MANAGERIAL INCENTIVES AND VALUE CREATION: EVIDENCE FROM PRIVATE EQUITY*

Phillip Leslie
Graduate School of Business
Stanford University
and NBER
pleslie@stanford.edu

Paul Oyer
Graduate School of Business
Stanford University
and NBER
pauloyer@stanford.edu

Abstract

We analyze the differences between companies owned by private equity (PE) investors and similar public companies. We document that PE-owned companies provide higher managerial incentives to their top management: CEOs have almost twice as much equity, 10% lower salary, and more cash compensation than their counterparts at comparable public corporations. We also find some evidence that PE ownership is related to improvements in operational efficiency and profitability. However, any differences between PE-owned companies and public companies disappear over a very short period (one to two years) after the PE-owned firm goes public.

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1 Introduction

Ostensibly, private equity (PE) firms buy companies, fix them, and then sell them. How is it that PE firms are able to do this and why were the companies unable to *fix themselves* in the first place? The mantra in the literature is that PE firms mitigate managerial agency problems—they create value by improving management.[1] Three mechanisms are emphasized: (i) greater debt disciplines managers, (ii) enhanced governance, and (iii) increased managerial incentives. In this study we examine the changes in managerial incentives caused by PE firms.

Managers as owners is a pillar of the PE approach. But how does the ownership of managers differ between public companies and PE portfolio companies, where managers in both cases have stock options and incentive plans of some kind? Kaplan (1989a) first documented differences in the share of CEO equity ownership between publicly traded firms and firms that had undergone a management buyout. Muscarella and Vetsuypens (1990) provide a similar analysis and Baker and Wruck (1989) provide a detailed case study, but no prior study has examined managerial ownership in post-1990 buyouts, as we do here.[2] It is important to examine more recent data for a couple of reasons. First, it is reasonable to expect that public companies have adopted some of the practices of PE firms from the 1980s. Holmstrom and Kaplan (2001) and Kaplan (1997) explicitly argue this point.[3] The failure of Jensen's (1989) well-known prediction that PE would lead to the demise of public corporations is also consistent with public companies' adoption of PE practices. More concretely, Hall and Liebman (1998) find that equity-based incentives for CEOs of public companies have risen dramatically during the 1980s and 1990s. Others are more skeptical of changing managerial incentives, such as Bebchuk and Fried (2004) who argue that managerial power continues to drive executive compensation in most public corporations to the detriment of shareholders.

A second reason why it is important to study more recent data on managerial incentives in PE-owned companies is that the approach of PE firms has been evolving. As Cao and

[1] See Jensen (1986 and 1989).

[2] In contemporaneous work, Jackson (2008) also looks at executive compensation in PE-backed firms (using a data gathering strategy similar to ours). However, he focuses on the potential conflict of interests between public shareholders and top managers when a firm is initially approached by a PE investor. Some of his analysis is similar to some of ours and, in those cases, we generally draw similar concusions.

[3] As Kaplan (1997) remarks: "Corporations have applied the three primary LBO insights without actually doing LBOs ... [c]orporations (and consulting firms) now implement this insight through innovative performance measurement and compensation programs," (p. 8). See also Hermalin (2005).

Lerner (2007) explain, the buyout industry is significantly more competitive in the late 1990s compared to the 1980s. Perhaps relatedly, PE firms are said to be getting larger and more operationally focused over time.[4] Also, as low-hanging fruit diminishes, the characteristics of acquired companies may also be changing. For instance, public companies with relatively low managerial incentives may be attractive targets for PE firms because of the potential for significant increases in incentives (and the potential improvements in profitability that may result). But such companies may be less common over time.

We compare managerial incentives at public companies with PE-owned companies, using data for U.S. firms during the period 1996 to 2006. A key challenge in this research is obtaining data on managerial incentives at PE portfolio companies, which are not required to disclose such information. Our approach is to collect data on companies that have PE owners and undergo an IPO (sometimes referred to as a *reverse LBO*). In such cases the PE-owned firms are required to disclose the same information as a public company for the two years prior to the IPO. The dataset covers 144 such companies. There are some important selection issues which we address, as discussed in Section 3.

While most prior work focuses on the fraction of equity owned by the CEO, we analyze broader evidence on managerial incentives. We also study salaries and bonuses, and we go beyond the CEO to examine compensation for up to three executives at any given firm. We also analyze whether certain factors may explain variation in managerial incentives among PE-owned firms, such as firm size effects and CEO turnover. In doing so, our study helps to shed light inside the black box of PE. In the same spirit, see Acharya, Hahn, and Kehoe (2008) for evidence concerning the importance of active governance by PE firms.

We find that, as conventional wisdom and economic theory suggest, top executive incentives are much stronger at PE-owned companies than at comparable publicly traded companies. More specifically, relative to his counterpart at a publicly traded company in the same industry with similar observable characteristics, the CEO of a PE-owned firm owns approximately twice as large a share of the firm, earns about 10% less in base pay, and receives a substantially larger share of his cash compensation through variable pay. These differences do not exist at companies before they are bought by PE firms, suggesting that they are the result of PE ownership. Hence,

[4]This argument was made by David Rubenstein (Co-founder and Managing Director of the Carlyle Group) in a presentation to the NBER in April 2008.

we conclude that the difference in managerial incentives that existed in the 1980s, between public companies and PE-owned firms, is still present during the period 1996 to 2006. Furthermore, these differences are robust to the inclusion of controls for selection and other factors that affect incentives.

As noted above, prior work has suggested that stronger incentives at PE-backed firms mitigate agency problems and improve performance. Therefore, we go on to measure whether PE-backed firms outperform their public counterparts in profitability and operational efficiency. Empirical studies of PE investment returns show that returns are high (see, for example, Kaplan and Schoar, 2005), but it remains unclear whether this is due to value creation or value capture by investors and employees.[5] We find some suggestive evidence that PE-owned firms are more profitable and have higher sales-per-employee than comparable public firms.[6] We also find that all differences between PE-owned firms and public firms quickly disappear after PE-owned firms execute an IPO.

Empirical research into the effects of PE ownership on managerial compensation is challenging because PE firms are usually not required to disclose compensation details, and also because PE ownership is not a random choice—no prior study, including ours, exploits an exogenous source of variation in PE ownership. We take two important steps in this paper to help identify the causal effects of PE ownership. First, we look at CEO incentives at public companies that are about to undergo an LBO led by a PE firm to determine if PE firms are attracted to firms with certain incentive characteristics. Second, we gather a large sample of public companies against which to compare the incentives of our PE sample, and allowing us to utilize regression, sample restrictions, and propensity score matching to make these samples as comparable as possible.

In the next section we describe anecdotal evidence about the range of managerial incentives implemented by PE firms in their portfolio companies. In Section 3 we summarize the data used in our study, and explain our approach to addressing selection concerns. Section 4 then contains our analysis of the differences in managerial incentives between public corporations and PE-owned companies. In Section 5 we examine evidence concerning operational differences, and in Section 6 we explore the longevity of high managerial incentives once a PE-owned firm

[5] See, for example: Davis, et al, (2008), and Guo, Hotchkiss and Song (2008).

[6] An additional source of value creation may relate to tax advantages of debt (see Kaplan, 1989b).

undergoes an IPO. Section 7 concludes.

2 Institutional Background on PE Firms

In this section we provide an overview of some of the key changes that PE firms implement in managerial compensation at their portfolio companies. The information in this section is based on interviews we performed with a half dozen experienced executives at several leading PE firms.[7] The purpose of including this information is to expand our understanding beyond the limited set of facts we are able to study in the formal empirical analysis. It is common in the literature on private equity to propose that enhanced managerial incentives are a major driver of value creation. However, we are unaware of any paper that provides a description of what "enhanced managerial incentives" entail, other than the evidence provided by Kaplan (1989a) and Muscarella and Vetsuypens (1990), showing that the fraction of equity owned by the CEO tends to increase. While this is an important feature (which we also examine), the interviews we summarize below clearly indicate that increasing CEO equity is one piece of a more complex set of changes.

Enhanced equity participation is not limited to the CEO. Not surprisingly, all members of the senior management team (Chief Financial Officer, Chief Operations Officer, Chief Technical Officer, and so forth) also obtain significant equity stakes in almost every instance. However, PE firms tend to seek even broader participation. Typically, the top 20 to 80 managers in an acquired company obtain significant equity. The number may vary according to the kind of business: manufacturing firms tend to involve fewer managers in equity participation, while service firms tend to involve more managers. It is not unusual to have 150 or more participating managers. One PE executive told us of a deal that included 500 managers in the equity program.

A very important aspect of the equity programs is that managers are required to contribute capital—managers purchase the equity with their own funds. One interviewee explained that equity sharing is less about *compensation* of managers than it is about *investment* by managers. Arguably, this feature is why managerial equity programs are the cornerstone of the PE model which transforms managers as agents into managers as owners.

[7] Specifically, we interviewed six managers of varying levels of seniority (including general partners) at three PE firms (two of which are "top-tier" PE businesses).

Exposing managers to downside risk may be as important for motivating managers as the potential upside. However, the interviewees also emphasized that requiring managers to invest themselves helps to reveal information (as in Lazear, 2005). If any manager is unwilling to make a significant investment (often described as an investment on par with their home) then it is crucial to understand why. Is it because of personal financial limitations? If so, the PE firm will find creative ways to help the manager invest. Or is it because the manager has private information about the business that brings into question future profitability? Hence, increased equity participation of managers may be as important for mitigating adverse selection as it is for overcoming moral hazard.

Alongside equity investments by managers are stock options which are granted in proportion to the initial investment by managers (although not necessarily the same proportion for all managers in a firm). It is typical for CEOs to obtain two to three times their initial equity in options. Options vest uniformly, often over five years. There may be some controversy surrounding CEO options in particular, since other managers may obtain lower multiples than the CEO, which can be interpreted as a form of kick-back for CEOs to push the deal. A simple example of a CEO equity package is as follows. Suppose the PE firm acquires the target company for \$8 billion, with 50% leverage (i.e., \$4 billion in equity, and \$4 billion in debt). Suppose the PE firm expects to sell the business for \$16 billion, yielding a 200% return on equity invested. The CEO may invest \$5 million of his personal wealth (which is often a rollover of the equity previously owned in the company) and obtain three times that in options for a total stake of \$20 million. With 200% return on equity invested, the CEO obtains \$60 million upon exit. CEO ownership may increase when competition among PE firms for deals is intensified.[8]

PE firms also expend significant effort redesigning cash bonus structures for managers. The changes are customized to specific businesses, but are generally said to involve an increase in the performance weighting and amended performance criteria. It is unclear if the overall level of cash bonuses is increased, but it is probably not decreased. Some interviewees at PE firms asserted the changes they implement should have already been done by the firms.[9] Other

[8] In fact, Jackson (2008) specifically analyzes the potential for PE firms to, in essence, bribe CEOs to push their deal. He refers to this phenomenon as "deal bounties," arguing that this issue would be particularly common when PE firms buy publicly traded companies whose directors may be especially susceptible to moral hazard problems. This seems unlikely to be a major determinant of CEO pay at PE-backed firms more broadly, however, as less than 7% of PE acquisitions are public-to-private transactions (Strömberg, 2008).

[9] Consistent with this view, prior research has noted the difficulty of changing compensation structures, and that such changes are more likely in the face of bankruptcy or other dramatic changes in ownership structure—people

interviewees said that such changes reflected strategic redirection. Others again emphasized that the changes in bonus structures were not necessarily better, and indeed might be worse in some dimensions. This could be because PE firms are not expert in utilizing non-financial measures that encourage leadership development, for example. According to the interviewees, salaries are largely unchanged.

