How does Private Equity Bid in Corporate Asset Sales?

by

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Abstract

We model the decision by private equity to bid for corporate assets, and analyze interactions between the bidding of private equity and strategic buyers. The model predicts that seller gains depend on the type of buyer. The aggressiveness of private equity bidding is related to expectations about its ability to enhance the value of the asset and to successfully exit from its investment. The model also predicts a relationship between the gains in the enterprise value of the asset while owned by private equity, the type of exit transaction, and the gains to the original seller of the asset. Empirical tests show that private equity deals generate greater seller returns relative to sales to strategic buyers and that the gains to firms that sell assets to private equity are related to type of exit transaction and the subsequent increase in the asset's enterprise value, which exceeds that of benchmark firms. The evidence supports the view that private equity has valuable restructuring skills.

Keywords: Private Equity, corporate auctions, asset sales, secondary buyouts, restructuring.

JEL: G32, G34.

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Abstract

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How does Private Equity Bid in Corporate Asset Sales?

Since the early 1990s, private equity has become a major participant in financial markets and an important bidder for corporate assets, an activity previously dominated by strategic buyers (operating firms). We develop an auction-based theoretical model and provide empirical results that enhance our understanding of the role of private equity as bidders in corporate asset sales. We address several key questions. One, how do private equity firms decide whether to enter into the competitive bidding for an asset, and how do the bidding behaviors of private equity and strategic buyers interact? Two, how are the gains to firms that sell assets affected by the type of acquirer: strategic buyer versus private equity? Three, for private equity deals, how are these gains related to subsequent changes in enterprise value generated by private equity and its choice of exit route: IPO, sale to a strategic buyer, or secondary buyout (sale to another private equity firm)? Our theoretical model generates an array of predictions that provide perspective on the role of private equity in enhancing the value of corporate assets. We use a sample of large corporate asset sales to empirically test the model's predictions and provide evidence about fundamental issues relating to private equity. Overall, our findings support the conclusion that private equity bids aggressively for assets that are expected to generate important gains in value at exit, based on its ability to manage, restructure, and improve these entities. We also find a pecking order in the predicted relationship between the gains to the original seller, the asset's performance while under private equity control, and the type of exit transaction.

Corporate asset sales are a useful venue for analyzing the bidding behavior of private equity and its competition with strategic firms, because, unlike mergers, these transactions are invariably non-hostile, are typically seller-initiated, and leave the selling firm's management team in place

after the transaction.[1] Thus, it is logical to assume that a corporate seller seeks to structure the sale process to spur competition between potential bidders that include both private equity and strategic buyers. Moreover, the legal framework of asset sales allows a corporation to identify assets for sale and to set the rules for an auction without reference to shareholder involvement or concerns about legal actions where a court may be called upon to second-guess the merits of a decision. Thus, our auction-based model closely conforms to the institutional framework governing asset sales.[2]

With regard to strategic bidders, our model applies the usual assumption that their bids reflect the value of exogenous synergies between their assets and the asset for sale. However, with regard to private equity bidders our theory endogenizes their decision to enter the bidding, and the aggressiveness of their bidding is a function of their ability to enhance the value of the asset and exit successfully. Although private equity bidders do not enjoy synergies, they may be able to improve an operating asset in ways that are not feasible for strategic firms or the parent seller. For example, managers of lesser performing subsidiaries lodged within a parent organizational structure have an incentive to lobby or influence parent decisions to secure additional resources to protect their unit, costly activities, generally referred to as influence costs, that harm parent value (Meyer, et. al., 1992). Private equity has the skills to eliminate such costs by altering strategies, devising and implementing effective restructuring plans, and enforcing management discipline. In addition, private equity's valuation of the asset depends on the expected revenue at exit and encompasses expected synergies of future strategic bidders.[3]

[1] Eckbo and Thorburn (2008) report that on average asset sales make up 38% of all merger and acquisition transactions over the period from 1970 to 2006.

[2] The business judgment rule governs asset sale decisions, which gives managers broad discretion about the conduct of the sale and insulates the transaction from shareholder voting and shareholder litigation. The laissez-faire approach of corporate law to asset sales is justified since both seller and buyer managers continue to operate subject to the discipline and monitoring of financial markets (Gilson, 1981).

[3] Since the sources of value for private equity versus strategic bidders are distinct and cannot be replicated by bidders belonging to the other buyer type, in auction parlance, the bidding competition between private equity and

Our analysis shows that when the expected gains for an asset are large, private equity is more likely to enter the bidding and win the auction with relatively aggressive bids, whereas assets that have lower restructuring potential are more likely to be acquired by strategic buyers for relatively low bids. Thus, our theoretical model predicts that on average seller revenue is higher at news of an asset sale to private equity compared to a strategic buyer. This prediction is in contrast to prior empirical studies that consistently show that share price effects and synergistic gains at asset sales to strategic buyers are modest. In addition, for private equity deals, the gains to the parent seller should be positively correlated with the expected subsequent performance of the asset, as proxied by its ex post performance (measured as the annualized growth rate in enterprise value of the asset at the exit transaction, a consistently observable metric). Our theory also predicts that the subsequent performance of assets while under private equity management should exceed that of benchmark firms, and should also be related to the type of, and time to, the exit transaction. Better exit performances and shorter times to exit should occur for IPOs, followed by sales to strategic buyers, and then secondary buyouts. The reason that the gains in value should be greater for trade sales compared to secondary buyouts is that after the asset's restructuring by the original private equity buyer, the marginal contribution of further restructuring rounds is relatively low, implying that a subsequent private equity bidder is less able to compete with strategic bidders with sufficiently strong synergies. Thus, a secondary buyout occurs when strategic bidder synergies are low and the subsequent private equity acquirer acts as a form of buyer of last resort, expecting to resell the asset when strategic bidder synergies are higher. In sum, the model suggests that a secondary buyout is a less favorable form of exit than a sale to a strategic buyer or an IPO.

In practice, a strategic buyer may be either a public or a private operating firm since each

strategic buyers is governed by a private values structure.

is motivated by expected synergies. However, private operating firms are exempt from public reporting and often have strong equity-based links between managers and owners, thus sharing some of the characteristics of private equity. We provide insight about private strategic bidders by analyzing the effects on seller gains for each type of buyer.

We take our model to the data by analyzing large corporate asset sales from 1994 through 2004. Our main findings are broadly consistent with the bidding behavior of private equity implied by our auction model. One, at asset sale announcements when the buyer is private equity, sellers earn large positive excess returns, 3.78%, that are significantly greater than when the buyer is a public operating firm, 1.25%, or a private operating firm, 0.95%. We find a positive excess return to public strategic buyers, 0.48%, suggesting an extraction of rents for their private information about expected synergies and that their behavior does not entail the overbidding by acquirers that Bargeron, et al. (2008) find in their study of mergers. Nevertheless, the overall level of synergies in asset sales to strategic buyers is low, consistent with findings reported in prior asset sale studies. The pattern of our results is similar when wealth gains are scaled by transaction size. The empirical results indicate that private strategic buyers are similar to public strategic buyers.

Two, we assess whether the information conveyed at asset sales is asset-specific, as in our model, or is more broadly applicable to the industry, by evaluating the effect of these announcements on industry values. We find no intra-industry gains, consistent with the view that the private information conveyed by these deals is asset-specific and that a private values setting is an appropriate framework for modelling corporate asset sales.

Three, we test whether seller gains at sales to private equity are related to the asset's ex post gains in enterprise value and to the type of exit transaction. Of the 146 assets sold to private equity

there are 121 with an exit (as of 2010). We confirm the type of exit transaction and obtain the enterprise value at exit. We evaluate the annualized change in the enterprise value of each asset over the period it is owned by the original private equity buyer and find that on average it is significantly greater than its public benchmark firm (matched by SIC code and enterprise value). These gains are not a direct measure of profitability for investors in private equity funds, but they are a useful metric of the business success of the entity while under private equity management. As our model predicts, parent seller gains at the original sale are directly related to the form of exit and to the subsequent gain in the asset's enterprise value, with seller shareholders earning significantly greater gains in deals that exit by IPO or strategic asset sale rather than secondary buyout or bankruptcy. Our evidence shows that private equity bids aggressively and generates large seller gains for assets that subsequently prove to be a rich source of value, thus supporting the hypotheses that asset sales can be plausibly modeled as auctions, that private equity buyers have effective restructuring skills, that private equity bids reflect the expected gains from restructuring the asset, and that the expected exit method and the time to exit are related to the magnitude of these gains.

Our analysis of exit type and subsequent changes in enterprise value contributes to the private equity literature in a manner that differs from prior studies, which focus on either the operational (performance) effects of private equity activity or assessments of returns to fund investors, studies that raise issues of selection bias in the data and that often generate ambiguous findings. Several studies report evidence that firms controlled by private equity improve their operating performance, reduce employment, and lower capital investment relative to comparable public firms (Kaplan, 1989a, 1989b; Muscarella and Vetsuypens, 1990; Lichtenberg and Siegel, 1990; Liebeskind, Wiersema, and Hansen, 1992; Bharath, Dittmar, and Srivadasan, 2010). Other studies find

productivity changes at firms owned by private equity are little different from comparable public firms, R&D investment is greater, employment tends to increase, and private equity's governance structure is highly effective (Cornelli and Karakas, 2008; Lerner, Sorensen and Stromberg, 2009; Leslie and Oyer, 2009; Guo, Hotchkiss, and Song, 2008). Recent studies of returns to fund investors find few if any gains after adjusting for fees and write-downs (Kaplan and Schoar, 2005; Jones and Rhodes-Kropf, 2004; Phalippou and Gottschalg, 2009).

Our formal treatment of the role of an informed buyer and the differentiation of private equity versus strategic buyers departs from prior asset sale studies, which do not provide any analytical treatment of buyers and focus almost exclusively on the effects on sellers (Jain, 1985; Hite, et al., 1987; John and Ofek, 1995; Sicherman and Pettway, 1992). Overall, our work is consistent with the view that private equity buyers have valuable skills in restructuring and value creation. We argue theoretically and confirm empirically that private equity is willing to generate higher bids, producing economically important gains to sellers, when it expects to significantly increase an asset's value, and that these gains are systematically related to the type of exit.

The paper is organized as follows. In Section I, our theoretical model is presented. Section II describes sample construction. Section III contains empirical results for the valuation effects of asset sales, detailing the differential effects of alternative buyers. Conclusions are in Section IV.

I Theoretical Analysis

A. The Model Set-up

A.1 Asset

A parent firm, the initial seller, is to sell an indivisible, tangible, productive asset with an

ascending bid auction. The asset has the potential to produce a constant and perpetual expected cash flow of c_1, with a present value of $v_1 = \frac{\delta}{1-\delta}c_1$. Under its current organization as a division of the seller firm, however, a per-period loss of $c_1 - c_0$ arises due to inefficiencies in the current organizational form.[4] Thus, when remaining part of the seller firm, the asset produces a net cash flow of only $c_0 < c_1$, with a present value of $v_0 = \frac{\delta}{1-\delta}c_0$. We denote by $Z = v_1 - v_0 > 0$ the loss in value due to these inefficiencies.

A.2 Potential buyers

There are two different populations of potential buyers of the asset: private equity firms, henceforth PEs, and operating firms, henceforth strategic bidders or SBs. Within each population category, the exact composition of the buyer pool varies over time.

Private equity: There are m PEs, where $m > 1$. PEs have a unique ability to restructure the asset so as to increase its cash flow, but achieve no operating synergies with the asset. A PE that buys the asset will first restructure it and then sell it through an *exit IPO* or sell it to interested parties through an *exit auction*. We denote by $v_0 + x_{PE}$ the value of the asset to a PE buying from the initial seller. The parameter x_{PE} is endogenous in our model and depends both on the potential operating performance of the asset following restructuring and on the expected market value of the asset at the exit.

