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

Charlie Eaton Sabrina T. Howell

Constantine Yannelis *

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Abstract

This paper studies how private equity buyouts create value in higher education, a sector with opaque product quality that is heavily dependent on government subsidy. With novel data on 88 private equity deals and 994 schools with private equity ownership, we show that private equity buyouts lead to higher tuition and higher per-student debt. Exploiting loan limit increases, we find that private equity-owned schools are better able to capture government aid. After buyouts, we observe lower education inputs, graduation rates, student loan repayment rates, and earnings among graduates. While enrollment increases, neither changes to the student body composition nor a selection mechanism fully explain the results. In a subsidized industry, private equity owners' high-powered incentives to maximize value may intensify focus on capturing government aid at the expense of consumer outcomes.

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*UC Merced, NYU Stern & NBER, and Chicago Booth. Email: ceaton2@ucmerced.edu, sabrina.howell@nyu.edu, constantine.yannelis@chicagobooth.edu. Acknowledgements: We are grateful to discussants Pierre Azoulay, Michael Ewens, Jonah Rockoff, and Richard Thakor and also for comments from Raji Chakrabarti, Francesca Cornelli, David Deming, Michael Dinerstein, Michael Ewens, Caroline Hoxby, Will Gornall, Arpit Gupta, Justine Hastings, Steve Kaplan, Larry Katz, Theresa Kuchler, Alexander Ljungqvist, Holger Mueller, Thomas Philippon, Larry Schmidt, Antoinette Schoar, Albert Sheen, Doug Staiger, Lesley Turner, Jeff Wurgler, David Yermack and seminar participants at the NBER Labor Studies and Education Summer Institute, MIT Sloan, Harvard Business School, Yale School of Management, Berkeley Haas School of Business, The Federal Reserve Bank of New York, the NBER Entrepreneurship meeting, the FMA Napa Conference, the SFS Cavalcade, and NYU Stern. We are also grateful to Suzanne Chang, Dalya Elmalt and Katerina Nikalexi for superb research assistance. Sabrina Howell thanks the Kauffman foundation for generous financial support, and thanks the Stern Infrastructure Initiative for Preqin data. Constantine Yannelis thanks the Fama Miller Center and the Becker Friedman Institute for generous financial support.

1 Introduction

In competitive industries where incentives are aligned between stakeholders, private equity buyouts can create value for both consumers and equity holders. Conversely, in sectors with intensive government subsidy and opaque product quality, value for equity holders may come at the expense of customers. This paper studies private equity buyouts in post-secondary education, where information frictions combined with government loan guarantees and direct subsidies contribute to potential incentive misalignment among stakeholders. We examine value creation and its consequences among three stakeholders. Proxies for value creation from the equity holder perspective include enrollment and profits. Proxies for value creation for the government (taxpayers) and for consumers (students) include graduation rates, earnings, loan burdens and repayment rates, and tuition. We show that while private equity buyouts positively affect proxies for firm value, they lead to greater capture of government aid and deteriorating student outcomes.

Prior work has identified at least three mechanisms through which private equity buyouts increase firm value: 1) Reducing financial constraints (Boucly, Sraer, and Thesmar 2011); 2) Operational efficiency improvements (Davis, Haltiwanger, Handley, Jarmin, Lerner, and Miranda 2014, Bernstein and Sheen 2016); and 3) Information technology adoption (Agrawal and Tambe 2016). Shleifer and Summers (1988) identify a fourth potential mechanism in the context of hostile takeovers: the breach of implicit contracts with stakeholders. All of these mechanisms appear to some degree in our data. This is the first study to examine private equity buyouts in a heavily subsidized industry, where there are significant information frictions regarding product quality. In this context, we show that the activities that increase value for equity holders after a private equity buyout may limit value creation for students. This pattern is consistent with violating implicit contracts with government and consumers. Our findings may be relevant to other sectors with similar characteristics that also receive large amounts of private equity investment, such as healthcare, infrastructure, and defense.[1]

We employ novel data on 197 deals in which private equity firms acquire independent,

[1] See Appendix B Figure 1.

privately-owned schools. These deals are associated with 557 school-level ownership changes. Private equity-owned school systems establish an additional 437 schools. Using regressions with school and year fixed effects as well as a matching estimator, we confirm that private equity ownership leads to higher profits; in fact, profits triple after a buyout. This concurs with existing work associating private equity buyouts with higher firm value, including Kaplan (1989), Cao and Lerner (2009), Boucly, Sraer, and Thesmar (2011), Guo, Hotchkiss, and Song (2011), Davis, Haltiwanger, Handley, Jarmin, Lerner, and Miranda (2014), and Bernstein, Lerner, and Mezzanotti (2018). Existing literature has also found better management among private equity-owned firms (Muscarella and Vetsuypens 1990, Bloom, Sadun, and Van Reenen 2015, and Cohn, Nestoriak, and Wardlaw 2017). Consistent with this, we find that chief executive turnover increases after a buyout by around 36 percent.

The higher revenue that we observe comes partly from a $1,600 increase in tuition, which is approximately half average total tuition at community colleges. It also comes from almost 50 percent higher enrollment. Reliance on federal aid increases after private equity buyouts and approaches the 90 percent of revenue threshold that is the statutory limit. Per-student borrowing and per-student federal grants increase by about 12 and 14 percent of their respective means. We exploit a 2007 student loan borrowing limit expansion to test whether private equity-owned schools are more responsive to changes in federal loan guarantees. Relative to other institutions, private equity-owned schools respond to the increase by raising tuition faster than other for-profit schools, which induces higher levels of borrowing. Superior capture of government aid is thus a channel through which high-powered incentives of private equity ownership translate to higher profits. This is a purely rent-seeking phenomenon and is unambiguously not in students' or taxpayers' interest.

We find sharp declines in student graduation rates, loan repayment rates, and labor market earnings after private equity buyouts (the declines are 13, 5.6, and 5.8 percent of their respective means). Enhanced recruiting and reduced instructional quality can reconcile the otherwise puzzling combination of higher enrollment despite higher tuition and deteriorating student outcomes. Private equity-owned schools have twice the share of employees in sales as other

for-profits. We show that education inputs, including the ratio of faculty to students, the absolute number of faculty, the share of spending devoted to instruction, and the absolute dollars spent on instruction, decline after the buyout. Transitions to online education could produce declines in faculty ratios. Online education could both reduce transportation costs for students and enable economies of scale for the school. However, we find a small effect of buyouts on the propensity of a school to become primarily online or to increase the share of distance students, and the effects on student outcomes are not attenuated when online schools are omitted from the sample.

Private equity buyouts may lead to changed operations that are detrimental to student success. There are two obvious alternatives to this interpretation. One is a selection mechanism, in which private equity firms are skilled at selecting targets on trajectories to the changes we observe. For all outcomes, we show visual event studies among switcher-schools around the buyout year. These reveal discontinuous breaks in outcomes and sharp changes to trends around the buyout year. There are no meaningful observable pre-trends. Private equity firms clearly do not acquire schools at random, but this visual evidence indicates that a selection mechanism is unlikely to fully explain the effects.

The second alternative channel is student composition. Students who attend after the buyout may be less prepared than those who attended before. This channel has ambiguous implications for student welfare and depends on school value-added, which we do not directly observe. To hold any composition effects fixed, we use partially treated cohorts. These are students in two-year programs who are already enrolled before a buyout occurs but have at least one year at the now private equity-owned school. For graduation and loan repayment rates, we compare the cohort with partial treatment to the previous one with no treatment. Partially treated cohorts experience more than half the negative effect on graduation rates, and the full effect on repayments rates, that fully treated cohorts experience. This does not reflect the elimination of degree programs after the buyout, a possible short term channel. We cannot rule out that the mechanism in the cohort analysis is different from the primary longer term effect, but the cohort analysis strongly suggests that composition does not explain our main results.

Whether additional students enrolled as a result of post-buyout expansion are better or worse off depends in part on their outside option. A large literature finds that the expected labor market returns to for-profit education are lower than the returns to non-selective community college.[2] If the source of expansion is substitution away from community colleges, the new students are unlikely to be better off. Indeed, we find suggestive evidence that a new private equity-owned school in a commuting zone siphons student enrollment growth from community colleges. Consistent with this finding, Cellini, Darolia, and Turner (2017) show that community colleges and for-profit schools are direct substitutes. Substitution towards a school with lower returns is not as surprising as it may seem. In addition to for-profits using much more sophisticated and aggressive marketing, college students are known to be poor forecasters of their future earnings.[3]

The evidence against composition and selection channels do not allow us to strictly rule out that mechanisms besides reduced quality (evidenced by declines in instructional support) explain the negative effects on student outcomes. However, the results offer substantial evidence consistent with private equity ownership leading to implicit contract violations. An important further piece of evidence is that we find dramatic increases in law enforcement actions after buyouts, most of which stem from accusations of recruiting rule violations, such as quotas for sales staff, and misrepresentations of student loan terms, graduation rates, and student employment outcomes.

Our results shed light on how private equity creates value. Relative to closely-held private firms or diffusely-held publicly traded firms, private equity-owned firms have particularly high-powered incentives to increase firm value. This is because private equity fund managers 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. Fund managers can increase value though operational changes because buyout contracts give them substantial control

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

[3]For example, see Arcidiacono et al. (2014, 2016); Stinebrickner and Stinebrickner (2013); Wiswall and Zafar (2014); Hastings et al. (2017). This literature has found that students from low income backgrounds are particularly prone to overestimating the earnings of past graduates in their major and institution, and that students who are overly optimistic about their earnings and academic ability are particularly prone to dropping out.

rights over the firm (Jensen 1989).[4] When incentives between investors and consumers are aligned, quality improvements will accompany firm value creation (Hart, Shleifer, and Vishny 1997). This seems to be the case for chain restaurants; in this sector, Bernstein and Sheen (2016) show that private equity ownership improves consumer outcomes. With negligible government subsidy and relative product quality transparency, chain restaurants contrast with for-profit colleges, where severe information frictions and government subsidy contribute to low price elasticity of demand.

In particular, the expansion of federal student loan programs since the early 1990s has created opportunities to increase firm value through implicit contract violations. Students often enroll with zero up-front costs, reducing the salience of tuition. At the same time, education quality is extremely opaque, allowing for marketing and recruiting strategies that mislead students. The for-profit target population may be more vulnerable to these approaches because it is extremely socioeconomically disadvantaged (Deming, Goldin, and Katz 2012). Opacity also enables cutting expenditures on instruction and reducing full-time faculty employment, two well-established causes of lower graduation rates (Bound and Turner 2007, Webber and Ehrenberg 2010). Low levels of instructional support might induce students to drop out rather than pay tuition for another semester. With rolling academic terms that can start as often as once a week, however, for-profit colleges may be able to enroll more additional students through recruitment expenditures that are lower than the cost of keeping students enrolled.

