sample to for-profit schools that change ownership from independent to private equity owned. There are two goals in this analysis. One is to test for pre-trends, which sheds light on whether a selection mechanism most likely explains our results. The second is to show the raw effect within switcher-schools, without any controls.

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. We restrict the sample to schools that existed in the year prior to the private equity buyout, so that there is a "switch", and do not include schools established by the private equity owned school systems after the buyouts. After this restriction, there are small variations in sample size across years as schools enter and exit. When they are not present, they are recorded as missing. We take a slightly different graphical approach to showing earnings around the buyout, because of the strong time trends in earnings. This is described below.

3.1.2 Within-school regressions

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

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

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 composition of the student body to assess whether a changing student body drives any observed effects. These include the share of students who are black, the share of students who are white, the share of students who are Hispanic, and the amount of Pell grants per full-time equivalent student, in 2015 dollars.

There may be concern that our results are driven by a few large private equity deals, and the schools subsequently acquired by those private equity targets. These are likely to have correlated outcomes. We address this in two ways. First, we two-way cluster standard errors by parent company (SystemID) and year in all specifications. Our results are not sensitive to alternative clustering. Second, we present robustness tests in which we omit the three largest school systems (by number of UnitIDs) that are ultimately private equity-owned.[13]

3.1.3 Matching

We also use a coarse-exact matching (CEM) estimator. CEM has some of the benefits of exact matching without the curse-of-dimensionality that produces few matches with continuous covari-

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

ates. The algorithm coarsens continuous variables into bins, and then matches treated and control observations exactly in strata defined by these bins. Iacus, King, and Porro [2012] note that CEM has a number of attractive properties, such as the ability to adjust imbalance on one variable without affecting the maximum imbalance of others, and handing high dimensionality without a large sample.

For each private equity-backed school, we identify the year prior to the buyout event, and match the subsequently private equity owned schools in that 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. We then coarsely match on the total number of students, the percent of students on federal grants, the share black, the share white, the highest degree type offered, whether the school is primarily online, and whether the school is selective. We do not match on the outcome variable. For example, when we examine the effect on share white, we omit the share white from the matching criteria. Appendix B Table 4 shows that the imbalance across strata decreases dramatically after the CEM procedure.

3.2 Results

We present the effects on student outcomes and school operations in Sections 3.2.1 and 3.2.2. Publicly traded schools and types of private equity are examined in Sections 3.2.3 and 3.2.4.

3.2.1 Student outcomes

Private equity buyouts lead to a 6 percentage point decline in graduation rates, relative to a mean of 45 percent across all schools. This effect, shown in Table 2 Panel 1, 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. For affected students, lower graduation rates is unambiguously detrimental. It may also harm their peers who do graduate. In their experiment sending resumes with different degrees to employers, Deming et al. [2016] found that employers' positive response to degrees were strongly related to differences in graduation

rates, among other measures of school quality.

We observe both mean and median earnings. InTable 2 Panel 2 columns 1-2, we find that private equity buyouts lead to 5.8 percent lower within-cohort average earnings, relative to a mean across all schools of $31,269, in 2015 dollars. Data limitations prevent us from using the matching estimators for the wage data.[14] Median earnings decline by a similar, albeit slightly smaller amount (columns 3-4). We plot how average earnings evolve around the buyout in Figure 4.

As 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, we graph coefficients from a fixed effects regression. Figure 4 shows the coefficients β_j from the following specification:

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

Here, $1[Year = j]$ is an indicator of a year pre or post the buyout year $Year_{PE}$, α_i and α_t are respectively school and year fixed effects, and X_{it} are demographic school controls. The sample is all schools, and the control group is all non-private equity owned schools. Thus $Year$ is always zero for non-private equity owned schools. We see no differential effects for schools prior to a private equity buyout. Afterwards, we see a deterioration in log earnings six years after enrollment.

Average loans per borrower increase by nearly $600 following a private equity buyout, or about 12 percent of the mean across all schools of $5,147. This is shown in Table 2 Panel 3 column 1. The matching model yields a smaller effect of $343. We see a striking raw increase in borrowing in the visual analysis, in Figure 3. Higher borrowing could reflect four different channels. One is that students are poorer and thus need to borrow more conditional on tuition. The second 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 third possibility is that

[14]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.

the school's degree mix changes after the buyout, such that students enroll in higher cost degrees. Finally, the fourth possibility is that tuition increases, but the degree mix remains the same. All of these may be at play, but we show very large increases in tuition below, suggesting that the fourth channel is active.

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 visual event study is the right-hand plot in in Figure 3, reveals a striking downward shift and subsequent negative trend.

3.2.2 Operations

The effects on student outcomes – graduation rates, wages, loans, and repayment rates – occur immediately after the buyout. They could be driven by a number of mechanisms, including lower quality students, lower quality education, and higher costs. Operational changes help shed light on the mechanism.

We first examine financial variables, which also tests whether private equity ownership benefits firms in higher education as it has ben shown to do in other industries. Table 3 Panel 1 shows that buyouts lead to dramatic increases in profits; the coefficient of 1.2 implies a 332 percent increase (columns 1-3). While the mean of profits across all schools is $27 million, it is just $6 million among among for-profits and community colleges. The large magnitude of the effect is less surprising in education, as gross margins are substantially higher than in other industries. Eaton et al. [2016] note that between 2003 and 2012, gross margins among U.S. publicly traded schools averaged 55 percent, compared to 33 percent across across 99 major industries. Private equity ownership also leads to about a 260 percent increase in revenue (columns 4-6). The visual event studies are in Figure 5.

Total expenditure increases by 245 percent (columns 7-9). Higher profits derive primarily from higher revenue, as costs start from a much lower base. Expenditure's visual event study, not shown, exhibits a similar pattern as profits and revenue. 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 limited data prevents us from using this variable in the main analysis). These shares at private equity owned schools dwarf those at other types of institutions.

The increased revenues and costs after private equity buyouts stem from both tuition and enrollment growth. Table 3 Panel 2 columns 1-3 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 $3,607).[15] The number of full-time equivalent enrolled students increases by 48 percent (columns 4-6). For both tuition and enrollment, the matching estimator yields roughly double the OLS effects. The visual event studies reveal a marked jump after the buyout for both variables (Figure 5).

