Equity and Cash in Intercorporate Asset Sales: Theory and Evidence

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Abstract

We develop a two-sided asymmetric information model of asset sales that incorporates the key differences from mergers and allows the information held by each party to be impounded in the transaction. Buyer information is conveyed through a first-stage competitive auction. A seller with unfavorable information about the asset accepts the cash offer of the highest bidder. A seller with favorable information proposes a take-it-or-leave-it counteroffer that entails buyer equity. Thus, the cash-equity decision reflects seller, but not buyer, information in contrast to theoretical and empirical findings for mergers. The central prediction of our model is that there are relatively large gains in wealth for both buyers and sellers in equity-based asset sales, whereas cash asset sales generate significantly smaller gains that typically accrue only to sellers. Our empirical results are consistent with the predictions of our theoretical model.

Keywords: Asset sales, means of payment, auctions, two-sided asymmetric information.

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1. Introduction

Research on asset sales concludes that a firm sells an operating asset, such as a production facility or a division, when another entity can generate greater value from it. Maksimovic and Phillips (2001) report that these transactions increase economic efficiency, a result that is consistent with positive valuation effects for asset sales reported by Jain (1985), Klein (1986), and Hite, Owers, and Rogers (1987). These studies implicitly treat asset sales as partial acquisitions that fall within the province of theoretical models of mergers. In this paper we develop a theoretical model of intercorporate asset sales that reflects the salient legal and institutional characteristics that differentiate these transactions from mergers and that generates predictions about the means of payment in asset sales that differ sharply from models of mergers such as Hansen (1987), Fishman (1989), and Eckbo, Giammarino, and Heinkel (1990). The value of our approach is reinforced by evidence that equity-based asset sales generate more favorable share price effects than cash sales (Slovin, Sushka, and Polonchek (2005)), a finding that is opposite to the evidence for mergers (Travlos (1987), Franks, Harris, and Mayer (1988), Asquith, Bruner, and Mullins (1983), and Servaes (1991)), but is corroborated in our empirical tests.

Our two-stage model of asset sales consists of a competitive auction that is followed by bilateral negotiations. It explains the transaction's financial structure as an informationally efficient mechanism for the sale of an operating asset, where the seller and potential buyers possess private information that is impounded in the transaction: the buyers' information through competitive bidding, and the seller's through the deal's financial structure. As a result, the asset is allocated efficiently to the highest-valued use. The model generates detailed, unambiguous predictions about combined wealth gains from asset sales, the distribution of the gains between buyers and sellers, and the determinants and valuation effects of the deal's financial structure. We find that payment in the form of buyer equity signals favorable information about the asset, implying greater gains in wealth relative to cash sales for buyers and sellers. Sellers obtain gains in both types of transactions, while buyers obtain significant gains only in equity-based deals. Thus, in a setting characterized by two-sided asymmetric information, the use of equity to acquire an asset has value-

enhancing consequences, a finding that stands in contrast to theory and evidence for mergers or corporate investments (Myers and Majluf (1984)).

Our model incorporates the key features that distinguish asset sales from mergers. One, corporate law mandates that in a merger, target shareholders have irrevocable voting and appraisal rights.[1] Merger models reflect this fact by assuming that the final stage of the game entails a take-it-or-leave-it offer from the acquirer to the target. In contrast, an asset sale is governed by contract law and the business judgment rule, which limits disclosure and obviates shareholder participation, giving seller and buyer managers broad legal discretion to privately develop a transaction structure. Two, mergers are generally buyer-initiated, while asset sales are generally seller-initiated. Three, the sequential nature of entry in merger bidding is conducive to a preemptive bid to deter entry by other potential bidders and limit competition (Fishman (1989)). In contrast, sellers of assets foster competitive and coetaneous bidding via an auction-like process, followed by private negotiations between a seller and a selected buyer.

Our model accords with the legal and institutional structure of asset sales by allowing both the buyer and seller to have active roles in influencing the terms of the sale. Each party holds important, complementary private information. A seller has detailed knowledge about the intrinsic quality of the asset (including contingent liabilities) that is material to its value and is not readily available to potential buyers. Each potential buyer has private information about the value it can generate by conjoining the asset with its existing assets. Our model captures this situation in a double signaling game, incorporating an auction-type procedure followed by bilateral negotiations between the seller and the highest bidder. The seller begins the game by initiating a first-stage competitive auction process. Buyers can submit cash, equity, or mixed bids, but in equilibrium buyers submit only pure-cash bids because equity signals negative information, lessening the probability of winning the auction. We show that equilibrium bids signal each buyer's full set of private information, allowing the seller to initiate exclusive bilateral negotiations with the buyer offering the highest

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[1]Appraisal is a judicial hearing that determines the fair cash value to be paid for the shares of dissenting shareholders. Appraisal protects shareholders from managerial opportunism in a merger, a transaction in which final period problems could be severe since the target ceases to exist after the deal and target managers would no longer be subject to the constraints and monitoring of financial markets (Fischel (1983)).

bid. In the second stage, the seller can terminate the sale, accept a buyer's cash offer, or make a take-it-or-leave-it counteroffer encompassing buyer equity. The possibility that an asset sale can conclude with a seller counteroffer is a key element of our model that cannot be applied to a merger where it is the buyer that must submit the last (public) offer and by law target shareholders make the final decision on the bid. This difference is a reason why in merger models buyer private information determines the means of payment, while in asset sales the financial structure of the deal is related to seller private information. In our model a seller with private information that the asset is of high value proposes to the highest bidder a take-it-or-leave-it counteroffer that includes equity as a means of payment. We show that to signal credibly and ensure no imitation by a seller with a low-value asset, the seller of a high-value asset allows the buyer a share of the gains from the deal. When the seller's private information indicates a low quality asset, there is a cash transaction with the highest bidder. Thus, in a cash deal the market's response can be non-positive for the buyer, while it is unambiguously positive for the seller, although weaker than for an equity deal.

Overall, the model predicts that cash asset sales generate small gains in combined wealth relative to equity-based asset sales, and these gains accrue to sellers, while in equity-based sales there are greater gains in combined wealth that are shared by buyer and seller. Viewed globally, buyers expect a share of the gains from trade that corresponds to their information rent, which is the reward that elicits their willingness to participate in the game and convey private information to the seller in the first-stage auction. The lack of profit to buyers in cash asset sales is more than compensated for by a positive expected return to equity-based sales, reflecting the price a bidder is prepared to pay to win the first-stage auction. The model also predicts that a transaction is more likely to be equity-based when seller private information is important, whereas buyer information has no effect on the probability that a transaction will entail buyer equity.

Given the model's predictions about combined gains, we conduct empirical tests on samples of asset sales in which both parties publicly trade. Since the formation of blockholdings can create value ipso facto, we study the set of equity-based asset sales in which no corporate blockholding is formed because the relevant buyer equity is distributed to seller shareholders, not the seller firm. Equity-based sales generate

significant average excess returns of 6.9% for sellers, 3.4% for buyers, and combined gains are 4.2%. For cash sales, seller returns are 1.4%, but buyer returns and combined gains are not significant. Relative to transaction size, combined excess returns are large for equity-based deals, but negative and not significant for cash deals. Sellers capture 60% of the total gains in equity-based deals, but all of the gains in cash deals. For the full sample, equity-based plus cash deals, there are positive average returns to buyers as well as to sellers. We find significant improvements in buyer performance after equity-based deals, but no change after cash deals. A logit model indicates, consistent with our theory, that private information about the seller, but not the buyer, affects the choice of the means of payment. Overall, our work provides a valuable framework for analyzing asset sales, demonstrates the importance of modeling two-sided asymmetric information, and explains the link between gains in wealth and the means of payment.

Among merger models, those closest in spirit to our asset sale model are Hansen (1987), Fishman (1989) and Eckbo, Giammarino, and Heinkel (1990) since their work is based on two-sided asymmetric information. These models predict a less favorable market reaction to equity-based mergers compared to cash transactions, paralleling the results of merger models with only one-sided, acquirer-based private information, such as Berkovitch and Narayanan (1990). The contrast between this prediction and our result that in asset sales the use of equity signals higher value relative to cash deals, reflects the important institutional and legal differences between the two types of transactions with respect to the role of shareholders and the nature of entry into the bidding competition. After establishing the assumptions and selling procedures of our model, we discuss the intuition as to why these factors generate such different predictions about the effects of the means of payment for asset sales versus mergers.

Our model bears some relation to divestiture models, such as Nanda and Narayanan (1999) and Habib, Johnsen, and Naik (1997), where sellers have private information about assets to be divested, but there is no role for informed buyers in such models, nor is there any consideration as to how the means of payment affects wealth gains, issues central to our work. Several studies, such as Fulghieri and Lukin (2001), explain how high-value firms can use equity to attract informed investors and information

acquisition activity, but there are no previous models that consider the joint problem of selling an asset and the choice of the means of payment. In the literature on non-cash auctions, Hansen (1985) and Crémer (1987) show that an uninformed seller can extract all value with an equity offer, and Bhattacharyya and Singh (1999) and Rhodes-Kropf and Viswanathan (2000) analyze non-cash bankruptcy auctions. Our work is also related to the "unrestricted" bidding model of De Marzo, Kremer, and Skrzypacz (2004). Nevertheless, none of these auction models takes into account two-sided asymmetric information, a key element of our model.

The remainder of the paper is organized as follows. In Section 2, the asset sale game is presented, and in Section 3 the major results are developed for a two-stage auction model where both parties have asymmetric information. In Section 4 sample development is described. In Section 5 empirical results that test the model's predictions are reported. Conclusions are offered in Section 6.