In settings such as healthcare and education, where consumers depend on implicit contracts with the firm, many service providers are nonprofit (Hansmann 1980). Glaeser and Shleifer (2001) discuss how in such settings weaker incentives to maximize profits or increase value for investors can make nonprofit status optimal. This mechanism requires consumers to rationally choose not-for-profit firms over for-profit ones. It may be infeasible when intensive government subsidy separates revenue from the consumer and quality is hard to observe. In our context, it

[4]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. Private equity contracts are complex and state-contingent, usually giving the investor substantial control rights (Lerner and Schoar 2005). For overviews, see Kaplan and Strömberg (2009) and Metrick and Yasuda (2010).

seems likely that improved subsidy design could better align incentives. This might be one avenue towards addressing the growth in federally guaranteed student debt – which increased from $241 billion in 2003 to $1.6 trillion in 2019 – and possible accompanying adverse effects, including high levels of default and reduced entrepreneurship.[5]

Our paper contributes to the literature on private equity and the real effects of acquisitions, including Brown, Gredil, and Kaplan (2013), Ewens, Rhodes-Kropf, and Strebulaev (2016), and Ma, Ouimet, and Simintzi (2018). In addition to Bernstein and Sheen (2016), two papers offer insights related to ours. Matsa (2011) shows that highly levered supermarket firms, which sometimes become highly levered through private equity buyouts, experience higher inventory stock-outs. Ljungqvist, Persson, and Tag (2016) study the misalignment between private and social incentives in private equity-backed stock delistings. The healthcare economics literature has examined how incentives and ownership affect the price and quality of care, though there has been no study of private equity. While providers appear to respond to incentives, there are mixed results on ownership.[6]

The paper proceeds as follows. In Section 2, we discuss the institutional context and data. Estimation approaches are in Section 3. The relationship between buyouts and government aid is in Section 4. Student outcomes are considered in Section 5. Operational mechanisms that may explain the effects are in Section 6. Section 7 concludes.

2 Data and Descriptive Statistics

2.1 Institutional Context

For-profit schools ("for-profits") have existed in the U.S since the early 1900s, but enrollment has grown substantially in the past two decades, comprising around two million students and 10

[5]See Looney and Yannelis (2015), Bleemer et al. (2017), Krishnan and Wang (2017) and Mueller and Yannelis (2019).

[6]Dafny et al. (2016), Duggan (2000), Clemens and Gottlieb (2014), Adelino, Lewellen, and Sundaram (2015), Sloan et al. (2001), Hackmann and Pohl (2018).

percent of enrollment at the peak in 2011 (left graph of Figure 1). As of 2016, about 1.2 million students were enrolled at for-profit schools. In 2011, the last year for which two-year default rates are available, for-profits accounted for about 40 percent of student loan defaults. For-profits attract more socioeconomically disadvantaged students than community colleges, which are the closest comparison (Deming, Goldin, and Katz 2012, Looney and Yannelis 2015).

There are well-known information frictions in post-secondary higher education. 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). For example, Hastings et al. (2017) find that students who apply to low-earning college degree programs underestimate earnings of recent graduates by approximately 100 percent. Additionally, Stinebrickner and Stinebrickner (2013) find that many students enter school with misperceptions about their ability, and drop out after observing their academic performance. Students may not be well-informed about which programs are optimal for them (Lang and Weinstein 2013). Programs are difficult to compare to each other, and prospective students rarely have visibility into previous cohorts' outcomes.

For-profits devote far more resources to recruiting than other types of schools, which compounds these information frictions. Salespeople can market zero upfront costs to low-income students, despite higher average tuition among for-profits than alternatives. 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 (this variable cannot be used in analysis because data are limited to these years). While public and non-profit schools have less than one percent of employees in sales, private equity-owned schools over seven percent. Other for-profits have four percent. Government investigations have found evidence of deceptive marketing practices among for-profits.[7]

For-profits garner about 90 percent of their revenue from public sources (CFBP 2012, Kelchen

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

2017). They are incentivized to target low-income students, who qualify to pay tuition primarily with federal grants and loans and so need not be billed regularly. Tuition is the most important determinant of the amount of federal aid a student may receive, which incentivizes for-profits to increase tuition above cost (Cellini and Goldin 2014). Federal revenue arrives when the student begins school and is largely disconnected from graduation rates and labor market outcomes. The taxpayer bears the cost of student defaults.[8] Thus, government aid and loan guarantees create a potential misalignment of incentives between for-profit school owners and consumers.

Most for-profit colleges, including those targeted by private equity funds, are open enrollment institutions and thus do not select students. The students attending these schools tend to have fairly low levels of academic achievement, are often first-generation students, and do not have peer networks that attend college (Deming, Goldin, and Katz 2012). While it is unlikely that private equity groups have a preference for high default students, government loan guarantees make profit maximizers indifferent to whether a student defaults. Students with low academic ability may be more likely to attend schools with low value added, and also more likely to default. Indeed, a large and growing literature in the economics of education shows that many students learn about their academic ability, and eventually drop out after several quarters. Stinebrickner and Stinebrickner (2012)); Arcidiacono et al. (2014); Arcidiacono et al. (2016). Other work has shown that college students are quite sensitive to information revelation regarding career outcomes, for example Wiswall and Zafar 2014. We further expand on this point and the institutional context of the for-profit higher education sector in Appendix A Sections 1-3.

2.2 Private Equity in Higher Education

Private equity buyouts of publicly traded firms in the 1980s were thought align managers with investors interests in short-term profit maximization (Jensen 1989). In recent decades, however,

[8]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.

managers of publicly traded firms have to some degree deterred leveraged buyouts through increased shareholder value creation, both through changes to governance and increased profitability (Holmstrom and Kaplan 2001, Kaplan and Strömberg 2009). Parallel to this shift, private equity investors increasingly turned to investments in smaller, privately-held companies. Acquisitions of privately held firms made up a majority of all U.S. buyouts between 1980 and 2005 and constitute all but two of the buyouts in the for-profit college sector in the years for which we have full data (Davis et al. 2014).

Private equity buyouts can affect target firm operations and finances. Operationally, Bloom et al. (2015) find that private equity owned firms have superior management than other privately owned firms. Davis et al. (2014) show that private equity owned manufacturing firms expand productive plants and shutter underperforming ones. Bernstein and Sheen (2016) demonstrate that restaurant worker training and incentive alignment improve after private equity buyouts.[9] Financially, private equity buyouts are typically accomplished using debt that is collateralized by target firm assets (Metrick and Yasuda 2010). This paper focuses on student outcomes and does not address firm capital structure.

To collect higher education private equity deal data, we researched the parent ownership history of every for-profit college in the U.S. from 1987 through 2016 that was eligible for federal aid (termed "Title IV eligible").[10] We identified 197 private equity buyouts of for-profit college companies before 2016. Appendix Table B.1 describes the PE deals and firms. The firms 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, and data on firm performance from Preqin, a commercial private equity data provider.[11]

[9] In a working paper, Fracassi, Previtero, and Sheen (2017) also find that consumers benefit from private equity buyouts of chain retail stores.

[10] 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. None of the deals we use in analysis are secondary. In some cases, the PE owner exits by selling to another PE firm. We do not examine these deals; as far as our data are concerned, the school remains PE owned.

[11] The education deal data is courtesy of Mitch Leventhal.

Thirty-five percent of the firms have an education specialty, and the average number of education deals is 2.1 (the median is zero). Among the firms that match to Preqin (62 out of a total of 118), median fund returns are roughly similar to industry benchmarks. For example, 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.

Figure 1 shows the private equity-owned share of total enrollment and defaults over time.[12] Private equity-owned schools account for approximately 35 percent of total for-profit enrollment in our data on the near-universe of for-profits. Most of the increase in the for-profit share of student loan defaults since 2000 has been among private equity-owned schools. Appendix B Figure 2 shows that on average, private equity-owned schools have higher default rates than any other type of school. The left graph in Appendix B Figure 3 shows the number of private equity deals in the for-profit education sector over time.[13] Appendix A Section 4 describes the role of private equity in for-profit higher education in detail.

Private equity investments in higher education have taken two forms. One is the purchase of independent (small, private) colleges, usually with consolidation intent. An example that illustrates the broader pattern we find in the data is TA Associates' buyout of Florida Career College for $53 million in 2004. At the time, Florida Career College had four campuses and 2,500 students. After adding three additional campuses and expanding enrollment to 4,000 students, TA Associates sold its stake in 2007 for $192 million, almost quadrupling its investment. Later in 2007, federal investigators found employees producing fraudulent high school diplomas for applicants and encouraging students to lie about their high school status.[14] The second type of deal is the buyout of an existing chain institution; the biggest have taken

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

[13]Appendix B Table 1 Panel 1 shows that nearly 80 percent of the deals are known buyouts, while the other 20 percent may be minority stake purchases. For simplicity, we use the term "buyout" in the remainder of the paper. Panel 2 shows that among the 43 deals where we can identify a liquidity event (an "exit"), the average time to exit was 6.8 years. Of these, 22 were sales to other private equity firms, and 7 were IPOs. Twenty-seven remain in the private equity firm's portfolio.

[14]See the Chronicle for further information.

public companies private. For example, in 2007 KKR and SAC Capital took Laureate Education private for $3.8 billion.[15]

2.3 School Characteristics and Student Outcomes

School characteristic and student outcome data come primarily from the Integrated Postsecondary Education Data System (IPEDS). All schools that are Title IV eligible must report to IPEDS.[16] Most variables are reported at the school level according to a unique "UnitID" that remains constant over time and across ownership changes. There are no UnitID mergers in our sample. We create a unique identifier, "SystemID", to represent the parent institution, including parent companies of for-profit college chains. This is important because for-profit college companies often operate multiple schools.[17]

At the SystemID level, the buyouts are associated with SystemID switches of ownership. A parent company purchased in a buyout often owns multiple schools, and after the buyout the parent often purchases additional schools. We have 994 schools, or UnitIDs, that ever come under private equity ownership.[18] Of these, 557 are through ownership changes. They are graphed over time in the right plot of Appendix B Figure 3. In turn, 326 of these are through the private equity deal, and 231 are through subsequent acquisitions by the now-private equity-owned school. The remaining 437 are new schools established by private equity-owned school systems.[19]

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

[16]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.

[17]The data used for analysis are comprised of an unbalanced panel. Exit, however, is much less common among private equity owned schools. New schools enter the data set when they become Title IV eligible. Of the 994 schools that were ever Title IV eligible and under private equity ownership since 1987, 194 leave the dataset due to closure or cessation of Title IV reporting prior to the last year for which data is available. Another 291 schools owned by private equity are excluded from our analysis in years following changes in their parent company to publicly traded ownership. Among the 7,034 for-profit schools that were ever Title IV eligible but never under private equity ownership, 4,410 close or cease Title IV reporting prior to the last year for which data is available.

[18]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.