PEs can restructure the asset through two channels: one, by eliminating the loss in value Z that the asset generates within the structure of a parent operating firm, increasing the per-period expected cash flows from c_0 to c_1; two, by improving the asset's operations, leading to an extra

[4] These inefficiencies encompass influence costs that are generated by a division or subsidiary that undertakes non-productive activities such as lobbying the parent for greater attention and seeking resources from the wider organization, actions that attempt to benefit the unit but that do not contribute to the value of the parent firm as a whole.

increase from c_1 to $c_2 > c_1$. The first component of gain encompasses the concept of the elimination of influence costs; that is, there is some restructuring potential, Z, specific to the separation of an asset from a parent that is not present in a merger. The second component of gain captures the perspective that PE owners offer, for some firms, unique capabilities of creating value that cannot be replicated by other owners such as strategic buyers. The elimination of Z will be realized with certainty during the first period of PE ownership. Thus, for simplicity the uncertainty about restructuring outcomes is centered on the second component. In the first and any subsequent round of PE ownership, with probability p the cash flow can be permanently increased to c_2, and hence its present value to $v_2 = \frac{\delta}{1-\delta}c_2$. With probability $1-p$ the cash flow remains at c_1. Once v_2 is attained no further improvement is possible. Thus, the first restructuring round generates at least $Z = v_1 - v_0$ whereas the expected number of restructuring rounds required to improve the asset's performance to v_2 is $1/p$. By the nature of a private equity deal, it is during the initial restructuring round that the asset undergoes a substantial reorganization as it is transformed from a subsidiary into an independent firm, unlocking its potential value v_1. Although subsequent restructuring rounds may also generate positive benefits, they involve lesser restructuring. A PE incurs a one-off cost of $e < Z$ for the first restructuring effort after it buys the asset, and we normalize to 0 the cost of restructuring that occurs during each subsequent period of ownership of the asset by a PE.

Since the asset is taken private under PE ownership, we assume that only the PE owning the asset knows whether the restructuring of the asset has achieved v_2. In other words, at the time that a PE exits the investment by selling the asset, the present value of the asset's cash flow, $\widetilde{v} \in \{v_1, v_2\}$, is privately known to the PE. Although the main results of our model are not altered if we assume heterogeneity with respect to the restructuring ability of PEs, we keep the theory more tractable

by assuming that these abilities are identical. That is to say, the parameters p, c_0, c_1, c_2 and e do not depend on the identity of the PE.

Strategic buyers: We assume that in every period $t = 0, 1, ...$, there is random draw of $n > 1$ new potential strategic buyers from a constant population, so that the distribution of potential buyer characteristics is i.i.d. across time. This assumption captures the idea of a time-varying set of strategic bidders. SBs have no special ability to restructure the asset. However, there are synergies between the assets of the SBs and the asset for sale. For a given $v \in \{v_0, v_1, v_2\}$, that is, the present value of the cash flow generated by the asset, the valuation of the asset to a SB i is equal to $v + \widetilde{x}_i$, where we denote by $\widetilde{x}_i$ the idiosyncratic operating synergies between the assets of SB i and the asset for sale. We assume that the synergies, $\widetilde{x}_i \in [x_L, x_H]$, with $x_L \leq 0 < x_H$, are exogenous and private information to the strategic bidder i and that synergies are i.i.d. among the SBs with c.d.f. F. We denote by $\widetilde{x}^{(1)}$ and $\widetilde{x}^{(2)}$ the first and second highest synergies among n SBs, respectively. Let $F^{(\tau)}$ be the c.d.f. of $\widetilde{x}^{(\tau)}$, for $\tau = 1, 2$. We assume that $E[\widetilde{x}_i] > 0$, implying that the expected synergies of SBs are positive. We allow for $F(0) \geq 0$, which implies that there can be a strictly positive probability that in a given period t no SB is interested in acquiring the asset.

A.3 Timing and PE Exit

At time $t = 0$, the asset is sold in an auction with an ascending bid format and a starting price of v_0. Since the asset for sale is not publicly listed, a PE must first spend $\alpha > 0$ in order to identify and evaluate the asset and its potential p for improvement through restructuring. Each PE simultaneously decides whether to invest α and participate in the auction or abstain from bidding. Strategic buyers know their operating synergies and can participate without cost. If the asset is sold to a strategic bidder i, it will become part of the buyer's operating structure and generate cash

flows with a present value of $v_0 + \widetilde{x}_i$. If a PE participating in the auction, say PE j, acquires the asset, then the asset will first undergo restructuring; eventually, PE j will sell it again.

PE j will sell the asset either through an *exit auction* or through an *exit IPO*. In an exit auction, the PE owner sells the asset in an auction with an ascending bid format. Potential buyers are PEs and SBs. We assume that SB synergies are i.i.d. with the synergies of SBs participating in the initial auction or any other subsequent contest for the acquisition of the asset. At the exit stage the first PE's restructuring of the asset has already increased the asset value to $\widetilde{v} \in \{v_1, v_2\}$. Thus, if $\widetilde{v} = v_1$, a PE buyer can improve the asset's operating performance to v_2, and eventually resell the asset through a new exit auction or an IPO. At this stage the asset has been identified as restructurable so PE bidders do not need to invest α before bidding.

If PE j decides to exit via an IPO, then extensive disclosure requirements, the activity of stock market analysts, and informed trading lead to a substantial reduction in asymmetric information; we capture this effect with the simplifying assumption that the asset's true value $\widetilde{v}$ will become fully transparent in an IPO. It follows immediately that the PE's revenue from the IPO, denoted $V_{IPO}(\widetilde{v})$, will reflect the asset's true profitability $\widetilde{v} \in \{v_1, v_2\}$, and may incorporate an increment reflecting the possible future premium that would be paid in the event of a subsequent acquisition by a strategic acquirer or a PE. Thus, we assume $V_{IPO}(\widetilde{v}) \geq \widetilde{v}$.

B. Equilibrium

We solve the game by backward induction. To proceed, we shall first determine the revenue that PE j expects to receive once it owns an asset with performance $\widetilde{v} = v_1$. Second, we deduce $v_0 + x_{PE}$, i.e. PE j's valuation of the asset in the initial auction. Third, we compute bidders' expected equilibrium profit in the initial auction. Fourth, we compute the equilibrium entry decision

of PEs. This procedure allows us to analyze the seller's expected revenue in the initial auction, conditional on the winning bidder being a PE or a SB. We focus on symmetric equilibria.

The analysis is based on the claim (*Claim 1* henceforth) that if a PE buys the asset, then at the exit it will conduct an IPO if $\widetilde{v} = v_2$ and it will auction the asset if $\widetilde{v} = v_1$. Lemma 3 in the Appendix shows that this claim is correct in equilibrium if a takeover of the asset after the IPO is possible among the same (random) set of buyers that participate in the exit auction.

B.1 IPO exit and exit auction

If PE j, after acquiring the asset and restructuring it, exits through an IPO, then the asset's true value will be fully disclosed in the IPO process and PE j's revenue will be $V_{IPO}(\widetilde{v}) \geq \widetilde{v}$.[5]

Let V_{PE} denote the expected cash flow for a PE j that owns the asset whose current performance is $\widetilde{v} = v_1$ and will proceed to sell it in one time period. This value is computed at the beginning of a given period t and just after the asset has paid the cash flow. Note that V_{PE} also represents PE j's expected continuation payoff just after buying the asset from the initial seller and investing e for restructuring it, but before observing the restructuring outcome. Then V_{PE} must satisfy the following equation:

$$V_{PE} = \delta p(c_2 + V_{IPO}(v_2)) + \delta(1-p)\left(c_1 + \int_{x_L}^{\min\{x_H, V_{PE}-v_1\}} V_{PE} dF^{(2)}(x) + \int_{\min\{x_H, V_{PE}-v_1\}}^{x_H} (v_1 + x) dF^{(2)}(x)\right). \tag{1}$$

This equation says that with probability p the asset's operating performance improves in period t; the PE will then receive c_2 at the end of the period and immediately sell the asset through an IPO, yielding an expected revenue of $V_{IPO}(v_2)$. With probability $1 - p$, the asset's performance does

[5] Note that in the case of an IPO, PE j will typically retain ownership of a fraction β of the asset; however, since the IPO occurs at a fair price, PE j's gain does not depend on β.

not improve in period t, and so the PE will receive c_1 and will proceed to sell the asset through an exit auction with an ascending bid format. Potential bidders in the auction include PEs and SBs. Based on Claim 1, bidders will deduce that if PE j is exiting with an auction it must be $\widetilde{v} = v_1$. The maximum bid that a PE k that is participating in the auction is willing to make for the asset amounts to V_{PE}. If in fact, PE k wins the auction (i.e., there is a secondary buyout), then it will be in exactly the same situation as PE j is today. Note that PE j will not sell the asset for less than V_{PE}, since if today's auction proceeds are less than V_{PE}, PE j would rather continue restructuring and retain the asset for one additional period. Thus, the exit auction will be won by the strategic bidder with the highest synergies, provided that its synergies $\widetilde{x}_i$ lead it to value the asset at more than V_{PE}; i.e., $v_1 + \widetilde{x}_i \geq V_{PE}$. Otherwise, the asset will remain in the hands of a PE (either PE j or another PE buyer). Thus, the auction proceeds of PE j will correspond to the maximum of the second highest bid and V_{PE}. Let x denote the second highest synergy among the n strategic bidders. Recall that its c.d.f. is $F^{(2)}$. The PE seller payoff is $v_1 + x > V_{PE}$ only if the second highest strategic bidder values the asset more than the PE bidders, which occurs for $x > V_{PE} - v_1$. Otherwise, the seller's expected proceeds is V_{PE}. This reasoning suggests that in equilibrium in an exit auction a strategic winner pays more than a PE winner. Thus, when a PE-owned asset (which at this point is a stand alone entity) is auctioned off, we expect that the returns to the PE seller will be greater on average when the asset is sold to a strategic buyer rather than to another private equity firm (a secondary buyout).

Note that there are two channels leading a PE to value the asset at V_{PE}. One source of value is the PE's restructuring ability to achieve v_2. The other source is the resale profit that a PE can make when auctioning the asset, with performance v_1, to SBs who enjoy synergies with the asset.

Let us first consider these two elements separately.

Suppose $V_{PE} > v_1 + x_H$ implying that no SB would ever have synergies that are high enough to allow it to acquire the asset from a PE. In this case the asset will remain in PE hands until its operating performance has been improved to $\widetilde{v} = v_2$, at which point, it will be sold via an IPO. In terms of equation (1) this corresponds to the case $V_{PE} - v_1 \geq x_H$ and provides a V_{PE} equal to

$$\widehat{V}_{PE} = \frac{\delta\left(p(c_2 + V_{IPO}(v_2)) + (1-p)c_1\right)}{1-(1-p)\delta} \geq v_1 \ ,$$

where the inequality is strict whenever $p > 0$.[6] Thus, in the absence of SBs, a PE values the asset more than v_1 because of the potential for restructuring. Consider now the case where $p = 0$, i.e. once v_1 is achieved there is no prospect for further restructuring. By setting $p = 0$ and rearranging equation (1) it can be shown that[7]

$$V_{PE}|_{p=0} > v_1 + \delta E\left[\max\{0, \widetilde{x}^{(2)}\}\right].$$

Moreover, in the limit we will have $\lim_{\delta\to 1} V_{PE}|_{p=0} = v_1 + x_H$. These expressions show that even for an asset that cannot be restructured, a PE's valuation is substantially higher than v_1, provided that there is a liquid exit market consisting of potential SB buyers and that the PE can continue to hold the asset.