2. A theoretical model of asset sales

2.1. Basic assumptions

A firm, the seller, wishes to sell an indivisible, tangible, productive asset. There are $N > 1$ potential buyer firms. We denote by x_i the value of a buyer firm i if it does not purchase the asset. The random variable x_i represents the intrinsic value of buyer firm i's existing assets, including potential synergies, and is privately known by buyer i. We assume that buyers' types are i.i.d. on the interval $[x_L, x_H]$ with cumulative density function F. The value of a buyer firm if it operates the asset depends on both parties' private information. The seller possesses non-public information about the intrinsic qualities and various uses of an asset that it currently owns, while a buyer holds an advantage in knowing the intrinsic value of its existing assets and the potential synergies of the asset for sale when combined with the buyer's operations. We denote by $w(v, x_i)$ the value of buyer firm i if it operates the asset, where $w(.)$ is strictly increasing in both arguments and differentiable in x_i. The random variable v represents the intrinsic quality of the asset and is privately known by the seller. We assume that v takes value v_L with probability p and $v_H > v_L$ with probability $1-p$. We denote by y the value of the asset to the seller and we assume that $w(v_L, x_i) - x_i \geq y \geq$

0. Thus, an asset sale generates overall value equal to $w(\textbf{\textit{v}}, \textbf{\textit{x}}_i) - \textbf{\textit{x}}_i - y \geq 0$. Moreover, we assume that synergies are increasing in buyer and seller private information. More precisely, $w_2(\textbf{\textit{v}}, \textbf{\textit{x}}_i) \geq w(\textbf{\textit{v}}, x_H)/x_H$, and $w_2(\textbf{\textit{v}}, \textbf{\textit{x}}_i) \, \textbf{\textit{x}}_i \, / w(\textbf{\textit{v}}, \textbf{\textit{x}}_i)$ are nondecreasing in $\textbf{\textit{v}}$, where $w_2(.)$ is the derivative of w with respect to $\textbf{\textit{x}}_i$, its second argument. The last two assumptions indicate that the value created by a deal is sufficiently sensitive to the quality of the buyer's existing assets $\textbf{\textit{x}}_i$ and that this sensitivity does not decrease with the quality of the asset for sale. For simplicity, we assume that y is common knowledge.[2]

2.2. Selling procedures

We model the negotiation among the seller and the potential buyers as follows. First, the seller collects confidential offers for the asset from potential buyers, where the form of payment may encompass any combination of cash and buyer common stock. Let (B_i, C_i) be the offer from potential buyer i, where C_i is the cash component of the offer and B_i denotes the fraction of the buyer's total equity that is offered to the seller. We require that the cash component C_i be nonnegative, and that the equity component B_i not exceed a fraction of ownership in the buyer, i.e., $C_i \geq 0$, and $0 \leq B_i \leq 1$. These offers are firm and the seller can decide to (i) accept the offer of one of the buyers as is, (ii) enter into further exclusive negotiation with one of the buyers, or (iii) not sell the asset. In case (i) or (iii) the game ends with the seller's decision, with either a transaction on the buyer's terms or no transaction. When the seller chooses option (ii), it then proceeds to conduct an exclusive negotiation with one selected buyer. At the onset of this negotiation, the seller provides a contractual letter of intent to the selected buyer indicating that it intends to sell the asset and that the terms of any final agreement will be at least as favorable to the buyer as in the case in which the buyer's original offer (B_i, C_i) is accepted. The seller then makes a take-it-or-leave-it counteroffer to the buyer. If the buyer accepts this counteroffer, the transaction is concluded on the terms of the counteroffer. If the counteroffer is rejected, no transaction ensues, but the seller fulfills its commitment by paying as

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[2] If the seller's value from using asset y depends monotonically on the intrinsic quality of the asset $\textbf{\textit{v}}$, the seller will require higher revenue for a high quality asset and lower revenue for a low quality asset. At the same time, as shown below, the seller obtains higher revenue in equilibrium when a high quality asset is sold. The seller's equilibrium revenue will meet its own value whatever the intrinsic quality of the asset $\textbf{\textit{v}}$.

compensation for the breach of contract what the buyer would expect to obtain if the initial offer had been accepted.[3] Nevertheless, in equilibrium it will be in the buyer's and seller's interests to conclude the deal.

Let bidder i be the buyer that submitted the offer selected by the seller. If the seller chooses option (i), then the buyer's original shareholders will receive an expected profit of

$$\Pi_B(x_i, B_i, C_i) = (1 - B_i) \, (\, E[w(v, x_i) \mid \text{seller accepted } (B_i, C_i) \,] - C_i) - x_i \, ,$$

and, when $v = v \in \{v_L, v_H\}$, the seller's expected profit is

$$\Pi_S(v, B_i, C_i) = B_i \, (E[w(v, x_i) \mid \text{offer } (B_i, C_i) \,] - C_i) + C_i - y.$$

The counteroffer if the seller chooses option (ii) can encompass any combination of cash and buyer equity. We denote by c the cash component of the counteroffer while β denotes the fraction of the buyer's total equity that the seller receives if its counteroffer is accepted. Similar to a buyer's offer, we require $c \geq 0$ and $0 \leq \beta \leq 1$. If the buyer accepts the counteroffer, it acquires the asset in exchange for a cash payment c and a proportion of its equity β. Thus, if buyer i accepts the counteroffer (β, c), the expected profit to the buyer's original shareholders will be

$$\Pi_B(x_i, \beta, c) = (1 - \beta) \, (E[w(v, x_i) \mid \text{counteroffer } (\beta, c) \,] - c) - x_i$$

and the seller's expected profit will be

$$\Pi_S(v, \beta, c) = \beta \, (E[w(v, x_i) \mid \text{offer } (B_i, C_i) \,] - c) + c - y$$

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[3] A derivation of this compensation is found in Section 3.1. Our model can be generalized to reflect different compensation rules.

Finally, if the buyer rejects the counteroffer (β, c), no transaction takes place and the buyer will be appropriately compensated for breach of contract, receiving $(1 - B_i)(w(v_L, x_i) - C_i) - x_i$, that is, the buyer's equilibrium gain in the case when its initial offer is accepted, as we demonstrate in the next section.

The two-stage approach of our model accords with the legal and institutional structure that applies to asset sales and captures two important differences relative to merger models. First, since the sale of an asset is governed by contract law and the business judgment rule, an asset sale is a legally binding contract between teams of buyer and seller managers who have the broad legal authority to conduct an asset sale, and are insulated from shareholder voting and litigation. In our model, both buyer and seller managers play active roles in influencing the terms of the transaction. We will show that as a result of the first-stage auction-type bidding process, the seller is able to extract each buyer's private information, and as a result becomes the only party that has valuable private information. Thus, after the auction, the seller retains substantial bargaining power and can decide to conclude the auction or to open negotiations with the selected buyer by making a take-or-or-leave-it counteroffer that reshapes the financial structure of the deal. Our prediction that a seller with favorable private information will prefer to be paid with buyer equity rather than cash is a result of this structure. By contrast, corporation law requires that a merger be approved by a majority of target firm shareholders. Merger models, such as Hansen (1987), Fishman (1989), and Eckbo, Giammarino, and Heinkel (1990), incorporate this constraint by assuming that the acquirer must submit the last offer to target shareholders, who then make the final decision to accept or reject it. As a result, it is buyer private information that determines the financial structure of the merger, with the acquirer preferring to pay for the target with equity when its private information is unfavorable, and to use cash when its private information is favorable.[4]

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[4] The decisive role of the seller's final offer stage can be corroborated with the following counterfactual. Suppose that intercorporate asset sales were to be made subject to the same corporate statutes and laws that govern mergers. In our model, such a rule would take the form of a third round in which the buyer makes a final offer to seller shareholders after the seller's second-stage counteroffer. It is possible to show that in this scenario the asset will always be sold for cash since the seller has no incentive to disclose private information in a second-stage counteroffer.

The second difference is that in a merger one buyer typically initiates the process, and rival bidders emerge only subsequently. The sequential nature of entry for merger bidding creates a rationale for the initial bidder to make a preemptive cash bid to discourage (costly) entry by other bidders (Fishman (1989)). In contrast, in an asset sale the seller encourages competitive bidding by seeking out the participation of multiple bidders from the outset, thus forestalling preemptive bidder strategies. Our analysis shows that when bidding is simultaneous or coetaneous, as is typical in asset sales, buyers reveal their private information via cash offers so that the cash-equity choice is not related to acquirer asymmetric information.

3. Equilibrium

3.1. Central results

We solve the game by backward induction. To begin, consider the stage where buyer firms have submitted their offers, the seller has selected one offer, and the seller must decide whether to accept it as is or to make a counteroffer to the selected buyer. Let (B, C) be the selected offer, and denote by $x(B, C) = E[x_i \mid$ bidder i offers $(B, C)]$ the seller's expectation regarding the type of the potential buyer i that offered (B, C). We claim that, in equilibrium, after observing buyers' bids, the seller will be able to deduce all buyer private information on x_i. In other words, at this phase of the game all of the buyer's private information about its existing assets and their potential value when combined with the seller's asset, is revealed to the seller, leaving the seller's private information as the only remaining source of uncertainty. We also claim that the selected offer provides the seller at least y, that is, its reserve value for the asset. We verify these claims in Proposition 2. Fix $x = x(B, C)$ and let v be the intrinsic value of the asset. Then the seller will make a counteroffer if it can find (β^*, c^*) such that

$$(\beta^*, c^*) \ = \ \arg\max_{c \geq 0, 0 \leq \beta \leq 1} \beta(w(v, x) - c) + c$$

subject to

$$\beta(w(v, x) - c) + c \ > \ B(w(v, x) - C) + C$$

$$\Pi_B(x, c, \beta) \ \geq \ \max\{(1 - B)(w(v_L, x) - C) - x, 0\}$$

The first constraint states that a counteroffer is made only if, when accepted, it provides the seller with strictly more than the buyer's initial offer. The second constraint implies that the buyer accepts the counteroffer only if it provides a nonnegative profit and more than what it could claim if the negotiation fails (the buyer's expected payoff if the offer is rejected). If no (β^*, c^*) satisfying both constraints exists, then the seller will accept the buyer's offer as is.

Since the seller has the ability to make a counteroffer and has private information on v, this phase of the negotiation is a signaling game that, as usual, exhibits multiple equilibria. In order to restrict the set of equilibria of this game, we use the refinement known as D1 to define a buyer's out-of-equilibria beliefs when it observes a counteroffer that was "unexpected" in equilibrium. The refinement D1, introduced by Cho and Sobel (1990), states that if the buyer observes an out-of-equilibrium counteroffer, it surmises that this counteroffer comes from the seller type that is "more eager" to make it. This refinement leads to a unique separating equilibrium where the seller makes a counteroffer only if $v = v_H$. To credibly signal that the intrinsic quality of the asset is high, the seller's counteroffer includes payment in the form of buyer equity. Such a counteroffer maximizes seller revenue if $v = v_H$, under the constraint that the seller would prefer the buyer's original offer if $v = v_L$. This constraint limits the fraction of equity that the high-value seller can demand when $v = v_H$. More precisely, we obtain the following result:

Proposition 1: *Suppose the seller selects offer (B, C) that uniquely identifies the type x = x(B, C) of the buyer that submitted this offer. Then the signaling game has a unique separating equilibrium outcome satisfying the D1 criterion, that has the following structure :*

if $v = v_L$, then the seller accepts the offer (B, C);

if $v = v_H$, then the seller makes an all-equity counteroffer $(\beta^*, c^*) = (B + (1 - B)C/w(v_L, x), 0)$ and the buyer accepts the counteroffer.

Thus, the equity component in the structure of the deal is lower for low quality assets than for high quality assets.