[19]Some variables are reported at the OPEID level, which in some cases aggregates UnitIDs. There are a total of 374

Table 1 summarizes the variables we use in analysis.[20] These descriptive statistics indicate that other for-profits are in some ways more similar to community colleges than to private equity-owned schools, suggesting that private equity-owned schools may drive many of the characteristics generally associated with for-profits in, for example, Deming, Goldin, and Katz (2012), Cellini and Goldin (2014), Cellini and Turner (2016), and Deming, Yuchtman, Abulafi, Goldin, and Katz (2016). The graduation rate (fraction of students who graduate within 150 percent of normal time) averages 48 percent for private equity-owned schools, compared to 55 percent at other for-profits. We do not report IPEDS data on community college graduation rates because they are neither accurate nor comparable.[21] The average loan per borrower among full-time first year students is $7,456 at private equity-owned schools, compared to $5,711 for other for-profits and $3,543 at community colleges.

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

switcher OPEIDs. This is smaller because OPEIDs sometimes encompass multiple UnitIDs and the data for which we use OPEIDs (repayment rates and earnings) are available for fewer years.

[20]For comprehensive descriptions, sources, and years available for all variables used in analysis, see Appendix B Table 2. Data are presented at the school (UnitID level), except for profits, which are at the SystemID level because financial data are reported to IPEDS through parent UnitIDs for multiple associated UnitIDs (see Jaquette and Parra 2014). The data span 1987 through 2016, but some variables are not available until the early 1990s. A year corresponds to the spring term of the academic year, which begins on August 1 and ends July 30. For example, observations for the 2008-2009 academic year are identified as 2009.

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

scenario for repayment outcomes. The repayment rate averages 32 percent among private equity-owned schools, 41 percent at other for-profits, and 47 percent at community colleges.

Private equity-owned schools are larger, with mean enrollment of 748 students, compared to 387 at other for-profits. Per full-time equivalent student, tuition revenue averages $17,521 at private equity-owned schools relative to $14,210, $3,672, and $10,995 at non-private equity-owned for-profits, community colleges, and nonprofit/state schools, respectively. Community colleges and other for-profits respectively have 4.4 and 4.5 full-time faculty per 100 full-time equivalent students, while private equity-owned schools have 3.6. Per-student Pell Grant revenue indicates the degree to which the student body is low-income. At private equity-owned schools, it is slightly higher than at other for-profits, but it is almost three times higher than at community colleges. We also compiled statistics on degrees and major types, though these are not reported for brevity. The most common degree type at a private equity target school (in the year before acquisition) is a 1-year Communications degree (18 percent of degrees awarded). Our online time-varying indicator variable follows Deming et al. (2012).[22] We observe 126 school switches from not-online to online.

We observe average and median earnings using data from the NSLDS College Scorecard database. The source is a link between students and salaried (W-2) and self-employed (Schedule SE) earnings data from Department of the Treasury tax records. Wage outcomes cover individuals who (a) borrowed from the federal government and (b) were employees in the Social Security system or were self-employed and filed a tax return. Average and median wages are therefore likely higher than if graduates who are unemployed or not in 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. Average earnings for graduates of private equity-owned schools are $26,829 (in 2015 dollars). Earnings for graduates of community colleges are slightly higher, while they are slightly lower for graduates of other for-profits.

[22]It indicates that the school either has "online" in its name, or has no state constituting more than one-third of freshman enrollment. For-profits usually draw primarily from the surrounding area.

2.4 Law Enforcement Actions

Law enforcement actions against higher education institutions are informative about college operations. We found 125 instances in which a state or federal agency initiated an investigation.[23] Most allegations relate to misrepresentation and false claims. For example, there are 28 cases of job placement statistic misrepresentation, 23 of credentials or accreditation misrepresentation, and 31 of other types of false claims. Violations of sales and recruiting regulations and fraud also feature prominently (44 allegations). Our analysis employs an indicator variable at the school-year level that is one if the school experienced its first law enforcement action that year, because some schools experience multiple allegations. There are 58 such first-time actions. These are not concentrated in a few school systems, nor do any particular PE firms or PE firm types have disproportionate actions. The exception is the Fortis system, in which 13 unique schools experienced first-time actions. Although private equity-owned school-years comprise just 4 percent of all school-years in our data, they are 58 percent of the first-time actions.

3 Primary Estimation Approaches

3.1 Visual Event Studies

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

[23] These are described in Appendix B Table 3. We collected data primarily from Republic Report. https://www.republicreport.org/2014/law-enforcement-for-profit-colleges/ .

as missing.

3.2 Within-school Regressions

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

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

PE_{it} takes a value of one if the school is private equity-owned in year t. We include school fixed effects (α_i) and year fixed effects (α_t). $\mathbf{X}_{it}$ is a vector of controls comprising fixed effects for the highest degree that the school offers, whether the school is selective, and whether it is publicly traded (formerly private equity-owned schools are not identified as private equity-owned after they IPO). The sample consists of all institutions in our data. We include non-profits because private equity firms have sometimes purchased non-profits and transformed them into for-profits. For each outcome variable we present a second model with additional controls for the demographic composition of the student body. These include family income (Pell grants per student in 2015 dollars) and the shares of students who are black, white, and Hispanic. We two-way cluster standard errors by parent company (SystemID) and year in all specifications. This captures potential correlation across schools within the largest deals. Our results are not sensitive to alternative clustering approaches.

Our main specification uses all years of available data, but all our results are robust to excluding pre-2000 data, as there may be concern that it is lower quality. The results are also robust to restricting to switcher schools and collapsing the years on either side of the buyout into single averages, as suggested in Bertrand, Duflo, and Mullainathan (2004).

3.3 Buyout Predictors and Matching Estimator

Our third approach is a matching estimator, which besides the approach in Section 3.1 showing the effects by year and thus demonstrating an absence of pre-trends, is the best available means to try to rule out selection.[24] To identify appropriate matching variables, we examine buyout predictors. For this exercise, the sample is restricted to other for-profits. Further, among the target schools, the sample is restricted to the year before the buyout. In a logit model with year fixed effects, we tested a wide variety of observables at the school and commuting zone (proxy for the local labor market) levels. Variables with predictive power are shown in Table 2. Private equity firms target schools in areas with more community colleges and a larger number of total enrolled students, but a smaller number of existing for-profits. This suggests they are identifying areas with large target populations but few competitors. They target schools that have lower recent profit growth but higher profits than the average for-profit school. They also target schools with more students, a higher share of students who are white, and that have lower loan repayment rates. No other variables consistently predict being a target. These include education inputs, enrollment growth at the school and commuting zone level, the proximity of revenue to the 90 percent threshold that is the legal maximum, and other student outcomes.

We deploy the variables with predictive power in a nearest-neighbor matching (NNM) estimator.[25] Unlike propensity score matching, which uses the logit estimated probability of treatment, NNM flexibly (i.e., with no functional form assumption) uses the distance between covariate patterns to define the "closest" control for a given treated observation. The flexibility requires more data, and the data required grows with each additional matched covariate. Therefore, we match only on the variables that have some predictive power (omitting the outcome

[24] In other panel event-study settings, Freyaldenhoven, Hansen, and Shapiro (2018)'s 2SLS method might be a promising alternative. However, their approach requires a strong pre-trend in a covariate that is a proxy for unobserved confounds. We do not observe strong pre-trends in observable, relevant covariates, so in our context the method is unlikely to identify the parameter of interest.

[25] The variables used are number of community colleges in the commuting zone, number of pre-existing for-profits in the commuting zone besides the target, one-year profit growth, log profits, the log number of FTE students, the 3-year loan repayment rate, and the share of students who are white. In the final specification (column 5 of Table 2), where all variables are used, the sample size declines and some variables lose significance. We nonetheless match on these, as they appear to have some predictive power.

variable if it is one of the matching covariates) and adjust for bias in matching on multiple continuous covariates. For each private equity-owned school, we match target schools in the pre-buyout year to other for-profits. We assess outcomes two years after the buyout in the matched sample. Considering outcomes two years after the buyout serves as a robustness test for the main OLS approach, which uses all years after the buyout. It ensures that the effects immediately follow the buyout and are not an artifact of something that occurs in later years. Together with the differences in estimating models, this means that the NNM estimates may not always be close in magnitude to the OLS estimates. Appendix B Table 4 shows that the imbalance decreases dramatically after the NNM procedure.

If higher revenue stems from increased capture of government aid, one mechanism is higher tuition, which is funded by higher student loans and grants. We turn to these government aid-related student outcomes in Table 3 Panel 1. Columns 1-2 show that tuition per student increases by over $1,600, relative to a mean across all schools of $9,528 (note tuition at community colleges averages just $3,673).[26] The effect doubles in the matching estimator, to $3,306 (column 3). The visual event study in Figure 4 Panel A shows a striking increase immediately after the buyout.

4 Capturing government aid

We further explore how private equity buyouts can lead to aid capture by exploiting the 2007 loan limit increase. As mentioned above, over 90 percent of total revenue at for-profits comes from government sources. Section 4.1 contains our main test of whether private equity-owned schools are better at capturing aid using loan limit increases, and Section 4.2 contains two supplementary tests.

[26]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.

4.1 The Effect of the 2007 Loan Limit Increase

A regulatory change in 2007 in which the government increased student loan borrowing limits created growth options for for-profit schools. 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.[27] We examine whether schools already under private equity ownership were more responsive than their counterparts to this opportunity. We find that schools that were owned by private equity funds increased both tuition and borrowing at a faster rate relative to other schools, which is consistent with these schools being better able to capture government aid.

We employ a standard difference-in-difference framework, specified in Equation 2. This estimates the differential effect of private equity ownership, relative to other schools before and after the loan limit increase. We compare private equity owned schools to all schools and to other for-profit schools. We also visually show trends, which indicate that private-equity backed for-profits evolve similarly to other for-profit schools prior to the limit increase, but increase tuition and borrowing sharply following the limit increase.

$$L_{it} = \alpha_i + \alpha_t + \beta PE_i * Post2007 + \gamma X_{it} + \varepsilon_{it} \tag{2}$$

In Equation 2, the term L_{it} denotes average borrowing or headline tuition in school i in year t. The coefficient of interest is β, which captures the increase in average borrowing at private equity-owned institutions relative to other institutions after the limit increase. If private equity-owned institutions are better at capturing aid, we would expect average loan amounts to rise at a

[27]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 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.

faster rate relative to other institutions, and the coefficients β should be positive and significant. We include school and year fixed effects (α_i and α_t), and school controls X_{it} as in Equation 1. Standard errors are clustered at the SystemID level to address potential serial correlation. The year 2007 is excluded from the analysis, as the two reforms took place in 2007 and 2008 and thus it is somewhat ambiguous when the treatment occurs. The results are not sensitive to including 2007.

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

Table 4 presents estimates of Equation 2. Consistent with the graphical evidence, the results indicate that following the loan limit increases, average borrowing increased by about $800 at private equity-owned institutions relative to other schools (Panel 1). Columns 1-3 include all schools, while columns 3-6 include only for-profit schools. Reflecting increases in borrowing across all schools, the year trend is positive. The coefficient on being private equity-owned is also positive, as borrowing was higher at private equity-owned schools before the reform.