Moving to measures of education quality, buyouts lead to a 0.45 decline in the number of faculty per 100 full time students (columns 1-2), relative to a mean of 5.3 across all schools, and 3.6 among private equity owned schools. The visual event study also reveals a decline after the buyout (Figure 5). The matching estimate is imprecise, possibly because of the small sample for this variable. The share of expenditure devoted to instruction declines by about three percentage points, though the matching estimator yields a higher effect of 6.5 percentage points (Table 3 Panel 3 columns 1-3). The mean across all schools is 48 percent.

The chances of a school having its first law enforcement action increases dramatically after a private equity buyout. The dependent variable in columns 4-6 of Table 3 Panel 3 is one if the school experienced its first action in a given year. We have only 58 such instances (of which private equity-owned schools were responsible for 41). A visual comparison is in Appendix B Figure 3.

Finally, we turn to demographics. We find no effect of the buyouts on Pell grant revenue per student, suggesting that average income levels do not change much after the buyout. The share of white students falls by about five percentage points (columns 7–8), relative to a mean across all schools of 62 percent. We find a roughly symmetric increase in the share of black students, not

[15]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.

shown.

3.2.3 Public ownership

Publicly traded schools may also have high-powered incentives to maximize profits relative to independent for-profit schools. It is also the case that most publicly traded schools were formerly private equity owned. We explore publicly traded schools in Appendix C. We alter the definition of PE_{it} in Equation 1 to include public firms that were formerly private equity owned. We estimate Equation 3:

$$Y_{it} = \beta_1 PE_{it} + \beta_2 Public_{it} + \beta_3 PE_{it} Public_{it} + \gamma \mathbf{X}_{it} + \alpha_i + \alpha_t + \varepsilon_{it} \tag{3}$$

The coefficient on the interaction term tells us the effect of being a publicly traded school that was formerly private equity owned. The details of the estimation are described in the text portion of Appendix C.

Broadly, public firms behave similarly to private equity owned firms. However, private equity ownership is associated with much larger increases in tuition and loans, and a larger decrease in graduation rates. Public ownership is not associated with higher loans (Appendix C Table 1 Panel 2). The results are consistent with publicly traded firms having higher-powered incentives than other schools, but private equity owned schools having the most high-powered incentives, and thus the most adverse effect on student outcomes. Further discussion can be found in the Appendix text.

3.2.4 Private equity type

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 also 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.[16]

Second, we omit the largest three deals. We define "large" as the number of schools (UnitIDs) purchased in the deal sand subsequently acquired by the private equity owned school system. The results, shown in Appendix B Table 5, are in general as strong as our main specification, both in magnitude and statistical significance, indicating that a few large deals do not explain the effects. The exception is average loans, where the effect falls from $1,100 to $700, albeit still significant at the .01 level.

4 Selection and Composition Effects

In the absence of experimental variation in private equity ownership, we cannot affirmatively establish whether the results described in Section 3.2 are causal. This section attempts to draw some conclusions about whether students are likely better or worse off as a result of the buyouts, and for which outcome variables we can be most confident.

The effects may not be causal if they are explained either by private equity firm selection ability or by changing student composition. A selection mechanism implies that private equity firms chose targets that would have changed anyway in the absence of the buyout; they are simply excellent at screening. A composition mechanism implies that the types of students enrolled changed after the buyout - in particular, that they became less well-prepared, with worse expected outcomes.

In the following subsections, we introduce new tests to examine whether selection or composition can explain the results (Sections 4.1 and 4.2). We explore the source of additional enrollment in Section 4.3).

4.1 Selection

If private equity firm selection ability explains our effects, then both existing and additional students would have had similar changes in outcomes in the absence of the buyout. A selection

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

mechanism is most plausible when the target firm is on a trajectory towards the post-buyout outcomes during the pre-buyout years. The visual event studies in Figures 3 and 5 are largely devoid of pre-trends. This is evidence against selection.

There is much evidence that private equity owners improve governance and management of firms in which they invest (Cornelli and Karakacs 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 if the private equity buyout has a causal effect on school operations, we will be more likely to observe management changes following a private equity buyout.

We test this hypothesis in Appendix B Table 6. 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, and 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.

We find a 3-8 percentage point increase in rate of CEO turnover in the three years after the buyout. 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 improving management by bringing in new executives. Also note that the loan limit increase analysis, in Section 6, provides additional evidence that private equity owned schools are better managed.

4.2 Composition

There are two concerns related to composition. First, the school may attract different types of students after the buyout compared to before. This might be especially expected in light of the

school quality declines we observe. Second, we observe large enrollment increases. The marginal student targeted by the expansion may be less well qualified, with poorer labor market potential. In this case, the negative results on student outcomes could be explained by the change in student composition. We address these possibilities in turn.

4.2.1 Evidence from main regressions

In Section 3, the second regression model for each outcome variable controlled for ethnicity and family income proxies. These regressions are problematic because the composition covariates are also "outcomes." Also, the controls do not capture more nuanced aspects of the student body composition, such as preparation. However, the fact that these regressions yield as strong or stronger effects than the first model indicates that demographics are not responsible for the main effects.

4.2.2 Partially treated cohort analysis

We conduct a compelling test for causality using cohorts that are already enrolled at the school before the private equity acquisition occurs, but that subsequently have one or more years at the now private equity-owned school. 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. Of the student outcomes, we are able to conduct this test only for graduation rates.[17]

The result is in column 4 of Table 2. 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. Thus a changing student body composition cannot explain the decline we observe in graduation rates.

[17] It is not possible for student loans because they are measured only in the cohort's first year, in which they are either fully treated or not treated at all. It is not reliable for earnings and repayment rates because those data are published for exiting cohorts, which are comprised of students from multiple entering cohorts. We cannot construct exiting cohorts that receive partial treatment.