Proof: See Appendix A.

Let us develop the intuition for the particular form of the counteroffer, *(β*, c*)*. First, to establish that the equilibrium counteroffer must be an all-equity offer (*c* = 0*), consider a hypothetical mixed counteroffer with a positive cash component. If this offer were to satisfy the incentive constraints necessary for a separating equilibrium, then the seller with a high-value asset could propose a counteroffer with more equity and less cash from which it derives a strictly higher payoff and that would still satisfy both incentive constraints. The reason for this result is that more equity leads to a greater payoff differentiation between the two types, thus allowing the high-type to appropriate more value without risking imitation by the low-type. Any mixed offer is dominated by another offer with less cash, and only an all-equity offer is robust against this argument. Second, for an all-equity offer to be separating, we need to ensure that the incentive constraint for the seller with the low-value asset is satisfied:

$$B(w(v_L, x) - C) + C - y \geq \beta^* w(v_L, x) - y.$$

This result implies that $\beta^* = B + (1 - B)C/w(v_L, x)$ is the maximum equity participation for the seller with the high-value asset that does not violate incentive constraints. As a result, the seller must "leave money on the table".

Now, we turn to the first phase of the two-stage sales procedure where potential buyers compete in making offers for the asset. For the moment, we set aside the possibility that buyers make any offers other than pure-cash offers (although these bids will be the equilibrium offers as we argue below). Moreover, each bidder anticipates that upon winning the auction, if the intrinsic quality of the asset is v_L, it will pay its bid C_i, whereas if the intrinsic quality of the asset is v_H, its payment will entail buyer equity.

We focus on symmetric equilibria where a potential buyer's offer is a differentiable increasing function $C: [x_L, x_H] \rightarrow \mathbb{R}^+$ of its type, as is standard in auction theory. Let $C(.)$ be the bidding function in a symmetric equilibrium. Note that in equilibrium, $x(0, C)$ is the inverse of the bidding function $C(.)$. With bids in the form of cash, the seller will select the bidder that submits the highest bid, as this will be the

bidder that values the asset the most. Then the best pure-cash bid for a potential buyer of type x will be the solution to the following maximization problem:

$$\max_{g \in [x_L, x_H]} \left(p(w(v_L, x) - x - C(g)) + (1 - p)((1 - \beta(g))w(v_H, x) - x) \right) F_N(g)$$

subject to (1)

$$\beta(g) = \frac{C(g)}{w(v_L, g)}$$

where $F_N(g) = F(g)^{N-1}$ is the probability that the highest type among the potential buyer's competitors is smaller than g. This expression provides the expected payoff to a buyer of type x if it behaves like a buyer of type g. Note that the submission of an offer $C(g)$ instead of $C(x)$ affects the potential buyer's expected profit in three ways. First, it affects the probability of the bidder being selected by the seller. Second, it affects the cash payment when its offer is accepted, i.e., whenever $v = v_L$. Third, it affects the equity payment that it will make whenever $v = v_H$. In fact, by bidding $C(g)$ the bidder induces the seller to believe that its type is g, information that will affect the seller's counteroffer in the case $v = v_H$. This third factor makes this competition different from that of a standard first-price sealed-bid auction. In equilibrium, bidder i must find it optimal to choose $g = x$.

By substituting $\beta(g)w(v_L, g)$ into $C(g)$, the buyer's objective function (1) can be rewritten as

$$\pi(x, g) = (E[w(v, x)] - x - \beta(g)(pw(v_L, g) + (1 - p)w(v_H, x))F_N(g) \tag{2}$$

The first order condition, using the derivative of expression (2) with respect to g, is $\pi_2(x, g)|_{g=x} = 0$, which leads to the following differential equation in $\beta(x)$:

$$E[w(v, x)] (f_N(x) (1 - \beta(x)) - \beta'(x) F_N(x)) = f_N(x)x + \beta(x) F_N(x) p w_2(v_L, x) \tag{3}$$

where $f_N = F_N'$.

The final step of the analysis is to show that pure cash bids are indeed optimal and preferred by buyers to any combination of cash and equity. We show in Appendix B that if all but one potential buyers adopt the pure-cash bidding strategy *(0,C(x))* that solves expression (1), then the remaining bidder's best response is *(0,C(x))*. We then obtain the following result:

Proposition 2: *There exists a symmetric equilibrium of the entire game, where all buyers are making fully revealing pure cash bids in the first phase of the game. A buyer of type x makes a pure cash offer (0,C(x)) that is strictly increasing in its type x and that is characterized by*

$$C(x) \ = \ \frac{w(v_L,x)}{F_N(x)} \int_{x_L}^{x} \phi(t,x) f_N(t) dt \ , \tag{4}$$

where

$$\phi(t,x) \ := \ \left(1 - \frac{t}{E[w(v,t)]}\right) \exp\left(-\int_{t}^{x} \frac{p w_2(v_L,z)}{E[w(v,z)]} dz\right) \tag{5}$$

and

$$C(x_L) \ = \ \left(E[w(v, \ x_L)] - x_L\right) \frac{w(v_L, x_L)}{E[w(v, \ x_L)]} \tag{6}$$

Moreover, y < C(x) < w(v_L,x) for all x ∈[x_L ,x_H].

Proof: See Appendix B.

In our proof that pure-cash bids are an equilibrium, we first establish that no pure-cash deviation can be profitable for this bidder. Then, to complete the proof, we only need to show that there is no profitable deviation *(B, C)* involving a strictly positive equity component. The seller's out-of-equilibrium beliefs regarding the type *x* of the bidder that made such an offer must satisfy the D1 criterion. Applying this criterion to this phase of the game, it follows that an equity component in the offer is a negative signal regarding the quality of the buyer's existing assets. In other words, the seller's out-of-equilibrium belief after observing such an offer makes the buyer's offer less attractive relative to the offers of other buyers.

More precisely, the buyer could always find an alternative deviating offer in pure cash that, if accepted by the seller, would provide the same payoff of the offer *(B, C)*. However, this pure cash deviation would have a greater chance of being selected by the seller from among the different offers, as it does not include the negative signal provided by the non-zero equity component in *(B, C)*. Thus, a deviating offer involving equity is always dominated by a pure-cash deviation that in turn is not profitable.

3.2. Empirical implications

For purposes of empirical testing, the implications of our model focus on the following metrics.

Value creation.   One metric is the gain in the combined market value of the buyer and seller that arises from an asset sale. According to Proposition 1, assets with low intrinsic value should be sold for cash, so cash asset sales should be associated with low wealth generation effects. In contrast, equity-based asset sales should be observed when the asset has a high intrinsic value, so these asset sales should be associated with strong positive wealth generation effects. Our model predicts that on average equity-based asset sales generate a greater increase in combined value than cash asset sales.

The cash-equity choice.   In our model, the private information held by sellers plays a different role than that of private information held by buyers. Accordingly, the comparative statics of the two sources of adverse selection exhibit distinctive empirical predictions about the financial structure of the transaction, that is, the choice of equity versus cash. To develop comparative statics with respect to seller private information, consider the case of a seller that has no private information (that is, $v_L = v_H$). It is easy to show that the model predicts that there will be only cash deals since there is no incentive for the seller to make an equity counteroffer, while the reasons bidders prefer to submit cash offers remain unchanged. The importance of the seller's private information on the value of post-transaction buyer equity increases in the probability that the seller is privately informed. The comparative statics are as follows: an increase in the importance of the seller's private information increases the likelihood that the means of payment will be equity-based, which is our second metric. In contrast, in our model a change in the importance of the

buyers' private information leaves the structure of the equilibrium unchanged with respect to the choice between cash and equity, implying no effect on the frequency of equity versus cash deals.

Value sharing.   A third metric measures how the value created by the transaction is shared between the seller and the buyer's original shareholders. The model predicts that the proportion of the gains received by the buyer is greater in equity-based transactions than in cash transactions. To see this point, we denote as $\theta(v, x)$ the share of the value created by the asset sale that accrues to the original shareholders of the buyer, for a given level of the intrinsic quality of the asset for sale and the buyer's existing assets. In equilibrium, the observed profit to the buyer's original shareholders is *(1 - β(x))w(v, x) - E[**x**]*,[5] so the observed $\theta(v, x)$ is

$$\theta(v,x) = \frac{(1 - \beta(x))w(v,x) - E[\boldsymbol{x}]}{w(v,x) - E[\boldsymbol{x}] - y}$$

which is increasing in v,[6] the intrinsic value of the asset, that is, the private information of the seller. Since a greater intrinsic value v is associated with equity-based deals and a smaller intrinsic value with cash deals, the model predicts that on average sellers will appropriate a smaller proportion of the value created by equity-based deals relative to cash deals.

Wealth gain vs wealth loss. A fourth metric is the sign and magnitude of buyer and seller profits across all asset sales (for cash asset sales as well as equity-based asset sales). This metric allows us to identify the party that has the most valuable information in an asset sale.

Buyer: The ex-ante expected profit (empirically proxied by averaging over cash asset sales plus equity-based sales) is positive because the buyer can extract an informational rent due to its private information about its synergy with the asset. The average profit in equity-based asset sales is larger than the ex-ante profit because the value created in these deals is greater, and the buyer appropriates a larger share of

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[5] The value and the financial structure of the deal convey buyer and seller private information accurately. However, prior to the transaction the market will price the buyer at $E[\boldsymbol{x}]$ as there still is asymmetric information regarding the buyer's existing assets. Hence, if the true gain of buyer shareholders is *(1 -β(x))w(v, x) - x,* the empirical observation of this gain using stock prices will be *(1-β(x))w(v, x) - E[**x**]*. The effect of this pricing error is an increase in the variance of the unexplained residual.

[6] In fact, $\partial \theta / \partial v > 0$ iff $\beta(x) > y/(E[\boldsymbol{x}] + y)$, which is true as $\beta(x) \geq 1 - x_L/E[w(\boldsymbol{v}, x_L)]$ and $w(v_L, x_L) - x_L - y > 0$.

this value. Conversely, the buyer's profit in cash asset sales is smaller than the ex-ante profit. It should be noted that it is possible that buyers expect to lose money in cash asset sales. Namely, from Proposition 2 it follows that the ex-ante profit of a buyer goes to zero as its type approaches x_L, which implies this buyer type will lose money in a cash asset sale, but make a positive profit in an equity-based asset sale. Note also that as the importance of buyer private information narrows, its ex-ante payoff converges to zero. In this case, buyers on average will sustain losses in cash asset sales and gains in equity deals. Conversely, if the importance of buyer private information is large, the buyer informational rent will also be large and consequently the average profit for buyers will be positive for cash deals.