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

$$L_{it} = \alpha_i + \alpha_t + \sum_{j=2002}^{2012} \beta_j PE_i * 1[Year = j] + \gamma X_{it} + \varepsilon_{it} \tag{3}$$

The treatment is restricted to schools that were acquired by a private equity group before 2007. The results are plotted in the top panel of Figure 5. The solid line shows point estimates of the coefficients β_j. We do not observe any significant differences between the private equity-owned

and other for-profit groups before 2007. The coefficients are near and not distinguishable from zero. After 2007, borrowing increases faster at private equity-owned schools, and this difference becomes significant at the .05 level three years after the reform. We find an approximate 13 percent increase in borrowing, and a 9 increase increase in tuition post buyout, relative to other schools.

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. Table 4 Panel 2 presents regression results for tuition. We see sharp increases in tuition that completely offset the increase in borrowing. Figure 5 Panel B also shows that there was no pre-trend; the timing of the limit increase coincides with the tuition hike.[28]

In sum, 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. Their superior ability to capture this strategic opportunity is also evidence of operational changes; in particular, different management that engages in rent-seeking behavior. The expanded capture of government subsidies and guaranteed loans naturally leads to higher profitability (Bachas et al. (2019)). Consistent with existing private equity literature, we find in Table 3 that buyouts lead to dramatic increases in profits. The coefficient of 1.2 implies a 332 percent increase (Panel 2 columns 4-5), while the matching estimate is considerably smaller, at 150 percent.[29] The large effect mirrors the summary statistics; average profits are $6 million among both for-profits and community colleges, while they are $34 million among private equity-owned schools. This industry is in general quite profitable; between 2003 and 2012, profits (gross margins) among U.S. publicly traded for-profit schools averaged 55 percent, compared to 33 percent across 99 major industries (Eaton et al. 2016).

[28]Additionally, Appendix B Table 5 shows that there is no increase in faculty student ratios, suggesting that additional tuition increases are not being passed on to higher institutional quality.

[29]We present further results relating to financials in the appendix. Visual event studies for profits, revenue, and expenditure are in Appendix B Figure 6. Higher profits derive primarily from higher revenue, as costs start from a much lower base. Expenditure increases are likely due to increased sales and recruiting effort. Figure 2 shows the share of school employees in sales (left graph) and non-instructional activities (right graph), by school type and ownership between 2012 and 2015 (the fact that data are limited to these years prevents us from using this variable in analysis). These shares at private equity-owned schools dwarf those at other types of institutions.

4.2 Responses to Regulatory Cutoffs and Events

Figure 3 shows the share of school revenue from Title IV sources, such as federal student loans and grants, before and after a buyout. Before the buyout, target schools receive approximately 60-70 percent of their revenue from Title IV programs. Afterwards, the fraction of revenue received from Title IV sources increases to slightly above 80 percent six years after a buyout. The variance of the fraction of revenue from Title IV programs also decreases markedly. The "90/10 Rule," which stipulates that a for-profit school eligible for Title IV may not receive more than 90 percent of their revenue from Title IV programs. The tight clustering in Figure 3 of just below the statutory cutoffs for aid eligibility several years after private equity buyouts suggests that management at private equity owned schools more consistently targets the threshold. Note that the fraction of revenue coming from Title IV programs is a lower bound on the total fraction of revenue coming from all government sources, as there exist many non-Title IV loan, grant and subsidy programs.

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

We conduct two additional tests for subsidy capture. First, 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. School survival depends on not triggering these thresholds. 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, which may be vulnerable

to manipulation (Looney and Yannelis (2019)). We find evidence that private equity-owned institutions are better at avoiding the threshold. Appendix B Figure 7 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.[30] The solid line shows private equity-owned institutions, and the other two lines show independent for-profit and non-profit schools. The vertical line is the 25 percent two-year CDR threshold. CDRs largely evolve smoothly across the threshold among independent for-profits and other schools. In contrast, there is a sharp drop in the default density right before the threshold at private equity-owned schools, consistent with avoiding the threshold. This helps explain why private equity-owned schools have slightly lower CDRs than other for-profits in Table 1 Panel 2.

The second test exploits the Gainful Employment (GE) rule, which aimed to tie a school's access to federal grants and federally guaranteed loans to student labor market performance. The rule was announced in 2010, watered down following court cases, and ultimately suspended in 2017. Since private equity-owned schools have illiquid and unobservable value, we turn to publicly traded schools to study the effect of the GE rule.[31] 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 Figure 1 shows dramatic changes in abnormal returns around the events, while there are no changes for a group of control firms. Difference-in-differences regressions confirm the effect. This analysis suggests that a major aspect of for-profit market value is rent-seeking capture of government aid.

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

[31] Many of the largest public firms were once private equity-owned, including Devry, EDMC, and Corinthian. Others have been acquired by private equity in public-to-private reverse LBOs, such as Apollo, which owns the University of Phoenix. Details of these events are in Appendix C Table 1. In Section 6.7, we will show that publicly traded schools appear broadly similar to private equity-owned schools, with less adverse outcomes for students. Appendix C contains detailed explanation of the rule, our estimation approach, and the results.

5 Buyouts and Student Outcomes

Students are stakeholders in the school whose interests differ from those of equity holders. The arguments in Shleifer and Summers (1988) and Appelbaum and Batt (2014) suggest that private equity investors may violate implicit contracts with non-financial stakeholders. Private equity general partners may be more disposed towards this behavior because of their compensation structure, which incentivizes the rapid increase operating profits and firm value in the service of a short-term exit. The compensation structure and other private equity financing practices also minimize general partner exposure to potential long-term liabilities from implicit contract violations, such as regulatory backlash or negative reputation effects in consumer markets.

This section first examines how private equity buyouts affect the student outcomes of graduation rates, loan repayment and earnings. There are at least three non-mutually exclusive mechanisms for any effects. First, private equity buyouts can affect students by changing operations. Second, private equity firms may select schools on different trends, affecting average outcomes. Finally, buyouts may affect the composition of students. Sections 5.2 and 5.3 examine school selection and changing student body composition. We consider operational changes in Section 6.

5.1 Effect of Buyouts on Student Outcomes

This section continues to employ the estimation strategies in Section 3 to examine the relationship between buyouts and measures of student success. We begin with the graduation rate, which is the share of students who graduate within 150 percent of the degree's normal time. Graduation rates are a standard measure of school performance in the education literature, as failing to graduate is unambiguously detrimental to affected students (Bowen, Chingos, and McPherson 2009, Stinebrickner and Stinebrickner 2012, Arcidiacono et al. 2016). It may also harm their peers who do graduate if the degree is perceived as lower quality by employers. For example, in an experimental setting, Deming et al. (2016) show that employers prefer candidates with degrees

from programs that have higher graduation rates. The graduation rate metric only includes full-time students (who are also the vast majority of students at for-profit colleges), so taking longer to get a degree does not mean that a student is working in the labor force and taking a light course load (see Gilpin and Stoddard 2017). Relatedly, Bound, Lovenheim, and Turner (2007) show that lower graduation rates do not reflect a longer time to degree or greater human capital acquisition (i.e., more credits); instead, longer times to degree are associated with dropping out and worse labor market outcomes.

In Table 5 Panel 1, we show that private equity buyouts lead to a six-percentage point decline in graduation rates, or about 13 percent of the mean across all schools. This relationship is consistent across our baseline model (column 1), the model with composition controls (column 2), and the matching estimator (column 3). Figure 6 Panel A contains the event study plot. As in the following figure for loan repayment, it omits the year before the buyout because these students are partially treated, which we examine below. Both panels reveal a negative effect on graduation rates. The effect is immediate, which is consistent with the fact that the buyout year is the first affected academic year. Given that the majority of programs are one-year programs, operational changes can take effect quickly.

While dropping out is, as discussed above, a bad outcome for the student, falling graduation rates could be profit maximizing for schools. Particularly for one-year programs, the school receives tuition from the government (and the student acquires debt) when the student has been in class for early in the semester. If the student drops out, the school no longer bears the instructional, service, and facilities costs associated with her attendance. Allowing students to drop out may be profit maximizing if it is more expensive to prevent drop outs, and lose tuition in subsequent periods, rather than to simply allow students to drop out and enroll more students.

Defaulting on student loans is an adverse outcome relative to repaying for the vast majority of borrowers. This is in part because federal student debt is effectively non-dischargeable in bankruptcy, so wages may be garnished. The share of students in repayment, shown in Table 5 Panel 1 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 in Figure 6 Panel B shows a downward trend after the buyout.

Private equity buyouts are associated with 5.8 percent lower within-cohort average earnings six years after enrollment, relative to a mean across all schools of $31,269, in 2015 dollars (Table 5 Panel 2 columns 1-2). Median earnings decline by a similar, albeit slightly smaller amount (columns 3-4). There are insufficient data for the matching estimator.[32] Earnings exhibit strong time trends, increasing over most of our sample period and decreasing in the Great Recession. Therefore, we graph coefficients from a fixed effects regression. Appendix B Figure 8 shows the coefficients β_j from the following specification:

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

Here, $1[Year = Year_{PE} + j]$ is an indicator of a year before or after the buyout year. The year before the buyout (-1) is the baseline, normalized to zero. We also include school and year fixed effects (α_i and α_t). The sample is all schools, and the control group is all non-private equity-owned schools. The results in Appendix B Figure 8 contain no pre-trends and indicate a deterioration after the buyout in log earnings.

5.2 Selection

Private equity firm screening ability could explain the effects on graduation rates, repayment rates, and earnings. Such a selection mechanism would imply that private equity firms choose targets that would have changed anyway (i.e., with no buyout). This is most plausible when the target firm is on a trajectory towards the post-buyout outcomes during the pre-buyout years. Instead, the visual event studies presented in this section as well as subsequently when we discuss operational changes are largely devoid of pre-trends. They instead reveal discontinuities in levels and trends

[32]This is because we only observe six cohorts (as described in Section 2.3). 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.

immediately around the buyout year. Though we cannot rule out some influence of selection, a selection mechanism is unlikely to fully explain the results.

5.3 Student Body Composition

Private equity ownership may change the type of students that enroll. For example, additional students targeted by the expansion may be less well qualified, with poorer labor market potential. This would be a causal effect of the buyouts, but has very potentially different implications for value-added. Demographic controls do not significantly attenuate the results for any outcomes. We also find no effect of private equity buyouts on Pell grants per student or the share of students on federal grants, and the small negative effect on the share of students who are white is not robust to the matching estimator (Appendix B Table 6). Therefore, observable demographic changes to the student body do not explain the main results.

We hold fixed composition using cohorts that are already enrolled at the school before the private equity acquisition occurs. We restrict the sample to two-year programs at ultimately private equity-owned schools. We compare the cohort that enrolled the year before the first private equity-owned year with the earlier cohort that enrolled two years before. The former cohort had one year of private equity treatment, while the latter had zero. We can conduct this test only for graduation and repayment rates.[33] The results are in Table 6. The partially treated cohorts experience a 3.5 percentage point decline in graduation rates, slightly more than half the main effect among fully-treated cohorts. The effect on repayment rates is the same as that among fully-treated cohorts. Thus, a changing student body composition cannot explain the declines in graduation and repayment rates.