There is an interesting question concerning the role of exit: does the fact that PE firms intend to exit (after five years, say) enhance or diminish the effectiveness of managerial incentives? On the one hand, managers and investors both obtain a liquidity event at the same time, providing alignment around timing. In contrast, with public companies managers may divest sooner than investors would prefer. On the other hand, there can be disagreement between managers and the PE firm concerning the details of exit. For example, managers may prefer not to exit via an IPO, since they are required to hold stock for a minimum period, delaying their liquidity event. Several interviewees made the compelling point that PE firms tend to favor managers when discord arises, since it is essential to maintain a reputation for treating managers well.

In some PE buyouts there will be significant turnover in management, including senior managers and sometimes the CEO. Some PE firms are known for their tendency to replace senior management in their acquired companies. Other PE firms tend to view a strong management team as a desirable characteristic of a targeted acquisition, preferring instead to rely on enhanced incentives for aligning these managers with their own interests. We are unaware of any study documenting the degree of managerial turnover in PE acquisitions. When there is management turnover, an important task of the PE owner is identifying and recruiting talented managers. See Kaplan, Klebanov and Sorensen (2007) for an analysis of which CEO characteristics and abilities matter for hiring decisions in PE buyouts.

It would be ideal to obtain data on *all* managers' equity investments, option grants, bonus structures and firing/hiring of managers, in order to formally analyze/verify the generality of the anecdotal evidence discussed here. By its very nature, it is difficult to obtain information on the practices of private equity firms for a broad sample, let alone such confidential details of managerial incentives.[10] In the next section we describe the data utilized in our formal analysis, which has some obvious limitations that we shall discuss. However, the advantage of

are more willing to accept change when they feel less secure in their jobs. See, for example, Schaefer (1998).

[10]Indeed, even for public companies this level of detail is not usually available.

our dataset is that we have information about 144 PE-owned companies with clear selection criterion, allowing readers to evaluate the generality of our findings.

3 Data and Identification

A challenge for all empirical research into the causal effects of PE ownership is the fact that acquired firms are not randomly chosen.[11] Hence, cross-sectional differences in managerial incentives, say, between PE-owned firms and public companies would not necessarily reflect a causal effect of PE ownership. Instead, Kaplan (1989a) relies on panel data covering periods before (when the firm is publicly traded) and during PE-ownership, documenting the within-firm changes in managerial incentives over time. Post-buyout information is only available for firms with publicly traded debt, outstanding preferred stock or publicly traded equity, leading to a small sample size (48 firms) and possible selection concerns. Muscarella and Vetsuypens (1990) utilize panel data covering periods during and after PE ownership, relying on reverse-LBOs, in their analysis of differences in managerial incentives between the PE-owned period and post-IPO. There are 72 firms in their sample. Neither of these prior studies utilize a comparison sample (to control for time effects), or regression analysis (to control for size effects and other covariates), as we do here.

We study 144 reverse-LBOs that took place between 1996 and 2005. We compare managerial incentives during the PE-ownership phase (the "before-period") with the publicly traded phase (the "after-period"). We also rely on a comparison sample of publicly traded firms, utilizing regressions to control for time-effects, firm-size effects (which turn out to be important), and other observable differences. Finally, we also include a sample of firms that were publicly traded and then acquired by a PE owner. For these firms, we observe only the pre-acquisition incentives (and other observables), but this is sufficient to provide a straightforward test of an important selection concern: do PE firms tend to acquire companies with already high managerial incentives? A priori, identification of a causal effect is more compelling in this anaylsis than in the prior research.

Specifically, we used CapitalIQ to generate lists of two types of firms that have time periods

[11] See Bharath and Dittmar (2006) and Mehran and Peristiani (2006).

when they are owned by a PE firm and other periods when they are publicly traded (and therefore must disclose financial and compensation data). First, we looked at all firms that, according to CapitalIQ, underwent a leveraged buyout (LBO) between 1996 and 2004, *and* completed an IPO after the LBO but before the end of 2005. It is important that we condition our sample on firms that underwent a buyout after 1996 so that we can be certain of including firms that are PE-owned.[12] We dropped firms that we determined to be venture capital-backed (rather than PE-backed). This is our *PE-owned* sample of companies. In the analysis below, we clarify when we use information about these firms during the private ownership phase and when we use information about these firms after they have gone public.

Of the 144 firms in the *PE-owned* sample, 62 are cases where a PE firm acquired a division of a larger (often public) company, 47 are buyouts from a private (non-PE) owner (often the founder and/or their family), 19 are public-to-private transactions, and 16 were sales from one PE firm to another. This distribution of sources is quite similar to that of PE investments more generally (see Strömberg, 2008.) Table 1 shows the number of LBOs and IPOs by year for the PE-owned companies in our dataset. Most LBOs are early in the sample period, which is to be expected given that the firm must go public by 2005. The IPOs build over the sample years, with a distinct drop during the weak stock market of 2001–2003. Our sample size is large compared to the earlier studies by Kaplan (1989a) and Muscarella and Vetsuypens (1990). More recently Guo, Hotchkiss, and Song (2008) study a sample of 192 LBOs from the period 1990 and 2006, which is more observations than our study, but covering a longer period of time.[13]

The second type of firm in our dataset, which we refer to as the *going-private* group, comprises firms that CapitalIQ lists as having a "going-private transaction" between the beginning of 1998 and October 2007, and for which there is some compensation data available in Standard and Poors' ExecuComp database. There are 89 firms in this group. The annual rate at which firms enter this group went up dramatically in 2004–2006 because of the wave of large PE-backed purchases. These larger firms were more likely to be included in ExecuComp. Table 1 shows the annual rate of going private for firms in this group.

The fact that we do not observe pre-acquisition incentives for our sample of PE-owned com-

[12]CapitalIQ does not record the ownership status of firms each period, forcing us to rely on (infrequent) transactions to infer ownership status.

[13]Other recent studies include Cressy et al (2007) with a sample of 122 LBOs, Desbrieres and Schatt (2002) sample of 161 LBOs, and Vinten (2007) with a sample of 73 LBOs.

panies raises the question that PE acquirers may target companies with already high managerial incentives, as noted above. Hence, a finding that PE-owned companies have high managerial incentives may be due to selection, rather than a causal effect due to changes that are implemented by the new owners. Our second group of firms—the going-private sample—allows us to control for selection because we see the characteristics of firms that are attractive to PE firms but are not yet owned by them.

We also generated a comparison sample that includes all firm-years in ExecuComp that are not in one of the other two samples. ExecuComp oversamples large firms (it includes the entire Standard and Poors' 500), so the comparison sample firms are larger, on average, than the two PE samples. We limit the comparison sample to a subset of smaller firms that more closely match those in the other samples for some of our analysis. The inclusion of a comparison sample allows us to control for year effects, as well as other firm-specific observables that may explain differences in managerial incentives. As we show in the next section, this feature of the analysis turns out to matter.

We had hoped to focus our analysis on a sample of firms that went from public to private and back to public during the time frame of our analysis. However, we were only able to identify five such companies, which we refer to as the *public-PE-public* group.[14] This sample is too small for formal analysis, but we use one company in this group (Petco) for illustrative purposes. There are so few firms in this group because, as Strömberg (2008) shows, only 6% of PE-owned companies were stand-alone public firms before a PE firm bought them, and only 13% of PE-owned firms leave PE-ownership through IPO. As a result, we focus on differences between firms in their private phase and those that are public as our estimate of differences between PE-owned firms and public firms. Then we look at differences between public firms and firms that are about to go private, to see if there are systematic differences between public firms and firms that have a PE-owned stage when both groups are publicly held.

Table 2 shows summary statistics for all four groups of firms in our dataset. As expected, the comparison sample is noticeably larger by most measures (assets, sales, and so forth) than any of the other groups. The difference is not as large in the medians, however, because PE

[14]A total of nineteen firms in our sample were public-to-private transactions that later had an IPO. However, only five of these could be used to construct a public-PE-public sample because most underwent dramatic changes during the PE stage so that they were not comparable during their two public stages.

firms make fewer investments in the largest corporations that drive up the average size of public firms. We gathered all compensation data directly from the IPO prospectuses. We determined who was the CEO at the time of the IPO and we gathered compensation information for that person and for other executives listed by CapitalIQ. We used proxy statements after the IPO to gather compensation data for our post-IPO analysis (see section 6). Our stock ownership data includes shares owned, exercisable options, and unexercisable options. We matched this hand-gathered compensation data to accounting and stock return data from Compustat and CRSP, respectively.

In the analysis below we examine the effect of PE ownership on three measures of managerial incentives. These measures are also included in Table 2. The first measure is *CEO Ownership*, which is the conventional metric studied by prior authors (such as Kaplan, 1989a). It is the most obvious gauge of incentives because it ties the wealth of the executive to the value of the firm. To compute the measure, we aggregate the number of shares that the CEO either owns outright or holds options to buy and divide by the number of shares outstanding. We treat options as if they are fully vested which overstates their incentive effect—each option creates somewhat less incentive and has less value than a share because the price may be below the strike price when the executive wants to exercise the option. We do so out of necessity because, for the PE-owned sample, we are limited by the detail of the compensation and ownership data in the IPO prospectus. We know how many options the CEO holds but we do not have details on the date of expiration, strike price, etc. Our approach is conservative because options make up a larger part of ownership for the comparison group than for the PE-owned group, leading us to overstate CEO ownership in public corporations relative to PE-owned firms.[15]

An alternative approach to measuring the magnitude of equity-based incentive is to compute the dollar value of the equity owned by the CEO. However, the value of the equity during the PE ownership phase is unknown.[16] It is also worth noting that the incentive effect of executive ownership may also depend on leverage due to the well-known stockholder-bondholder conflict. Simply put, in a highly leveraged firm the equity holders obtain the benefits from upside risk, while debt holders bear the downside risk. Hence, holding the fraction of equity owned by the

[15]Kaplan (1989a) and Muscarella and Vetsuypens (1990) do not include options in their analysis of CEO equity ownership in LBOs. Options were less common in compensation packages in the 1980s than in recent times, so this was a less important issue for their samples.

[16]Our approach is consistent with Kaplan (1989a) and Muscarella and Vetsuypens (1990) who also use the fraction of equity as the measure of managerial incentives.

CEO fixed, as the debt-equity ratio increases the CEO may be more likely to implement risky investments, even at the expense of lowering the expected value of the company. In response, debtholders have implemented covenants in their contracts with PE firms that mitigate these effects (see Lehn and Poulsen, 1991). Of course these contracts are confidential and we have no information on them. It is difficult to assess how big an issue the stockholder-bondholder conflict is for the purpose of our analysis. Regardless, the motivation for this study stems from the agency conflict between managers and equity owners.

Salary is the second measure of managerial incentives. We expect firms that want to provide stronger incentives would pay lower salaries to their CEO for at least two reasons. First, when expected payouts from incentives are high, then (assuming the risk premium is not too great) the firm will want to lower base pay so as to keep compensation costs down. Second, lower salaries increase incentives of risk-averse workers by increasing the likelihood of low pay (where marginal utility with respect to income is particularly high).

The third measure is *Non-Salary Cash Pay*, defined as cash pay that is not the CEO's base salary divided by total cash compensation (i.e. CEO's variable pay share). Firms that provide higher incentives will utilize more bonuses, because bonuses are a contingent payoff. In Table 2 we show summary statistics for these three measures of managerial incentives, for each sample of firms in our dataset.