4.2.3 Education quality

The partially treated cohort analysis highlights the immediacy of the decline in graduation rates. More generally, our measures of success in Section 3.2.1 decline immediately after the buyout. One mechanism for this is suggested by the fact that education inputs were also shown to precipitously decline. If immediate education quality declines are closely associated with immediate graduation rate declines, this would be evidence for operational changes rather than changing student composition leading to the deteriorating outcomes we observe after private equity buyouts.

We explore whether schools that experience large declines in graduation rates in the year after the buyout year are also those with large negative changes in education inputs. Graphical evidence is in Appendix B Figures 4 and 5. Appendix B Figure 4 contains two bin-scatter plots. In both, the x-axis contains 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 plot, the y-axis shows the change in graduation rates. There is a very striking positive relationship between faculty changes and graduation rate changes. 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. In the right plot, the y-axis shows absolute graduation rates in the year after the buyout, and also shows a positive slope.

Appendix B Figure 5 repeats this exercise using changes in the instruction share of spending on the x-axis. 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. Again, we see positive slopes in both plots, though the left plot is flatter than any of the others.

Regression analysis is in Appendix B Table 7, which asks whether the effect of private equity buyouts on graduation rates in the first year after the buyout is larger among schools with particularly large declines in education inputs. We again use the 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

$$Y_{i,t} = \beta_1 PE_{i,t} \cdot \left(\Delta_{t-1,t}^{EducInput} < 25pct \right) + \gamma \mathbf{X}_{it} + \alpha_i + \alpha_t + \varepsilon_{it} \tag{4}$$

Here, $\Delta_{t-1,t}^{EducInput} < 25pct$ 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.

Columns 1 and 2 find that the effect of PE on graduation rates in the year after the buyout is much larger for schools with large negative changes in their faculty to student ratios. 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) have graduation rates fall by 6 pp in the first year after the buyout.

Thus schools with immediate declines in graduation rates after private equity buyouts are also those with large immediate declines in education inputs. This analysis supplements Section 3.2.2, which showed how buyouts lead to immediate declines in education inputs, even as private equity owned schools have vastly larger shares of resources allocated to sales and marketing (Figure 2). The evidence supports a mechanism in which lower quality education, rather than simply composition changes, increases student attrition.

An alternative mechanism is that tuition increases lead to higher attrition. However, there is evidence that students are relatively unresponsive to tuition changes because they fund tuition with government grants and guaranteed loans (e.g. Bleemer et al. 2017). Thus the tuition hikes that we

see after private equity buyouts are unlikely to cause lower graduation rates, though they are likely to cause the loan increases that we observe.

In sum, composition changes stemming from under-preparedness (rather than demographics, which we can rule out) could affect some of our results. We can rule out that this mechanism explains the effects on graduation rates, and we show that reductions in education inputs are a viable alternative.

4.3 Source of Additional Enrollment

The previous section showed that it is very unlikely that existing students (types that enrolled previously) are made weakly better off by the buyout. However, whether additional students – regardless of their preparedness – are better or worse off as a result of the buyout depends on their outside option. Thus the source of additional enrollment is central to the welfare effects of private equity ownership. 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. In particular, the closest substitute will be either independent for-profits and community colleges. A rich education 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 colleges.[18] A striking example from this literature is the experimental evidence in Darolia et al. [2015] and Deming et al. [2016]. They assess employer perceptions of higher education institutions by submitting otherwise identical resumes with different degrees to job openings. They find that employers prefer applicants who are graduates of non-selective community colleges to those with for-profit degrees by large margins, and that for-profit degrees in many cases were no

[18] 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.

better than having no postsecondary degree at all.

In light of this literature, if new students at private equity-owned schools would otherwise attend community colleges, this would be some evidence of a welfare reduction for these students. To the degree the substitution to higher-tuition schools is financed by federal sources, it is also a negative outcome for the taxpayer. We examine evidence for substitution at the commuting zone level, because commuting zones because they roughly correspond to local labor markets. We regress the change in all community college enrollment (Δ^{96-16}Enrollment) within a commuting zone on the change in private equity (Δ^{96-16}PE Enrollment) in that commuting zone.[19] The results are in Table 4. 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. The second column repeats the analysis using full-time enrollment, and finds similar results. Thus, we cannot reject full substitution away from community colleges.

Appendix B Figure 6 shows graphical evidence corresponding to table 4. The figure collapses 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. Consistent with the evidence in Table 4, there is a strong negative relationship between community college and private equity backed for-profit enrollment between 1996 and 2016. Appendix B Figure 7 uses an event study approach. It shows increasing community college enrollment over time prior to the entry of for-profit private equity backed institutions, and a sharp break in trend following entry.

Placebo tests are in columns 3 and 4 of Table 4. For-profit schools tend to be open enrollment and enroll students at the lower end of the academic ability distribution, so 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. Consistent with our effects not being driven by general population or other enrollment growth, we see no statistically significant effect for higher quality institutions.

[19]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.

This is confirmed in Appendix B Figure 8. In sum, private equity owned schools appear to draw enrollment away from community colleges, where student returns to education are known to be higher than in the for-profit sector.

While we cannot estimate the welfare effects of a private equity buyout, this section has provided compelling, albeit only suggestive, evidence that students are likely worse off than they would have been had the buyout not occurred.

5 Capturing government aid

There are many mechanisms that may drive the effects we observe, but we focus on superior capture of government aid because it is well supported by the data, it is unambiguously not in the public interest, and it raises important policy issues both for education and the procurement of public goods with opaque quality in general. The evidence in Section 3 found that after a buyout, tuition and loans increase, while repayment decreases. These are suggestive of increased capture of government aid.

In this section, we present three additional analyses to explore this mechanism. First, Section 6.1 examines how schools responded to a federal increase in the amounts that students could borrow. Section 6.2 uses data on publicly traded schools to show how their market prices respond to regulatory announcements that would have tied federal aid more closely to student outcomes. Finally, Section 6.3 shows that private equity owned schools appear better able to bunch under an easily manipulable regulatory threshold.

5.1 Selection: The effect of the 2007 Loan Limit Increase

An unexpected regulatory change in 2007 created growth options for for-profit schools. The government increased student loan borrowing limits. We examine whether schools already under private equity ownership were more responsive than their counterparts to this new opportunity.