Seller: The ex-ante and ex-post profit of the seller are positive. More precisely, the seller's average profit in an equity-based asset sale is greater than its ex-ante expected profit (empirically proxied by averaging over cash asset sales plus equity-based sales), which in turn is larger than its average profit in a cash asset sale, which is greater than zero.

4. Sample development

We construct samples of intercorporate sales of operating assets from 1989 through 2002, using Factiva (formerly the Dow Jones News Retrieval Service) and Lexis-Nexis. Ownership data for buyers and sellers are from proxy statements from Edgar or the SEC File from Q-Data Corporation. Other information sources are the Wall Street Journal, Standard and Poor's Stock Reports, Stock Guide, and Directory of Corporations, and SEC filings. The announcement date is the initial public report of the asset sale.

Testing the predictions of the theoretical model requires that certain filters be applied to the data to obtain the final samples of asset sales. One filter is that both the buyer and seller must be publicly traded firms with CRSP data. Thus, transactions that involve a buyout firm or other private entity are excluded. This criterion ensures that the combined gains in wealth and the distribution of the gains between the buyer and the seller can be evaluated for each transaction. A second filter is that specific information about the terms of the transaction is publicly reported, including whether the payment is in cash or is equity-based. Three, to minimize reporting bias, and increase the likelihood that the transaction is material, an asset sale

must have a transaction price of at least $100 million, and the seller must not be in financial distress. Four, the operating asset must be wholly-owned by the seller prior to the sale, and the transaction must transfer the seller's full ownership of the asset to the buyer. An additional filter for equity-based asset sales is that the relevant shares of buyer stock are not paid to the selling firm, and instead, are conveyed directly to its shareholders, ensuring that the seller does not become a corporate blockholder in the buyer. This empirical strategy generates a sample of equity-based transactions that has no overlap with previous studies (Allen and Phillips (2000) and Slovin, Sushka, and Polonchek (2005)). Our samples consist of 37 equity-based asset sales and 93 cash sales. The events are well distributed over the sample period.

Descriptive statistics are reported in Table 1. Dollar values are in constant (1997) dollars. Both cash and equity-based asset sales are major transactions between large capitalization firms. The average (median) value of cash asset sales is $1.38 ($1.01) billion compared to $1.91 ($1.20) billion for equity-based sales. Mean (median) capitalization is large for both buyers and sellers in equity-based sales, $9.30 ($1.98) billion and $7.69 ($1.93) billion, respectively, but firms in cash asset sales are larger still, $20.85 ($5.98) billion for buyers and $14.85 ($10.02) billion for sellers. The mean (median) ratio of transaction price to seller market value is 0.77 (0.58) for equity-based sales, and is higher than the ratio of 0.31 (0.11) for cash sales, with the difference in means (medians) statistically significant. For buyers, the mean (median) ratio is 0.90 (0.45) in equity-based sales, which is larger than the mean (median) ratio of 0.49 (0.13) in cash sales, and the difference in means (medians) is statistically significant. A broad range of industries is represented in both samples. There are 33 4-digit SIC codes among the 37 buyers and 32 4-digit SIC codes among the 37 sellers in the equity-based sample, and 64 4-digit SIC codes among the 93 buyers and 65 4-digit SIC codes among the 93 sellers in the cash sample. In the equity-based sample, buyer equity is the dominant means of payment, representing on average (median) 71.3% (70.3%) of the consideration paid. All-equity deals comprise 38% of the equity sample. On average (median), the buyer equity conveyed to sellers as a proportion of buyer shares outstanding is 28.9% (24.1%).

Buyers and sellers in cash asset sales have dispersed ownership structures. Mean (median) insider holdings by top executives and members of the board of directors as a percent of outstanding shares is 5.0% (1.8%) for buyers and 5.3% (1.0%) for sellers. For equity-based asset sales, mean (median) insider holdings are 9.4% (1.6%) for buyers. Sellers in equity-based sales have significantly greater insider holdings, with a mean (median) of 11.5% (4.6%), than sellers in cash sales, whereas the differences between the two sets of buyers are not significant. In each sample there are similar mean (median) institutional holdings, with 50.7% (54.0%) for buyers and 48.7% (51.1%) for sellers in cash sales, and 52.0% (52.2%) for buyers and 53.9% (56.8%) for sellers in equity-based deals.[7] These figures are well above average institutional holdings at NYSE/ASE firms (McConnell and Servaes (1990)).

In equity-based asset sales, the shareholders of the selling firm take ownership of relevant buyer shares based on a pro rata distribution established in the transaction agreement. Seller blockholdings, defined as a shareholding of 5% or more of seller shares, are rare, since there is only one instance, and in this specific case, the size of the asset sale implied that the shareholder did not become a 5% blockholder in the buyer. We also examine proxy statements for each buyer in the subsequent year, and find that no blockholders emerge. Thus, the equity-based transactions do not induce the formation of blockholdings at buyer firms. Blockholders are also rare among the buyers, given only two cases. There is a modest reduction in the mean ratio of insider holdings to total outstanding shares at buyers, from 9.38% to 6.93%, during the subsequent year as expected, an expected result since shares issued as payment for an asset increase the buyer's total outstanding shares, but the change is not significant (p=0.35). There is a trivial (p=0.87) increase in the median ratio of insider holdings at buyers after the sale. Overall, the equity-based asset sales have modest effects on buyer ownership structure.

5. Empirical results

5.1. Valuation effects on buyers and sellers

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[7] Institutions are investment firms, banks, insurance firms, college endowments, and 13F money managers.

In Table 2, we report valuation effects on buyers and sellers at announcements of intercorporate asset sales, using standard market model methodology.[8] For cash transactions, the two-day average excess return for sellers is 1.43% (t-statistic of 5.31), the median return is also highly significant, and the quartile data indicate that the mean return is not the result of outliers. The five-day average excess return (not reported in the table) is 2.21% (t-statistic of 5.03). These returns are similar to seller returns reported by Klein (1986), Hite, Owers, and Rogers (1987), Lang, Poulsen, and Stulz (1995), John and Ofek (1995), and Slovin, Sushka, and Polonchek (2005). The two-day average excess return to buyers in cash sales is close to zero, -0.03% (t-statistic of -0.12), and the median and quartile returns indicate that the mean is not the result of outliers. The five-day return is 0.48% (t-statistic of 0.82). As in previous studies, these results suggest that the market does not view cash asset sales as positive net present value transactions for buyers. The evidence indicates that, on average, the gains in value from cash asset sales accrue solely to sellers.

Although average excess returns are the standard method of reporting event study results, we also report transaction returns (wealth gains as a fraction of transaction values) for buyers and sellers to take account of the size of the transaction, to draw accurate comparisons between cash versus equity-based asset sales, and to test the predictions of the model. For cash sales, the two-day average transaction return to sellers is small, 0.21%, and not statistically significant (t-statistic of 0.02). However, the median figure of 6.50% is statistically significant (p=0.01). For buyers, the average (median) transaction return is negative, -14.15% (-1.01%), and is not statistically significant given a t-statistic of -1.34 (p=0.24). This lack of significant transaction returns to buyers corroborates the non-positive average buyer returns for cash asset sales, and is consistent with our model's prediction that buyer gains in cash asset sales should be low relative to equity-based sales.

From the perspective of our theoretical model, combined returns that weight announcement excess returns of buyers and sellers by pre-announcement market capitalization serve as a gauge of the combined gain in value from an asset sale. Moreover, since investors hold diversified portfolios, our focus is on

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[8]All univariate results reported in this study are robust with respect to the use of three and four factor (Carhart (1997)) market models.

assessing the extent to which intercorporate asset sales enhance combined shareholder wealth and thus contribute to economic efficiency, as well as on the distribution of wealth gains between buyers and sellers. While prior studies include asset sales in which one participant is not publicly traded, our sample design requires that each buyer and seller are publicly traded. These combined returns measure the difference between pre-transaction versus post-transaction values of buyers and sellers, including the value of the relevant asset, and hence reflect the information that is conveyed by the financial structure of the deal.

For cash asset sales the combined mean (median) returns are small, 0.15% (0.28%), and not significant given a t-statistic of 0.58 (p=0.41), so the null hypothesis of zero gains cannot be rejected. In (constant) dollars, the average change in combined value for cash sales is a loss of -$41.4 million, while the median change is a gain of $33.2 million, both modest figures relative to the mean (median) value of the transactions ($1,380.9 ($1,010.7) million). For the ratio of the combined dollar gains for cash sales relative to transaction values, the mean (median) combined excess transaction return is -13.94% (2.80%) and is not significant, given a t-statistic of -1.06 (p=0.67). We conclude that cash asset sales generate little combined gain in shareholder wealth, and any gains that do occur accrue to sellers, results that are consistent with the predictions of our theoretical model.

For equity-based asset sales, the two-day average excess return to sellers is 6.92%, (t-statistic of 13.57); the five-day return is similar, 6.80% (t-statistic of 8.95). The average (median) transaction return to sellers is 20.00% (9.48%), and is statistically significant. These results are not due to outliers, since there are similar results at each percentile level. The positive and significant returns suggest that equity-based asset sales, like cash sales, are positive net present value transactions for selling firms. Moreover, seller two-day average (median) excess returns and transaction returns in equity-based sales are significantly greater at the 1% (10%) level than the comparable returns in cash sales. Thus, equity-based asset sales generate greater gains to sellers than cash sales.

For buyers in equity-based sales, the two-day average excess return is positive, 3.44% (t-statistic of 6.11), and the five-day return is similar, 3.92% (t-statistic of 4.23); the median return, 2.31%, is also highly

significant. These results indicate that equity-based asset sales are positive net present value transactions for buyers, in contrast to the non-significant returns to buyers in cash asset sales. The mean (median) two-day return to buyers is significantly greater in equity-based deals than in cash sales (p-value of 0.01 (0.00)). Moreover, the mean (median) buyer transaction return of 20.15% (4.87%) is also statistically different from zero, and significantly greater than the comparable return to buyers in cash sales. Thus, the greater seller gains in equity-based asset sales do not represent a redistribution of wealth from buyers. Instead, there are greater gains to both sellers and buyers in equity-based asset sales relative to cash sales.

An estimate of the expected (ex ante) excess returns to buyers and sellers of assets is obtained by evaluating the average excess returns to buyers and to sellers over both samples of asset sales (130 transactions). The global average excess returns are 0.96% (t-statistic of 4.17) for buyers and 2.99% (t-statistic of 11.97) for sellers (not reported in the table). Thus, although buyers do not obtain positive average excess returns in cash asset sales, when all asset sale transactions are taken into account, buyer average excess returns are positive, suggesting that buyers extract an informational rent that is based on their private information about expected firm value, including the asset. From the perspective of our theory, these global results are consistent with the view that buyer information is valuable, but is not sufficient in magnitude to generate a positive average excess return to buyers in cash sales.