The higher dropout rate among partially treated cohorts strongly points to a quality decline, since the student chose to enroll in the program and pay substantial up-front tuition (mostly through loans that are non-dischargeable in bankruptcy), presumably the student believed the

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

degree was valuable. In the following section, we show that measures of education inputs fall after the buyout and continue to decline through the sixth year after the buyout. This will suggest that it is unlikely that quality initially declined, leading enrolled students to determine that despite significant sunk costs, they should drop out, and then quality rebounded such that composition effects explain the results among subsequent cohorts. However, it is possible that other mechanisms may explain the falling graduation rates among the partially treated and subsequent cohorts. We cannot affirmatively establish that the same operational changes explain both the immediate effect captured in the cohort analysis and the longer term effects. One possible mechanism we are able to rule out is that the elimination of degree programs does not explain the immediate fall in graduation rates (Section 6.6).

6 Operational Mechanisms

This section explores operational mechanisms that may explain the deterioration in student outcomes observed in Section 5, and the increase in profits shown in Section 4.

6.1 Education Inputs

One possible mechanism is that education quality declines. Though we do not observe education quality directly, we show that measures of education inputs fall after private equity buyouts in Table 7. The number of full-time faculty per 100 full-time students falls by 0.45 (Panel 1 column 1), relative to a mean of 5.3 across all schools, and 3.6 among private equity-owned schools. There is also an absolute decline in the number of full-time faculty (Panel 1 columns 4-6). The share of expenditure devoted to instruction declines by about three percentage points (Panel 2 columns 1-2), relative to a mean across all schools of 48 percent. Similarly, absolute instruction spending declines, conditional on enrollment (Panel 2 columns 4-5). For all the education input variables, the matching estimates are imprecise, but their magnitudes are in all cases in the same direction as the main estimates, and much larger for the faculty per student ratio and instruction spending.

The lack of statistical significance may reflect the small samples for these variables. Appendix B Figures 14 and 15 show the raw mean visual event studies. They reveal that education inputs decline in the first year after the buyout and continue to decline through the sixth year thereafter.

These declines in education inputs may be responsible for the deterioration in student outcomes that we observe. Bound, Lovenheim, and Turner (2010) argue that lower institutional resources per student have contributed more than compositional changes to the overall decline in college graduation rates, and find that declines in the faculty to student ratio account for over three-quarters of graduation rate reductions in their sample. Motivated by their analysis, we examine the association between education input and graduation rate changes both to shed light on the mechanism and also to help explain why the effects of buyouts on graduation rates are so immediate. If operational changes are responsible for deteriorating outcomes, we expect that education quality declines should correlate with graduation rate declines. Appendix B Figure 10 Panels A and B show that this is the case: in the year around the buyout, schools that decrease their faculty-to-student ratio or instruction share of spending experience graduation rate declines, while schools that increase these education inputs experience graduation rate increases. Regressions in Appendix B Table 8 also find that the negative effect of private equity on graduation rates in the year after the buyout is much larger for schools with large negative changes in their faculty to student ratios.[34]

Firms can implement operational changes, particularly those that involve labor, relatively quickly. There is no reason that actions such as reducing the number of faculty and reallocating resources from instruction to sales would require more than a few months, in time for the buyout to impact what we term the first affected academic year. Adjustments involving fixed capital, such as the school's physical plant, might be expected to take years.

Tuition hikes might also explain the fall in graduation rates if students who are already

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

enrolled decide that the program does not merit higher costs. While this explanation is intuitive, two institutional features that are related to the incentive problems in education suggest that tuition may not play a significant role. First, as mentioned above, most programs are one year only and so because payment is up-front, there is no benefit tuition-wise from dropping out mid-year. Second, students are price inelastic because the size of their loan package is not salient at the time of borrowing, and they have no reason to be sensitive to grant amounts (Bleemer et al. 2017). Consistent with this, we find no relationship between changes in tuition and graduation rates immediately around the buyout year (Appendix B Figure 10 Panel C). The absence of a relationship contrasts with the previous panels showing the relationship with changes to faculty and instructional resources.

The example of Florida Career College's buyout also illustrates how private equity pressures for rapid growth in operating margins can lead to declines in education inputs. After TA Associates exited in 2007, Florida Career Colleges was acquired by Greenhill Capital Partners and Abrams Capital. Initially, the school took steps to address compliance issues raised by regulators in late 2007. In an email interview with the authors, however, a former high-level manager said: "When presenting annual results to investors, I told Managing Partner of PE firm [sic] that I wanted to address all the compliance and regulatory achievements. He laughed and said 'they don't care about that. All they want to know is how much money you made them.'" The investors subsequently replaced the senior management. Afterwards, the former high-level manager said "they started decimating faculty and student services."

The decline in education inputs is consistent with case studies in a U.S. Senate report on private equity-owned for-profits (Senate 2012). In Appendix A Section 4, we summarize the report's evidence that reductions in student support following private equity buyouts had negative impacts on educational quality with implications for student outcomes. Student complaints consistently point to a heavy reliance on part-time instructors with minimal certification and high instructional staff turnover rates. For example, after the buyout of Concorde Career Colleges by Liberty Partners in 2006, the entire 2010 class of nursing students at one campus filed a complaint

with administrators. In their complaint, the students wrote that: "instructors [were] late to start class ... [by] 20-40 minutes," lectures were "vague" and "lack[ed] structure," and instructors were "ill prepared" (Senate, 2012, 374).

6.2 Enrollment

Boucly et al. (2011) find that private equity buyouts of privately held firms lead to relaxed financial constraints at portfolio firms. Access to greater capital is likely to support investments needed to achieve rapid enrollment growth. Indeed, we find that after a buyout, the number of full-time equivalent enrolled students increases by about 48 percent. This is shown in Table 8 columns 1-3. The visual event study shows that the increase begins in the second year after the buyout, which contrasts with the impacts on student outcomes that occur immediately (Appendix B Figure 11). Given the negative effects on student success measures, buyouts are unlikely to make existing student types (i.e., that would have enrolled before the buyout) weakly better off.

Whether additional students – regardless of their preparedness – are better or worse off as a result of the buyout depends on their outside option. In Appendix D, we show that additional students enrolled as a result of expansion after buyouts seem to be drawn away from attending community colleges. Since the education economics literature finds strong evidence that (a) community colleges are an available substitute to for-profits, and (b) the returns to for-profit education are zero or negative relative to community college education, this points to additional students being unlikely to be made better off by the buyout.

6.3 Deceptive Recruiting

It may initially seem inconsistent that demand increases while education quality and student outcomes decline. The higher share of employees in sales (Figure 2) suggests that private equity-owned schools improve sales and marketing operations to attract more students. The law enforcement actions at private equity schools are primarily related to recruiting violations, including predatory and misleading marketing, and the use of excessive commissions or quotas

for salespeople. The chances of a school having its first law enforcement action increases dramatically after a private equity buyout. The dependent variable in columns 4-5 of Table 8 is one if the school experienced its first action in a given year. The coefficient is .003, significant at the .01 level, relative to a mean of .004. We have only 45 such instances (of which private equity-owned schools were responsible for 41), so there are insufficient observations for the matching estimator.[35] There may be concern about endogeneity in the law enforcement actions, many of which occurred between 2010 and 2014; perhaps the federal government targeted private equity-owned schools for political reasons. Such politicization is less likely at the state level, where cases typically originate directly from student complaints. We therefore limit the law enforcement actions to those brought by state attorneys general in column 6. The effect persists, though it is attenuated.

An example of deceptive recruiting as an operational change post-buyout comes from a U.S. Senate case study of Ashford University and University of the Rockies after they were acquired by a Warburg Pincus-owned firm. In the years after the buyout, marketing and recruitment comprised 39 percent of expenditures. Brent Park, a former recruiter for Bridgepoint, testified that "If we don't have a degree they want, we are supposed to convince them that one of ours will work for them anyway" (Senate, 2012, 305). Four students submitted complaints that they were deceived about financial aid and whether the program in which they enrolled would actually provide adequate certification for teaching or dental licenses (Senate, 2012, 306). In a context of severe information frictions, deceptive and aggressive marketing is apparently a successful strategy.

6.4 Governance

Private equity investors often change governance in their portfolio companies (Kaplan and Strömberg 2009, Bloom et al. 2015). For example, one mechanism is that private equity managers join the board of the portfolio firm and actively supervise portfolio firm managers (Cornelli and

[35] A visual comparison is in Appendix B Figure 13.

Karakas 2008). At smaller privately held firms, the new owners may bring in experts in, for example, sales and marketing. Gompers, Kaplan, and Mukharlyamov (2016) find that 31 percent of private equity investors recruit their own senior management teams before investing, which then replace the pre-buyout management team. We expect that private equity buyouts may affect operations through changes in management.

We test this hypothesis in Appendix B Table 9. The dependent variable is an indicator for whether a school's Chief Executive changes within three years of the buyout.[36] 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 by around 36 percent. This is consistent with private equity firms changing management by bringing in new executives. Therefore, new management is one channel for changed operations.

6.5 Online Schools

Greater access to capital and managerial expertise may lead to informational technology upgrades under private equity ownership (Agrawal and Tambe 2016). This could improve educational delivery and benefit students. For example, online education could reduce transportation costs for students and make enrollment possible for students who found transportation costs prohibitive. For the school, online education's low marginal costs per student presents opportunities for economies of scale.

We examine whether private equity ownership is associated with schools transitioning from primarily brick-and-mortar to online in Table 8 columns 7–8. We find a positive, albeit somewhat imprecise effect of 1.2 percentage points. As with law enforcement actions, the small number of schools that switch to being online prevents us from using the matching estimator. In unreported

[36] College Chief Executives are defined in IPEDS. They are typically university presidents or other senior academic officials. We define a Chief Executive change as an indicator of whether the last name of the Chief Executive listed in IPEDS changes from the previous year.

analysis, we confirm that our effects on faculty, instruction spending, and student outcomes are not attenuated when online schools are omitted from the sample. We also find no effect on the intensive margin (number of out-of-state students). Thus online education also does not explain the decline in labor inputs that we observe in Section 6.1.

Technology may alternatively be dedicated to sales activities. In an exploratory interview for this study, a former Vice President at Corinthian Colleges pointed technology upgrades as particularly central to expanding recruitment and enrollment. While others have emphasized the role of technology in expanding online degree programs, the Corinthian Vice President stressed the role of technology in recruitment for brick-and-mortar campuses. Technology adoption included expanded use of targeted cable television and web-based advertising to target underserved students. Corinthian coupled the targeted advertising with round-the-clock call center operations because, according the Vice President, "If you let a lead sit for 24 hours, the conversion rate was X... If you got back to them within the amount of time it took to cook a thing of popcorn in the microwave, 3 minutes, you had like 4X." While we do not observe sales technology, Figure 2 suggests this may play a role.