4 Managerial Incentives in PE-Owned Businesses

As noted in the introduction, one view of PE firms is that they create value in the businesses they acquire as a result of improved management. Some of the improvement may stem from management turnover, but the literature tends to emphasize the role of reduced agency costs. That is, PE mitigates the principal-agent problem between managers and owners via a combination of higher debt levels, enhanced monitoring, and increased incentives.

To illustrate the changes in managerial incentives that take place when a PE firm acquires a public company, consider the example of Petco and the equity ownership of CEO Brian Devine, as depicted in Figure 1. This example is one of the few firms in the public-PE-public group

discussed above. Between 1995 and 1999, during the initial public phase, Devine owned about 2% of the equity. After Petco was taken private in 2000, Devine's ownership share sharply increased to about 10%. Petco undertook an IPO in 2002 and Devine's share was immediately reduced to about 7%, and then continued to fall after that. Devine stepped down as CEO in 2004 but continued as Petco's Chairman. By 2006, he owned about 4% of Petco. PE ownership is associated with higher top management ownership in the case of Petco. We will show below that this example is representative of PE-owned firms.

To examine these effects more generally, we estimate the following specification:

$$Y_{it} = \alpha + X'_{it}\beta + \theta_1 PrivateEquity_{it} + \theta_2 GoingPrivate_{it} + \epsilon_{it} \quad (1)$$

in which Y_{it} is one of the three measures for managerial incentives (discussed in Section 3) at firm i in year t, and X is a vector of control variables that includes observed firm characteristics (assets, sales, market capitalization, employees, cash/assets), 2-digit SIC dummies, and year dummies. There are two key variables of interest. First, $PrivateEquity_{it}$ is a dummy equal to one for companies that are owned by a PE firm. We only include these firms in the last year before they go public (that is, while they are still owned by PE firms). Second, $GoingPrivate_{it}$ is a dummy equal to one for public companies in their last year before being acquired by a PE firm. Lastly, α, β, θ_1 and θ_2 are coefficients to be estimated, and ϵ is an error term that contains unobserved factors which also affect incentives.

In principle, the panel structure of the data allows for firm fixed effects to be included, but in that case θ_1 would be identified by within-firm differences in managerial incentives before and after their IPO.[17] On the one hand, this source of identification is based on a comparison of compensation under PE ownership versus public ownership.[18] On the other hand, it is conceivable the changes implemented by PE firms will be long-lasting, or last for at least several years after the IPO. Supposing PE firms do in fact increase managerial incentives following the LBO, and supposing these higher incentives are long-lasting following the subsequent IPO exit of the PE owners, then the inclusion of firm fixed effects in equation (1) will lead us to incorrectly infer that PE firms do not increase managerial incentives. Hence, we do not include firm fixed effects in the analysis in this section. In any event, how long-lasting are the changes in incentives implemented by PE firms is a separate and interesting question, which we examine in Section 6.

[17] Firm fixed effects are of no use for the $GoingPrivate_{it}$ sample because we only observe these firms when they are public.

[18] Indeed, this is the variation exploited by Muscarella and Vetsuypens (1990).

In the absence of firm fixed effects, θ_1 is identified by cross-sectional variation. This is why it is essential to include firm characteristics that may explain variation in managerial incentives and are correlated with PE ownership. It is therefore important to control for factors favoring PE acquisition: cash reserves, industry factors (such as availability of profitable investments), and macroeconomic factors (such as interest rates).[19] The above specification includes controls for cash, industry dummies, and time dummies, which control for these three factors, respectively. Hence, θ_1 is identified from within-industry and within-year variation.

Furthermore, the inclusion of $GoingPrivate_{it}$ in equation (1) provides us with a diagnostic for whether the estimate of θ_1 is picking up a causal effect of PE, or if θ_1 is due to selection—PE firms choosing to acquire public companies with already high managerial incentives. Specifically, if $\theta_1 = \theta_2$ then public companies that are acquired by PE firms tend to have the same level of incentives, in the year before going private, as do PE-owned firms (prior to IPO). And if $\theta_2 = 0$ then public companies that are acquired by PE firms tend to have the same level of incentives, in the year before going private, as do public firms that do not go private.

Another concern is that the choice of which PE-owned firms undergo an IPO may induce a bias due to endogeneity. One story may be that IPOs are more likely in certain periods (e.g. IPO waves, hot markets or other time-related factors). However, these kinds of year effects do not bias our analysis because the inclusion of year dummies flexibly controls for these factors. Of more concern is the possibility that PE firms are more likely to undertake an IPO for high performing firms in their portfolio than the under-performers. It is also conceivable that high performers tend to have relatively higher managerial incentives. Hence, a finding that PE ownership is associated with higher managerial incentives and performance improvements may be driven by this kind of selection bias rather than a causal effect. However, we actually find that managerial incentives and firm performance are not significantly correlated in our sample of PE-owned firms, leading us to be less concerned about this source of potential bias.

The estimates for variations on the above specification are reported in Tables 3, 4 and 5. Each of these tables corresponds to one of the three measures of managerial incentives that were explained in the prior section. For all specifications in these three tables, an observation is an executive-year combination. Also, every specification in these tables includes year dummies.

[19] See Jensen (1989).

4.1 Fraction of Ownership by the CEO

The dependent variable in Table 3 is the *Fraction of Stock Owned by the CEO*, which we described in Section 3. Controlling only for year effects, in column (1) we report that the CEO in a PE-owned business tends to have 3.8 percentage points more equity than the CEO in public companies. Adding industry dummies in column (2) reduces this difference by a small amount, to 3.2 percentage points. Including controls for observed firm characteristics in column (3) further reduces the difference—with the full set of controls and industry dummies, we estimate the CEO in a PE-owned business has 2.3 percentage points more equity (on average) than his/her counterpart in public companies.[20]

Recall from Table 2 that the mean level of CEO ownership in the comparison sample of public corporations is 3.6%. Hence, the estimate of 2.3 percentage points more ownership associated with PE represents a dramatically higher level of managerial incentives—64% higher. As a reality check on the data, note that the coefficient on *Log(Assets)* in column (3) is negative and significant, picking up the expected size effect (managers tend to have a smaller fraction of ownership in larger firms). In an unreported regression we re-estimated the specification shown in column (3), dropping all firm/years (from each group) where the firm employs more people than the 75th-percentile of PE-owned firm employment. The results are basically unchanged, which indicates that the findings are robust to the exclusion of large firms.

In column (4) we report the estimates from a median regression of the same specification in column (3). This addresses a concern over outliers and allows us to compare results with Kaplan (1989a), who focuses on medians. In this case, we find the predicted median equity ownership is 2.5 percentage points higher for CEOs of PE-owned businesses than their public company counterparts. Hence, while there is skewness in the distribution of equity ownership, the tendency for (economically and statistically) higher levels of equity ownerhip in PE companies is not driven by outliers.

Though we believe the *going-private* group is a valid comparison group to correct for the endogeneity of private equity ownership, we did a robustness check on this assumption by redoing the analysis in Table 3 (using the specification in column 3) with propensity score matching.

[20] The estimate is significantly different from zero with 99% confidence.

That is, we estimated the *PrivateEquity* "average treatment effect," using nearest neighbor propensity score matching so that the estimate of this coefficient would be more closely based on comparisons with observations in the control sample that are most similar to those in the PE-owned group. See Dehejia and Waba (2002) for details on this application of the original idea in Rosenbaum and Rubin (1983). This resulted in a highly significant estimated *PrivateEquity* effect of 0.028, which is similar to our regression results, providing additional support for our identification strategy.[21]

These matching results, as well as the results in the first four columns of Table 3, are based on the fraction of stock owned by the CEO. However, as noted in Section 2, equity programs implemented by PE firms are likely to include many managers. Column (5) of Table 3 expands the sample to include the three highest-paid managers, as a basic indication of whether equity ownership is in fact higher among managers outside of the CEO. [22] In this case, the estimated coefficient on the PE dummy is 1.7%, down from the comparable estimate for the CEO of 2.3%. Hence, not only does the CEO in PE-owned firms tend to have higher equity than the CEO in comparable public companies, but this is also true of the top three managers (as a group).

As detailed above, the coefficient on $GoingPrivate$ (θ_2) indicates whether PE firms choose targets that already have relatively strong incentives. In the results of the full specification presented in column (3) of Table 3, we report that $\hat{\theta}_2$ is insignificantly different from zero. This indicates that public companies that are acquired by PE firms tend to have the same level of incentives, in the year before going private, as do public firms that do not go private. We also find that $\hat{\theta}_2$ is significantly different from $\hat{\theta}_1$ with 79% confidence in column (3), and with over 97% confidence in all the other specifications in Table 3. This indicates the public companies that are acquired by PE firms tend to have a significantly lower level of incentives in the year before going private than their PE-owned counterparts, providing support for our identification strategy.

To examine the differences between the distribution of management ownership in PE and public companies in more detail, Figures 2 and 3 show kernel density estimates of distributions of executive ownership. Figure 2 shows the empirical distributions for each type of firm without

[21] We did similar propensity score matching analyses for the other incentive measures in the next two sections and, again, the results mirrored those in the regressions we present.

[22] We have information for up to five executives per firm. CapitalIQ often lists fewer, which would leave a very small sample of fourth and fifth highest paid managers.

conditioning on any other variables. Figure 3 shows the distributions of executive ownership for each type of company, conditional on the full set of controls. Specifically, Figure 3 graphs the distributions of the residuals from a regression identical to the one in column 3 of Table 3, except that the regression excludes *PrivateEquity* and *GoingPrivate* from the set of explanatory variables. Comparing the distributions in both figures leads to the same qualitative conclusion: compared to public companies, the distribution of equity owned by the CEO in PE-owned businesses has greater variance, and puts more weight on high levels of ownership. In more quantitative terms, in Figure 3 (with controls) the interquartile range of equity ownership is 8.3% for PE-owned firms, and 3.7% for public corporations. Also, in Figure 3, the 75th-percentile is 4.1 percentage points higher for PE-owned firms than public firms.

Our estimates may understate the differences between PE-owned firms and other firms because we treat shares and options the same in our analysis (as discussed in Section 3). When we exclude options and look at only shares, the results are very similar (the estimated effect of PE-ownership is even slightly larger). Overall, the regression results in Table 3, as well as Figures 2 and 3, make it clear that top executive ownership is significantly larger (both statistically and economically) in PE-owned firms than at typical publicly held corporations.

4.2 Salary of CEO

We now examine a second measure of managerial incentives — salary. We again estimate versions of equation (1), but now with the dependent variable: *Log(Salary of CEO)*. Table 4 contains the results. The number of observations is reduced by 168 from the above analysis, because of observations with zero salary (dependent variable is in logs).

The estimates in columns (1) and (2) imply that salaries are 34-36% lower at PE-owned companies than public corporations, conditional only on year and industry dummies. Much of this difference is simply because the PE-owned firms are smaller, however. The results for the complete set of controls are given in column (3): we estimate that, on average, the salary of the CEO at PE-owned companies is 9.6% lower than for similar public companies (based on the estimated coefficient of -.10). As with equity ownership, this finding is robust to the exclusion of large firms (unreported estimates).