The following proposition describes V_{PE} as well as the behavior of PE bidders and strategic bidders in an exit auction.

[6] Note that $\widehat{V}_{PE} = v_1$ for $p = 0$, which means that the value of the asset to a PE that has no synergies, that will never be able to improve the asset's performance to v_2 nor to sell it to SBs is equal to the present value of a perpetuity paying c_1 in every period.

[7] In this case the level of $V_{PE} - v_1$ that solves equation (1) is equal to the r solving $r = \delta E\left[\max\{r, \widetilde{x}^{(2)}\}\right]$.

Proposition 1 *Consider the case of a PE owning an asset with* $\widetilde{v} = v_1$.

(i) If $x_H \leq \widehat{V}_{PE} - v_1$, *then the value of the asset to a PE is equal to* $V_{PE} = \widehat{V}_{PE}$ *and in case of an exit auction, no SB bids for the asset.*

(ii) If $x_H > \widehat{V}_{PE} - v_1$, *then the value of the asset to a PE is given by the value* $V_{PE} > \widehat{V}_{PE}$ *that solves equation (1). In case of an exit auction, a SB outbids PE bidders only if its synergies are above the threshold* $V_{PE} - v_1$.

(iii) The PE is indifferent between selling to another PE and retaining the asset.

Note that V_{PE} is increasing in p and in $c_2 - c_1$, which are both measures of the growth potential for the asset. Consider a given distribution $F^{(2)}$ of SB synergies, and let us compare assets with a strong potential for growth to assets with little potential for growth. An asset that has a strong potential for growth will correspond to case (i) of Proposition 1. In this case SBs will not bid in an exit auction and the PE owner may postpone the exit until v_2 is attained (in about $1/p$ periods) and then exit the investment through an IPO. On the other hand, if both p and $c_2 - c_1$ are small, the asset has little growth potential, implying that case (ii) of Proposition 1 applies. The probability of an IPO exit is smaller, whereas that of an exit auction is larger. The lower is p, the longer it will take to fully restructure the asset and achieve v_2, and the more likely it is that the PE will sell the asset to a strategic buyer whose synergies are sufficiently strong to outweigh the expected restructuring gains that can be realized by a PE.

Let us now fix both p and $c_2 - c_1$ and vary $F^{(2)}$. When there are only a few potential strategic buyers ($F^{(2)}(0)$ is large) or their synergies are low ($\int_{x_L}^{x_H} x dF^{(2)}(x)$ is small), it will take more time to sell the asset to a strategic buyer and thus the PE might instead decide to sell the asset to another PE. For the opposite case, that is when competition among synergistic buyers is intense

and synergies are high, the PE will sell the asset relatively quickly to a strategic buyer, and for a relatively high revenue.

B.2 Initial auction

From the previous section we are able to deduce that the maximum amount of money that PE is willing to pay for the asset in the initial auction is $V_{PE} - e > v_1$ described in Proposition 1 which corresponds to the present value of next period's expected cash flow and exit revenue, net of the first restructuring cost e. Since they are homogeneous, all PEs value the asset at the same level. We define

$$x_{PE} = V_{PE} - e - v_0 > 0$$

as the extra value a PE attaches to the asset compared to the value of the asset to the initial seller.[8] By applying the implicit function theorem to equations (1) - (3) and by direct differentiation of $\widehat{V}_{PE}$, we can show that V_{PE} is increasing in p, c_1, c_2, δ, n and $E[\widetilde{x}_i]$, i.e., the higher the growth potential or the lower the cost of capital or the higher the number of potential SB buyers and their expected synergies, the higher will be the value that a PE attaches to the asset for sale. Formally,

Corollary 1 *In equilibrium, x_{PE} is larger than $\delta E[\max\{0, \widetilde{x}^{(2)}\}] > 0$ and is an increasing function of p, c_1, c_2, δ, n and $E[\widetilde{x}_i]$.*

The value of the asset for SB i is exogenous and equal to $v_0 + \widetilde{x}_i \in [v_0 + x_L, v_0 + x_H]$. Thus, in the symmetric equilibrium of the initial auction each bidder will increase its bid until it reaches its own valuation of the asset. Since all PEs value the asset the same, as long as there are at least two PEs in the initial auction they will bid up to their valuation and realize zero profit. Alternatively, a

[8] Note that $V_{PE} > v_1$ implies $x_{PE} := V_{PE} - e - v_0 > v_1 - e - v_0 = Z - e > 0$.

PE that does not face competition from other PEs will pay the maximum between v_0, the starting price, and the highest SB valuation as long as this does not exceed $v_0 + x_{PE}$. In this case, its expected profit is strictly positive and equal to[9]

$$\pi^*_{PE} = \int_0^{x_{PE}} (v_0 + x_{PE} - (v_0 + x))dF(x)^{(1)} + x_{PE}F^{(1)}(0) = \int_0^{x_{PE}} F(x)^{(1)}dx > 0.$$

B.3 PE entry decision

Let us now consider the decision of a PE to invest α and to bid for the asset in the initial auction. Let x^*_{PE} be such that $\pi^*_{PE} = \alpha$. The entry decision depends on whether other PEs enter the auction or not. Lemma 1 describes the unique symmetric equilibrium of this entry game.

Lemma 1 *In the unique symmetric equilibrium, the probability with which each PE participates in the initial auction is* $q^* = 1 - (\alpha/\pi^*_{PE})^{\frac{1}{m-1}}$ *if* $\pi^*_{PE} > \alpha$, *and* 0 *otherwise.*

B.4 Seller revenue

Due to the fact that the valuation by PEs reflects both the asset's restructuring potential and the synergies with a future SB buyer that are incorporated in the exit value, the economic forces determining x_{PE} suggest that $x_{PE} > E[\widetilde{x}_i]$. Furthermore, the following proposition shows that first, the probability of a PE winning the initial auction increases with x_{PE}; second, that for x_{PE} large, the expected seller revenue from a winning PE bid is larger than the seller revenue from a winning SB bid; third the same finding is true if we compare the seller revenue from a PE bid when x_{PE} is large with the seller revenue from a SB bid when x_{PE} is small. Formally, for a given level of x_{PE}, let $R_{PE}(x_{PE})$ and $R_{SB}(x_{PE})$ denote the seller's expected revenue conditional on the winner

[9] Recall that starting bidding price is v_0.

of the auction being a PE and a SB, respectively. Then we have:

Proposition 2 *The probability of a PE winning the initial auction is increasing in x_{PE}. There exist thresholds $\underline{x}_{PE}, \overline{x}_{PE}$, with $x^*_{PE} < \underline{x}_{PE} < \overline{x}_{PE} < x_H$ such that for $x_{PE} < \underline{x}_{PE}$ and $x'_{PE} > \overline{x}_{PE}$ we have $R_{SB}(x'_{PE}) < R_{PE}(x'_{PE})$ and $R_{SB}(x_{PE}) < R_{PE}(x'_{PE})$.*

As discussed earlier, a large x_{PE} also means that it is more likely that a PE wins the initial auction. That is, if we consider the comparative statics of the underlying parameters that drive x_{PE} according to Corollary 1, then the variation of any of the parameters p, c_1, c_2, δ, n and $E[\widetilde{x}_i]$ explains a correlation between the frequency of a PE outcome and the expected difference between a winning PE bid and a winning SB bid that increases as PE outcomes become more likely. We will use this correlation in the discussion of empirical predictions to which we turn next.

C. *Empirical implications*

As our discussion prior to Proposition 1 shows, when p is positive and $E\left[\widetilde{x}^{(2)}\right]$ is not negligible, a PE can enjoy both the gain from restructuring and the gain from the synergies of future SBs. This suggests that for values of the parameters that are not extreme, on average a PE should value the asset more than the average SB. As a consequence the seller expected revenue conditional on a PE winning should be larger than the seller expected revenue conditional on a SB winning.

Let us then consider variations of the parameters p, c_2, and Z that express PE restructuring potential, as well as variations of the expected level of synergies among SBs, expressed by n and $E[\widetilde{x}_i]$. Our model says that the PEs' endogenous value component, x_{PE}, is increasing in these parameters; the probability of a PE winning will increase in any of these parameters, and at the same time the expected bid level of a winning PE bidder relative to that of a winning SB bid will also increase. In other words, Proposition 2 shows that assets with a low PE value (low x_{PE})

are more likely to be sold to SBs, and to be sold to them at relatively low prices, while assets with a high PE value (high x_{PE}) are more likely to be sold to PEs, and at relatively high prices. Thus, if we analyze a sample of assets with cross-sectional variation of the underlying parameters discussed above, then this co-variation makes it likely that on average winning PE bids are higher than winning SB bids. Since a measure of seller revenue is given by the seller's abnormal return, this analysis leads to our first set of empirical implications:

Empirical Prediction 1. The average abnormal return of the initial seller is higher when selling to a PE compared with selling to a SB, under plausible parametric assumptions.

According to our model the improvement from v_0 to v_2 is only available if an asset is PE-controlled, which by definition does not apply to a public benchmark firm. Hence we should observe:

Empirical Prediction 2. For assets acquired by PEs, the ex post performance of the asset until exit (growth rate of enterprise value) should exceed that of a benchmark publicly traded firm.

Empirical Prediction 3. If an asset is sold to a PE bidder, intra-industry rival firms of the asset should not exhibit any abnormal return reaction to the sale announcement.

According to our model, the most valuable assets to a PE are those with strong growth potential and many potential synergistic buyers. After acquiring such assets a PE will quickly restructure them and sell them through an IPO. The second most valuable assets are those that have smaller growth potential but can have substantial synergies with future potential parents (strategic buyers). When a PE buys this type of asset, it will be able to exit the investment relatively quickly through an asset sale to a strategic buyer. Assets that are less valuable to a PE are those that are difficult to restructure and have few synergies with SBs. However, a PE can buy such an asset when there

are only a few bidders interested since it can acquire it for a relatively low price; but restructuring the asset will be more time consuming and exit will tend to occur through a sale to another PE that acts as buyer of last resort. It is also possible that these assets will culminate in Chapter 11. This reasoning leads to the following empirical implications:

Empirical Prediction 4. The abnormal return of the initial seller should be positively correlated with the expected performance of the asset, which can be gauged by the subsequent growth rate of enterprise value.

Empirical Prediction 5. The performance of a PE owned asset is related to the choice of exit route. The economic performance of the asset should be the highest when exit occurs through an IPO, followed by a sale to a SB, and should be lowest in a secondary buyout. The expected time to exit for the different exit routes is inversely related to the performance of the first PE owner.

Empirical Prediction 6. A PE receives a smaller revenue when exiting via a secondary buyout compared to a trade sale.

II Sample

Our data set consists of corporate sales of large operating assets by publicly traded firms obtained from the SDC Acquisition Database for 1994 through 2004.[10] We confirm that each event is an asset sale, and we identify the initial announcement date and obtain transaction data from sources that include SEC filings, Factiva, Lexis-Nexis, the Wall Street Journal, and Standard and Poor's Stock Reports, Stock Guide, and Directory of Corporations. Events are categorized by type of buyer: private equity, public operating firm, and private operating firm. We verify that the assets

[10] Our sample goes through the end of December 2004 in order to have a sufficient period of time to observe exits by private quity buyers.

sold are wholly-owned operating businesses of public (CRSP) firms that are not in bankruptcy nor divesting the asset due to a regulatory or judicial mandate. The identity of the acquirer and terms of the transaction must be publicly reported and the transaction must transfer full ownership of the subsidiary to the buyer. To minimize reporting bias, the minimum transaction price is $100 million, a condition that increases the probability that each asset is of sufficient size and stature to be material, and that for sales to private equity the business is likely to warrant enough subsequent interest in the business press to generate coverage of the date and type of exit transaction.