We use a difference-in-difference approach to assess how private equity owned schools reacted relative to other schools. We find that private equity held schools raise tuition and borrowing at a faster rate following loan limit increases, consistent with these institutions being better at capturing government aid.

5.1.1 Approach

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.[20] We compare private equity owned institutions to other for-profit schools using Equation 5 .

$$L_{it} = \alpha_i + \alpha_t + \beta PE_i * Post2007 + \gamma X_{it} + \varepsilon_{it} \tag{5}$$

The term L_{it} denotes average borrowing or headline tuition in school i in year t. School fixed effects α_i absorb time invariant school specific factors, such as wealth in the area where a school is located and a school's alumni network. Time fixed effects α_t absorb national time varying factors that affect schools in the same fashion, such as the state of the national economy or changes in federal grant aid. We include school specific controls X_{it} for institution size. Standard errors are clustered at the institution system level to address potential serial correlation. 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 in-

[20]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.

stitutions, and the coefficients β should be positive and significant. 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, private equity-owned schools and other for-profit colleges would have trended similarly in terms of average student borrowing. Thus, any increase in borrowing at private equity-owned institutions following the limit increase is due to these institutions being better at capturing federally guaranteed loans. This assumption implies that, prior to the 2007 limit increase, we should see borrowing at private equity-owned and non-private equity owned institutions trending similarly. The top row of Appendix B Figure 9 provides graphical evidence that this is indeed the case. The left hand panel compares private equity-owned schools to all for-profits. Prior to the 2007 limit increase, we see average borrowing levels track each other closely for private equity and non private equity owned for-profits. Consistent with private equity-owned schools being better at capturing federal loans, we see slightly higher levels of borrowing at private equity-owned schools.

Following the increase in borrowing limits, we see the two series diverge further, with private equity-owned for-profits seeing a larger increase in average borrowing. A potential concern is that this effect could be driven by changes in the selection of schools around 2007, with private equity groups acquiring more for-profits with higher average borrowing after the limit increase. To address this concern, the right panel restricts the treatment group to institutions that were private equity owned prior to 2007. The results on the right hand panel are quite similar to the patterns in the left panel, suggesting that the observed effects are not driven by changes in the composition of private equity owned schools.

5.1.2 Results

Table 5 makes the graphical evidence presented in Appendix B Figure 9 explicit. Table 5 presents estimates of equation 5. The results indicate that following the loan limit increases, average borrowing increased by an additional thousand dollars at private equity-owned institutions relative to

other schools. The result is robust to different specifications. The first two columns presents a simple difference in difference, rather than including year and school fixed effects, we include a year trend and an indicator for whether a school is private equity-owned. Columns (1) through (3) include all schools, while columns (3) through (6) include only for-profit schools. The results are quite similar across the two different control groups are both significant at the .01 level. Consistent with tuition inflation and increases in borrowing, the year trend is positive and highly statistically significant. The coefficient on being private equity owned is also positive and highly significant in column (2), which is consistent with borrowers at private equity-owned schools borrowing more prior to the reform.

Columns (2) and (3) add in school and a year fixed effects, and controls respectively. The results remain similar, and differential effect private equity-ownership following the limit increase remains significant at the .05 level or higher. Columns (4) through (6) present identical specifications, restricting the sample to schools that were owned by a private equity group prior to 2007. This avoids selection effects in which private equity groups may have targeted schools differently after the limit increase. The results are quite similar and statistically indistinguishable from the results in the other columns, confirming that private equity-owned schools saw faster growth in borrowing following the limit increase in 2007.

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. This effectively allows us to observe the timing of the estimated effect in column (5) of Table 5.

$$L_{it} = \alpha_i + \alpha_t + \sum_{j=2002}^{2012} \beta_j PE_i * 1[Year = j] + \gamma X_{it} + \varepsilon_{it} \tag{6}$$

The treatment is restricted to schools that were acquired by a private equity group prior to 2007, and standard errors are clustered at the system level. The solid line shows point estimates of the coefficients β_j , while the dashed line shows a 95 percent confidence interval. The results are shown in left panel of Figure 6. Consistent with the raw averages seen in Appendix B Figure 9, we do not

observe any significant differences between the private equity-owned and other for-profit groups prior to 2007. The coefficients are very close to zero, and not statistically distinguishable from zero at conventional levels. Following the limit increase in 2007, we see borrowing increase relatively faster at private equity owned schools, and within three years from the reform this difference becomes significant at the .05 level. The timing of the effect is thus consistent with private equity owned for-profits capturing additional revenue through federal loans.

It is possible that this increase in borrowing is beneficial to students. Indeed, Goodman et al. [2017] find that many young borrowers are credit constrained, and use student loans as an additional source of liquidity. However, if schools are raising tuition to capture credit expansions, this is unlikely to benefit students. Appendix B Figure 9 Panel B shows that this is the case. Private equity owned schools raise tuition at a faster rate relative to other institutions. Table 5 Panel 2 presents regression results for tuition. We see sharp increases in tuition that completely offset the increase in borrowing. Figure 6 Panel B also shows that there was no pre-trend; the timing of the limit increase coincides with the tuition hike.[21]

The results are consistent with private equity owned schools responding to the credit expansion by hiking prices to capture government aid. Their superior ability to capture a new strategic opportunity is also evidence that they are better managed than other for-profits. The analysis presents evidence that private equity ownership improves operations, and does so in a way that is rent-seeking rather than in the interests of students.

5.2 Gainful Employment Announcement

We are interested in the sensitivity of school profit to the school's 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 access to federal grants and federally guaranteed loans to student la-

[21] 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 being passed on to higher institutional quality.

bor market performance. The life of the rule involved its announcement in 2010, watering down through court cases, and ultimate suspension 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. We showed earlier that publicly traded schools appear broadly similar to private equity owned schools, with somewhat less adverse outcomes for students. The largest of the public firms were once private equity owned (shown in Appendix C Table 2).