Median regression shows a slightly magnified estimate (column 4) for θ_1. Interestingly, the inclusion of the top-three managers exacerbates the difference in salaries between PE-owned and public companies: from 9.6% (column 3) to 16.3% (column 5). Hence, the salary gap between senior managers (other than the CEO) at PE-owned firms compared to public companies is even larger than it is for the CEO.

The estimated coefficient on the *GoingPrivate* dummy is insignificantly different from zero in all specifications in Table 4. Moreover, the estimated coefficient on *PrivateEquity* is significantly different from the estimated coefficient on *GoingPrivate* with over 99% confidence in all specifications. This provides further verification that the differences in incentives we are finding at PE firms compared to public firms is a causal effect, rather than a selection effect.

4.3 Variable Pay Share of CEO's Cash Compensation

The third measure of managerial incentives we examine is the *Variable Pay Share of Cash Compensation*, defined as: (total cash compensation – salary) / (total cash compensation). Cash compensation primarily includes salary and bonuses. Hence, the measure is essentially bonuses. Firms that provide higher incentives will utilize more bonuses, because bonuses are a contingent payoff. We again estimate versions of equation (1), but now with the dependent variable: *Variable Pay Share of Cash Compensation*. Table 5 contains the results. The number of observations is reduced by 142 from the analysis of equity ownership because of executive-year combinations with zero total cash compensation.

As shown in Table 5, the difference in variable pay share between PE firms and public companies is significant (with 95% confidence) in all columns. In the full specification reported in column (3), we find that PE-owned businesses tend to provide 12.7% higher variable pay shares than public companies. Recall from the discussion of anecdotal evidence in Section 2 that our interviewees did not have a strong sense of whether bonuses would be higher at PE-owned companies.

The estimate for θ_1 based on median regression in column (4) is an attentuation of the estimate from the mean regression of the same specification. When we include the top-three managers (column 5) there is a small reduction in the estimated coefficient on *PrivateEquity*

compared to column (3). The estimated coefficient on the *GoingPrivate* dummy is insignificantly different from zero in all specifications in Table 5, and the coefficients on *PrivateEquity* and *GoingPrivate* are significantly different from each other with 90%, 75%, 99%, 98% and 99% confidence in columns (1) to (5), respectively. This again verifies the absence of a selection effect.

4.4 Heterogeneous Effects

The above analysis focuses on mean differences in managerial incentives between PE-owned and public companies. However, these differences may also depend on other interesting factors. For instance, there is reason to expect that the differences between public corporations and PE-owned businesses have decreased over time, as public companies learn to mimic the practices of PE firms. Or as Holmstrom and Kaplan (2001) argue, public firms have been catching up with PE practices during the 1990s, due to: (i) innovation in information and communications technology which made capital markets more efficient (i.e., enhanced disciplining); and (ii) deregulation which increased the rewards to restructuring. We therefore ask whether the gap in managerial incentives between PE companies and public companies has been shrinking over time?

To examine this possibility, we generalize the specification in equation (1) to allow θ_1 and θ_2 to have different values in the years 1996–2001 and 2002–2005. In Table 6 we report the results for two different measures of managerial incentives: fraction of equity owned by the CEO, and salary of the CEO (the first two measures examined above). In each case we report the estimates for the coefficient on *PrivateEquity* interacted with a group dummy. In column (1) it is apparent that the difference between PE and public companies in terms of equity ownership has decreased over time, consistent with the prediction of Holmstrom and Kaplan (2001).[23] The estimate for the post-2001 group is significantly different from zero, indicating sustained differences in managerial incentives between PE-owned firms and public corporations. Column (2) shows that the difference in average salaries has increased over time, contrary to expectations. Hence, the evidence is mixed as to whether there is convergence over time in managerial incentives between public and PE-owned companies.

[23]The estimates reported in column (1) are statistically different with 91% confidence.

A second form of heterogeneity we explore is size effects: is the gap in managerial incentives between PE companies and public companies different for big versus small companies? This is of interest because agency costs are likely to be higher in larger companies (e.g., harder to monitor) and incentives may create more risk for a CEO in a larger company. Also, there is a trend towards bigger PE acquisitions. In columns (3) and (4) of Table 6 we report estimates for the equity ownership and salary measures, for the largest 25% of PE-owned firms, and the smallest 25% of PE-owned firms. The measure of size is based on the number of employees (of the PE-owned company). We find that the difference between PE-owned firms and public corporations, with respect to equity ownership of CEOs, is bigger in the smallest 25% of firms than in the largest 25%. The difference is statistically different with only 88% confidence, however. We also find that the difference in salaries between PE-owned and public companies is greater in the top 25% than in the bottom 25% (but the difference is not statistically significant). These point estimates suggest that large public companies tend to provide more similar managerial incentives to their PE counterparts than do small public companies.

A third form of heterogeneity relates to differences across PE firms, which may differ in the degree to which they emphasize managerial incentives versus other mechanisms such as replacing management, enhanced oversight, and the importance of debt.[24] In other words, how homogeneous are the practices of PE firms, and how substitutable are they? As a basic test of such differences, we ask whether top-tier PE firms tend to implement different managerial incentives than other PE firms? To identify the top-tier PE firms, we adopt the "power list" in the March 5, 2007, issue of *Fortune*: Blackstone, KKR, Carlyle, TPG, Bain Capital, Providence Equity Partners, Apollo Advisors, Warburg Pincus, Cerberus, and Thomas H. Lee. In column (5) of Table 6 we report that in the case of top-10 PE firms, the equity ownership of the CEO is no different, on average, from their public counterparts. In contrast, for non-top-10 PE firms, CEO ownership in PE-owned companies tends to be significantly greater than in their public counterparts. In column (6) we find no difference in CEO salaries between these two groups of PE firms. This is far from conclusive, but it suggests there may be important differences across PE firms in their approach to modifying managerial incentives in the companies they acquire.

Lastly, a fourth form of heterogeneity concerns managerial turnover: do incentives in PE-owned businesses tend to differ for CEOs that join the firm following the buyout (i.e., there is

[24]See Cressy, Munari and Malipiero (2007) for a related analysis of differences in PE performance based on the degree of specialization.

CEO turnover) compared to CEOs that are present before and after the buyout? It is conceivable that management turnover is an important driver of value creation (see Kaplan, Klebanov and Sorensen, 2007), and may be a substitute for increased managerial incentives. In columns (7) and (8) of Table 6 we distinguish firms where the CEO joined before the LBO with firms where the CEO joined after. We find significantly higher equity-based incentives for those CEOs that were present before the buyout, consistent with the view that management turnover and increased incentives may be substitute drivers of value creation.[25] The estimates for salary differences suggest a different story, however. In column (8) we report that salaries for new CEOs tend to be significantly lower than salaries for old CEOs (relative to their public counterparts), suggesting weaker incentives for CEOs that were present before the buyout. The fact that incentives and salary are positively related to CEO tenure could be due to executives becoming more valuable with experience or tenure, to the fact that pre-PE CEOs may have been founders, or it could indicate that the PE firms had to make more attractive offers to CEOs in place at the time of the transaction in order to get them to help get the deal approved by employees and other stakeholders.

4.5 Summary

To summarize the key results in this section, we find that, relative to public corporations, on average, PE-owned firms: (i) provide the CEO with 2.3 percentage points more equity (that is, nearly twice as much); (ii) 9.6% lower salary; and (iii) 12.7% higher variable pay share. These estimates are all based on a specification in which we control for year dummies, industry dummies, and various observed firm characteristics. Our analysis also indicates these estimates are not driven by selection effects and can plausibly be interpreted as the causal impact of PE ownership.

How do these results compare to prior research? In Table 7 we summarize the findings from the two prior papers that also study CEO equity ownership in public versus private (via LBO) businesses—Kaplan (1989a) and Muscarella and Vetsuypens (1990). We also include the results from our analysis in the table. As noted above, both prior studies examine pre-1990 buyouts. It is also important to note that both papers focus on within-firm variation and make no attempt to

[25]The difference between the two groups is statistically significant with 98% confidence.

compare managerial incentives to a set of comparable public firms, or whether PE firms choose to acquire companies with unusually low managerial incentives in the first place.[26]

Generally we find lower levels of CEO equity ownership than the prior papers, though the difference between our findings and Kaplan (1989a) are fairly small with respect to the medians. The proportional difference between public and private is more similar across studies. In terms of means, Kaplan finds a 107% increase, Muscarella and Vetsuypens find a 39% increase, and we find a 64% increase. In terms of medians, Kaplan finds a 357% increase, Muscarella and Vetsuypens find a 42% increase, and we find a 147% increase.[27]

5 Operational Differences Between PE-Owned Businesses and Public Corporations

Having shown that PE firms significantly (statistically and economically) increase managerial incentives relative to public companies, based on U.S. data for the period 1996 to 2004, the question naturally arises as to whether there are corresponding improvements in operational performance? This question has actually received much more attention in the literature than the changes in managerial incentives by PE firms. Indeed, there are numerous papers, with a wide range of results, looking for evidence of value creation by PE firms. In Table 8 we present a summary of this literature. Conclusions depend on what measure, time period, and geographic location of the sample is used and how the sample is constructed (type of acquisition and type of exit). In this section we also examine this kind of evidence for our sample.

Although not a measure of performance, as a reality check on the data, we first analyze the changes in the importance of debt. We analyze the debt-assets ratio instead of the more conventional debt-equity ratio, because negative equity is not uncommon in the data. Again, using Petco as an example, Figure 4 shows that PE ownership is associated with a dramatic increase in debt. Petco's debt returned to its pre-PE level slowly over a few years after it went

[26] Muscarella and Vetsuypens' (1990) findings are based on a comparison of incentives before and after an IPO, which confounds the issue of the longevity of higher incentives introduced by PE firms (as discussed in Section 3).

[27] Another interesting comparison is with CEO ownership in private firms more generally (not just firms that have undergone an LBO). Cole and Mehran (2008) find that CEO's typically own in excess of 75% of the equity in private corporations in 2003. These firms tend to be significantly smaller than those that underwent an LBO.

public again. We will again show that Petco is reasonably typical of other PE-owned firms.

To examine changes in debt for the broader sample, we regress the debt-assets ratio on the same controls as column (4) in Tables 3 to 5. There are conspicuous outliers in the distribution of debt-asset ratios, so we trim the top and bottom 1 percent of observations (there is no impact on the qualitative findings). The results are provided in column (1) of Table 9. As expected, we find that PE ownership causes an average increase of 51.3% in the debt-assets ratio. We also find that the debt-assets ratio in going-private companies is insignificantly different (at the 1% significance level) from the public company control sample, indicating that this effect is not driven by selection.

We now turn to measures of profitability and operational efficiency. First, Figure 5 shows the EBITDA to assets ratio at Petco over its different forms of ownership. The graph indicates that there is an underlying time trend of improving performance that existed before the PE ownership phase and was also present after. Hence, on the face of it, the figure does not provide compelling evidence that the PE owners caused an increase in profitability (by this measure). The example highlights the importance of controlling for time effects.

Using the same regression framework and controls we used for the debt-assets ratio and the incentive measures, we examine the following performance measures: *EBITDA / (Total Assets)*, *Sales Per Employee*, and *Employees / (Total Assets)*. The results for each of these dependent variables are reported in columns 2 to 4 of Table 9. We find that the estimated effect of PE ownership on *EBITDA / (Total Assets)* is marginally statistically significant (90% confidence level), and the effect on *Sales Per Employee* is positive and significant (95% confidence level). In both cases there is also no significant difference between the going-private firms and the public controls. The estimated effect on *Employees / (Total Assets)* is insignificant. We also looked at the correlation between the level of incentives and the above performance measures, finding no strong relationships.