The final sample consists of 146 asset sales to private equity, 287 to public strategic buyers, and 48 to private strategic buyers. Descriptive statistics are shown in Table I. Values are reported in constant (1997) dollars. These are large deals, with an average (median) transaction value of $398 ($212) million for private equity, $644 ($255) million for public strategic buyers, and $308 ($222) million for private strategic buyers. None of the differences in means (medians) is statistically significant. Median transaction values are almost identical, suggesting that private equity has been an effective competitor in large asset sales. The mean (median) seller market capitalization is $22 ($4.6) billion, $21 ($5.2) billion, and $8 ($2.6) billion in the respective subsamples; for public buyers it is $22 ($2.7) billion. The three median ratios of transaction price to seller market value are of similar magnitude. There is a broad range of industries given 105, 156, and 38 different 4-digit SIC codes for the assets in the respective subsamples.

III Empirical Results

A. Valuation Effects of Corporate Asset Sales

In Table II, two-day market model average excess returns, proportion of returns positive, and

median returns at the initial sale announcement are reported. For asset sales to public strategic buyers, seller excess returns are significantly positive, 1.25%, t-statistic of 6.10 (median of 0.27%), and similar to previously reported results (Jain, 1985; Hite, et al., 1987; John and Ofek, 1995; Sicherman and Pettway, 1992; Hege, et al., 2009). The median transaction return, 2.85% ($p = 0.29$), is reported to provide a metric for the economic importance of seller gains. As in previous studies, the results show that the market views these asset sales as having positive net present value for sellers, but the typical change in seller value is small relative to the size of the asset and is well below the premiums of 25% or more observed for targets in merger studies.

For asset sales to private strategic buyers, seller excess returns are positive, 0.95%, t-statistic of 2.19 (median of 0.46%), and not significantly different from the result for public buyers. The median seller transaction return, 3.68%, is similar to public buyer deals.

For asset sales to private equity, seller excess returns are positive and large, 3.78%, t-statistic of 12.42 (median is 2.06%); the proportion of returns positive is 82%. The mean and median seller returns are each significantly greater than seller returns in deals with public buyers ($p = 0.00$), and private operating firms ($p = 0.01$). The median seller transaction return, 22.25% ($p = 0.00$), is also significantly greater than in deals with public or private strategic firms ($p = 0.00$). This pattern of seller returns is consistent with the prediction of our auction model and indicates the value of private equity's restructuring abilities.

Our finding of greater returns to sellers when assets are sold to private equity is opposite to Bargeron, et al. (2008) and Gorbenko and Malenko (2010). Bargeron, et al. (2008) report greater gains (premiums) to merger targets acquired by public firms, a result they ascribe to overbidding that reflects agency problems at public acquirers. However, we find positive average returns to

public strategic buyers in asset sales, 0.48%, t-statistic of 3.10 (median is 0.33%), implying they extract a small rent for their private information about expected synergies. Thus, their behavior in the aggregate is not characterized by overbidding or reflective of agency problems (such as hubris or empire building) as discussed in the merger literature (Thaler, 1988; Barberis and Thaler, 2003; Baker, Ruback, and Wurgler, 2007). Nevertheless, the modest gains in combined shareholder wealth at asset sales to strategic buyers imply that synergistic gains are modest, consistent with prior asset sale studies cited earlier. Similarly, analyzing competitive auctions for entire firms and not divisions, Gorbenko and Malenko (2010) find that strategic buyers bid more, and display a greater dispersion in winning bids. Since both studies analyze full-firm mergers, possible restructuring gains from eliminating influence costs of the subsidiaries we study are absent.

Our theoretical model implies that the return reaction of rivals (public firms that are similar to the asset being divested) should not be correlated with the excess return of the initial seller. This prediction follows from the fact that the improvement in asset value from v_0 to v_1 and v_2 is only available for an entity controlled by private equity. Since firms that are rivals of the asset are not controlled by private equity, a winning private equity bid is not expected to have information content for other firms in the industry. We evaluate the intra-industry effect of private equity bids by examining share price responses of benchmark public firms in the same industry with activities similar to the asset sold. If a bid conveys new industry common information, then share prices of benchmark firms should increase at the sale announcement. We identify CRSP firms with the same 4-digit SIC code as the divested asset, construct an industry portfolio for each event (equally weighting all rival firms per event), and obtain the average portfolio excess return over all events in each sample. The intra-industry effects are small and not statistically significant, implying that

there is little industry common information conveyed by an asset sale to private equity, or indeed any asset sale irrespective of buyer type. This finding supports the view that asset sale transactions are appropriately modeled with a private values format.

B. Exit Transactions and Economic Performance for Private Equity Deals

Our auction model predicts that private equity bids are correlated with future revenues at exit transactions, type of exit, and time to exit. Since the change in parent seller market value at the initial sale announcement is influenced by the difference between the price paid and the market's prior assessment of the asset's value to the seller, parent returns should be related to private equity's expectations about its ability to generate value and exit the investment. Thus, if ex post realizations and ex ante expectations are related, seller returns should be related to the type of exit, the length of private equity ownership, and the ex post gains in asset enterprise value.

We investigate these predictions by determining the exit status (as of 2010) of each asset acquired by private equity. Because the sample includes all large eligible operating assets sold by CRSP firms from 1994 through 2004, our findings about subsequent outcomes are not subject to selection bias problems that are intrinsic to many studies of private equity due to lack of uniform disclosure and the secretive nature of private equity firms. Once acquired by private equity, the assets are not public firms and thus there is little disclosure about their operating performance or capital structure, although the limited reporting available for our sample suggests that they are highly levered while under private equity ownership. We identify the terms of the 121 exit transactions and confirm that each of the 25 assets without an exit remains a portfolio company of the original private equity buyer.

In Panel A of Table III, the average time to exit is 3.4 years. We find that the time pattern of exits

closely matches the implications of the theory, which predicts that exit is most rapid when via an IPO (2.1 years), longer via a trade sale (3.2 years), and longest via a secondary buyout (5.0 years). For the secondary buyouts time to exit is significantly longer than for IPOs ($p = 0.00$) and strategic sales ($p = 0.08$). This evidence suggests that private equity sells an asset to other private equity firms when a timely exit via an IPO or trade sale is not feasible. As a result, secondary buyouts may be regarded as less successful outcomes, or cases of incomplete restructuring, consistent with our theory. For bankruptcies the time to exit is 4.4 years.

To determine the ex post (annualized) rate of increase in asset enterprise value while under private equity ownership, we calculate transaction price, or market value of equity plus book value of debt, depending on the type of exit transaction, and compare this value to the original sale price. This metric is not a direct measure of profitability for fund investors, but it is a useful gauge of an entity's economic performance while under fund ownership. Our theory predicts that the performance of the asset is related to the type of exit mechanism, with expected performance highest for IPOs, next trade sales, followed by secondary buyouts. The data also allow us to test the model's prediction that the gains to the original parent firm seller are greatest for deals that exit via an IPO, and are greater for a strategic asset sale than a secondary buyout.

The mean (median) annual growth rate in enterprise value for the assets that exit is 48.45% (18.69%). To benchmark our results, the annual growth rate in enterprise value over an identical period is calculated for public firms with the same 4-digit SIC code as the asset and are closest in enterprise value to the original sale price. The mean (median) growth rate for the benchmark firms is 20.53% (6.12%) and the difference in sample and benchmark firm means (medians), Excess EV, is statistically significant, $p = 0.00$ ($p = 0.00$). Thus, the entities while owned by private

equity achieve considerable business success relative to benchmark firms, consistent with the view that private equity has valuable business skills. The changes in enterprise value at sample and benchmark entities are highly correlated, 0.74, consistent with the expectation that an asset's growth opportunity is related to growth in the relevant industry, but the overall pattern of results suggests that private equity has valuable skills that contribute to value, a portion of which is received by the original sellers at the sale announcement.

We disaggregate the results by type of exit. Entities that file Chapter 11 retain very little value, given an average (median) annual decline in enterprise value of -27.11% (-21.20%). In principle, private equity ownership could still increase an asset's enterprise value despite a bankruptcy filing, as could be the case for a sustainable business that becomes overlevered, but is reorganized through a negotiation between equity holders and creditors, either in the form of a prepackaged bankruptcy or under the guidance of a bankruptcy judge.[11] However, in our sample bankruptcy occurs after almost complete business failure, resulting in the loss of the private equity stake and large losses to unsecured creditors. Liquidation occurs in ten cases, with minimal payments to unsecured creditors, and equity is cancelled (no payment to private equity). Reorganization occurs in eight cases but almost all enterprise value is lost, with unsecured creditors absorbing large losses and equity interests cancelled. In only two cases is there a reorganization in which some private equity interests are conveyed to debtholders, resulting in a less levered entity that remains under private equity control.

The systematic pattern to business success achieved by type of exit suggests a pecking order with respect to gains in enterprise value that supports the predictions of our theoretical model. The

[11] For example, Kaplan (1989a) has argued that Campeau's acquisition of Federated Department Stores added value even though it ended in bankruptcy.

highest mean (median) annual enterprise value growth rate occurs for IPOs, 111.52% (43.64%), and is significantly greater than benchmark firms. The next highest mean (median) growth rate is exit by sale to strategic buyers, 36.81% (24.78%), also significantly greater than the growth rate of their benchmarks. This estimate of the gains in enterprise value understates the overall (global) economic gains since these transactions also add to buyer value. In 22 of the 37 deals where the strategic buyers have CRSP returns, the buyer average excess return is 4.20% ($p = 0.00$), and the average transaction return is 10.50% ($p = 0.05$); median returns are 2.96% ($p = 0.00$) and 7.75% ($p = 0.00$), respectively. The positive buyer excess returns indicate that there is no evidence of overbidding by public strategic buyers, just as in the case of asset sales as a whole.

Although secondary buyouts can be viewed as an alternative form of asset sale (where the buyer is another private equity firm rather than a strategic firm), our theoretical model predicts that in equilibrium a strategic buyer pays more than another private equity firm at the exit auction. The intuition for this prediction is that strategic bids encompass synergies that add value to the restructured asset, synergies that are not available to private equity, together with the expectation that the greatest improvements in restructuring the asset have already been carried out by the original private equity firm, leaving less scope for value creation by a second private equity owner. Our model suggests that a private equity firm is indifferent between keeping the asset or selling to another private equity firm. In actuality, private equity firms are often under pressure to exit quickly (Kaplan and Schoar, 2005) so secondary buyouts provide a means of exit when the termination date of a private equity fund draws near and strategic buyers are scarce.

For the secondary buyouts, the mean (median) annualized growth rate in enterprise value is 20.48% (10.38%), significantly less than for assets sold to strategic buyers, $p = 0.09$ ($p = 0.05$). This

finding suggests that exit by secondary buyout is associated with poor performance of the asset relative to assets that exit by IPO or strategic sale, although (median) performance is significantly ($p = 0.05$) more favorable than the gains achieved by benchmark firms. We point out that the greater gains in enterprise value when an asset owned by private equity (which like a target firm in a merger study is a stand-alone entity) is sold to a strategic buyer rather than to a second private equity firm, parallels results reported by Bargeron, et al. (2008) that there are greater gains (premiums) to merger targets acquired by public firms rather than private equity. They attribute this result to overbidding by public buyers (due to agency problems). In contrast, our theoretical model generates an explanation for this pattern of behavior for asset sale exits without the presence of overbidding by public buyers. Moreover, our model suggests that when a private equity firm wins the exit auction, it will have less potential to improve the asset than the first private equity buyer had. This reasoning implies that the asset's performance during the second buyout period should be no better than that during the initial round of private equity ownership. To test this implication, we examine the outcomes for the secondary buyouts exits (as of 2010, 11 of the 23 exit). In Panel B, performance during ownership by the second private equity firm is broadly similar to that of the initial private equity firm. The second private equity firm holds the asset for an average of four years and the mean (median) annualized growth rate in enterprise value is 15.19% (16.76%). Neither figure is statistically different from the gains for the first private equity round. Moreover, the second round gains differ little from the average (median) gains in enterprise value of benchmark firms, 14.92% (10.00%). This finding is consistent with our model's prediction and at odds with the view that performance can be improved when an asset is transferred to another private equity firm that has some specific ability to improve the restructured asset that is not

available to the first private equity owner. We conclude that a secondary buyout is an unfavorable form of exit relative to a sale to a strategic buyer or to an IPO.