6.6 Degree cuts

A potential operational change that might help explain the immediate fall in graduation rates is the elimination of degree programs. If private equity owners reduce degree offerings, students already enrolled in a cut program might be forced to drop out. In such a case, the immediate effects that we show in the cohort partial treatment test, where composition effects are held fixed, might in fact reflect degree program cuts. Composition changes might explain the persistently lower graduation rates in the following years.

We test this by identifying degree programs that are cut each year. We define a degree cut as a school-year in which there were no graduates of the degree, following a previous year with positive graduates. Appendix B Figure 9 shows the number of degree cuts by year around the private equity buyout, within schools that switched to private equity ownership. We separately

consider one, two, and four-year programs. In no case is there an observable increase in the years following the buyout. Appendix B Table 7 confirms this in regression analysis. Private equity ownership does not lead to cuts to degrees offered, so this cannot explain the immediate decline in graduation rates.

6.7 Private equity as an ownership type

A final step is to confirm the basic mechanism for our findings, which is that private equity ownership confers distinct incentives on schools. If the results stem from a "corporatization" of the school more generally, they are likely to also exist in transitions to chain ownership. To consider this, we create two new variables. First, we define a "chain" as any parent company (SystemID) that is not private equity-owned and that owns at least two schools (UnitIDs). These ownership changes are included as a separate indicator variable. Second, we restrict the "PE buyout" indicator to to instances where a private equity-owned school system acquires an independent school. This enables a more apples-to-apples comparison with non-PE chain acquisitions. The results are in Appendix B Table 10. The effects of chain acquisitions are smaller and often very imprecise, though they have a substantial negative effect on graduation rates and earnings, as well as a strong positive effect on enrollment. The results suggest a hierarchy of incentives and outcomes. Chains likely have more sophisticated corporate structures and arms-length owners than stand-alone, independent schools, giving them somewhat higher-powered incentives. Private equity ownership yields higher-powered incentives and leads to more adverse student outcomes.

We also examine how the private equity firms behind the deals may affect outcomes. First, we find very similar results to the main model when we include lead private equity firm fixed effects. Second, we ask whether the effects vary with 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. Third, we omit the largest three deals. We define "large" as the number of schools (UnitIDs) purchased in the deal and subsequently acquired by the private equity-owned

school system.[37] The results are generally as strong as our main specification, both in magnitude and statistical significance.[38]

7 Conclusion

The primary aim of a standard private equity investor is to increase the value of the target firm in order to sell their equity stake at a substantial profit. This paper asks whether -- in a highly subsidized industry that is known to suffer from incentive alignment problems -- operational changes induced by private equity ownership affect government subsidy capture and customer outcomes. 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, in the context of hostile takeovers, that changes in ownership 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 consumer – students and the government. From the private equity investor's perspective, it may be ex-post optimal to renege on the implicit contract due to information frictions and the fact that the vast majority of revenue is guaranteed by government programs. In fact, students and the government differ from employees in ways that may increase the appeal of reneging; students typically purchase a degree-program only once, and the government has largely not been a demanding counter-party. New shareholders can maximize value by reducing quality and increasing cost.

Indeed, we find that private equity buyouts lead to higher profits, tuition, and borrowing. They also lead to lower education inputs, graduation rates, repayment rates, and earnings. We use regulatory changes to show that private equity-owned schools raise tuition following credit expansions faster than other schools, which increases student debt. Superior federal aid capture is

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

[38] The results of these exercises are available on request.

an important channel through which high-powered incentives translate to higher profits. A focus on maximizing revenue from subsidies helps explain why buyouts do not lead to improvements in consumer outcomes in the postsecondary education sector.

Much of the existing literature has focused on sectors characterized by high levels of competition and product transparency, and low levels of government subsidy, such as manufacturing and the restaurant industry. In recent years, private equity groups have invested significantly in sectors such as healthcare, education, defense and infrastructure, which are characterized by low levels of competition, product opacity, and high levels of government subsidy. Ours is the first study to focus on private equity investments in a heavily subsidized industry, and contrasts with much of the existing literature. Future work might study the role of private equity in industries with less competitive market structures.

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Table 1: Descriptive Statistics by Institution Type

	Nonprofit, State	**Community**	**For profit, not PE**	**PE owned**
	Mean (Std Dev)	**Mean (Std Dev)**	**Mean (Std Dev)**	**Mean (Std Dev)**
Operating margin (mill 2015$)	40	6	6	34
	(102)	(16)	(34)	(63)
Publicly traded	0.00	0.00	0.14	0.000
	(0.000)	(0.00)	(0.35)	(0.00)
Selective admissions	0.68	0.089	0.092	0.077
	(0.467)	(0.29)	(0.29)	(0.27)
Highest degree offered**	1.12	2.12	2.32	2.01
	(0.40)	(0.33)	(0.75)	(0.723)
Graduation rate	0.52		0.55	0.48
	(0.21)		(0.25)	(0.21)
Repayment rate (3 year)†	0.66	0.47	0.41	0.32
	(0.17)	(0.121)	(0.16)	(0.13)
Mean earnings after school (2015 $)	37,667	28,321	24,275	26,829
	(11,117)	(4,920)	(7,959)	(8,219)
Full-time faculty per 100 students±	6.28	4.38	4.48	3.62
	(4.653)	(4.26)	(4.1)	(2.66)
Full-time faculty	261	109	16.8	24.8
	(465)	(110)	(32.2)	(45)
Share spending on instruction	0.47	0.54	0.41	0.36
	(0.14)	(0.13)	(0.24)	(0.15)
Spending on instruction (mill 2015 $)	71.4	19.5	2.31	4.55
	(219)	(26.9)	(6.01)	(7.37)
Students‡	3,885	3,148	387	748
	(5,656)	(3,866)	(1,232)	(1,413)

Continued on following page

Table 1 continued

	Nonprofit, State	**Community**	**For profit, not PE**	**PE owned**
	Mean (Std Dev)	**Mean (Std Dev)**	**Mean (Std Dev)**	**Mean (Std Dev)**
1st law enforcement action	0.00	0.00	0.00	0.004
	(0.007)	(0.006)	(0.018)	(0.061)
Online	0.000	0.000	0.012	0.017
	(0.000)	(0.000)	(0.109)	(0.127)
Share students white	0.67	0.69	0.51	0.44
	(0.28)	(0.25)	(0.32)	(0.26)
Loan per borrower (2015 $)	5,179	3,543	5,711	7,456
	(2,320)	(1,911)	(2,822)	(2,719)
Tuition revenue per student (2015$)	10,995	3,673	14,210	17,521
	(7,110)	(3,883)	(7,678)	(7,303)
Pell grants per student (2015 $)	1,350	1,725	4,109	4,609
	(1,682)	(1,292)	(3,193)	(3,104)
Federal grants per student (2015$)	1,980	2,335	6,115	5,814
	(2,183)	(2,219)	(5,816)	(5,152)
N (school-year obs)	55,103	29,678	34,286	4,540

Note: This table contains summary statistics at the school (UnitID, or campus) level. The exception is profits, which are at the firm/institution-year (SystemID) level; from left, N=47,834; 23,929; 8,254; and 438. ‡Full-time equivalent (applies to all below). *Grad rate at 150pct normal time for programs of 2 years or less duration. $^{\pm}$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 targeting

Dependent variable: Indicator for school experiencing PE buyout in following year

	(1)	(2)	(3)	(4)
Community colleges in CZ	.022**			.0043
	(.0093)			(.015)
For-profits in CZ	-.014***			-.018**
	(.0044)			(.0072)
Log FTE students in CZ	.12*			.46***
	(.065)			(.11)
Profit growth (last year)	-.00013*		-.00014**	-.000016
	(.000076)		(.000068)	(.00022)
Log profits	.093***		.051*	.27***
	(.032)		(.028)	(.052)
Log FTE students	.65***		.7***	.24***
	(.046)		(.042)	(.073)
3-yr repayment rate		-4.9***		-4***
		(.4)		(.55)
Share students white			.26*	.59**
			(.15)	(.29)
Year f.e.	Y	Y	Y	Y
N	28,250	14,846	35,388	11,472
Pseudo R^2	.15	.092	.14	.14

Note: This table shows estimates from logit regressions in which the dependent variable is an indicator for the school-year immediately preceding a private equity buyout. All other years for target schools are excluded from the sample. The sample is restricted to for-profit, non-publicly traded schools. Only variables with predictive power over buyouts are shown.

Table 3: Private Equity Ownership and Financial Outcomes

Panel 1

Dependent variable:	Tuition per student			Loan per borrower		
	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)
PE buyout	1610**	1637***	3306***	586***	592***	833**
	(607)	(565)	(1039)	(185)	(185)	(374)
Composition controls‡	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-
School Fixed Effects	Y	Y	-	Y	Y	-
Year Fixed Effects	Y	Y	-	Y	Y	-
N	102,354	102,354	5,193	75,022	75,022	11,482
R^2	0.82	0.84	-	0.65	0.65	-

Panel 2

Dependent variable:	Federal grants per student			Log profits		
	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)
PE buyout	837***	784***	1267*	1.2***	1.1***	.4*
	(176)	(219)	(746)	(.22)	(.22)	(.22)
Composition controls‡	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-
School Fixed Effects	Y	Y	-	Y	Y	-
Year Fixed Effects	Y	Y	-	Y	Y	-
N	86,412	86,412	12,333	80,119	80,119	10,804
R^2	.53	.55	-	0.83	0.83	-

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

Table 4: Effect of Loan Limit Increase

Panel 1: Borrowing

Dependent Variable: Average loan per borrower (2015$)

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

Panel 2: Tuition

Dependent Variable: Average tuition (2015$)

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

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

Table 5: Private Equity Ownership and Student Outcomes

Panel 1

Dependent variable:	Graduation rate (share graduate in 150% normal time)			Repayment rate (3 year)		
	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)
PE buyout	-.06***	-.059***	-.071**	-.033**	-.031*	-.077***
	(.012)	(.012)	(.031)	(.012)	(.011)	(.011)
Composition controls‡	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-
School Fixed Effects	Y	Y	-	Y	Y	-
Year Fixed Effects	Y	Y	-	Y	Y	-
N	56,965	56,839	3,458	19,746	19,746	12,663
R^2	0.8	0.81	-	0.96	0.96	-

Panel 2

Dependent variable:	Log mean earnings		Log 50th pctile earnings	
	(1)	(2)	(3)	(4)
PE buyout	-.056**	-.046**	-.052**	-.041*
	(.013)	(.012)	(.017)	(.016)
Composition controls‡	N	Y	N	Y
School type controls†	Y	Y	Y	Y
School Fixed Effects	Y	Y	Y	Y
Year Fixed Effects	Y	Y	Y	Y
N	16,861	16,861	16,861	16,861
R^2	0.97	0.97	0.96	0.97

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

Table 6: Cohort Partial Treatment Effect of Private Equity Ownership on Student Outcomes