The mean (median) combined gains from equity-based deals relative to the market values of the participants are 4.17% (2.35%) with a t-statistic of 4.55 (p=0.00), and are significantly greater (p=0.00) than the comparable figures for cash transactions. The combined mean (median) transaction return to buyers and sellers in equity-based asset sales is 40.15% (17.63%), significant at the 1% level, and the difference in means (medians) versus cash asset sales is statistically significant at the 1% (1%) level. Since the average gain in value for an equity-based asset sale is greater than for a cash asset sale, even though no blockholding is formed, our evidence suggests that the large incremental change in shareholder wealth is due to the equity-based structure of the transaction, and not to a change in ownership structure. Thus, equity-based asset sales are associated with expectations of important improvements in economic efficiency. Moreover,

dollar gains in combined value generated by equity-based asset sales are economically meaningful, given an average (median) gain of $913.8 million ($139.4 million) per deal.

Our findings complement empirical results reported by Allen and Phillips (2000) and Slovin, Sushka, and Polonchek (2005) who find positive effects on issuers of equity in transactions that create corporate blockholders. However, our evidence provides a more definitive test of the favorable signal content of the transfer of assets through equity-based transactions given a sample design that excludes events that result in the formation of corporate blockholdings. Thus, we conclude that equity-based asset sales contribute to economic value because they convey positive information about the value of the asset being sold and expectations of heightened future profitability from the buyer's use of the asset. As a result, our evidence is consistent with the central prediction of our theoretical model that an equity-based structure for an intercorporate asset sale is associated with a greater gain in overall value.

5.2. The choice between cash and equity and the effect of asymmetric information measures

We estimate a binomial logit model of the means of payment decision using the maximum likelihood method where the value function for the logit is specified as a linear function of firm-specific variables that serve as proxies for asymmetric information, plus an error term. The coefficients of the logit provide an estimate as to how an increase in a specified asymmetric information variable affects the marginal likelihood that an asset sale will involve buyer equity. As discussed in Section 3.2, our theory predicts that the private information characteristics of the buyer should be irrelevant to the choice of cash versus equity, while an increase in the probability that the seller has private information regarding the asset implies a higher frequency of equity-based deals. In contrast, merger models predict that it is buyer private information that is crucial for the choice of the means of payment.

We include several variables as proxies for asymmetric information. Since stock liquidity can be expected to be related to the degree of firm asymmetric information, we specify the average relative bid-ask spread (bid-ask spread divided by share price) and trading volume (relative to shares outstanding) during the month prior to the transaction, where a greater bid-ask spread indicates greater asymmetric information and

greater trading volume indicates less asymmetric information. We test three variables that are based on analyst earnings forecasts, using IBES data. Two variables measure the magnitude of analysts' earnings surprises and the dispersion among analysts' earnings forecasts, on the assumption that each is positively correlated with the degree of information asymmetry between managers and investors (Lang and Lundholm (1996) and Gomes and Phillips (2005)). The earnings surprise variable is computed as the absolute value of the difference between the median quarterly earnings estimates of analysts and the actual quarterly earnings per share of the relevant firm, normalized by stock price, averaged over the previous year. The earnings dispersion variable is the standard deviation of analysts' earnings forecasts, normalized by stock price, averaged over the previous year. The third variable is the number of analysts that follow the stock, on the assumption that an increase in analyst coverage is associated with a reduction in asymmetric information. We test two variables that measure a firm's investment alternatives, and thus are likely to be positively correlated with asymmetric information. One variable is research and development expenditures divided by (lagged) property, plant, and equipment; the other variable is the firm's market to book ratio.

The importance of seller private information for post-transaction value and the seller's gain is related to the size of the asset as a fraction of the post-transaction buyer.[9] Thus, we include in each specification the value of the relevant asset scaled by the value of the buyer plus the asset, and expect that this variable will have a positive effect on the probability of an equity-based deal.

The logit results are reported in Table 3, where the dependent variable is equal to one when a transaction involves buyer equity and zero for cash transactions. In the first logit specification, each corporate characteristic refers to the seller, in the second, each corporate characteristic refers to the buyer, and the third includes both sets of variables. In specification (1), several asymmetric information variables for the seller have the correct sign and are statistically significant. The estimated coefficients imply that the probability that the transaction will be equity-based rises with an increase in earnings surprises and an increase in research and development expenditures, and it falls with an increase in the number of analysts

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[9] If the asset is small relative to the buyer, the seller information on v will have little impact on w and will not be large enough to justify the expense of any fixed costs incurred to pursue an equity transaction. Such fixed costs exist in the form of the additional costs of negotiation and verification in the case of an equity deal.

that follow the firm and an increase in trading volume. In addition, as predicted, the probability that an asset sale will entail buyer equity increases as the size of the transaction increases relative to the size of the buyer. Thus, the probability that an asset sale will entail informationally sensitive securities (buyer equity) is related to variables that are proxies for the extent of asymmetric information about the seller. In comparison, in specification (2) none of the asymmetric information variables for the buyer are significant. Specification (3) incorporates the full set of seller and buyer variables, and the results are broadly similar to the other two equations. Overall, the logit results are consistent with a central prediction of our theoretical model, namely, that it is asymmetric information about the seller, and not the buyer, that influences the choice of equity versus cash in an intercorporate asset sale.

5.3. Distribution of wealth gains between buyers and sellers

With regard to the distribution of gains, our model predicts that the value of the variable θ, the share of the value created by the asset sale that accrues to the buyer's original shareholders, should be greater in equity-based deals than in cash deals. The values for θ (explained in Section 3.2) derived from the sample are consistent with the prediction of the theoretical model that buyers sustain a greater proportion of the gains in equity-based deals than in cash deals. The calculated mean (median) values of θ are 0.2580 (0.3311) in equity-based deals, both statistically significant at the 1% level, and 0.0722 (-0.1069) in cash deals, neither statistically significant. The difference between these means (medians) is statistically significant with p=0.00 (p=0.00).

Overall, our results suggest that equity-based asset sales generate positive and significant excess returns for both buyers and sellers, and that buyers obtain a substantial share of the gains generated by these deals. Consistent with the predictions of our model, for cash asset sales there are relatively small increases in shareholder wealth that accrue almost exclusively to sellers, while for equity-based asset sales there are significantly greater increases in wealth that are shared between buyers and sellers.

5.4. Cross-sectional regressions

Cross-sectional regressions are estimated for the asset sale returns. The dependent variable in one set of regressions consists of buyer excess returns, and in the other set consists of seller excess returns. Independent variables reflect the proportion of the transaction price that is in the form of buyer equity, deal size relative to buyer and seller, and characteristics of the participating firms, including variables that reflect financial characteristics, performance, size of the two firms, and proxies for asymmetric information (see Section 5.2). Consistent with our theoretical model, the regression results indicate that the proportion of the transaction price paid in buyer equity has a positive and significant effect on buyer returns and on seller returns, with this variable obtaining t-statistics of 3.84 and 3.00, respectively, corroborating the univariate results. However, all independent variables that reflect the characteristics of the participating firms, including the proxies for asymmetric information, consistently fall short of statistical significance, suggesting that such variables do not provide additional explanatory power once the percentage of equity is specified in a regression. These independent variables are also not significant when transaction returns for buyers and sellers are the dependent variables. Since only the proportion of equity in the deal is statistically significant, the regression results are not reported in the tables.

5.5. *Operating performance of buyers and sellers*

We examine the subsequent operating performance of buyer and seller firms to assess whether the increase in value at announcements of equity-based transactions is a precursor to improved operating performance. We apply the Barber and Lyon (1996) adjustment methodology. The fiscal year in which the asset sale occurs is defined as year 0. The matching procedure selects benchmark firms, based on data in year -1, that have the same 4-digit SIC code and market capitalization that is within a 90% to 110% range of the sample firm. Accounting data are from the Compustat Industrial and Research database. The two performance measures are return on assets, ROA (operating income before depreciation, interest, taxes, and extraordinary items, divided by average total assets) and return on sales, ROS (same definition of operating income, but divided by total sales). After winsorizing the data, we obtain the mean and median changes in benchmark-adjusted operating performance for years -1 to +4.

In Panel A of Table 4, buyer firms in equity-based asset sales outperform benchmark firms for each year after the transaction. These results suggest that the positive returns to buyer firms at announcements of equity-based asset sales reflect the market's anticipation of an improvement in subsequent buyer operating performance as a result of the transaction, with the gains in wealth generated by these transactions being shared between buyers and sellers. In contrast, buyers that acquire assets for cash do not show any significant improvement in subsequent benchmark-adjusted operating performance, as reported in Panel B. The difference in the means and medians between the changes in operating performance for buyers in equity-based asset sales versus buyers in cash asset sales become statistically significant two years after the transaction. By comparison, neither set of seller firms show any evidence of significant changes in subsequent benchmark-adjusted operating performance, so there is no evidence of improvement in seller firm profitability. Overall, the results indicate that equity-based asset sales are associated with an improvement in the subsequent operating performance of buyers, as well as a greater increase in shareholder wealth, relative to cash asset sales.

6. Conclusions

We develop a theoretical model of intercorporate asset sales based on the perspective that two-sided asymmetric information problems and the choice of the means of payment play central roles in these transactions. As a result of its ownership of the asset that is to be sold, the seller has private information that is material to the value of the asset, while each potential buyer has private information about its own existing assets and the value that can be generated if the asset is conjoined with them. Our theory generates a broad set of predictions about the overall gains in wealth from asset sales, the distribution of the gains between buyers and sellers, and the different roles that buyer and seller private information have in determining the terms of the transaction. We model the asset sale process as a double signaling game and show that the asset is allocated efficiently and that each party's information is impounded in the transaction: buyer information in competitive bidding, and seller information in establishing the financial structure of the deal. Our work provides valuable perspective as to why existing theoretical models of mergers are not

adequate for explaining intercorporate asset sales, and explains why empirical results on the choice between the use of equity versus cash in asset sales differ from the results for mergers.