Using four events surrounding the GE rule, we find that the market value of for-profit post-secondary schools is tightly connected to their ability to access federal aid regardless of student outcomes. 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 (held in April 2011), and then ultimately vacated in 2012. Appendix C contains detailed explanation of the rule, our estimation approach, and the results. Appendix C Figure 1 graphs abnormal returns around the events. This analysis suggests that a major aspect of for-profit market value is rent-seeking capture of government aid.

5.3 Cohort Default Rate Bunching

A key determinant of federal aid eligibility that has been consistently in force for decades is a limit on the extent to which students can default and the institution remain eligible for federal aid. It is crucial for schools to avoid triggering these thresholds. Specifically, before 2012, the policy held that the share of students that default in the fiscal year after the fiscal year in which they graduated cannot exceed 25 percent for three years in a row, nor can it be higher than 40 percent in a single year. The two-year cohort default rate (CDR) is the fraction of students within a certain repayment cohort who default within two years of entering repayment. As explained in Section 2.3, it is known that CDRs are vulnerable to manipulation, through the use of allowable non-repayment options such as deferments and forbearances.

We find evidence that private equity owned institutions manage to avoid triggering the thresh-

olds, which can result in loss of federal grants and loans. Appendix B Figure 10 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, while the other lines respectively show for-profit and non-profit schools. The solid vertical line shows the 25 percent two-year cohort default rate threshold.

At for-profit schools not private equity owned and at other schools, we see that cohort default rates largely evolve smoothly across the threshold. Consistent with avoidance regulation inducing thresholds, we see a sharp drop in the default density right before the threshold at private equity-owned institutions. This helps explain why private equity owned schools have slightly lower two year cohort default rates than other for-profits in Table 1 Panel 2.

This section has explored one mechanism for how private equity ownership affects outcomes. We have shown that superior rent-seeking federal aid capture is an important channel through which high-powered incentives translate to higher profits. This helps to explain the effects we observe on loans, tuition, and loan repayment rates.

6 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. Shleifer and Summers [1988] 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 investments 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. Overall, our evidence points to changed operations causing detrimental effects, rather than either selection or composition.

Thus high-powered incentives to maximize profit in the education industry appear to operate 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)

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)**
Graduation rate	0.52	0.27	0.55	0.48
	(0.21)	(0.18)	(0.25)	(0.21)
Loan per borrower (2015 $)	5,179	3,543	5,711	7,456
	(2,320)	(1,911)	(2,822)	(2,719)
Repayment rate (3 year)††	0.66	0.47	0.41	0.32
	(0.17)	(0.121)	(0.16)	(0.13)
Cohort default rate (2 year)†	0.051	0.097	0.12	0.11
	(0.059)	(0.089)	(0.13)	(0.060)
Ave earnings after school (2015 $)	37,667	28,321	24,275	26,829
	(11,117)	(4,920)	(7,959)	(8,219)
Students‡	3,885	3,148	387	748
	(5,656)	(3,866)	(1,232)	(1,413)
Share spending on instruction	0.47	0.54	0.41	0.36
	(0.14)	(0.13)	(0.24)	(0.15)
Faculty per 100 students±	6.28	4.38	4.48	3.62
	(4.653)	(4.26)	(4.1)	(2.66)
Tuition revenue per student (2015$)	10,995	3,673	14,210	17,521
	(7,110)	(3,883)	(7,678)	(7,303)
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)
Pell grants per student (2015 $)	1,350	1,725	4,109	4,609
	(1,682)	(1,292)	(3,193)	(3,104)

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. †Exiting cohort default rate 2 years after cohort exit. ±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 students graduating in 150% normal time)			
			CEM$^{\pm}$	Partial treatment in 2-yr programs
	(1)	(2)	(3)	(4)
PE owned	-.06***	-.059***	-.052**	
	(.012)	(.012)	(.022)	
Cohort partial treatment*				-.035**
				(.013)
Composition controls‡	N	Y	-	N
School type controls†	Y	Y	-	Y
School f.e.	Y	Y	-	Y
Year f.e.	Y	Y	-	N
N	56965	56839	953	737
R^2	0.8	0.81	.0058	0.78

Panel 2

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

Panel 3

Dependent variable:	Average loan per borrower (2015$)			Repayment rate (3 year)		
			CEM$^{\pm}$			CEM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)
PE owned	586***	592***	343**	-.033**	-.031*	-.057*
	(185)	(185)	(170)	(.012)	(.011)	(.03)
Composition controls‡	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-
School f.e.	Y	Y	-	Y	Y	-
Year f.e.	Y	Y	-	Y	Y	-
N	75022	75022	1747	19746	19746	148
R^2	0.65	0.65	.0023	0.96	0.96	.024

Note: This table shows regression estimates (OLS) of the effect of private equity ownership on student outcomes. Observations are at the school (UnitID)-year level. $^{\pm}$Coarse-exact matching is done first exactly on the year before the treated school's buyout, among for-profit schools, and then on characteristics (see Section 3); the dependent variables are measured 2 years after the treated school's buyout. *We compare the cohort that enrolled the year before the first private equity-owned year, and thus had partial treatment, with the earlier cohort that had none. Standard errors are clustered by institution/firm (a firm may have multiple schools, or campuses). ‡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 fixed effects for highest degree offered (not used in columns 4-7). The latter includes less than 2-year (certificate), 2-year, or 4-year. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table 3: Private Equity Ownership and Operational Outcomes

Panel 1

Dependent variable:	Log profits (mill 2015$)			Log total revenue (mill 2015$)			Log total expenditure (mill 2015$)		
			CEM$^{\pm}$			CEM$^{\pm}$			CEM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PE owned	1.2***	1.1***	1.3**	.96***	.93***	.64**	.9***	.87***	.62**
	(.22)	(.22)	(.55)	(.12)	(.12)	(.31)	(.14)	(.14)	(.31)
Composition controls‡	N	Y	-	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-	Y	Y	-
School f.e.	Y	Y	-	Y	Y	-	Y	Y	-
Year f.e.	Y	Y	-	Y	Y	-	Y	Y	-
N	80119	80119	1606	80119	80119	1850	80119	80119	1850
R^2	0.83	0.83	.0037	0.97	0.97	.0023	0.97	0.97	.0022

Note: This table shows regression estimates (OLS) and matching estimates of the effect of private equity ownership on firm (highest level of school or chain) financials. $^{\pm}$Coarse-exact matching is done first exactly on the year before the treated school's buyout, among for-profit schools, and then on characteristics (see Section 3); the dependent variables are measured 2 years after the treated school's buyout. Observations are at the firm (SystemID)-year level. Standard errors are two-way clustered by year and institution/firm (a firm may have multiple "schools", or campuses). ‡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. Coefficients marked with $*$, $**$,$***$, denote $p < .1$, $p < .05$, $p < .01$, respectively.