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

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

Table 7: Private Equity Ownership and Education Inputs

Panel 1

Dependent variable:	Faculty per 100 students			Number of Faculty		
	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)
PE buyout	-.45**	-.36*	-.9	-21***	-19***	-2.9
	(.19)	(.18)	(1.5)	(4.4)	(4.3)	(8.7)
Composition controls‡	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-
School Fixed Effects	Y	Y	-	Y	Y	-
Year Fixed Effects	Y	Y	-	Y	Y	-
N	62,432	62,432	5,352	62,432	62,432	5,352
R^2	0.83	0.83	-	.95	.95	-

Panel 2

Dependent variable:	Instruction spending share			Instruction spending (mill 2015$)		
	OLS		NNM$^{\pm}$	OLS		NNM$^{\pm}$
	(1)	(2)	(3)	(4)	(5)	(6)
PE buyout	-.03*	-.029*	-.02	-8***	-7.2***	-.21
	(.017)	(.016)	(.038)	(1.7)	(1.5)	(1.7)
Composition controls‡	N	Y	-	N	Y	-
School type controls†	Y	Y	-	Y	Y	-
School Fixed Effects	Y	Y	-	Y	Y	-
Year Fixed Effects	Y	Y	-	Y	Y	-
N	97,401	97,401	5,191	97,401	97,401	5,191
R^2	0.75	0.75	-	.94	.94	-

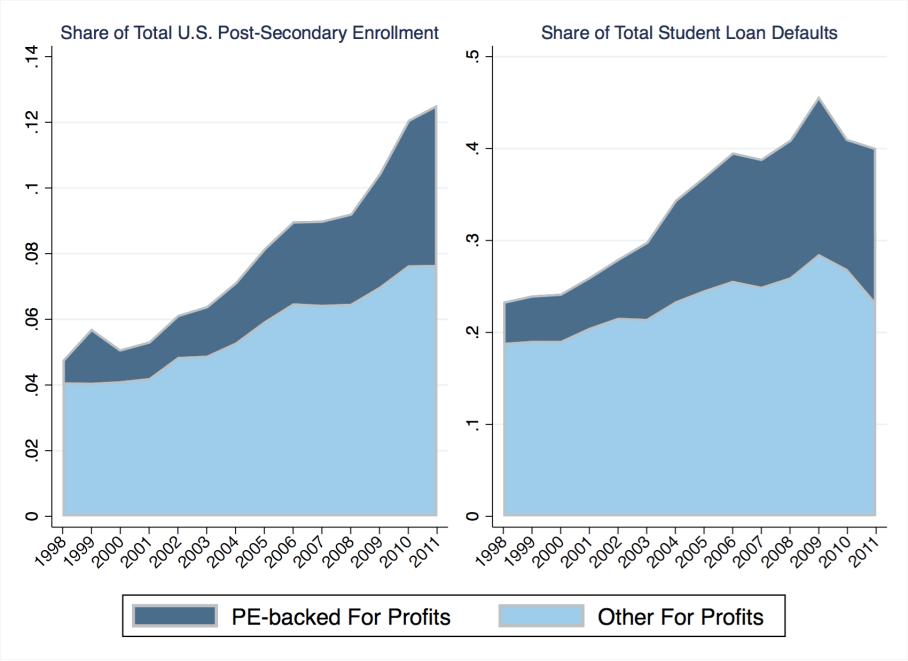
Note: This table shows regression estimates (OLS) of the effect of private equity ownership on measures of education inputs. Observations are at the school (UnitID)-year level. $^{\pm}$Nearest-neighbor matching is done within the sample of other for-profit schools. The dependent variable is measured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

Table 8: Private Equity Ownership and Operational Outcomes

Dependent variable:	Log FTE students			1st law enforcement action		1st AG law enf. action	Online	
	OLS		NNM$^{\pm}$	OLS			OLS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE owned	.39***	.37***	.34**	.0031***	.0031***	.0012*	.012*	.012*
	(.057)	(.055)	(.14)	(.00074)	(.00073)	(.00065)	(.0063)	(.0063)
Composition controls‡	N	Y	-	N	Y	N	N	Y
School type controls†	Y	Y	-	Y	Y	Y	Y	Y
School Fixed Effects	Y	Y	-	Y	Y	Y	Y	Y
Year Fixed Effects	Y	Y	-	Y	Y	Y	Y	Y
N	123,052	123,052	13,062	123,052	123,052	123,052	123,052	12,3052
R^2	0.97	0.97	-	0.14	0.14	.078	.58	.58

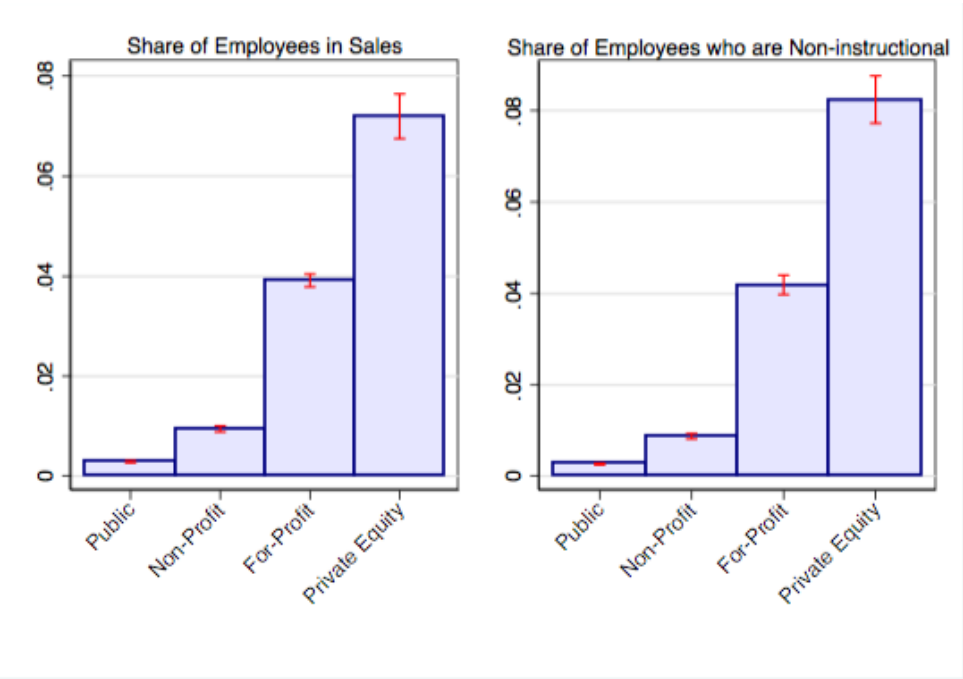
Note: This table shows regression estimates (OLS) of the effect of private equity ownership on school operational outcomes. Observations are at the school (UnitID)-year level. $^{\pm}$Nearest-neighbor matching is done within the sample of other for-profit schools. The dependent variable is measured the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

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



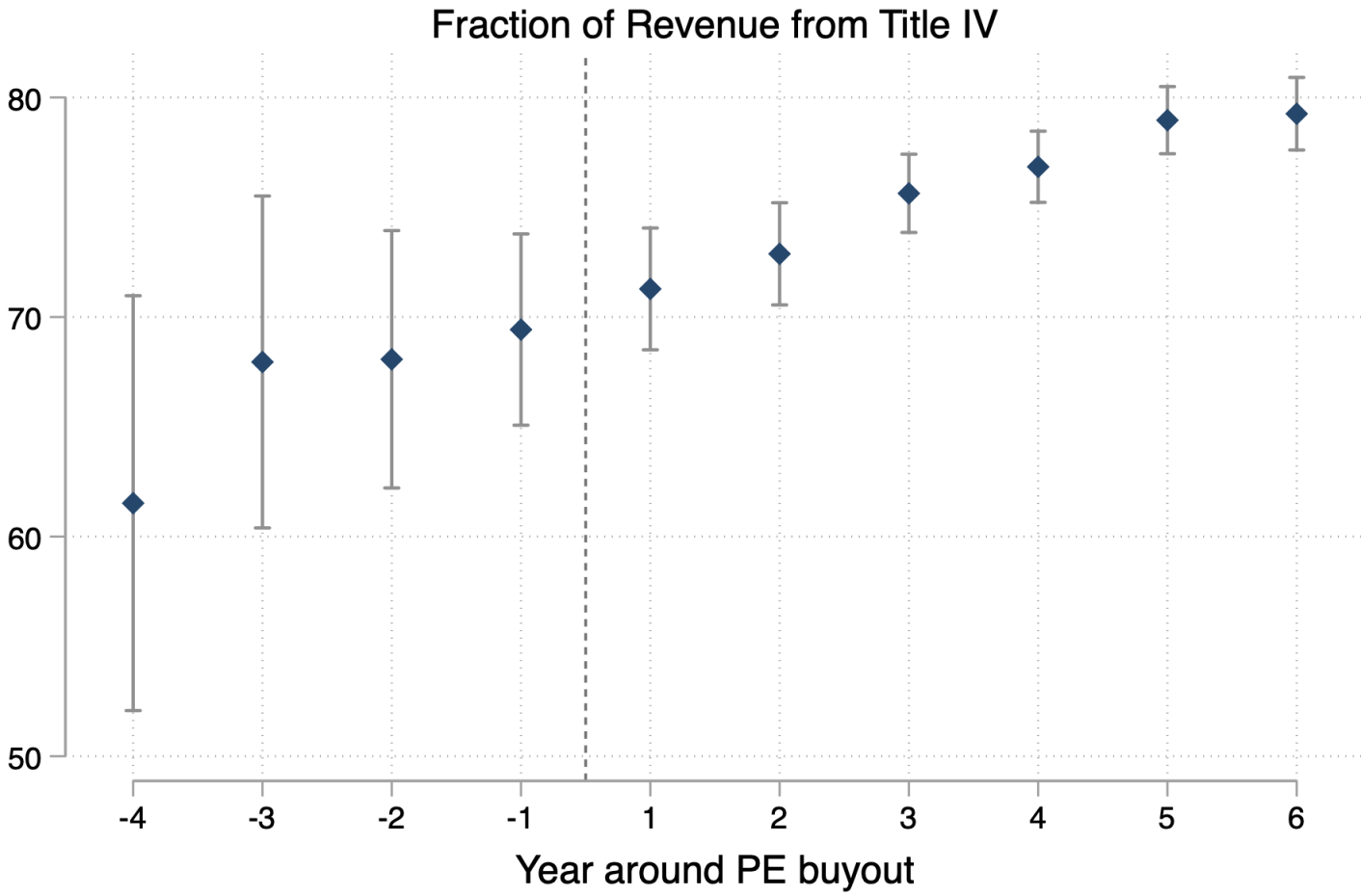
Note: The left graph shows the for-profit share of total US postsecondary enrollment by whether a school was ever private equity-owned. The right graph shows the share of total student loan defaults within two years of entering repayment, by whether a school was ever private equity-owned.

Figure 2: Employees in Sales and Non-Instructional Activities



Note: The figure above shows the share of employees who do sales and non-instructional activities by institution type from 2012 to 2015 (data available only for these years).