The structure of our model reflects two key characteristics of asset sales. First, asset sales entail auction-like procedures early in the process that are designed so that the seller can select the best buyer from a pool of candidates. Second, asset sales are governed by the business judgment rule which gives selling firm managers the flexibility to make a final, take-it-or-leave-it counteroffer to the (selected) bidder. This feature is crucial for distinguishing asset sales from mergers, which are subject to disclosure requirements and a final vote for approval or rejection by target shareholders. In our model, the selling firm commits to an auction-type procedure that enables it to elicit buyers' private information about the asset and to choose the buyer with the highest post-transaction value. If the seller's private information indicates that the asset is of low value, a cash deal is concluded with the highest bidder. When the seller's private information indicates that the value of the asset is high, the seller makes a take-it-or-leave-it counteroffer to the highest bidder that entails the issuance of buyer equity to the seller, signaling the positive information that the asset is of high value. The terms of this counteroffer insure that the seller of a low-value asset would not imitate the equity-based counteroffer. The model predicts strong gains in combined wealth and positive excess returns for both buyers and sellers for equity-based asset sales. In contrast, the model predicts only modest combined wealth gains in cash transactions, that are largely appropriated by sellers. A central feature of our model is the prediction that asymmetric information about the bidder's existing assets has no impact on the determination of the means of payment in an asset sale. Instead, the choice of the financial structure of the deal reflects only seller private information.

We test the model by analyzing the share price effects for a sample of cash asset sales and a set of equity-based asset sales that do not create a corporate blockholding in the buyer. The empirical results are consistent with the predictions of the theoretical model. Cash asset sales generate positive returns to sellers, negative and not significant returns to buyers, and no significant change in combined wealth. In contrast, equity-based asset sales generate large combined gains in wealth, with large positive excess returns to both

buyers and sellers that are significantly greater than the gains in cash asset sales. Sellers capture about 60% of the combined gains in wealth in equity-based deals, but all of the gains in cash deals. When viewed globally, buyers obtain a share of the overall gains generated by asset sales. The estimation results for a logit model of the choice of the means of payment indicate that asymmetric information about the seller, and not about the buyer, influences the choice of equity versus cash in intercorporate asset sales. We also find significant improvements in the subsequent operating performance of buyers in equity-based deals, but no changes in performance after cash deals. Overall, our findings demonstrate that selling firms establish a structure for intercorporate asset sales that ensures the informational efficiency of these transactions.

Appendix A.

Proof of Proposition 1

We construct the necessary structure of a separating equilibrium counteroffer. First, suppose that x is common knowledge at this stage of the negotiation and that $C < w(v_L, x)$ (we will show in Proposition 2 that this is indeed the case). If the seller makes a counteroffer (β^*, c^*) only when $v = v_H$, the equilibrium is separating. It follows that

$$E[w(\textbf{\textit{v}},x) \mid \text{seller accepted } (B, C)] = w(v_L, x),$$

$$E[w(\textbf{\textit{v}},x) \mid \text{counteroffer } (\beta^*, c^*)] = w(v_H, x).$$

Thus, the buyer is willing to accept a counteroffer (β^*, c^*) if

$$\Pi_B(x, \beta^*, c^*) = (1-B)\left(1 - \frac{C}{w(v_L, x)}\right)w(v_H, x) - x > \max\left\{(1-B)\left(w(v_L, x) - C\right) - x, 0\right\}$$

Second, observe that when $v = v_L$, the seller weakly prefers the initial offer (B, C) to the counteroffer (β^*, c^*) as the latter would provide a profit equal to

$$\beta^* w(v_L, x) - y = B(w(v_L, x) - C) + C - y.$$

When $v = v_H$, the seller strictly prefers the counteroffer to accepting the offer (B, C) since

$$\beta^* w(v_H, x) - y > B(w(v_H, x) - C) + C - y,$$

where the right-hand side would be its profit from accepting the buyer's initial offer. We are left to show that (i) there is no counteroffer $(\beta', c') \neq (\beta^*, c^*)$ that provides a higher profit for the seller, and (ii) that the equilibrium is unique.

(i) In order to show that there is no better separating offer, we determine the buyer's out-of-equilibrium beliefs using the D1 criterion. First, we describe how the D1 refinement applies to this signaling game. Let $\Pi^*_S(v_L, x)$ and $\Pi^*_S(v_H, x)$ be the seller's equilibrium profit for $v = v_L$ and $v = v_H$, respectively. Suppose that the buyer observes an out-of-equilibrium counteroffer (β', c'). For each seller's type $v \in \{v_L, v_H\}$, let $q(v)$ be the minimum probability of acceptance that makes this counteroffer attractive to the seller:

$$q(v) := \arg\min_{q \geq 0} q(\beta'(w(v,x) - c') + c' - y) \geq \Pi^*_S(v,x)$$

Then, the D1 criterion requires that the buyer believes that the deviation (β', c') comes from the seller's type that would find it attractive for the smallest acceptance probability,[10] i.e.,

$$E[v|(\beta',c')] = \arg\min_{v \in \{v_L, v_H\}} q(v)$$

First consider a deviation (β', c') that is potentially profitable for the seller when $v = v_H$, in the sense that $\beta'(w(v_H, x) - c') + c' - y > \Pi^*_S(v_H, x)$. It can be verified that the deviation (β', c') violates the seller's incentive compatibility constraint and therefore will also be potentially profitable for the seller when $v = v_L$. Thus,

$$\beta'(w(v, x) - c') + c' - y > \Pi^*_S(v, x) \tag{A1}$$

for $v \in \{v_L, v_H\}$. Then according to the D1 criterion, the buyer will believe that $v = v_L$ as $q(v_L) < q(v_H)$. To see this point, note that $\Pi^*_S(v, x) = \beta^* w(v, x) - y$ for $v \in \{v_L, v_H\}$, and so

$$q(v) = \frac{\beta^* w(v,x) - y}{\beta'(w(v,x) - c') + c' - y}$$

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[10] If $q(v_L) = q(v_H)$, then the out-of-equilibrium path belief can be freely chosen between 0 and 1.

Thus, $q(v_L) < q(v_H)$ if and only if $\beta^*(1 - \beta')c' + y (\beta' - \beta^*) > 0$, which is trivially verified for $\beta' \geq \beta^*$ and c' > 0. To verify that $q(v_L) < q(v_H)$ for $\beta' < \beta^*$ and $c' \geq 0$, observe that any (β', c') must satisfy expression (A1). Multiplying both sides of expression (A1) by β^*, adding $y(\beta'-\beta^*)$ to both sides and rearranging, we have $\beta^*(1 - \beta')c' + y (\beta' - \beta^*) > (\beta^* - \beta')(w(v, x) - y)$, which is strictly positive for all $\beta' < \beta^*$.

Thus, after observing an unexpected counteroffer (β', c') satisfying expression (A1), the buyer will believe that $v = v_L$ and will reject such a counteroffer. In fact, expression (A1) and $E[v| (\beta', c')] = v_L$ imply

$$\Pi_B(x, \beta', c') = (1- \beta') (w(v_L, x) - c') - x < (1 - B)(w(v_L, x) - C) - x,$$

which means that the buyer prefers to reject the counteroffer (β', c') and to claim the compensation $(1-B)(w(v_L, x) - C) - x$ instead. For the same reason, a deviating counteroffer that is potentially profitable for the seller only when $v = v_L$ will induce the buyer to believe $v = v_L$ and to prefer the compensation $(1-B)(w(v_L, x) - C) - x$ rather than to accept such a counteroffer. Thus, the seller cannot find an alternative counteroffer (β', c') that is better than (β^*, c^*) and that is acceptable to the buyer.

(ii) To show uniqueness, we demonstrate that any equilibrium where $(\beta_H, c_H) \neq (\beta^*, c^*)$ is the offer for type $v = v_H$, does not survive the D1 criterion. Consider an equilibrium where (β_L, c_L) and $\Pi_S(v_L, x)$ are the format of payment and the seller's profit, respectively, when $v = v_L$; similarly, let (β_H, c_H) and $\Pi_S(v_H, x)$ be the format of payment and the seller's profit, respectively, when $v = v_H$. The incentive compatibility constraint for the seller requires

$$\Pi_S(v_L, x) = \beta_L(w(v_L, x) - c_L) + c_L - y \geq \beta_H(w(v_L, x) - c_H) + c_H - y \tag{A2}$$

In order to show that there are no separating equilibria surviving D1 that are different from the one described in Proposition 1, we proceed in two steps.

First, we show that in any separating equilibrium it must be that $\Pi_S(v_L, x) = B(w(v_L, x) - C) + C - y$. This is true for all equilibria where the seller accepts the buyer's offer when $v = v_L$. In a separating equilibrium where the seller makes a counteroffer (c_L, β_L) when $v = v_L$, the type v is revealed in $t=1$, and therefore the overall value created is $w(v_L, x) - x - y$. Note that the buyer's equilibrium payoff must not be smaller than what the buyer can obtain by rejecting the counteroffer, that is $(1 - B)(w(v_L, x) - C) - x$. It follows that what remains for the seller is $\Pi_S(v_L, x) \leq B(w(v_L, x) - C) + C - y$. However, the seller always has the option to accept the buyer's cash offer and receive $B(w(v_L, x) - C) + C - y$. Thus, $\Pi_S(v_L, x) = B(w(v_L, x) - C) + C - y$.

Second, we show that a separating equilibrium different from the one described in Proposition 1 does not survive the D1 refinement criterion. Consider an equilibrium where $(\beta_H, c_H) \neq (\beta^*, c^*)$. Take a deviation for the seller that consists of making the counteroffer $(\beta' + \epsilon, 0)$, where $\epsilon > 0$ and is small, and β' satisfies $\beta' w(v_H, x) - y = \Pi_S(v_H, x) = \beta_H(w(v_H, x) - c_H) + c_H - y$. If such a counteroffer is accepted, this would clearly be a profitable deviation for the seller when $v = v_H$, thus $q(v_H) < 1$. Note that $\Pi_S(v_L, x) = B(w(v_L, x) - C) + C - y$ and the incentive compatibility constraint (A2) imply

$$\Pi_S(v_L, x) = B(w(v_L, x) - C) + C - y \geq \beta_H(w(v_L, x) - c_H) + c_H - y \geq \beta' w(v_L, x) - y \qquad \text{(A3)}$$

where the last inequality follows from the definition of β', implying

$$\beta_H(w(v_L, x) - c_H) + c_H - \beta' w(v_L, x) = c_H(1 - \beta_H)(w(v_H, x) - w(v_L, x))/w(v_H, x) \geq 0 \qquad \text{(A4)}$$

If $c_H = 0$, the first inequality in (A3) is strict because $(\beta_H, c_H) \neq (\beta^*, 0)$. If $c_H > 0$, the second inequality in (A3) is strict because of (A4). Therefore, when $v = v_L$ and for $\epsilon > 0$ but small, the seller strictly prefers the equilibrium payoff $B(w(v_L, x) - C) + C - y$ to the deviation obtained if counteroffer $(0, \beta' + \epsilon)$ is accepted. This implies $q(v_L) \geq 1$. Thus, according to the D1 criterion, when the buyer observes the out-of-equilibrium

counteroffer $(0, \beta' + \epsilon\,)$, it believes $v = v_H$ and therefore will accept such a counteroffer. Hence, the seller

has a profitable deviation for $v = v_H$. Thus, a contradiction. $\square$

Appendix B

Proof of Proposition 2

Proof: Consider a buyer whose competitors use the bidding strategy *(0, C(x))* described in Proposition 2. First, we show that *C(x)* is the buyer's best pure-cash response. Second, we show that no bid including equity can provide this buyer with an expected payoff greater than a pure-cash bid.