The overall pattern of the growth in enterprise value for the benchmark firms shows the same rank order as the sample assets, with the highest growth rate for IPOs and the poorest for bankruptcies. This evidence is consistent with the presumption that expectations about future industry developments are a factor in the bidding behavior of private equity. Nevertheless, for each exit category, except bankruptcies, the average (median) growth rate in enterprise value for assets originally acquired by private equity exceeds benchmark firms, indicating the ability of private equity to generate business improvements.

Consistent with our auction model, the pattern of gains to parent firm sellers of assets parallels the subsequent changes in exit enterprise value. Specifically, there are large statistically significant gains for assets that subsequently exit private equity via an IPO or a strategic asset sale, with median transaction returns to the original sellers of 45.05% ($p = 0.00$) and 24.72% ($p = 0.00$), respectively. By contrast, original sellers of assets that eventually sustain bankruptcy have a median transaction return of 7.15% ($p = 0.04$), a figure significantly smaller than for IPOs ($p = 0.05$) or strategic sales ($p = 0.10$). These results suggest that private equity submits lower bids when it expects to generate modest gains, resulting in weaker gains to sellers. The median seller transaction return for secondary buyout exits, 16.71% ($p = 0.00$), is smaller than for exits by IPO or sales to strategic buyers, but greater than for Chapter 11 exits.

To further test the relationship between the excess return of initial sellers and subsequent asset performance, we estimate regressions to control for other determinants of performance success, Table IV, using a series of widely used measures. Our theory predicts that private equity bids, and

in turn seller excess returns, convey information about expected future payoffs and private equity's ability to exit investments successfully. Our first dependent variable is the annual excess growth rate in asset enterprise value (i.e., the difference between the growth rates in enterprise values of the asset and its benchmark). The coefficient of the seller transaction return is positive and significant, suggesting that the seller's share price reaction at an announcement of a private equity deal provides a metric for the future success of the private equity investment. Our second performance metric is a profitability index for which we obtain very similar results.[12] In these regressions, there is some evidence that deals that exited during the high tech bubble (1999-2001) generated lower gains in enterprise value.

Our third performance measure is a binary variable of the relative eventual success of a private equity deal, IPO or strategic asset sale, versus relative failure, bankruptcy or secondary buyout, using a binomial logit model. The coefficients for the seller transaction return are highly significant, providing an estimate as to how an increase in the transaction return for the parent firm affects the marginal likelihood that an asset sold to private equity will exit via an IPO or strategic asset sale rather than secondary buyout or bankruptcy. The qualitative variable for exit during the high tech bubble years, while associated with lower growth rates in enterprise value, has a positive coefficient in the logit regression, suggesting exits by IPO and strategic sales were more likely during this period. There is no evidence that the success of a private equity deal is related to transaction size.

Overall, the seller transaction return is significant in all three specifications. These results are consistent with a central implication of our theoretical model that private equity expectations about future payoffs affect its bidding for an asset and the gains to selling firms.

[12] The profitability index has been introduced in the literature to mitigate holding period biases typically present in PE investments (e.g., Phalippou and Gottschalg, 2009).

C. Cross-sectional Regression Analysis

Overall, our results indicate a relationship between private equity outcomes and seller gains, and a rank order for the types of transactions by which private equity exits an investment. The large gains in enterprise value for the sample as a whole suggest that private equity has valuable skills that are reflected in its bidding behavior. We now use regression analysis to test whether other factors, specifically observable seller or asset characteristics, affect the statistically significant seller gains generated by private equity buyers. The dependent variable is defined as seller transaction returns and alternatively, excess returns. In each regression, two qualitative variables for the type of buyer are specified. One variable takes on the value of unity for private equity and zero otherwise. A second variable takes on the value of unity for private strategic buyers and zero otherwise. We test an array of independent variables but, for economy of presentation, we report a representative subset of regressions in Table V in which the dependent variable is the transaction return. The pattern of results is similar when the dependent variable is seller excess returns. A full set of regression results is available upon request to the authors.

The coefficients of the qualitative variable for private equity are consistently large and significant, and are robust with respect to the inclusion of other variables that reflect characteristics of asset sales, including variables that have been considered in other studies of asset sales. Seller variables reported include the size of the transaction relative to enterprise value, seller market capitalization, prior cumulative stock price performance, operating performance (ROA), market to book ratio, insider holdings, and use of proceeds (equal to one when used for debt reduction or repurchase of equity, and zero for retention). The effect of the variable for private equity buyers remains positive and strongly significant, irrespective of the regression specification.

Other seller variables tested but not statistically significant (results available upon request to the authors) include leverage, dividend payout, time listed on CRSP, growth in intangible assets, and measures of R&D. Alternative measures of size and capital structure do not alter the results. Also we test variables that gauge focus, complexity, and opacity, including whether the asset has the same SIC code as the parent (or public buyer), the number of seller business segments, the relative importance of the segment in which the asset is sold, and whether the seller is a conglomerate. Again, there is no evidence that the greater gains to seller firms associated with private equity deals are affected by seller or asset characteristics.

Since Lewellen et al. (1989) suggests that high insider ownership mitigates agency problems at buyers and Bargeron, et al. (2008) report greater returns to target firms acquired by publicly traded firms with low insider ownership, we specified variables for insider ownership of public strategic buyers. We find no effect of buyer insider ownership on seller returns (results available upon request). Together with the positive excess return to strategic buyers, this result suggests that bids by public acquirers do not reflects buyer agency problems.

We investigate whether greater seller returns in private equity deals are related to financial market conditions due to market timing opportunities given private equity funding cycles and evidence that well-established funds benefit from market fluctuations (Gompers and Lerner, 1998; Gompers, et al. 2008; Ljungqvist, et al. 2006). We test variables for 1-year and 3-year lagged performance of S&P500 and Nasdaq indexes, S&P500 operating performance, and dividend yields; for debt markets, bond term spread and corporate credit spread; for exit markets, Fama-French book-to-market ratio, number of IPOs, IPO first-day returns, and percentage of positive first-day returns; and for the relationship of capital supply and capital disbursements, capital raised but not

invested by funds over the past five years. None of the variables is statistically significant and the qualitative variable for private equity deals remains consistently significant, indicating the effect of the type of buyer for seller returns. We also test several variables to reflect deals in which an asset is acquired by the large, best known private equity firms, but these coefficients are not statistically significant, suggesting that identity of the private equity firm does not affect seller returns.

We estimate a binomial logit model of buyer type using the maximum likelihood method where the value function for the logit is specified as a linear function of asset- and firm-specific variables, plus an error term. The coefficients indicate how a change in a specified variable affects the marginal likelihood that an asset sold by a parent firm will be acquired by a private equity buyer (results are available on request). Our theory predicts that the level of strategic buyer synergies and the potential for restructuring by private equity should be key factors relevant to the type of winning buyer, although these factors are difficult to observe and measure. In Table VI, we test several factors that are observable to determine whether they have an influence on the type of buyer. We find two significant factors: one variable is a proxy for influence costs, and hence the scope for restructuring of an asset; the other variable is a metric for the growing importance of private equity in this sector of the corporate market. As an indicator of potential influence costs, we specify a qualitative variable for selling firms that are conglomerates (firms with three business segments or more). The coefficient is positive, which suggests that a conglomerate structure significantly increases the likelihood of a private equity deal for the asset. In the internal capital markets literature, influence costs generated by underperforming assets are viewed as more likely to be high in the case of a broad based conglomerate (e.g., Scharfstein and Stein, 2000; Rajan, Servaes, and Zingales, 2000). Thus, this result appears to be consistent with the view encompassed

in our model that when influence costs are high, the asset is more likely to be acquired by private equity. We also specify separate variables for the effect of transaction size before and after 2001 to capture the possibility that during the earlier years of the sample, the greater the size of the transaction, the less the likelihood of a private equity deal; i.e., there was some constraint on the ability of private equity firms to finance very large deals, reflecting either the smaller size of these firms or the fact that consortia of private equity firms had yet to become a major contender in this market. The non-significant coefficient during the later period suggests that in recent years private equity has had the capability of financing very large deals, so the size of an asset for sale has no impact on the likelihood of a private equity deal.

Since the results of the logit regression indicate that buyer type is to some degree a function of observable variables, we re-estimate the cross-sectional regressions for seller returns reported in Table V, replacing the private equity dummy variable with two variables: (1) the fitted values from the logit regression for buyer type, which can be interpreted as a proxy for the component of buyer type that is related to variables that can be observed, and (2) the residuals from the logit regression, which reflect the impact of non-observable variables on buyer type. Within the framework of our theory, we interpret these residuals as reflecting the impact of private information conveyed by the identification of the type of buyer. The results indicate that it is the residual component that is the significant factor explaining seller returns (Table VII), while the observable component has little impact (not reported in tables). These findings are consistent with a central prediction of our theoretical model that it is private information conveyed by the acquirer type that influences the level of the winning bid and the returns to sellers in corporate asset sales.

IV Conclusions

In this paper we analyze the participation of private equity firms in the competition for corporate assets. We develop an auction-type model of bidding competition that integrates the behavior of private equity interests with that of strategic buyers, providing a theoretical framework that conforms to the institutional structure of the asset sales market and the business model of private equity firms. In our auction model private equity's valuation for the asset is endogenous, explained by the fact that a private equity buyer can enhance asset value, and then exit the investment via an IPO or an auction to a strategic buyer or another private equity firm. In the model, competitive bidding conveys private information about synergies held by strategic buyers as well as about the participation of private equity bidders. We show that the gains in seller wealth are affected by the type of bidder. Our model predicts that average seller gains will typically be larger when selling to private equity compared to strategic buyers in a sample composed of assets with varying characteristics.

We test the empirical implications of the model by analyzing sales of large corporate operating assets from 1994 through 2004, and follow the pattern of private equity exits through 2010. Sellers earn large gains at sales to private equity, returns that are significantly greater than for deals with public or private strategic buyers. We find no intra-industry gains at news of asset sales, irrespective of the type of buyer, suggesting that the information conveyed is asset-specific rather than having industry-common elements.

We evaluate the change in the enterprise value of assets acquired by private equity over the period from acquisition until the exit by the original buyer. We find that the annual growth rate in the enterprise value of these assets is significantly greater than for public benchmarks, suggesting

the economic importance of private equity's business skills. We also determine the type of exit for the assets acquired by private equity, where the majority are by IPO or strategic asset sale, with a lesser percentage of secondary buyouts and bankruptcies. We find that the seller's return at the original asset sale announcement is directly related to the subsequent gain in enterprise value and to the form of exit from private equity, with sellers earning a significantly greater gain for assets that exit by IPOs or a sale to a strategic buyer rather than by a secondary buyout. Thus, private equity generates large gains in wealth for selling firms in the case of assets that prove to be a rich source of value for private equity. The results lead us to conclude that the ability to generate value from an asset underlies the bidding behavior of private equity.