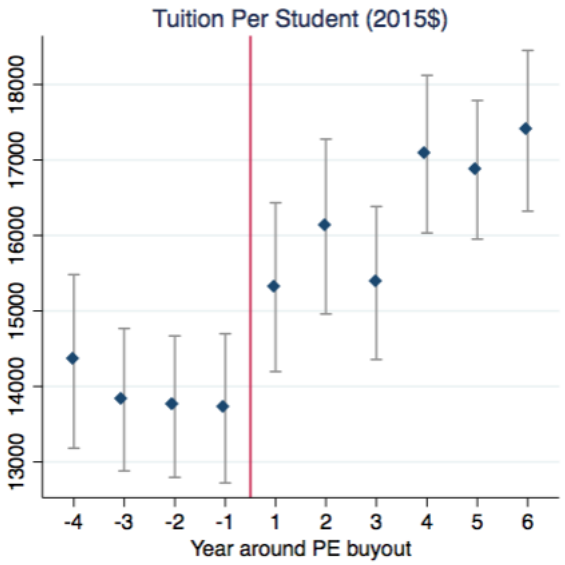
Figure 3: Distance from 90/10 Threshold



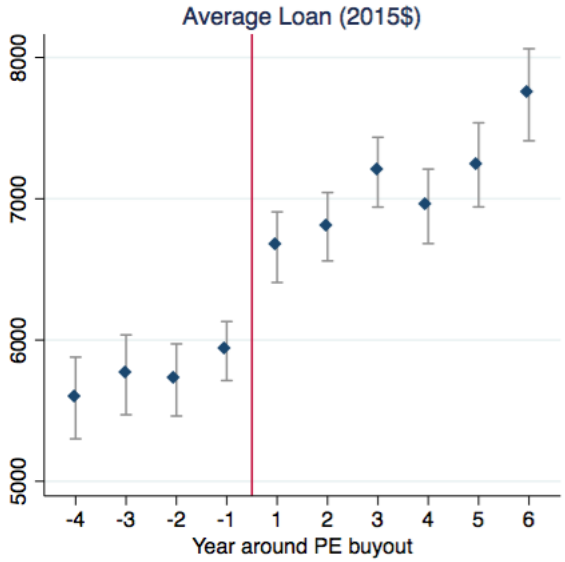
Note: The figure above shows, within the sample of school systems bought by PE, the average fraction of school revenue from Title IV programs in the years around the ownership change. The level of observation is the SystemID. We restrict the observations to schools that existed in the year prior to the buyout. 95% confidence intervals shown. The data source is the Department of Education FSA Proprietary School 90/10 Revenue Percentages. Data are available from 2007 to 2016.

Figure 4: Per-student Tuition and Per-student Loan Event Studies

Panel A: Per-student Tuition

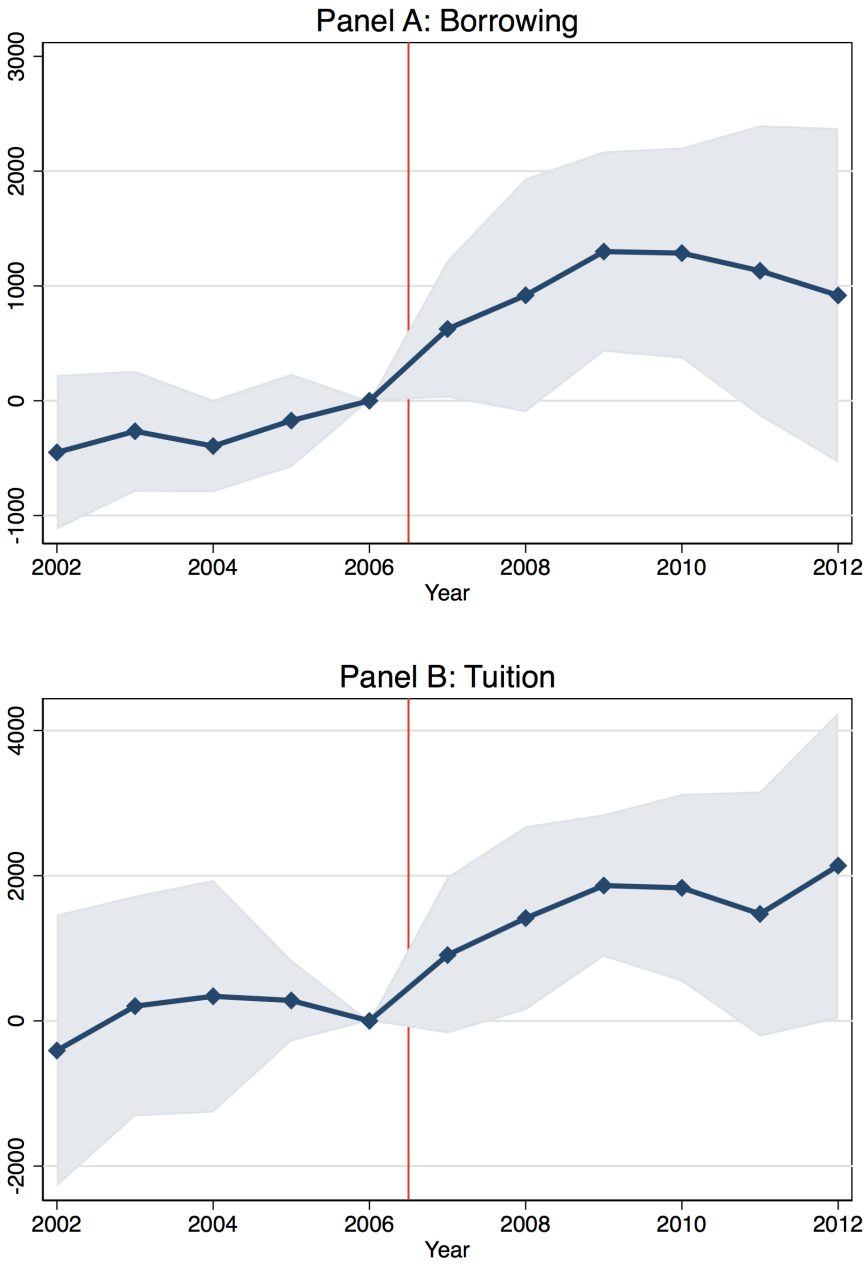


Panel B: Per-Student Loans



Note: The figures above show, within the sample of school systems bought by PE, the means of tuition per student and average loan per student 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 average loan variable. It is at the school, or UnitID level for the tuition per student variable, 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.

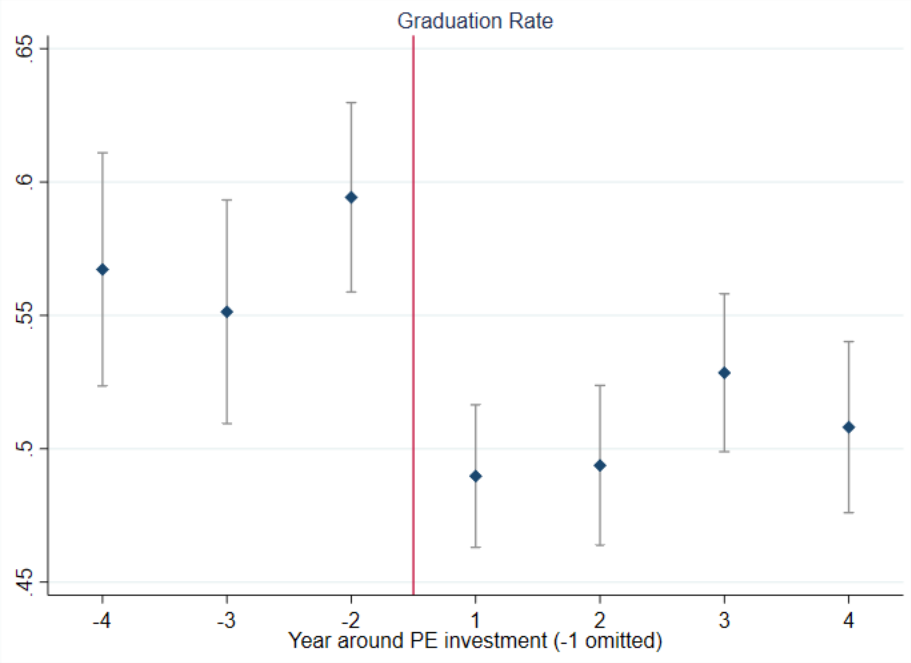
Figure 5: Loan Limit Increase Diff-in-diff Coefficients over Time



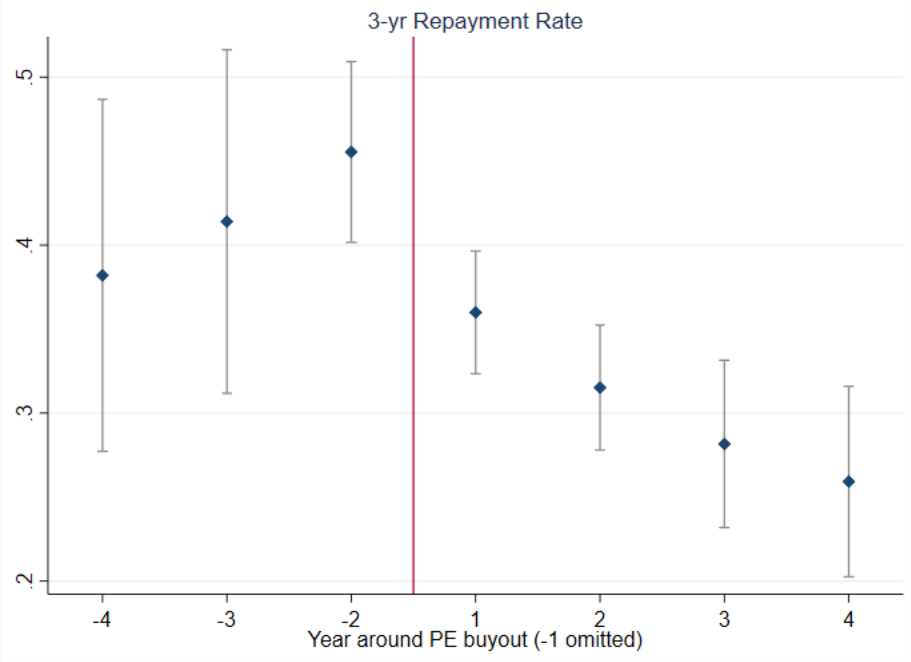
Note: The figure above shows coefficients β_j from the following specification $L_{it} = \alpha_i + \alpha_t + \sum_{j=2001}^{2015} \beta_j PE_i * 1[Year = j] + \gamma X_{it} + \varepsilon_{it}$, where 2006 is the base year. The areas represent 95% confidence intervals. Results are enrollment weighted. The vertical line is positioned before 2007, when student borrowing limits were increased. Standard errors are clustered at the school system level.

Figure 6: Graduation Rate and Repayment Rate Event Studies

Panel A: Graduation Rate



Panel B: Loan Repayment Rate



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