One reasonable interpretation is that our findings provide mild support for the hypothesis that PE ownership causes operational improvements. The point estimates in columns 2 and 3 are quite substantial. For example, *EBITDA / (Total Assets)* at PE-owned firms is predicted to be one-seventh higher than for comparable public firms. However, the standard errors are quite large and we cannot rule out much larger or negligible effects. More problematically

(and unlike the incentive and leverage measures), our results are quite sensitive to specification choices such as whether to trim outliers, which controls to include, and whether we use OLS or median regression. Given the variety of results and interpretations we can generate for the relationship between private equity ownership and operating success, it is perhaps not surprising that the conclusions of the papers listed in Table 8 are so inconsistent.[28] Standard accounting data (especially given the extreme leverage, write-offs, and other unusual accounting details associated with private equity) and the fairly small samples available make it difficult to come to definitive conclusions. Overall, we believe our results are consistent with the possibility that PE firms improve operational efficiency at their portfolio companies. However, like this literature as whole, we think drawing any strong conclusions is inappropriate.

6 Longevity of Increased Incentives after IPO

One of the virtues of our dataset is that we focus on PE-owned companies that undergo an IPO, which allows us to examine changes after the firm transitions from private to public. So we now analyze the longevity of the higher degree of managerial incentives once these companies go public. There are at least a couple of reasons why this is interesting. If the degree of managerial incentives rapidly falls following an IPO (or reverse buyout), this may suggest PE firms do not implement long-lasting organizational changes in general. Also, PE firms have been criticized by some commentators for "quick flips": buying companies and selling them shortly after (in one year, say) for a large profit. The suggestion is that one year is too short a time to implement real or permanent improvements in an organization, so the profit must stem from either underpaying for the company or overselling it to the new owners. However, if managers continue to maintain high equity stakes in their company after the IPO, then this suggests the IPO valuation may not be artificially high, because the managers also have significant wealth at stake.

To examine the longevity of managerial incentives following reverse buyouts, we generalize

[28] A few recent studies have used datasets that are not based on financial disclosures to compare large samples of PE-backed firms to comparable firms. For example, Davis, et al (2008) use Census data to show how PE ownership affects job creation and job destruction, and Lerner, Sørensen, and Strömberg (2008) use patent data to study the connection between PE ownership and innovation. These larger datasets allow for more precise estimates than can generally be done using accounting data. These analyses are very useful for showing how PE-backed firms operate, but they cannot directly show whether these firms are more or less efficiently operated than other firms.

equation (1) in the following way:

$$Y_{it} = \alpha + X'_{it}\beta + \sum_{j=-1}^{4} \theta_j PrivateEquity_{it} + \sum_{k=-5}^{-1} \theta_k GoingPrivate_{it} + \epsilon_{it}. \quad (2)$$

Instead of including only the first available observation for PE-owned firms that go public, we now include annual observations for the year before the IPO and each subsequent year up to four years after the IPO. The θ_j's capture how managerial incentives (or other dependent variables) evolve at these firms from just before the IPO until four years after. Similarly, instead of including only the last public year for the going-private sample, we now include all available years and the θ_k's track how incentives evolve in the years leading up to the purchase by a PE firm.

Rather than present regression coefficients, we graph the θ's and corresponding 95% confidence intervals. Figure 6 shows the θ's from a regression that estimates equation 2 with fraction ownership of the highest-paid executive as the dependent variable and all the control variables used in column 4 of Table 3.[29] The graph shows that the θ_k's are generally small for all years leading up to firms going private and there is no obvious trend before PE investments. The evolution of the PE-owned sample (and the θ_j's), however, shows that executive ownership drops quickly and substantially right after the IPO. Managerial ownership is very high before the IPO and at the time of the IPO, but quickly drops to levels similar to public firms. This suggests that whatever incentives PE firms put in place for managers of their companies last only as long as the PE ownership lasts. The firms do not appear to put in place different incentive systems that outlive the PE investment.

It would be interesting to distinguish between dilution of equity as a result of an IPO for the mechanical reason that there is an increase in total shares, and any reduction in CEO equity ownership due to disinvestment decisions by the CEO. This is difficult to implement in practice because, as they go public, most firms change the units of their equity in a way that makes a share before the IPO hard to compare to one after the IPO. However, having combed through the prospectuses of all the firms in our sample, it is clear to us that dilution is the primary driver in the decrease in CEO ownership (at least in the first year after the IPO). While there is a minority of CEOs that sell a substantial portion of their shares within a year after the IPO, the large majority do not.

[29] In this section, we use the executive in each firm-year with the highest salary because we do not always know who the CEO is at firms in the *PrivateEquity* sample for each year after the IPO.

Figure 7 presents similar time trends for the salary of the highest-paid executive. Again, the θ_k's are small, insignificant, and do not exhibit a trend leading up to the PE investment. The PE-owned firms again revert to compensation systems that are equivalent to those of public companies, though salary takes longer (three to four years) to reach public company levels than stock ownership does. Again, it appears that any incentive changes made by PE investors are only in place during the PE phase.

To the best of our knowledge, no prior study has examined the longevity of managerial incentives following reverse buyouts. However, several prior studies have also examined the longevity of firm performance after reverse buyouts. Most recently Cao and Lerner (2007) find that reverse buyouts tend to outperform (measured by ROA) IPOs for up to five years, and this is robust throughout the period 1980 to 2002.[30]

In Figure 8 we confirm that the capital structure effects of private equity (i.e., more debt relative to public firms) is also limited to the PE phase. Debt-asset ratios are much higher immediately before and around the time of the IPO but revert to typical public company levels within a year or two. Finally, Figures 9 and 10 look at trends in EBITDA and sales per employee. The individual year θ_j's and θ_k's are measured with considerable error, so we do not want to read too much into these graphs. But, taking the θ_k coefficients at face value, it appears that PE firms buy companies that are trending down in terms of sales/employee. Also, to the extent that firms emerge from PE ownership with high sales/employee, that effect appears to dissipate over a few years.

Overall, the graphs and the corresponding regressions in this section suggest that, while there are some important differences between PE-owned firms and comparable public companies, these differences are limited to the period in companies' lives when they are owned by PE firms. We do not find evidence that these firms put in place incentive systems or operational efficiency that outlives their ownership.

[30] See also the references cited in Cao and Lerner (2007).

7 Conclusion

As Murphy (1999) remarks in the first sentence of his article: "Few issues in the history of the modern corporation have attracted the attention garnered by executive compensation in United States companies." But nearly all of that research concerns public companies, and there is good reason to believe managerial incentives are quite different in private firms—increased managerial incentives are often cited as one of the key drivers of value creation in companies taken private (PE buyouts). A number of questions immediately arise. Do PE firms in fact increase managerial incentives? If so, by how much? How deep do increased incentives tend to go in such companies? Are there other differences with public companies in terms of how incentives are structured? Why don't public companies provide similar incentives? Are public companies moving in this direction? How important is increasing managerial incentives as a driver of value creation in PE-owned companies? When the PE owner exits (by IPO, say) are the higher incentives enduring? These are core questions for understanding the mechanisms by which PE firms create value and generate returns for their investors. Furthermore, these questions are just as relevant to understanding the causes and consequences of executive compensation in public corporations.

All of the prior research into managerial incentives in PE-owned firms examine pre-1990 buyouts. As explained in the introduction, it is timely to revisit these issues using recent data. Using data from 144 companies that were owned by PE investors and subsequently went public during the period 1996 to 2005, we study differences in incentives, capital structure, and operational performance between PE-owned companies and comparable public corporations. An additional virtue of studying more recent buyouts is that we are able to examine many more buyouts than the prior papers.

We find that top managers of PE-owned firms have substantially higher-powered compensation contracts than their counterparts at public companies: executives at PE-owned firms own more equity, have lower salaries, and get more of their annual cash compensation in variable pay than managers at public firms. Executives at firms that are public but about to get bought by PE firms exhibit no such differences relative to other public firms, suggesting that PE firms implement these incentive contracts, rather than selecting firms that already use high-powered incentives. Our analysis of firm performance suggests that PE-ownership may also improve profitability, although our estimates are only mildly statistically significant.

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Table 1. Timing of Ownership Transitions

	Private Equity		Going Private
	Acquisition	IPO	Acquisition
1996	25	9	
1997	20	13	2
1998	21	10	9
1999	28	17	5
2000	9	15	5
2001	10	12	2
2002	13	6	2
2003	10	29	4
2004	8	33	14
2005			30
2006			16
Total	144	144	89

"Private Equity" sample includes firms where CapitalIQ indicates a major investment by a private equity firm ("acquisition") between 1996 and 2004, *and* subsequently completed IPO after the LBO but before 2005. "Going Private" firms are companies that CapitalIQ indicates had a "going-private" transaction betwen 1998 and October 2007, and for which there is compensation data in the ExecuComp database.

Table 2. Summary Statistics

	Private Equity	Going Private	Comparison Sample
Firms	144	89	2555
Firm/Years	662	711	19,768
Assets	$831	$3,728	$15,676
	[334]	[1,091]	[1,818]
	(1,523)	(6,587)	(79,612)
Sales	$669	$2,455	$5,561
	[272]	[1,053]	[1,323]
	(1,325)	(3,561)	(16,263)
Market Capitalization	$874	$3,107	$8,020
	[562]	[902]	[1,826]
	(1,065)	(5,100)	(24,527)
Employees	3,640	18,747	19,606
	[1,602]	[7,100]	[5,000]
	(6,562)	(36,574)	(60,662)
Cash/Assets	6.9%	10.9%	16.1%
	[3.4%]	[6.2%]	[9.0%]
	(10.2%)	(13.0%)	(17.5%)
CEO Ownership	7.80%	5.89%	3.57%
	[5.53%]	[2.92%]	[1.73%]
	(8.40%)	(7.76%)	(6.02%)
Salary	$405K	$643K	$715K
	[$376K]	[$638K]	[$656K]
	($190K)	($335K)	($375K)
Non-Salary Cash Pay	42.3%	35.7%	43.9%
	[46.2%]	[42.0%]	[49.5%]
	(23.2%)	(27.3%)	(24.5%)

See notes to Table 1 for description of sample in each column. "Private Equity" firm characteristics are for year after IPO. "Going Private" firm characteristics are for last full year as a public company. "Comparison Sample" firm characteristics are for 2004. Firm characteristic information is in $millions. Pay information is for all available executive-years. "CEO Ownership" is the fraction of the firm's equity owned by the CEO. "Non-Salary Cash Pay" is the fraction of a CEO's cash compensation that is not salary: (total cash compensation - salary)/(total cash compensation). Sample medians are in brackets and standard deviations are in parentheses.