Appendix

Proof of Proposition 1: Observe that the maximum PE revenue from selling to a strategic buyer is $v_1 + x_H$. For $x_H < \widehat{V}_{PE} - v_1$, this maximum revenue is less than $\widehat{V}_{PE}$, PE's expected continuation payoff obtained by never auctioning the asset and selling it via an IPO as soon as $\widetilde{v} = v_2$. The case $x_H > \widehat{V}_{PE} - v_1$ is an immediate consequence of the following Lemma:

Lemma 2 *If $x_H > \widehat{V}_{PE} - v_1$, then equitation (1) has a solution satisfying $\widehat{V}_{PE} < V_{PE} < v_1 + x_H$.*

Proof: Introducing the notation $r_{auc} = \min\{x_H, V_{PE} - v_1\}$, equation (1) can be restated in terms of the following system of equations:

$$V_{PE} = \delta \left(p(c_2 + V_{IPO}(v_2)) + (1-p) \left(c_1 + \int_{x_L}^{r_{Auc}} V_{PE} dF^{(2)}(x) + \int_{r_{Auc}}^{x_H} (v_1 + x) dF^{(2)}(x) \right) \right), \tag{2}$$

$$v_1 + r_{Auc} - V_{PE} = 0. \tag{3}$$

Solving (2) in V_{PE} leads to

$$V_{PE}(r_{Auc}) = \frac{\delta \left(p(c_2 + V_{IPO}(v_2)) + (1-p) \left(c_1 + \int_{r_{Auc}}^{x_H} (v_1 + x) dF^{(2)}(x) \right) \right)}{1 - (1-p)\delta F^{(2)}(r_{Auc})}.$$

By substituting $V_{PE}(r_{Auc})$ for V_{PE} in equation (3) we have

$$v_1 + r_{Auc} - V_{PE}(r_{Auc}) = 0. \tag{4}$$

Then it is sufficient to show that there exists $r_{Auc} \in [x_L, x_H]$ that solves equation (4) and leads to $V_{PE}(r_{Auc}) > \widehat{V}_{PE}$. Note that

$$\begin{aligned} V_{PE}(r_{Auc})|_{r_{Auc}=x_L} &= \delta \left(p(c_2 + V_{IPO}(v_2)) + (1-p) \left(c_1 + \int_{x_L}^{x_H} (v_1 + x) dF^{(2)} \right) \right) \\ &> \delta \left(c_1 + v_1 + (1-p) \int_{x_L}^{x_H} x dF^{(2)} \right) \geq v_1, \end{aligned}$$

where the inequalities follow from $c_2 > c_1$, $V_{IPO}(v_2) \geq v_2 > v_1$, $\int_{x_L}^{x_H} dF^{(2)} = 1$ and $\int_{x_L}^{x_H} x dF^{(2)}(x) = E[\widetilde{x}^{(2)}] \geq E[\widetilde{x}] > 0$. Thus, the LHS of equation (4) is strictly negative for $r_{Auc} = x_L \leq 0$. Observe now that $V_{PE}(r_{Auc})|_{r_{Auc}=x_H} = \widehat{V}_{PE}$. By substituting this expression into equation (4), we obtain that the LHS of equation (4) is strictly positive for $r_{Auc} = x_H$ if and only if $x_H > \widehat{V}_{PE} - v_1$. Hence, the system (2) - (3) has a solution for $r_{Auc} \in]x_L, x_H[$. Since $V_{PE}(r_{Auc})$ is decreasing in r_{Auc} and $V_{PE}(r_{Auc})|_{r_{Auc}=x_H} = \widehat{V}_{PE} > v_1$, it must be that the V_{PE} solving (1) satisfies $\widehat{V}_{PE} < V_{PE} < v_1 + x_H$. □

This completes the proof of Proposition 1. ■

Proof of Lemma 1: Note that if a PE j does not participate in the initial auction its payoff is nil either because it will never buy the asset or because it will buy it at the fair PE value V_{PE} from another PE via an exit auction. If PE j invests α to participate to the initial auction, then its payoff is $-\alpha + \pi^*_{PE}$ if it is the only PE bidder and $-\alpha$ otherwise. If $\pi^*_{PE} < \alpha$, no PE will ever invest α and the resulting q^* is nil. Consider the case $\pi^*_{PE} \geq \alpha$ and let q be the mixed strategy entry probability adopted by each of the other $m-1$ PE in a symmetric equilibrium. Then PE j is indifferent between entering or not if and only if $-\alpha + (1-q)^{m-1}\pi^*_{PE} = 0$, which is true for $q = q^*$. □

Proof of Proposition 2: For a given x_{PE}, the probability of a PE winning the initial auction is $F^{(1)}(x_{PE})(1-(1-q^*)^m)$, that is the probability that the highest of SBs bidder's synergies is less than x_{PE} times the probability that at least one PE participates to the auction.

Consider first $R_{PE}(x_{PE})$. The PE wins only if the highest value of synergies among SBs is less than x_{PE}. If the winning PE faces no competition from other PEs, then it will pay the highest of the SBs' valuations, for which the expectation, conditional on PE winning the auction, is $v_0 + E[\widetilde{x}^{(1)} \big| \widetilde{x}^{(1)} < x_{PE}]$. If there is at least one other PE bidder, then the winning PE will have to pay $v_0 + x_{PE}$. It immediately follows that $R_{PE}(x_{PE})$ can be expressed as

$$R_{PE}(x_{PE}) = v_0 + \theta E[\widetilde{x}^{(1)} \Big| \widetilde{x}^{(1)} < x_{PE}] + (1-\theta)x_{PE} \ ,$$

where $\theta \in]0,1[$ only depends on q^*. Clearly, $R_{PE}(x_{PE})$ is continuous and increasing in x_{PE} equal to $v_0 + \theta E[\widetilde{x}^{(1)}] + (1-\theta)x_{PE}$ for $x_{PE} \geq x_H$. Consider now $R_{SB}(x_{PE})$. If a SB faces no competition from PEs, then it will pay the highest of other SBs valuations, that in expectation equals $v_0 + E[\widetilde{x}^{(2)}]$. If a SB wins in the presence of PEs, he will pay the maximum between the highest of the other SBs' valuations and x_{PE}, which in expectation is $v_0 + E[\widetilde{x}^{(2)} \big| \widetilde{x}^{(2)} > x_{PE}]$. Note, however, that when x_{PE} increases, a SB will tend to win only when facing no competition from PEs. Hence we can write

$$R_{SB}(x_{PE}) = v_0 + \gamma(x_{PE})E[\widetilde{x}^{(2)}] + (1-\gamma(x_{PE}))E[\widetilde{x}^{(2)} \Big| \widetilde{x}^{(2)} > x_{PE}] \ ,$$

where $\gamma(x_{PE})$ increases with x_{PE} and tends to 1 as x_{PE} approaches x_H. Thus, we have $R_{SB}(0) = R_{SB}(x_H) = v_0 + E[\widetilde{x}^{(2)}]$. Since $R_{SB}(x_H) < R_{PE}(x_H)$ the result follows from the continuity of R_{SB} and R_{PE}. ■

Verification of Claim 1: Let $V_{Auc}(\widetilde{v})$ denote the PE expected revenue from an exit auction when $\widetilde{v} \in \{v_1, v_2\}$. We say that the takeover market for the asset after its IPO is *open* if in every period a takeover contest for the asset is possible among a set of buyers randomly drawn from the same buyer population as in the exit auction described in the model. It is sufficient to show that in equilibrium the following lemma holds:

Lemma 3 *If the takeover market for the asset after its IPO is open, then in equilibrium* $V_{IPO}(v_2) > V_{Auc}(v_2)$ *and* $V_{Auc}(v_1) > V_{IPO}(v_1)$.

Proof: We first show that $V_{Auc}(v_1) > V_{IPO}(v_1)$. Note that PE bidders' value of the asset when $\widetilde{v} = v_1$ is V_{PE}, whereas SB i values the asset $v_1 + \widetilde{x}_i$. Hence if PE j auctions the asset its expected revenue can be written as

$$V_{Auc}(v_1) = E\left[\max\left\{V_{PE}, v_1 + \widetilde{x}^{(2)}\right\}\right] > v_1 \ ,$$

where the inequality follows from $V_{PE} > v_1$ and $E\left[\widetilde{x}^{(2)}\right] > 0$. If PE j sells the asset via an IPO, then its true value $\widetilde{v} = v_1$ will be publicly known at the time of the IPO. Then, the asset will be subject to a takeover contest by the same expected set of PEs and SBs that would participate today if the asset were auctioned. Hence today's revenue from the IPO satisfies

$$\begin{aligned} V_{IPO}(v_1) &\leq \delta\left(c_1 + E\left[\max\left\{V_{PE}, v_1 + \widetilde{x}^{(2)}\right\}\right]\right) \\ &< E\left[\max\left\{V_{PE}, v_1 + \widetilde{x}^{(2)}\right\}\right] = V_{Auc}(v_1). \end{aligned}$$

To see that $V_{IPO}(v_2) > V_{Auc}(v_2)$ note first that $V_{Auc}(v_2) = V_{Auc}(v_1)$. This is because from the fact that PE j auctions the asset, bidders deduce that $\widetilde{v} = v_1$ and their bids will reflect this belief. It is then straightforward to see that $V_{IPO}(v_2) > V_{Auc}(v_1)$. In fact, $V_{IPO}(v_2)$ reflects the expectation of the synergies of future strategic acquirers plus the present value of the asset's maximum possible cash flow, v_2. Similarly, the revenue $V_{Auc}(v_1)$ reflects the synergies of future strategic acquirers; however, at the moment of bidding the expected value of future cash flows is strictly less than v_2. □

References

Baker, M., R. Ruback, and J. Wurgler, 2007, Behavioral corporate finance: A survey, in Handbook of Corporate Finance: Empirical Corporate Finance, edited by E. Eckbo, Elsevier/North-Holland.

Barberis, N. and R. Thaler, 2003, A survey of behavioral finance, in Handbook of the Economics of Finance, edited by G. Constandinades and M. Harris, Elsevier/North-Holland.

Bargeron, L., F. Schlingemann, R. Stulz, and C. Zutter, 2008, Why do private acquirers pay so little compared to public acquirers? Journal of Financial Economics 89, 375-390.

Bharath, S., A. Dittmar, and J. Srivadasan, 2010, Does capital market myopia affect plant productivity? Evidence from "going private" transactions, Working paper, University of Michigan.

Cornelli, F. and O. Karakas, 2008, Private equity and corporate governance: Do LBOs have more effective boards? Unpublished working paper, London Business School.

Eckbo, E., and K. Thorburn, 2007, Corporate restructuring: Breakups and LBOs, in Handbook of Corporate Finance: Empirical Corporate Finance, edited by E. Eckbo, Elsevier/North-Holland.

Gilson, R., 1981, A structural approach to corporations: The case against defensive tactics in tender offers, Stanford Law Review 33, 819-851.

Gompers, P., and J. Lerner, 1998, What drives venture capital fund raising? Unpublished working paper, Harvard University.

Gompers, P., A. Kovner, J. Lerner, and D. Scharfstein, 2008, Venture capital investment cycles: The impact of public markets, Journal of Financial Economics 87, 1-23.

Gorbenko, A.S. and A. Malenko, 2010, Strategic and financial bidders in takeover auctions, Unpublished working paper, Stanford University.

Guo, S., E. Hotchkiss, and W. Song, 2008, Do buyouts (still) create value? Journal of Finance, forthcoming.

Hege, U., S. Lovo, M. Slovin, and M. Sushka, 2009, Equity and cash in intercorporate asset sales: Theory and evidence, Review of Financial Studies 22, 681-714.

Hite, G., J. Owers, and R. Rogers, 1987, The market for interfirm asset sales: Partial sell-offs and total liquidations, Journal of Financial Economics 18, 229-252.

Jain, P., 1985, The effect of voluntary sell-off announcements on shareholder wealth, Journal of Finance 40, 209-224.