The first order condition when the buyer is restricted to pure-cash bids can be verified by direct substitution of expressions (4), (5), and (6) into (3), taking into account that $\beta(g) = C(g)/w(v_L, g)$. In order to prove the second order condition we will show that the objective function is pseudoconcave, i.e., $\pi_2(x, g) \geq 0$ for $g < x$ and $\pi_2(x, g) \leq 0$ for $g > x$. First, we show that $\pi_{1,2}(x, g)$, the cross derivative of $\pi(x, g)$, is strictly positive. In fact,

$$\pi_{1,2}(x, g) = f_N(g)(pw_2\,(v_L,\,x) + (1-p)w_2\,(v_H,\,x)(1-\beta(g)) - 1) - \beta'(g)F_N(g)\,(1-p)w_2(v_H,\,x)\,) \tag{B1}$$

Equation (3) leads to

$$\beta'(g)F(g) = f_N(g)\left(\frac{(1-\beta(g))E\big[w(v,g)\big] - g}{E\big[w(v,g)\big]}\right) - \frac{\beta(g)F_N(g)pw_2(v_L,g)}{E\big[w(v,g)\big]}$$

Substituting this expression into equation (B1), it results that $\pi_{1,2}(x, g) > 0$ provided that

$$g(1-p)w_2\,(v_H,\,x) + (pw_2\,(v_L,\,x) - 1)E[w(v,\,g)] > 0$$

It is easy to verify that the left hand side of this expression is strictly concave in p and that $w_2(v, x_L) \geq w(v, x_H)/x_H$ guarantees that the inequality is satisfied for $p = 0$ and $p = 1$. Consider now $g < x$, then $\pi_{1,2}(x, g) > 0$ implies $\pi_2(x, g) > \pi_2(g, g) = 0$, where the last equality follows from the first order condition. Similarly, for $g > x$, $\pi_{1,2}(x, g) > 0$ implies $\pi_2(x, g) < \pi_2(g, g) = 0$.

Notice that the expression of $C(x_L)$ can be obtained as $lim_{x \to xL} C(x)$. In order to see that $C(x)$ is an increasing function, note first that $\phi(t, x)$ is strictly increasing in t as $w_2(v, x) \geq w(v, x_H)/x_H > 1$ guarantees that $(1 - t/E[w(v, t))$ is increasing in t. Second, observe that

$$C'(x) = \beta(x)w_2(v_L,x)\frac{(1-p)w(v_H,x)}{E[w(v,x)]} + w(v_L,x)\frac{f_N(x)}{F_N(x)^2}\int_{x_L}^{x}\left(\phi(x,x) - \phi(t,x)\right)f_N(t)dt$$

which is positive as the argument of the integral is positive for $\phi(t, x)$ increasing in t. Moreover $C(x) = \beta(x) w(v_L, x) < w(v_L, x)$. Finally, $C(x)$ is larger than y as $C(x_L) = w(v_L, x_L) - x_L w(v_L, x_L)/E[w(v, x_L)] > w(v_L, x_L) - x_L \geq y$ and $C(x)$ is increasing.

Now we show that the pure cash bidding strategy depicted in Proposition 2 is an equilibrium of the first stage of the game satisfying the D1 criterion when potential buyers can offer any combination of equity and cash. In order to prove this result, recall that $x(B, C)$ is the seller's expectation of the type of a potential buyer that makes an offer (B, C). This expectation is derived from the equilibrium beliefs if an offer with $B = 0$ is observed and it is determined using the D1 criterion otherwise. Denote by

$$\beta(B,C) = B + (1-B)\left(\frac{C}{w(v_L,x(B,C))}\right)$$

the counteroffer that, according to Proposition 1, a seller of type $v = v_H$ makes if it selects offer (B, C) and holds beliefs $x(B, C)$. Note that the seller's counteroffer to an offer (B, C) also depends on the belief $x(B, C)$ induced by this offer. In order to describe how the D1 refinement applies to this phase of the game, we introduce the variable $q(x, B, C)$ defined as

$$q(x,B,C) := \arg\min_{q \geq 0} q\left[p(1-B)(w(v_L,x) - C) + (1-p)\beta(B,C)w(v,x) - x)\right] \geq \Pi_B^*(x)$$

where $\Pi^*_B(x)$ is the equilibrium expected payoff of a bidder of type x. Then for a deviating offer (B,C) the seller out of equilibrium path beliefs satisfy

$$x(B,C) = \arg\min_x q(x,B,C) \tag{B2}$$

In other words, the seller believes that the deviation (B, C) comes from the buyer's type that would find it attractive for the smallest winning probability.

Consider a deviation (B, C) with $B > 0$. It is sufficient to show that this deviation is not profitable for the bidder of type $x = x(B, C)$, as this is the bidder type that will most profit from such a deviation. Upon being selected by the seller after offering (B, C), this bidder's expected profit will be

$$(1 - B)E[w(v, x(B, C))](1 - C/w(v_L, x(B, C)))$$

Consider now an alternative pure-cash deviation $(0, C')$, where C' is such that the bidder of type $x(B, C)$ is indifferent between winning the auction with offer (B, C) or with offer $(0, C')$. In other terms C' satisfies

$$p(w(v_L, x(B,C)) - C') + (1 - p)(1 - \beta(0,C'))w(v_H, x(B,C)) = (1 - B)E[w(v, x(B,C))]\left(1 - \frac{C}{w(v_L, x(B,C))}\right)$$

with $\beta(0, C') = C'/w(v_L, x(0, C'))$, where $x(0, C')$ is the seller's expectation regarding the type of a buyer that offered $(0, C')$. Thus:

$$C' = \frac{E[w(v, x(B,C))]w(v_L, x(0,C'))}{pw(v_L, x(0,C')) + (1 - p)w(v_H, x(B,C))} \frac{\left(Bw(v_L, x(B,C)) + C(1 - B)\right)}{w(v_L, x(B,C))} \tag{B3}$$

Lemma 1B: If $x(0, C') \geq x(B, C)$, then the seller prefers a buyer that offers $(0, C')$ to a buyer that offers (B, C).

Proof: If $v = v_L$, then the seller's expected revenue from accepting the offer (B, C) is $B(w(v_L, x(B, C))$ $+C(1-B) \leq C'$, which is the seller's revenue if it accepts offer $(0, C')$, where the inequality follows from

expression (B3) and $x(0, C') \geq x(B, C)$. If $v = v_H$, then the seller's expected revenue from making a counteroffer $(0, \beta(B,C))$ to a buyer that offered (B, C) is $(B + (1-B)C/w(v_L, x(B, C)))w(v_H, x(B, C)) < C'w(v_H, x(0, C'))/w(v_L, x(0, C'))$, which is its expected revenue by making a counteroffer $(0, \beta(0, C'))$ to a buyer that offered $(0, C')$. The inequality follows from expression (B3), $x(0, C') \geq x(B, C)$ and the fact that $w_2(v, x_i)x_i/w(v, x_i)$ is not deceasing in v. $\square$

Lemma 1B implies that if $x(0, C') \geq x(B, C)$, then the offer $(0, C')$ has higher probability of being accepted by the seller than the offer (B, C). Therefore, if a buyer of type $x = x(B, C)$ finds that deviating to offer (B,C) is profitable, then it must also be profitable to deviate to offer $(0, C')$ as the latter has higher probability of winning the auction and provides the same payoff of (B, C). However, from the first part of the proof, we know that there is no pure-cash profitable deviation. Hence a contradiction. Thus, to complete the proof it is sufficient to show that $x(0, C') \geq x(B, C)$ is consistent with the D1 criterion. First, suppose that any bidder with synergy $x' < x(B, C)$ receives a higher payoff from offer (B, C) than from $(0,C')$, conditional on winning the auction. It then follows that

$$q(x', 0, C') \geq q(x', B, C) \geq q(x(B, C), B, C) = q(x(B,C), 0, C'),$$

where the second inequality follows from (B2) and the equality follows from the definition of C'. Thus,

$$x(0, C') = \arg\min_x q(x, 0, C') \geq x(B, C).$$

Finally, we show that if $x(0, C') \geq x(B, C)$ then any bidder with synergy $x' < x(B, C)$ receives a higher payoff from offer (B, C) than from $(0, C')$, conditional on winning the auction. We need to show that

$$p(1 - B)(w(v_L, x') - C) + (1 - p)(1 - \beta(B,C))w(v_H, x') \geq p(w(v_L, x') - C') + (1 - p)(1 - \beta(0, C'))w(v_H, x')$$

which can be rewritten as

$$- pBw(v_L, x') + p(C'-C) + (1-p)p\beta(B,C)\left(\frac{w(v_L, x(B,C)) - w(v_L, x(0,C'))}{pw(v_L, x(0,C')) + (1-p)w(v_H, x(B,C))}\right)w(v_H, x') \geq 0$$

Note that equality holds for $x' = x(B, C)$ because of the definition of C', whereas the inequality is strict for

$x' < x(B, C)$, as $x(B, C) \leq x(0, C')$ and $w(.)$ is a strictly increasing function. $\square$

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Table 1
Descriptive statistics

Statistics for means and medians, in parentheses, are reported for buyer and seller firms listed on NYSE/ASE/Nasdaq that engaged in asset sales over the sample period 1989 through 2002, using as the means of payment cash or buyer equity that is conveyed immediately to seller shareholders. Statistical significance for the difference between cash versus equity-based transactions is obtained by the Satterthwaite test for the difference in means and by the Wilcoxon signed ranks test for the difference in medians. The value of the transaction is calculated in millions of constant (1997) dollars. Buyer common stock used in payment for the asset is valued at the buyer's share price prior to the announcement of the transaction. 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. The seller's equity interest in the buyer is the percentage of the buyer's shares outstanding that seller shareholders gain as a result of the transaction. The percent of payment in equity is the percent of the transaction price that is paid in the form of buyer common stock. Insider ownership is the percentage of outstanding shares held by all officers and members of the firm's board of directors. Institutional ownership is defined as the percent of outstanding shares held by investment companies, banks, insurance companies, college endowments, and 13F money managers.