Panel 2

Dependent variable:	Tuition per student (2015$)			Log number of FTE students			Faculty per 100 students		
			CEM$^{\pm}$			CEM$^{\pm}$			CEM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PE owned	1610**	1637***	3866***	.39***	.37***	.8***	-.45**	-.36*	.21
	(607)	(565)	(778)	(.057)	(.055)	(.068)	(.19)	(.18)	(.43)
Composition controls‡	N	Y	-	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-	Y	Y	-
School f.e.	Y	Y	-	Y	Y	-	Y	Y	-
Year f.e.	Y	Y	-	Y	Y	-	Y	Y	-
N	102354	102354	859	123052	123052	4846	62432	62432	637
R^2	0.82	0.84	.028	0.97	0.97	.027	0.83	0.83	.00036

Panel 3

Dependent variable:	Instruction spending share			1st law enforcement action			Share students white	
			CEM$^{\pm}$			CEM$^{\pm}$		CEM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE owned	-.03*	-.029*	-.065***	.0031***	.0031***	.0031***	-.05***	-.033**
	(.017)	(.016)	(.025)	(.00074)	(.00073)	(.0012)	(.0072)	(.015)
Composition controls‡	N	Y	-	N	Y	-	N	
School type controls†	Y	Y	-	Y	Y	-	Y	-
School f.e.	Y	Y	-	Y	Y	-	Y	-
Year f.e.	Y	Y	-	Y	Y	-	Y	-
N	97401	97401	890	123052	123052	2577	123052	7229
R^2	0.75	0.75	.0076	0.14	0.14	.0027	0.92	.00068

Note: This table shows regression estimates (OLS) of the effect of private equity ownership on school outcomes. *All logged. Observations are at the school (UnitID)-year level. $^{\pm}$Coarse-exact matching is done first exactly on the year before the treated school's buyout, among for-profit schools, and then on characteristics (see Section 3); the dependent variables are measured 2 years after the treated school's buyout. Standard errors are clustered by institution/firm (a firm may have multiple schools, or campuses). ‡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. Coefficients marked with $*$, $**$,$***$, denote p < .1, p < .05, p < .01, respectively.

Table 4: 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

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 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
Observations	66,252	66,252	66,252	26,598	26,598	26,598

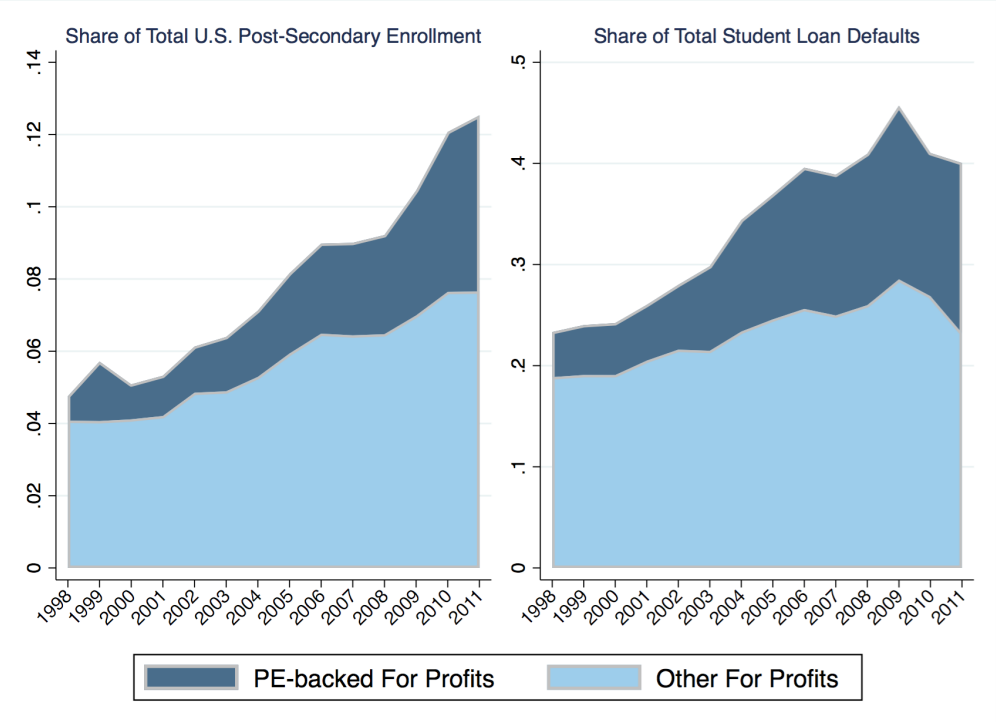
Panel 2: Tuition

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
Observations	61,501	61,501	61,501	12,534	12,534	12,534