John, K., and E. Ofek, 1995, Asset sales and increase in focus, Journal of Financial Economics 37, 105-126.

Jones, C., and M. Rhodes-Kropf, 2004, The price of diversifiable risk in venture capital and private equity, Unpublished working paper, Columbia University.

Kaplan, S., 1989a, Campeau's acquisition of federated: Value destroyed or value added? Journal of Financial Economics 25, 191-212.

Kaplan, S., 1989b, The effects of management buyouts on operating performance and value, Journal of Financial Economics, 24, 217-254

Kaplan, S., and A. Schoar, 2005, Private equity performance: Returns, persistence, and capital flows, Journal of Finance 60, 1791-1823.

Kaplan, S., and P. Stromberg, 2009, Leveraged buyouts and private equity, Journal of Economic Perspectives 23, 121-146.

Lerner, J., M. Sorensen, and P. Stromberg, 2009, Private equity and long run investment: The case of innovation, Unpublished working paper, Harvard University.

Leslie, P., and P. Oyer, 2009, Managerial incentives and value creation: Evidence from private equity, Unpublished working paper, Stanford University.

Lewellen, W., C. Loderer, and R. Roenfeldt, 1989, Mergers, executive risk reduction, and stockholder wealth, Journal of Financial and Quantitative Analysis 24, 459-472.

Lichtenberg, F. and D. Siegel, 1990, The effects of leveraged buyouts on productivity and related aspects of firm behavior, Journal of Financial Economics 27, 165-194.

Liebeskind, J., M. Wiersema, and G. Hansen, 1992, LBOs, corporate restructuring, and the incentive-intensity hypothesis, Financial Management 21, 73-88.

Ljungqvist, A., V. Nanda, and R. Singh, 2006, Hot markets, investor sentiment, and IPO pricing, Journal of Business 79, 1667-1702.

Maksimovic, V., and G. Phillips, 2001, The market for corporate assets: Who engages in mergers and asset sales and are there efficiency gains? Journal of Finance 57, 721-767.

Muscarella, C., and M. Vetsuypens, 1990, Efficiency and organizational structure: A study of reverse LBOs, Journal of Finance 45, 1389-1414.

Phalippou, L., and O. Gottschalg, 2009, Performance of private equity funds: Another puzzle? Review of Financial Studies 22, 1747-1776

Rajan, R., H. Servaes, and L. Zingales, 2000, The cost of diversity: The diversification discount and inefficient investment, Journal of Finance 55, 35-84.

Scharfstein, D. and J. Stein, 2000, The dark side of internal capital markets: Divisional rent-seeking and inefficient investment, Journal of Finance 55, 2537-2565.

Sicherman, H., and R. Pettway, 1992, Wealth effects for buyers and sellers for the same divested assets, Financial Management 21, 119-128.

Thaler, R., 1988, Anomalies: The winner's curse, Journal of Economic Perspectives 2, 191-202.

Table I
Descriptive Statistics

Statistics for means, and medians in parentheses, are reported for asset sales of $100 million or more conducted by publicly traded sellers listed on NYSE/ASE/Nasdaq over the sample period 1994 through 2004, obtained from the SDC Acquisition Database. Transactions are disaggregated on the basis of the type of buyer into 146 asset sales to private equity buyers (PE), 48 asset sales to private strategic buyers (private operating firms), and 287 asset sales to publicly traded strategic buyers. The value of the transaction is reported in millions of constant (1997) dollars. Firm market value is calculated as the number of shares outstanding multiplied by stock price prior to the event announcement, and reported in millions of constant (1997) dollars.

	Private Equity Buyer	Strategic Private Buyer	Strategic Public Buyer	
	Seller	Seller	Seller	Buyer
	N=146	N=48	N=287	N=287
Transaction value ($1997, m)	397.90	308.12	643.73	643.73
	(211.81)	(222.25)	(255.00)	(255.00)
Market value ($1997, m)	21,694.95	7,817.36	20,721.6	22,184.96
	(4,614.09)	(2,560.66)	(5,228.31)	(2,677.25)
Asset/MV	0.26	0.52	0.31	0.34
	(0.07)	(0.09)	(0.07)	(0.11)

Table II
Empirical Results for Share Price Responses at Asset Sales

Empirical results are reported for excess returns at asset sales of $100 million or more conducted by publicly traded sellers listed on NYSE/ASE/Nasdaq over the sample period 1994 through 2004, obtained from the SDC Acquisition Database. The metrics are two-day (-1, 0) announcement cumulative excess returns (CARs) for sellers and for publicly traded buyers (Panel A) and two-day median transaction returns (TR), measured as the dollar gains in value scaled by transaction value (Panel B). Excess returns and transaction returns in percent are in response to 146 asset sales to private equity firms (PE), 287 asset sales to publicly traded strategic buyers (Public SB), and 48 asset sales to private strategic buyers (Private SB). To obtain rival CARs, CRSP firms with the same 4-digit SIC code as the asset are used to form an industry portfolio for each event (equally weighting rival firms per event), and then are averaged over all events. Combined returns weight the buyer and seller returns by market capitalization. Excess returns are calculated using market model methodology; t-statistics are in parentheses, proportion of returns positive is in brackets. Median returns are in braces. The statistical significance of median returns is based on the Wilcoxon signed ranks test. Statistical significance for the difference between types of buyers is obtained by the Satterthwaite test for the difference in means and by the Wilcoxon signed ranks test for the difference in medians. Market model parameters are estimated using least squares over the pre-event period, t = -160 to -41, where day 0 is the date of the first public announcement. Statistical significance is denoted as: *** for the 1% level, **, for the 5% level, and *, for the 10% level.

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	Private Equity Buyer	Strategic Public Buyer	Strategic Private Buyer	p-difference in means {medians}			Strategic Public Buyer	
	Seller	Seller	Seller	PE / Public SB	PE / Private SB	Public SB / Private SB	Buyer	Combined
	N=146	N=287	N=48				N=287	N=287
Panel A: Excess Return								
Two-day CAR (-1, 0)	3.78%	1.25%	0.95%	0.00	0.01	0.81	0.48%	0.31%
	(12.42)***	(6.10)***	(2.19)**				(3.10)***	(1.40)
	{2.06%}***	{0.27%}**	{0.46%}	{0.00}	{0.00}	{0.78}	{0.33%}	{0.32%}
	[0.82]	[0.54]	[0.52]				[0.55]	[0.54]
Rival CAR (-1, 0)	0.05%	0.12%	-0.52%	0.93	0.66	0.61		
	(0.47)	(0.61)	(0.91)					
Panel B: Transaction Return								
Two-day median TR	{22.25%}***	{2.85%}	{3.68%}	{0.00}	{0.00}	{0.57}	{0.73%}	{2.46%}

Table III
Excess Returns to Sellers at Asset Sales with Private Equity Buyers and Subsequent Changes in Asset Enterprise Value

Excess returns (CAR) and transaction returns (TR) to sellers at announcements of asset sales to private equity buyers over the period 1994 through 2004 for sellers and the annualized rate of change in enterprise value implied by the difference between the asset's enterprise value at exit and the value at the original asset sale. Average excess returns reported are the two-day (-1, 0) announcement average excess returns for sellers and the average two-day gain in seller value scaled by transaction size; median returns are in braces. Excess returns are calculated using market model methodology. The statistical significance of medians is based on the Wilcoxon signed ranks test. Market model parameters are estimated using least squares over the pre-event period, t = -160 to -41, where day 0 is the date of the announcement in the Wall Street Journal. The duration of the interval from the asset sale to the date of the exit transaction is reported as of end of 2009. Annualized changes in enterprise value are reported for benchmark firms which are public (CRSP) firms with the same 4-digit SIC code as the asset sold that are closest in enterprise value to the value of the asset. Excess EV is the difference between the growth rate of the relevant asset and its benchmark. Private equity exits are disaggregated into IPOs, sales to strategic buyers, secondary buyouts (SBOs), no exit, and Chapter 11 filings. Of the 23 SBOs, the second private equity firm exits the investment in 11 cases. N is the sample size and statistical significance is denoted as: *** for the 1% level, **, for the 5% level, and *, for the 10% level.

		Panel A: By Type of Exit by 1st Private Equity Buyer						*Panel B: 2nd Private Equity Buyer*
	Full Sample	All Exits	IPO	Strategic Buyer	Secondary Buyout	No Exit	Chapter 11	2nd Private Equity Buyer
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
N	146	121	41	37	23	25	20	11
%		100%	34%	30%	20%		16%	9%
Time in PE {years}		3.37	2.13	3.19	4.95		4.42	4.25
		{2.84}	{1.82}	{2.77}	{5.00}		{4.20}	{4.20}
Seller CAR	3.78%***	4.04%***	5.11%***	3.49%***	4.81%***	2.51%***	1.97%**	
	{2.06%}***	{2.16%}***	{2.38%}***	{1.93%}***	{2.40%}***	{2.06%}*	{0.73%}*	
Seller TR	135.93%***	153.55%***	230.89%***	181.08%***	70.89%	50.65%*	31.76%*	
	{22.25}***	{23.87%}***	{45.05%}***	{24.72%}***	{16.71%}***	{19.27%}	{7.15%}	
EV growth rate		48.45%***	111.52%***	36.81%***	20.48%***		-27.11%***	15.19%*
		{18.69%}	{43.64%}	{24.78%}	{10.38%}		{-21.20%}	{16.76}
Rival EV growth rate		20.53%***	37.03%**	17.88%**	9.48%		4.31%	14.92%
		{6.12%}	{9.45%}	{6.21%}	{2.10%}		{3.94%}	{10.00}
Excess EV		27.93%***	74.49%***	18.93%***	11.00%		-31.42%***	00.27%
		{13.96%}***	{45.88%}***	{18.64%}***	{14.90%}*	{4.04%}	{-28.59%}***	

Table IV
Analysis of Private Equity Success

The first metric, Excess EV Annual Growth Rate, is the difference in the annualized rate of change in enterprise value (EV) implied by the difference between the asset's enterprise value at exit and its value at the original asset sale, minus the annualized rate of change in the enterprise value of the benchmark firm over the same period. The second metric, Excess EV Profitability Index, is the profitability index of the entity's enterprise value at exit and the value at the asset sale, calculated using a discount rate of 15%, (other discount rates generate similar results) minus the annual change of the enterprise value of the benchmark firm over the same horizon. The third metric, Exit Success, is a dummy variable that is equal to one if private equity exits from the asset via an IPO or a trade sale, and 0 otherwise. Regressions (1) through (4) are OLS regressions using (White) heteroskedasticity-consistent standard errors; regressions (5) and (6) are logit regressions. The independent variables are defined as follows: TR is the seller transaction return generated from event studies as described in Table 3; Ln TV is the log of the value of the asset sale transaction; and Year 1999-2001 is a qualitative variable that takes on the value of one for an asset that exits private equity during 1999-2001, years generally accepted as a period of hot IPO markets. The sample size is 121 and *t*-statistics are in parentheses, below the coefficients. Statistical significance is denoted as: *** for the 1% level, **, for the 5% level, and *, for the 10% level.