	Buyers		Sellers	
	Equity-based N=37	Cash N=93	Equity-based N=37	Cash N=93
	Mean (Median) (1)	Mean (Median) (2)	Mean (Median) (3)	Mean (Median) (4)
Value of the transaction ($1997, millions)	1,906.5 (1,205.0)	1,380.9 (1,010.7)	1,906.5 (1,205.0)	1,380.9 (1,010.7)
Market value ($1997, millions)	9,305.4** (1,983.2)***	20,850.2** (5,978.4)***	7,686.5** (1,927.6)***	14,851.2** (10,024.1)***
Value of transaction/market value (%)	89.5** (45.0)***	48.8** (13.3)***	77.4*** (58.0)***	31.2*** (10.8)***
Seller's equity interest in buyer (%)	28.9 (24.1)	– –	28.9 (24.1)	– –
Percent of payment in equity (%)	71.3 (70.3)	– –	71.3 (70.3)	– –
Insider ownership (%)	9.4 (1.6)	5.0 (1.8)	11.5* (4.6)***	5.3* (1.0)***
Institutional ownership (%)	52.0 (52.2)	50.7 (54.0)	53.9 (56.8)	48.7 (51.1)

Significance is indicated by *, at the 10% level, **, at the 5% level, *** at the 1% level.

Table 2
Empirical results for testing the information structure of asset sales

Empirical results are reported for metrics of asset sales predicted by the theoretical model. The metrics are (Panel A) two-day (-1, 0) announcement excess returns for buyers and sellers and for combined returns and (Panel B) two-day announcement excess returns relative to transaction size for buyers and sellers and combined returns. Average excess announcement returns in percent are in response to 37 equity-based asset sales and 93 cash asset sales over the period 1989 through 2002 for buyer and seller firms listed on CRSP. For combined returns, buyer and seller excess returns are weighted by their respective pre-announcement market values. Excess returns are calculated using market model methodology; t-statistics are in parentheses and the proportion of returns positive is in brackets. The statistical significance of the median and the proportion positive is based on the Wilcoxon signed ranks test. The p-values indicate the significance level of the difference between cash versus equity-based deals and are 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 announcement in Factiva.

	Buyer		p-value Equity vs Cash	Seller		p-value Equity vs Cash	Combined		p-value Equity vs Cash
	Equity	Cash		Equity	Cash		Equity	Cash	
Panel A. Two-day excess returns									
Mean	3.44%	-0.03%	(0.01)	6.92%	1.43%	(0.00)	4.17%	0.15%	(0.00)
t-statistic	(6.11)***	(-0.12)		(13.57)***	(5.31)***		(4.55)***	(0.58)	
Proportion>0	[0.68]**	[0.49]	(0.05)	[0.78]***	[0.62]**	(0.04)	[0.86]***	[0.54]	(0.00)
Quartiles									
75%	7.90%	2.69%		11.33%	3.05%		6.98%	2.03%	
Median	2.31%**	-0.33%	(0.00)	4.45%***	1.09%***	(0.00)	2.35%***	0.28%	(0.00)
25%	-0.41%	-2.07%		0.40%	-0.66%		0.72%	-0.96%	
Panel B. Two-day transaction returns (wealth gains relative to transaction size)									
Mean	20.15%	-14.15%	(0.03)	20.00%	0.21%	(0.10)	40.15%	-13.94%	(0.00)
t-statistic	(2.05)**	(-1.34)		(3.93)***	(0.02)		(3.21)***	(-1.06)	
Proportion>0	[0.68]**	[0.49]	(0.05)	[0.78]***	[0.62]**	(0.04)	[0.86]***	[0.54]	(0.00)
Quartiles									
75%	24.11%	12.41%		26.08%	22.08%		46.60%	26.07%	
Median	4.87%***	-1.01%	(0.01)	9.48%***	6.50%***	(0.03)	17.63%***	2.80%	(0.01)
25%	-0.58%	-20.41%		1.15%	-3.66%		4.10%	-24.20%	

Significance is indicated by *, at the 10% level, **, at the 5% level, *** at the 1% level.

Table 3
Logit estimates for the choice of means of payment: equity versus cash
This table presents coefficient estimates from logit regression models for the choice between cash versus equity-based asset sales. The dependent variable equals one for asset sales in which the means of payment entails buyer equity and zero for cash transactions. All firm specific variables are based on data prior to the announcement of the asset sale. Research and development expenditures (including advertising) are divided by property, plant, and equipment, calculated for the last fiscal year prior to the announcement date. Market/book is the market value of the firm divided by the book value of its assets. Analyst following is the number of analysts that generate an earnings forecast for the firm for the upcoming quarter. The analyst earnings surprise variable is the mean of the absolute value of the difference between the median quarterly earnings estimate and the actual quarterly earnings of the firms per share, normalized by the stock price, for the preceding year. Analyst earnings dispersion is the standard deviation of outstanding earnings forecasts normalized by stock price over the previous year. The bid-ask spread is the stock's daily bid-ask spread, divided by share price, averaged over the month prior to the announcement. Trading volume is the trading volume for the stock divided by shares outstanding averaged for the month prior to the announcement. The size of the asset is the value of asset divided by the sum of the value of the buyer firm plus the value of the asset, using share prices prior to the announcement of the transaction. The p-values are reported in parentheses; N is the sample size.

	(1)	(2)	(3)
Seller-Research & development	18.96		21.81
	(0.03)		(0.10)
Seller-Market/book	-0.01		-0.02
	(0.66)		(0.80)
Seller-Analyst following	-0.11		-0.10
	(0.01)		(0.04)
Seller-Analyst earnings surprise	30.62		48.85
	(0.08)		(0.03)
Seller-Analyst earnings dispersion	16.56		-25.44
	(0.80)		(0.81)
Seller-Bid-ask spread	-31.73		-57.05
	(0.32)		(0.18)
Seller-Trading volume	-267.80		-324.90
	(0.07)		(0.05)
Buyer-Research & development		3.97	6.58
		(0.66)	(0.23)
Buyer-Market/book		0.12	0.12
		(0.30)	(0.39)
Buyer-Analyst following		-0.03	-0.01
		(0.37)	(0.91)
Buyer-Analyst earnings surprise		-26.85	-18.85
		(0.58)	(0.84)
Buyer-Analyst earnings dispersion		14.94	40.77
		(0.90)	(0.82)
Buyer-Bid-ask spread		-7.99	-2.08
		(0.77)	(0.96)

Buyer-Trading volume		84.78	173.70
		(0.23)	(0.20)
Size of asset	4.96	2.35	6.28
	(0.00)	(0.05)	(0.00)
Intercept	0.02	-1.77	-0.57
	(0.99)	(0.08)	(0.75)
Proportion concordant	0.86	0.73	0.9
N	96	109	92

Table 4

Adjusted operating performance subsequent to asset sales

Changes in adjusted operating performance measures for buyers and sellers conducting equity-based and cash asset sales over the sample period 1989 through 2002 for firms listed on NYSE/ASE/Nasdaq. Performance measures for each firm are adjusted by subtracting the median (mean) performance measure for a group of matched firms benchmarked in year -1, the fiscal year prior to the asset sale. Return on assets, ROA, is operating income before depreciation, interest, taxes and extraordinary items divided by average total assets. Return on sales, ROS, is operating income divided by total sales. N is the sample size; p-values are in parentheses. Statistical significance is based on the t-test for mean changes in adjusted performance and on the Wilcoxon signed ranks test for median changes. The statistical significance of the difference between the change in an adjusted return measure for firms conducting equity-based asset sales versus the comparable measure for firms conducting cash asset sales is indicated by: [a] significant at the 10% level and [b] significant at the 5% level.

Year	Buyers					Sellers				
	-1 to 0	-1 to +1	-1 to +2	-1 to +3	-1 to +4	-1 to 0	-1 to +1	-1 to +2	-1 to +3	-1 to +4
A. Equity-based asset sale transactions										
Change in adjusted return on assets in percent, ROA										
Mean	2.09	3.85 [b]	4.42 [a]	5.36 [b]	4.26 [a]	-0.79	-0.88	-0.48	-0.49	0.16
(p-value)	(0.20)	(0.05)	(0.03)	(0.02)	(0.04)	(0.45)	(0.42)	(0.66)	(0.69)	(0.92)
Median	1.55	1.97	2.98 [a]	3.18 [a]	4.69 [b]	-0.06	0.21	-0.19	-0.53	0.12
(p-value)	(0.28)	(0.22)	(0.09)	(0.06)	(0.04)	(0.96)	(0.91)	(0.91)	(0.64)	(0.94)
Change in adjusted return on sales in percent, ROS										
Mean	1.26	2.25	4.15 [a]	4.25 [a]	3.70 [b]	0.88	-0.02	0.76	-0.14	-0.49
(p-value)	(0.32)	(0.18)	(0.03)	(0.06)	(0.09)	(0.44)	(0.98)	(0.49)	(0.90)	(0.71)
Median	1.66	2.12	3.14	3.44 [a]	4.90 [b]	0.79	0.47	0.29	-0.79	-0.65
(p-value)	(0.28)	(0.19)	(0.10)	(0.08)	(0.04)	(0.47)	(0.70)	(0.85)	(0.52)	(0.55)
N	29	28	27	24	21	25	24	22	20	19
B. Cash asset sale transactions										
Change in adjusted return on assets in percent, ROA										
Mean	-0.29	-0.73 [b]	0.60 [a]	0.22 [b]	0.05 [a]	-0.30	0.10	0.82	0.66	-0.55
(p-value)	(0.58)	(0.18)	(0.22)	(0.65)	(0.88)	(0.44)	(0.80)	(0.08)	(0.15)	(0.21)
Median	0.50	0.21	-0.09 [a]	0.11 [a]	-0.59 [b]	-0.60	0.21	0.46	0.09	-0.32
(p-value)	(0.25)	(0.68)	(0.81)	(0.79)	(0.24)	(0.17)	(0.66)	(0.24)	(0.83)	(0.41)
Change in adjusted return on sales in percent, ROS										
Mean	0.35	0.68	0.75 [a]	0.65 [a]	-0.50 [b]	0.39	-0.47	0.60	0.38	-0.14
(p-value)	(0.50)	(0.12)	(0.25)	(0.22)	(0.28)	(0.29)	(0.26)	(0.10)	(0.39)	(0.75)
Median	0.55	0.35	0.65	0.15 [a]	-0.10 [b]	-0.18	-0.58	0.35	0.12	0.16
(p-value)	(0.23)	(0.49)	(0.18)	(0.73)	(0.80)	(0.70)	(0.18)	(0.37)	(0.77)	(0.72)
N	81	79	74	69	64	71	71	68	67	63