Table 3. Effect of private equity on fraction of stock owned by the CEO

	(1)	(2)	(3)	(4)	(5)
PrivateEquity	0.0379	0.0325	0.0232	0.0263	0.0169
	(0.0056)	(0.0054)	(0.0053)	(0.0052)	(0.0025)
GoingPrivate	0.0237	0.0128	0.0125	0.0006	0.0033
	(0.0071)	(0.0068)	(0.0067)	(0.0006)	(0.0027)
Log(Assets)			-0.0097	-0.0038	-0.0044
			(0.0008)	(0.0002)	(0.0003)
Cash/Assets			0.0293	0.0058	0.0030
			(0.0033)	(0.0009)	(0.0013)
Log(Sales)			-0.0031	-0.0004	-0.0015
			(0.0010)	(0.0003)	(0.0004)
Log(Employees)			0.0047	-0.0009	0.0011
			(0.0007)	(0.0002)	(0.0003)
2-digit SIC dummies	no	yes	yes	yes	yes
Sample	CEOs	CEOs	CEOs	CEOs	Top-3
Regression Type	Mean	Mean	Mean	Median	Mean
R^2	0.0075	0.0850	0.1318	0.0987	0.1407
Observations	18,732	18,732	18,732	18,732	59,639

Each regression includes dummies for the years 1995 through 2006. *PrivateEquity* is a dummy equal to one for companies that are owned by a PE firm. *GoingPrivate* is a dummy equal to one for public companies in their last year before being acquired by a PE firm. Firms in these two groups only appear in the sample for this analysis once. The comparison group (which is the omitted category in the regression) is made up of all CEO-years in ExecuComp from 1995 through 2006 that are not in the *PrivateEquity* or *GoingPrivate* groups. The estimated coefficients on *PrivateEquity* and *GoingPrivate* are significantly different from each other with 97%, 99%, 88%, 99% and 99% confidence in columns (1) to (5), respectively.

Table 4. Effect of private equity on *log(salary of CEO)*

	(1)	(2)	(3)	(4)	(5)
PrivateEquity	-0.4417	-0.4107	-0.1007	-0.1240	-0.1775
	(0.0448)	(0.0427)	(0.0327)	(0.0265)	(0.0181)
GoingPrivate	-0.0177	0.0049	0.0311	-0.0038	0.0160
	(0.0578)	(0.0548)	(0.0418)	(0.0337)	(0.0190)
Log(Assets)			0.0979	0.1008	0.1105
			(0.0057)	(0.0041)	(0.0023)
Cash/Assets			-0.0585	0.0124	0.0942
			(0.0205)	(0.0167)	(0.0089)
Log(Sales)			0.0936	0.1077	0.0841
			(0.0063)	(0.0051)	(0.0028)
Log(Employees)			0.0385	0.0294	0.0333
			(0.0046)	(0.0037)	(0.0020)
2-digit SIC dummies	no	yes	yes	yes	yes
Sample	CEOs	CEOs	CEOs	CEOs	Top-3
Regression Type	Mean	Mean	Mean	Median	Mean
R^2	0.0541	0.1607	0.5124	0.4160	0.6946
Observations	18,564	18,564	18,564	18,564	59,601

Each regression includes dummies for the years 1995 through 2006. *PrivateEquity* is a dummy equal to one for companies that are owned by a PE firm. *GoingPrivate* is a dummy equal to one for public companies in their last year before being acquired by a PE firm. Firms in these two groups only appear in the sample for this analysis once. The comparison group (which is the omitted category in the regression) is made up of all CEO-years in ExecuComp from 1995 through 2006 that are not in the *PrivateEquity* or *GoingPrivate* groups. The estimated coefficients on *PrivateEquity* and *GoingPrivate* are significantly different from each other with 99% confidence in all columns (1) to (5).

Table 5. Effect of private equity on CEO's variable pay share

	(1)	(2)	(3)	(4)	(5)
PrivateEquity	0.0369	0.0394	0.1272	0.1089	0.1061
	(0.0210)	(0.0204)	(0.0194)	(0.0217)	(0.0123)
GoingPrivate	-0.0190	0.0017	0.0134	0.0285	0.0073
	(0.0271)	(0.0262)	(0.0248)	(0.0275)	(0.0128)
Log(Assets)			0.0100	0.0078	0.0102
			(0.0030)	(0.0034)	(0.0015)
Cash/Assets			0.1251	0.1289	0.1047
			(0.0122)	(0.0137)	(0.0060)
Log(Sales)			0.0582	0.0711	0.0543
			(0.0037)	(0.0042)	(0.0019)
Log(Employees)			-0.0123	-0.0148	-0.0120
			(0.0027)	(0.0031)	(0.0014)
2-digit SIC dummies	no	yes	yes	yes	yes
Sample	CEOs	CEOs	CEOs	CEOs	Top-3
Regression Type	Mean	Mean	Mean	Median	Mean
R^2	0.0490	0.1216	0.2147	0.1582	0.2312
Observations	18,590	18,590	18,590	18,590	59,614

Variable pay share of cash compensation is defined as (total cash compensation - salary) / (total cash compensation). Each regression includes dummies for the years 1995 through 2006. *PrivateEquity* is a dummy equal to one for companies that are owned by a PE firm. *GoingPrivate* is a dummy equal to one for public companies in their last year before being acquired by a PE firm. Firms in these two groups only appear in the sample for this analysis once. The comparison group (which is the omitted category in the regression) is made up of all CEO-years in ExecuComp from 1995 through 2006 that are not in the *PrivateEquity* or *GoingPrivate* groups. The estimated coefficients on *PrivateEquity* and *GoingPrivate* are significantly different from each other with 91%, 85%, 99%, 98% and 99% confidence in columns (1) to (5), respectively.

Table 6. Heterogeneity in Private Equity Effects on Ownership

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable	Ownership	Salary	Ownership	Salary	Ownership	Salary	Ownership	Salary
Group 1	Post-2001 IPO		Top 25% Employees		Top 10 PE Firm		Joined Before LBO	
	0.0137	-0.1459	0.0121	-0.0833	0.0047	-0.0991	0.0469	-0.0833
	(0.0077)	(0.0476)	(0.0104)	(0.0643)	(0.0100)	(0.0619)	(0.0091)	(0.0643)
Group 2	2001 or earlier IPO		Bottom 25% Employees		Other Firm		Joined After LBO	
	0.0351	-0.0607	0.0408	-0.0557	0.0328	-0.1012	0.0135	-0.0557
	(0.0073)	(0.0448)	(0.0106)	(0.0654)	(0.0062)	(0.0383)	(0.0070)	(0.0654)

Each regression is based on the same specification as in column 3 of Tables 3 (odd columns of this table) or 4 (even columns) with the *PrivateEquity* variable broken into at least two groups. "Top 25% Employees" refers to the largest 25% of PE-owned firms on the basis of number of employees. " Bottom 25% Employees" refers to the smallest 25% of PE-owned firms on the basis of number of employees. "Top 10 PE firm" includes the ten private equity firms on the *Power List* in the March 5, 2007 issue of *Fortune*: Blackstone, KKR, Carlyle, TPG, Bain Capital, Providence Equity Partners, Apollo Advisors, Warbarg Pincus, Cerberus, and Thomas H. Lee. "Joined Before LBO" refers to firms where the CEO is the same before and after the LBO; while "Joined After LBO" refers to firms with CEO turnover following the LBO. Note that the estimates for Groups 1 and 2 differ with 91%, 88% 88% 47%, 99%, <1%, 98% and 98% confidence in each column (1) to (8), respectively.

Table 7. CEO Fraction of Equity Ownership: Comparison of Findings

		Mean		Median	
		Public	Private	Public	Private
Kaplan (1989)		7.1	14.7	1.4	6.4
Muscarella and Vetsuypens (1990)		12.7	17.7	6.5	9.2
This study:	*unadjusted*	3.6	7.8	1.7	5.5
	regression adjusted	3.6	5.9	1.7	4.2

The *unadjusted* results are taken directly from Table 2. The *regression adjusted* entries are based on the estimates from columns (3) and (4) of Table 3.

Table 8. Previous Findings on the Impact of Buy-Outs on Profitability and Productivity

	Operational Performance
Ravenscraft and Scherer (1987)	3% decrease in operating income/assets
Kaplan (1989a)	20% increase in operating income/assets, and >28% increase in net cash flow/sales
Lichtenberg and Siegel (1990)	6% increase in TFP
Muscarella and Vetsuypens (1990)	Increase in operating income/assets
Smith (1990)	3-6% increase in operating income/assets
Wright et al (1992)	Significant increase in profit
Wright et al (1997)	1-3% increase in ROA
Desbrieres and Schatt (2002)	Decrease in operating income/assets
Harris et al (2005)	>70% increase in TFP
Cressy et al (2007)	5% increase in ROA
Vinten (2007)	4% decrease in ROA
Guo, Hotchkiss, and Song (2008)	12% increase in EBITDA/sales
Meuleman et al (2008)	Insignificant change in ROCE
Weir, Jones, and Wright (2008)	Mixed evidence on ROCE, and insignificant change in ROE

TFP: total factor productivity. ROA: return on assets. EBITDA: earnings before interest, taxes, depreciation and amortization. ROCE: return on capital employed. ROE: return on equity.

Table 9. Effect of Private Equity on Operational Measures

	(1)	(2)	(3)	(4)
Dependent Variable	Debt/Assets	EBITDA/Assets	Sales/Emp	Emp/Assets
PrivateEquity	0.5133	0.0202	138.27	-0.0002
	(0.0201)	(0.0112)	(69.57)	(0.0018)
GoingPrivate	0.0347	0.0058	-60.94	-0.0012
	(0.0252)	(0.0143)	(87.40)	(0.0022)
R^2	0.3061	0.2398	0.1195	0.1403

PrivateEquity is a dummy equal to one for companies that are owned by a PE firm. *GoingPrivate* is a dummy equal to one for public companies in their last year before being acquired by a PE firm. Each regression includes controls similar to those in column 4 of Tables 3 to 5, except column 3 which excluded controls for sales and employees, and column 4 which excludes the employees control variable.

Figure 1: Fraction of Petco's Equity Owned by the CEO

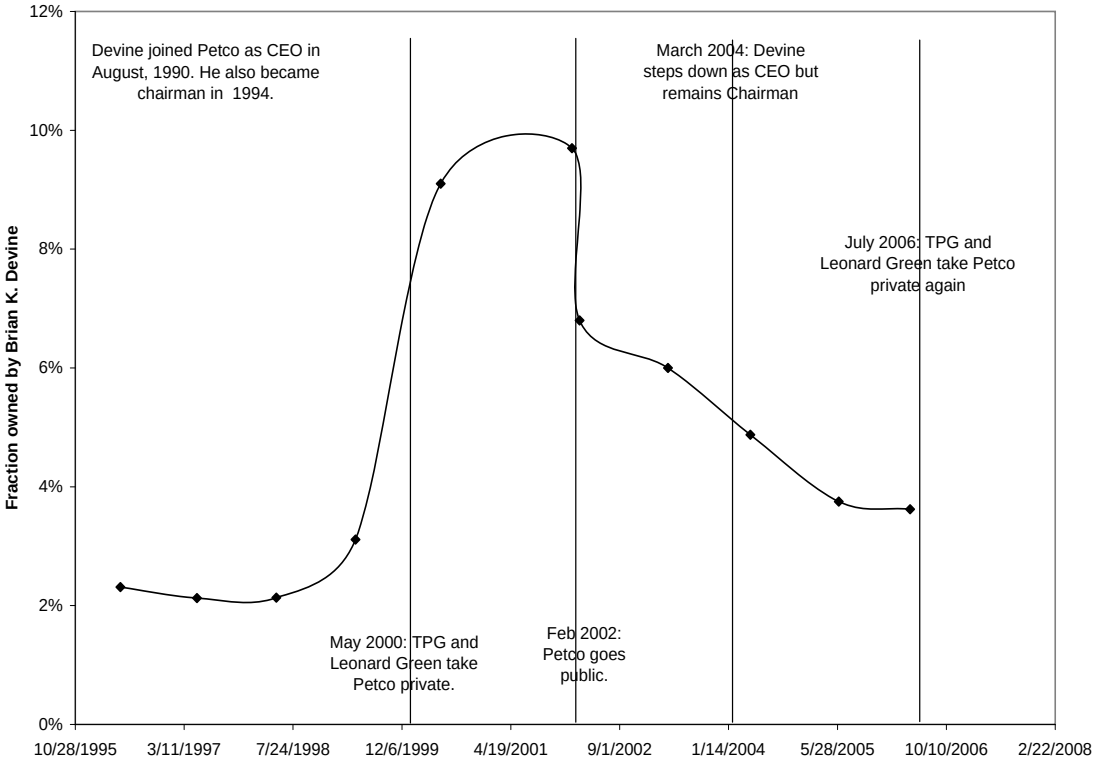


Figure 2: Kernel Densities of Unconditional Distributions of Fraction of Equity Owned by the CEO in PE and Public Companies