	Excess EV Annual Growth Rate		Excess EV Profitability Index		Exit Success	
	(1)	(2)	(3)	(4)	(5)	(6)
Seller TR	0.0012	0.0013	0.0031	0.0039	0.0092	0.0086
	(1.93)*	(2.21)**	(2.10)**	(2.38)**	(5.30)***	(4.61)***
Ln TV		-0.017		-0.007		0.165
		(-0.36)		(-0.04)		(1.16)
Exit in 1999-2001		-0.202		-0.953		2.899
		(-1.79)*		(-1.82)*		(4.81)***
Constant	0.1687	0.2872	0.0101	0.1510	-1.9587	-3.0626
	(3.64)***	(1.07)	(0.07)	(0.16)	(-12.84)***	(-3.58)***
R-squared/ Pseudo R-squared	0.0361	0.0641	0.0210	0.0741	0.0669	0.1343

Table V
Regressions of Seller Announcement Returns

Regressions explain excess returns to sellers of assets from 1994 through 2004. In regressions (1) – (4), the dependent variable is TR (transaction returns), and in regressions (5) – (8) seller CAR (cumulative excess returns). Qualitative variables, which take on the value of one for the relevant characteristic and zero otherwise, are defined as: PE is one for private equity buyers; POF is one for private operating firms; Focus is one when the seller and asset sold have the same 4-digit SIC code; and Proceeds is one when the seller pays out the proceeds to reduce debt or repurchase equity. Quantitative variables are defined as: Enterprise value (log) is logarithm of the asset's sales price; Pre-return is the seller's six-month cumulative excess period prior to the sale date; ROA is the seller's return on assets; Asset/EV is the value of the asset scaled by the seller's enterprise value; Insiders is the percentage of seller shares held by members of its Board of Directors and senior management; and M/B is the seller's market to book ratio. N is the sample size; *t*-statistics are in parentheses. Statistical significance is denoted as: *** for the 1% level, **, for the 5% level, and *, for the 10% level.

	Transactions Return				CAR			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE	112.74	101.51	99.30	100.06	2.43	2.52	2.52	2.44
	(4.51)***	(3.96)***	(3.86)***	(3.89)***	(4.20)***	(3.85)***	(3.96)***	(3.86)***
POF		-0.89	-3.83	-3.73		-0.40	-0.51	-0.58
		(-0.04)	(-0.17)	(-0.17)		(-0.36)	(-0.47)	(-0.55)
Focus				-10.10				0.44
				(-0.41)				(0.54)
Enterprise value (log)				4.57				-0.83
				(0.42)				(-3.87)***
Pre-return			-33.87	-33.44			-2.17	-2.23
			(-1.23)	(-1.21)			(-2.62)***	(-2.73)***
ROA		421.96	419.43	412.73		-8.02	-7.39	-6.04
		(1.93)*	(1.87)*	(1.84)*		(-1.62)	(-1.49)	(-1.25)
Asset/EV		5.62	4.38	10.17		-0.70	-0.77	-1.84
		(0.77)	(0.62)	(0.90)		(-0.30)	(-0.32)	(-1.09)
Insiders		-0.90	-0.90	-0.66		0.04	0.05	0.01
		(-1.38)	(-1.35)	(-0.98)		(1.32)	(1.47)	(0.37)
M/B		-0.16	-0.05	-0.10		-0.01	-0.01	0.01
		(-0.54)	(-0.13)	(-0.30)		(-0.78)	(-0.56)	(0.39)
Proceeds		-8.99	-13.40	-10.57		1.56	1.42	0.91
		(-0.42)	(-0.62)	(-0.54)		(2.50)***	(2.31)**	(1.53)
Constant	4.39	-42.14	-38.33	-81.43	1.23	1.36	1.31	9.41
	(0.34)	(-1.23)	(-1.10)	(-0.84)	(3.50)***	(1.74)*	(1.67)*	(4.00)***
N	481	448	444	444	481	448	444	444
R-squared	0.0440	0.0534	0.0551	0.0563	0.0318	0.0653	0.0874	0.1255
F	20.31	3.78	3.09	2.58	17.67	5.74	5.53	6.70

Table VI
Logit Analysis of the Choice between Private Equity Buyer versus Strategic Buyer

This table presents a logit regression analysis of whether an asset is sold to a private equity buyer or to a strategic buyer. The dependent variable equals 1 when the asset is acquired by a private equity firm. Variable definitions are as follows: Conglomerate takes the value of unity when the selling firm is a conglomerate, and zero otherwise; Cash is the selling firm's ratio of holdings of cash and short term securities to total assets; Transaction value is the transaction price for the asset that is sold; Dividend payout takes the value of unity when the parent firm divesting the asset is a dividend paying firm and zero otherwise; FF B/M is the Fama-French book-to-market value during the transaction month; Leverage is the selling firm's ratio of long term debt to total assets; M/B is the market to book ratio of the selling firm; Industry dummies are 12 Fama-French industry dummies. N is the sample size and heteroskedastic-consistent z-statistics are in parentheses. Statistical significance is denoted as: *** for the 1% level, **, for the 5% level, and *, for the 10% level.

	(1)	(2)
Conglomerate	0.4738	0.4377
	(2.10)**	(1.76)*
Cash	-0.9964	-0.5324
	(-0.69)	(-0.32)
Transactionvalue*prior2002	-0.0008	-0.0007
	(-2.27)**	(-2.07)**
Transactionvalue*post2002	-0.0001	-0.0001
	(-0.07)	(-0.12)
Enterprise value (log)	0.0947	0.1452
	(1.32)	(1.8)
Dividend payout dummy	-0.4102	-0.2922
	(-1.32)	(-0.88)
FF B/M	4.1425	5.1198
	(1.67)*	(1.94)*
Leverage		0.6203
		(1.12)
M/B		-0.0021
		(-0.74)
Const.	-1.0638	-2.911
	(-1.58)	(-3.13)***
Year dummies	Y	Y
Industry dummies	N	Y
N	474	473
LR	58.53	90.53
Prob > chi_squared	0.000	0.000
pseudo R-squared	0.1001	0.1553

Table VII

Regressions of Seller Announcement Returns Using Residual Values for Private Equity Dummy

Regressions explain excess returns to sellers of assets from 1994 through 2004. In regressions (1) – (4), the dependent variable is TR (transaction returns), and in regressions (5) – (8) seller CAR (cumulative excess returns). Qualitative variables are defined in Table V. The PE RESIDUAL variable consists of the residuals to the fitted values obtained from the logit regression in Table VI. N is the sample size; *t*-statistics are in parentheses below the coefficients. Statistical significance is denoted as: *** for the 1% level, **, for the 5% level, and *, for the 10% level.

	Transaction Return				CAR			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE RESIDUAL	53.13	46.79	45.80	46.89	1.15	1.27	1.23	1.15
	(3.90)***	(3.22)***	(3.18)***	(3.33)***	(4.43)***	(4.80)***	(4.82)***	(4.34)***
POF		-0.42	-3.48	-2.50		-0.60	-0.73	-0.79
		(-0.02)	(-0.15)	(-0.11)		(-0.52)	(-0.65)	(-0.72)
Focus				-7.88				0.62
				(-0.32)				(0.77)
Enterprise value (log)				6.99				-0.51
				-0.58				(-2.18)**
Pre-return			-29.68	-29.19			-2.06	-2.09
			(-1.08)	(-1.06)			(-2.51)**	(-2.56)**
ROA		356.85	331.35	327.56		-8.60	-8.32	-8.06
		(1.69)*	(1.55)	(1.52)		(-1.56)	(-1.50)	(-1.47)
Asset/EV		-12.57	-11.704	28.13		5.28	5.29	2.40
		(-0.31)	(-0.29)	(-0.56)		(1.63)	(1.59)	(0.65)
Insiders		-0.93	-0.93	-0.72		0.01	0.20	0.00
		(-1.46)	(-1.40)	(-1.07)		(0.38)	(0.58)	(0.13)
M/B		-0.02	1.08	0.37		-0.07	-0.05	0.00
		(-0.01)	(0.34)	(0.13)		(-1.27)	(-0.88)	(0.07)
Use of proceeds		-7.32	-11.11	-8.50		1.39	1.28	1.09
		(-0.35)	(-0.53)	(-0.43)		(2.24)**	(2.07)**	(1.77)*
Constant	4.39	-3.17	-0.67	-68.11	2.00	1.98	1.89	6.77
	(0.34)	(-0.10)	(-0.02)	(-0.64)	(7.06)***	(2.73)***	(2.63)***	(2.75)***
N	474	448	448	444	474	448	444	444
F	15.20	2.89	2.5	2.01	19.65	7.13	6.72	6.43
Prob > F	0.000	0.0038	0.0085	0.0201	0.000	0.000	0.000	0.000
R-squared	0.0441	0.0531	0.055	0.0565	0.0330	0.0868	0.1051	0.1169

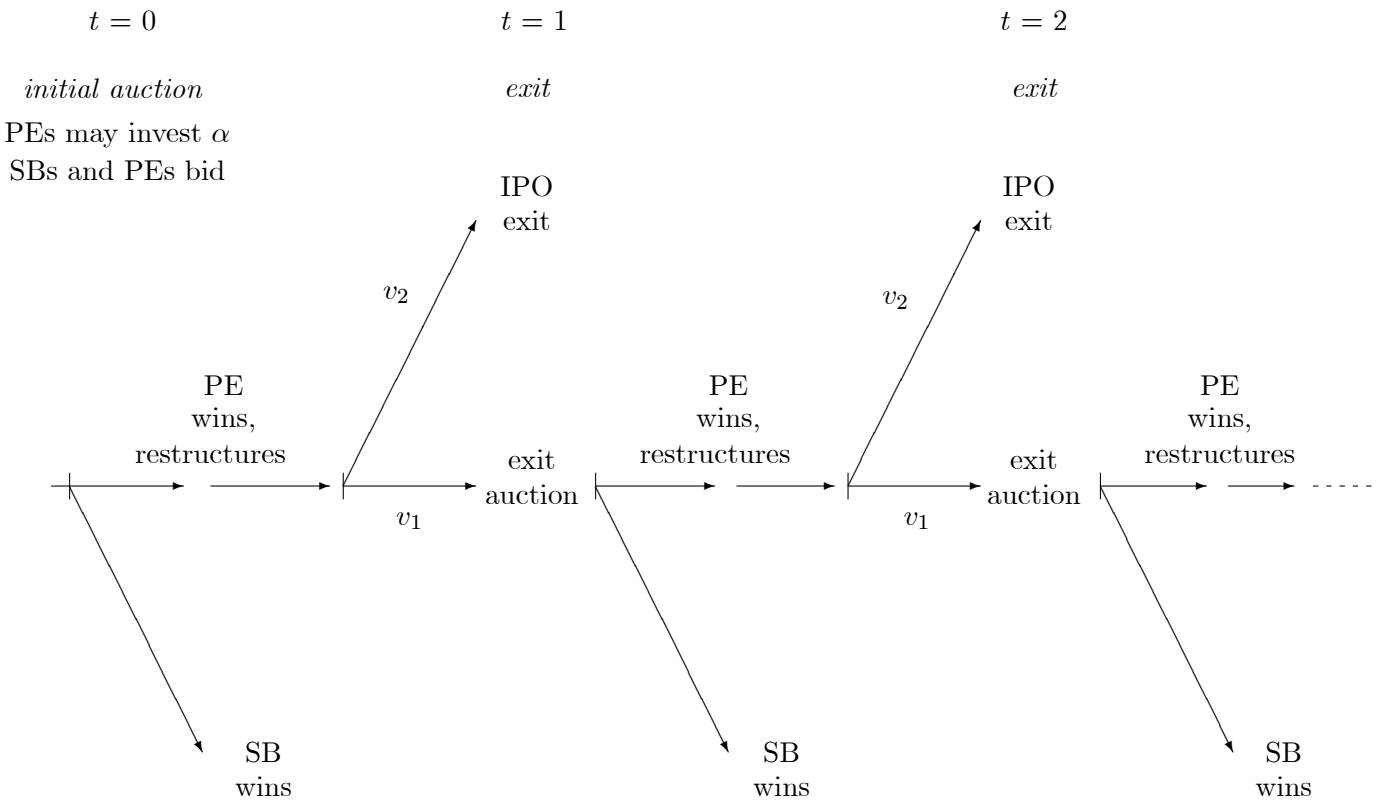

Figure 1. Time Line