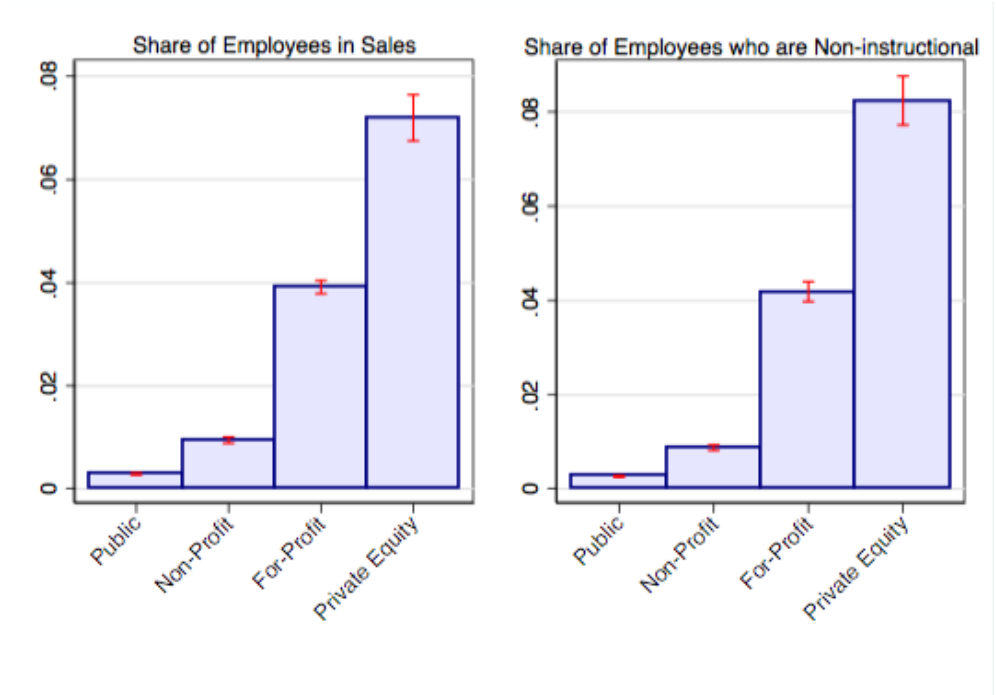
Note: This table shows the difference-in-difference estimate of the effect of the 2007 loan limit increase on borrowing, in panel 1, and tuition, in panel 2. Standard errors are clustered at the system level. Coefficients marked with $*$, $**$,$***$, denote $p < .1$, $p < .05$, $p < .01$, respectively.

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



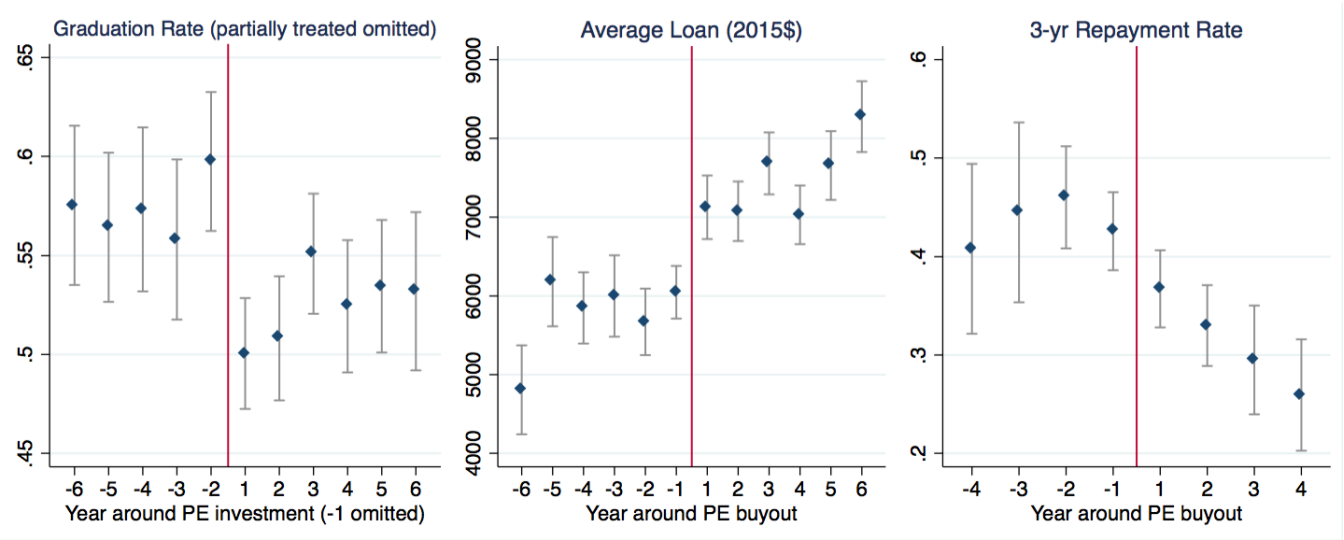
Note: The left figure shows the share of total US post-secondary enrollment in for-profit schools. The right figure shows the share of total student loan defaults within two years of entering repayment.