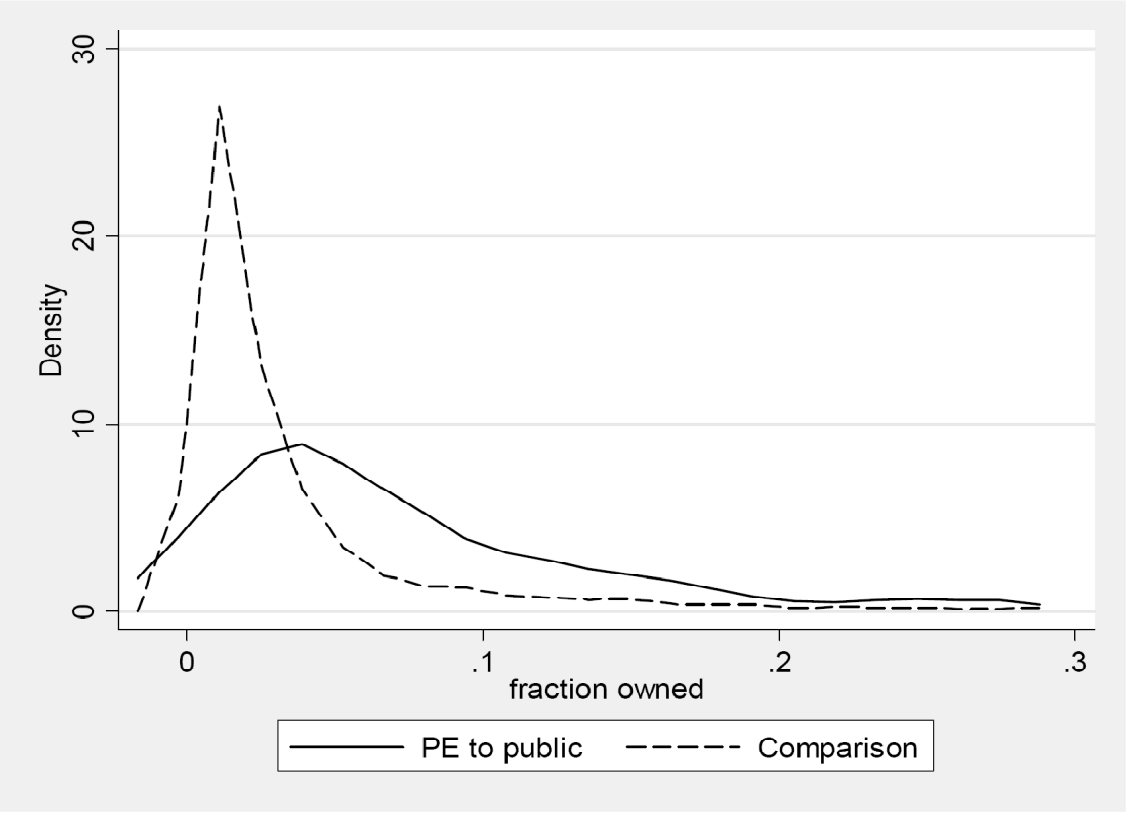
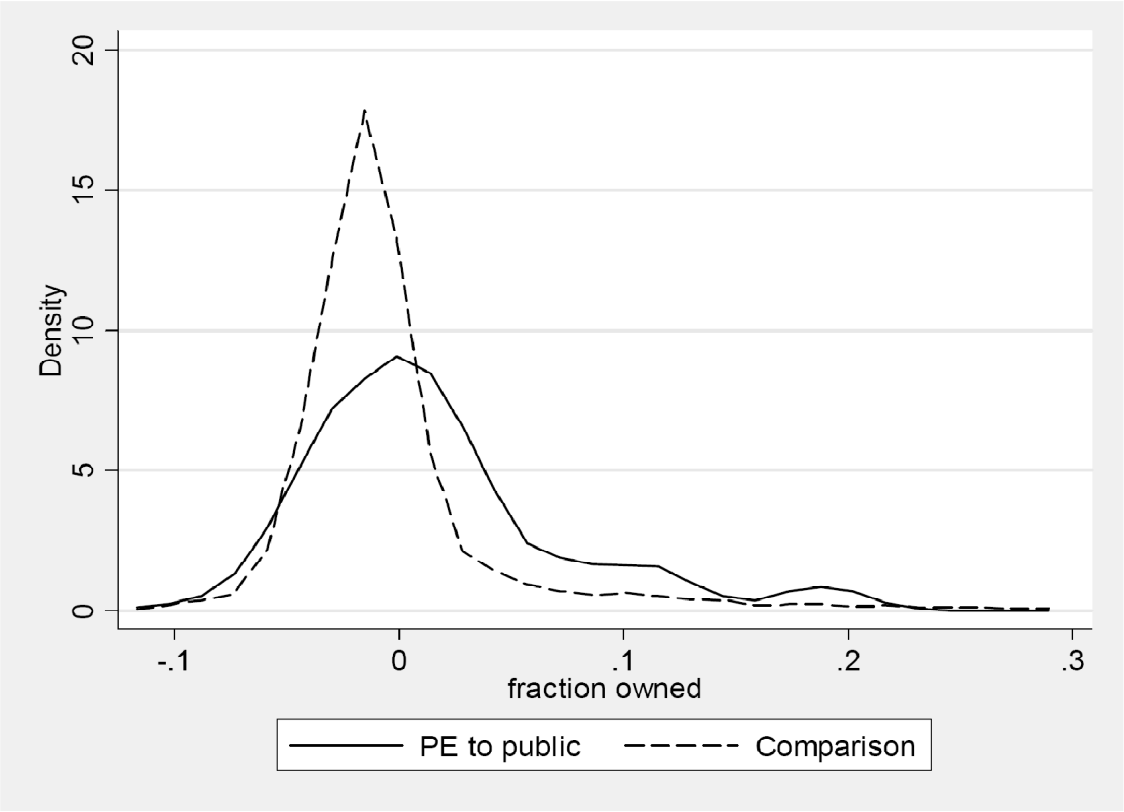


Figure 3: Kernel Densities of Conditional Distributions of Fraction of Equity Owned by the CEO in PE and Public Companies



Conditional on same controls as Table 3, column (4).