Figure 2: Employees in Sales and Non-Instructional Activities



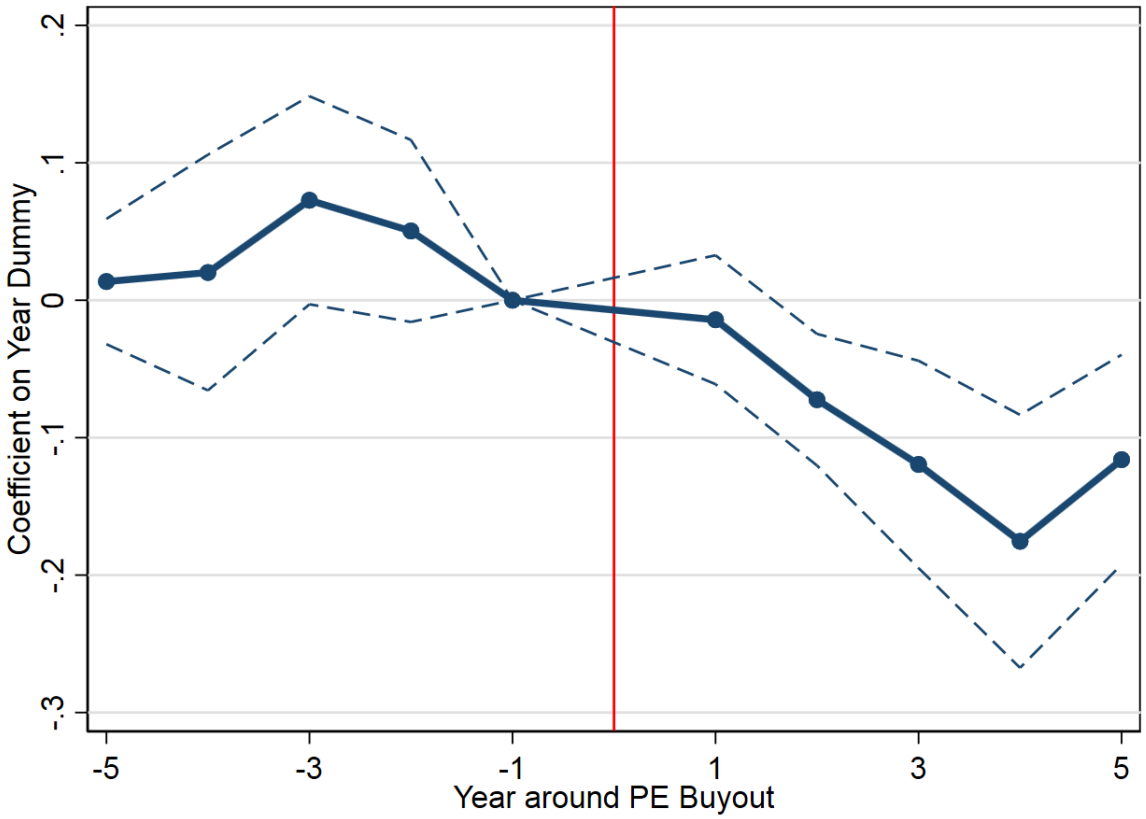
Note: The figure above shows the share of employees who do sales and non non-instructional activities by institution type. Data on sales and non-instructional staff comes from IPEDS.

Figure 3: Event Studies



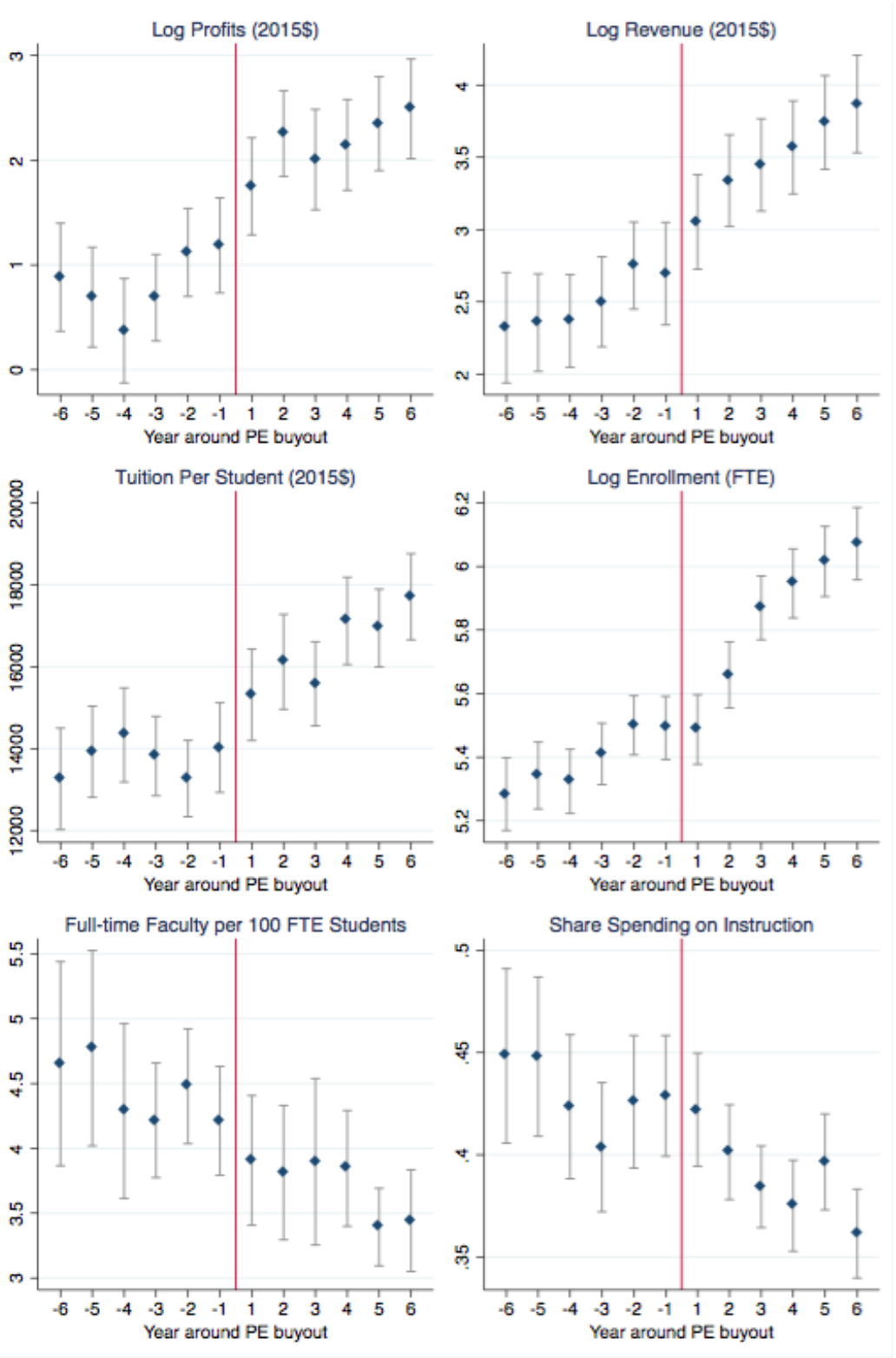
Note: The figures above show, within the sample of school systems bought by PE, the means of variables in the years around the ownership change. The level of observation is the school, or UnitID level (N=697). For graduation rates, we omit partially treated cohorts. For 4-year schools, this consists 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 very few certificate-only schools in the bought out, existed-before sample, which would be the remaining observations for the year before the buyout year (-1). We omit this year from the graph. For repayment rates, there are relatively few observations and we omit years -5 and -6. 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 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: 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: 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.