Figure 4: Debt-Assets Ratio at Petco

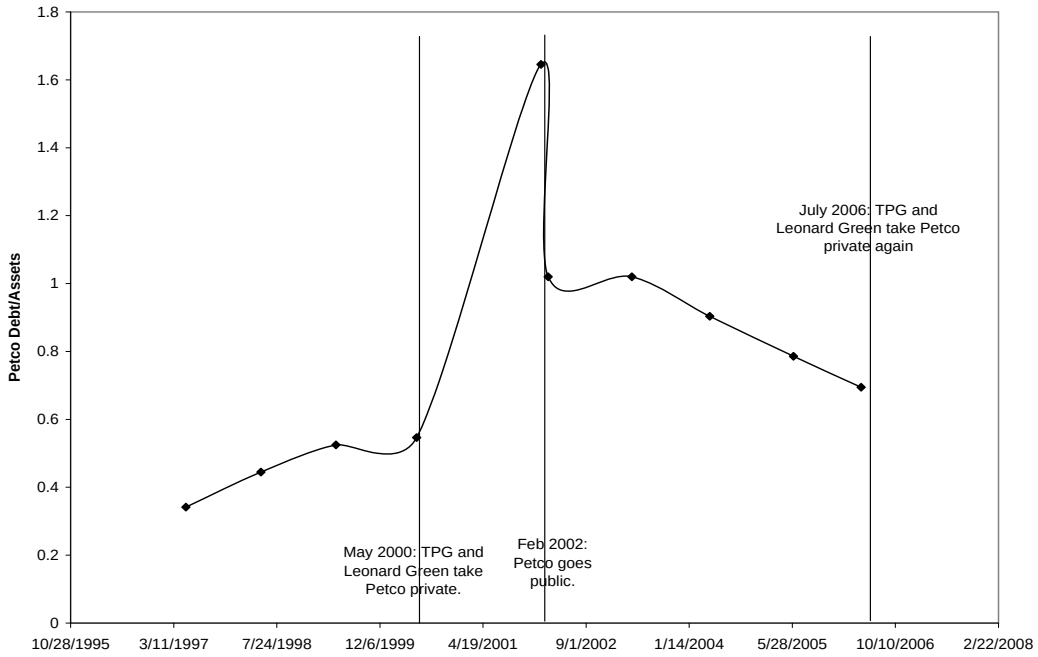


Figure 5: EBITDA-Assets Ratio at Petco

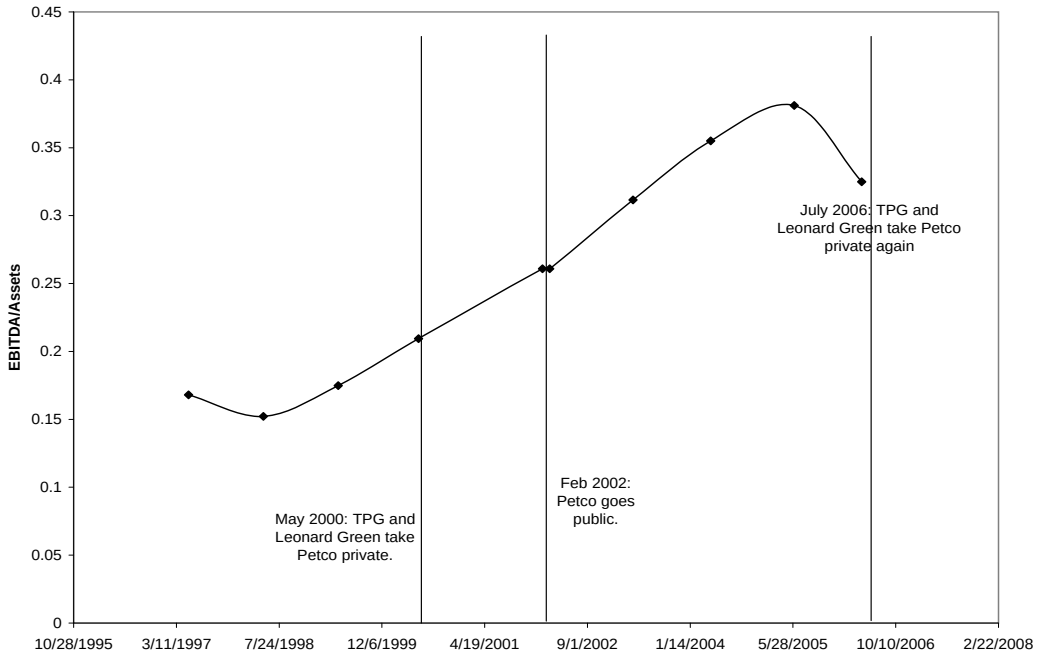


Figure 6: Executive Ownership at PE-Backed Companies

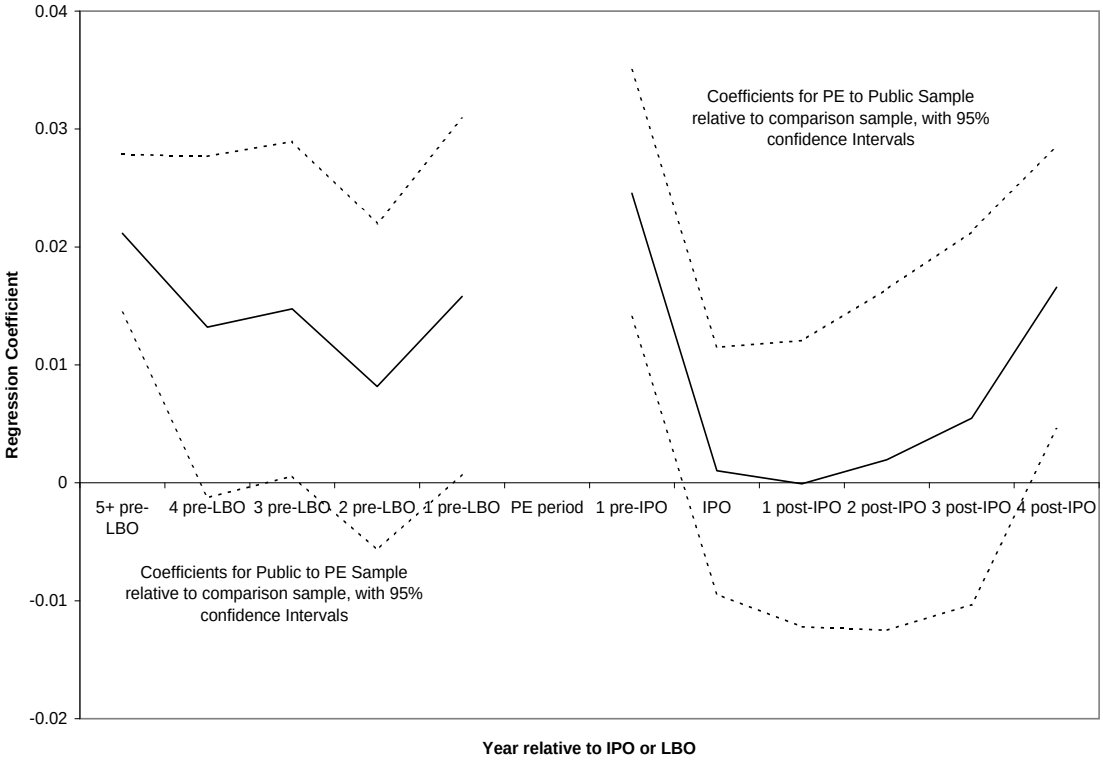


Figure 7: Executive Salary at PE-Backed Companies

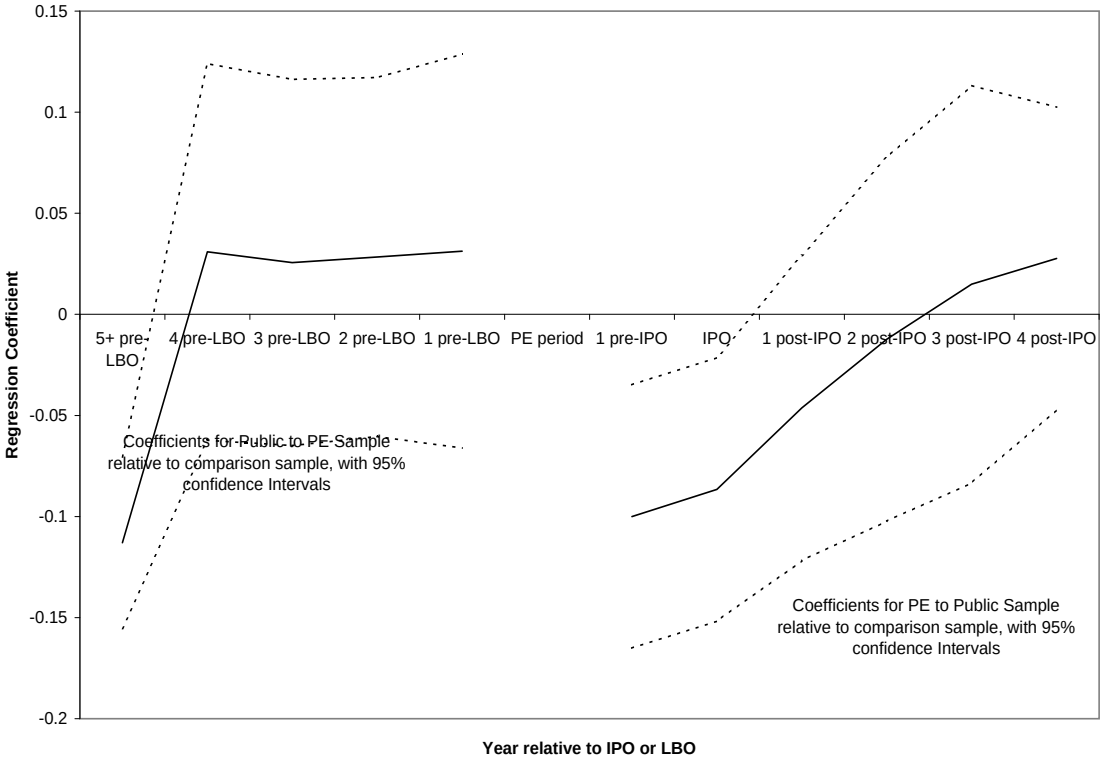


Figure 8: Debt/Assets at PE-Backed Companies

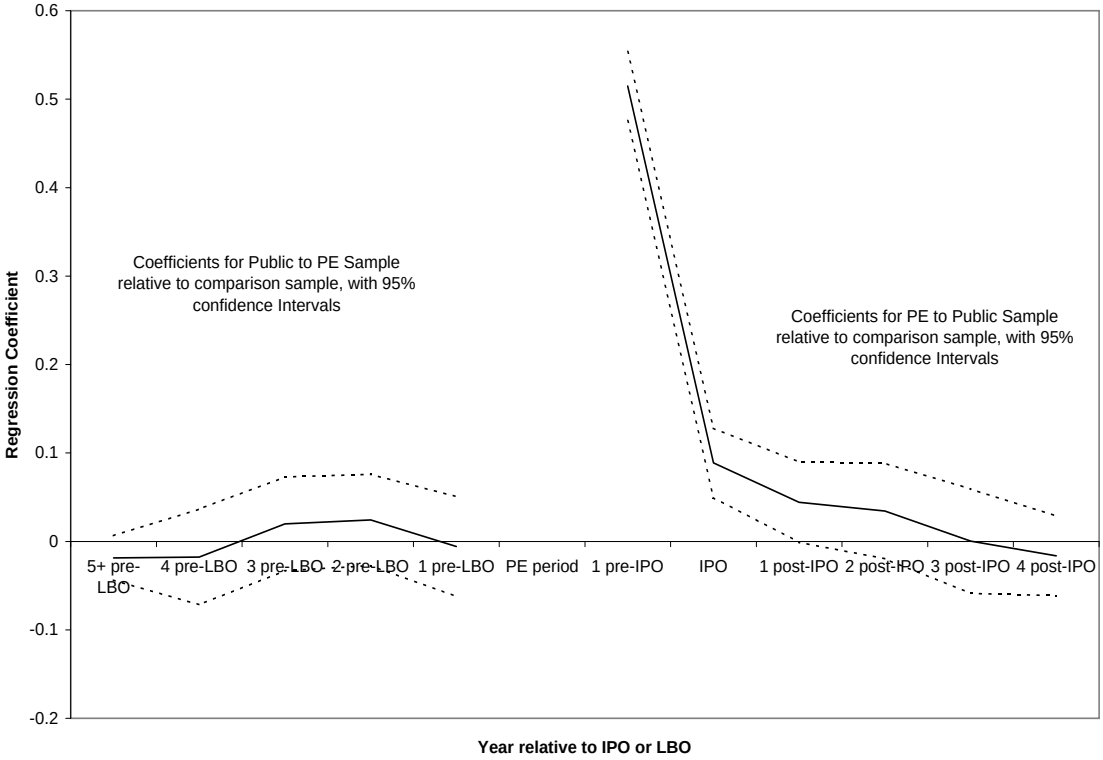
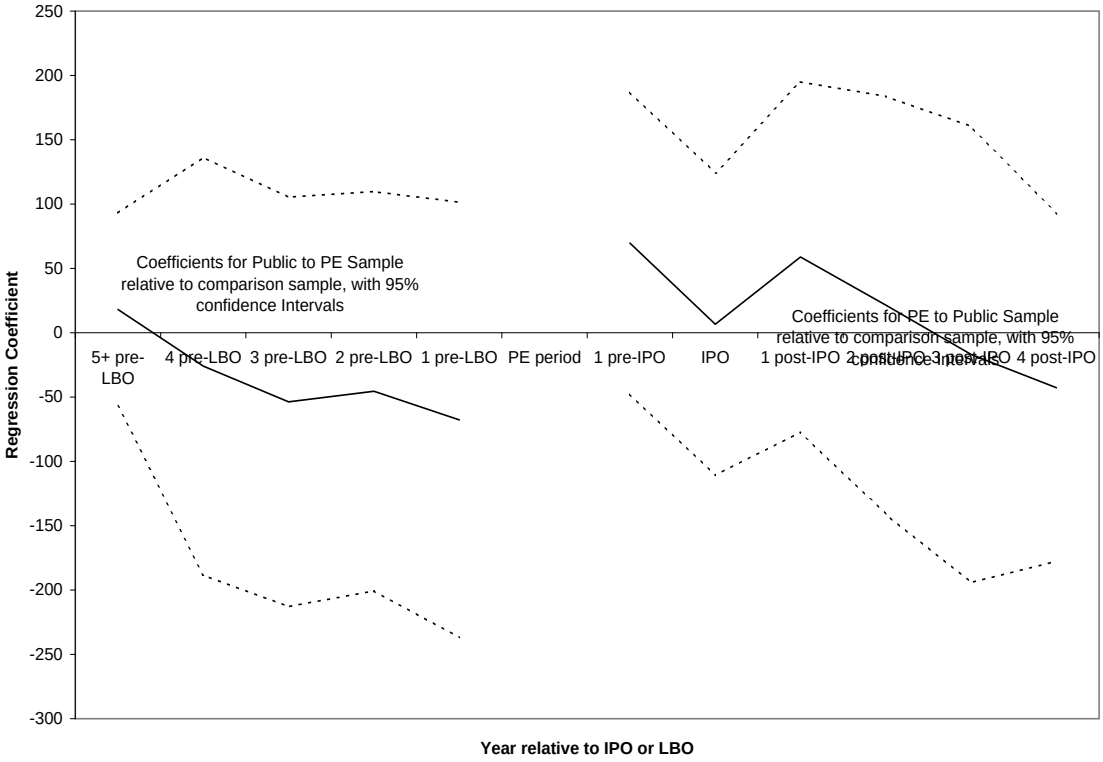



Figure 9: Sales Per Employee at PE-Backed Companies