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Do tender offers create value? New methods and evidence☆

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Abstract

Conventional techniques of estimating takeover value improvements measure only a fraction of the total gain and include revelation about bidder stand-alone value. To address these biases, we develop the probability scaling method, which rescales announcement date returns; and the intervention method, which uses returns at intervening events. Perceived value improvements are larger than traditional methods indicate. We cannot reject the hypothesis that bidders on average pay fair prices. Combined bidder-target stock returns are higher for

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hostile offers, lower for equity offers, and lower for diversifying offers. These effects reflect revelation about bidder stand-alone value, not differences in gains from combination.

JEL classification: G12; G34

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1. Introduction

This paper uses stock price data to estimate value improvements from takeovers, when value improvements are defined as changes in the discounted value of bidder and target cash flows brought about by the combination. Attempts to estimate the value effects of takeovers face two challenges. The first is the truncation dilemma. Given that not all takeover bids succeed, a short event window that extends only a few days past the bid announcement date estimates only a fraction of the value effects that would be brought about by a successful transaction. A long window that extends through successful completion of the transaction can capture the market's assessment of the full effect of takeover on value. However, this comes at the cost of introducing much greater noise and return benchmark errors.

The second challenge, the revelation bias, is that the bidder's return on the announcement date reflects not just news about the value to be derived from combination, but also news about the stand-alone value of the bidder. For example, firms sometimes deliberately time the announcement of takeover bids to be simultaneous with unrelated announcements.[1] More important, the very fact that a firm makes a bid will usually convey information to investors about the bidder's stand-alone value.

To address these issues, we estimate the stock market's perception of value improvements from tender offers using both conventional abnormal stock returns at the time of the initial bid and two new approaches. In our comprehensive 1962–2001 sample, all approaches imply substantial value improvements. Furthermore, the new methods imply estimates of shareholder value improvement that are much larger than those implied by traditional methods.

The first method, the probability scaling method (PSM), uses returns associated with the announcement of the initial bid. As in most past studies, the return cumulation window extends only a short time after the event. PSM then adjusts returns derived from this short window upward to reflect the probability that the

[1]The *Wall Street Journal* reported: "It's Wall Street's version of 'Wag the Dog.' Over the past week, both Mattel and Coca-Cola have announced acquisitions on the same day they also issued warnings about disappointing earnings. ... No one is suggesting that either company unveiled its acquisition solely to divert attention from its problems. ... But it is also clear that the acquisitions, like the [Iraq] bombings, helped shift attention away from other less favorable developments." The article gives other examples as well (Wall Street Journal, 1998, p. C1).

offer will fail. It addresses the truncation dilemma by exploiting ex post information about frequency of success to capture the missing slice of the gains from takeover.

The second approach, the intervention method (IM), extracts information about value improvement from the stock returns associated with intervening events such as the announcement of a competing bid. Like PSM, IM addresses the truncation dilemma through appropriate scaling of returns. At the same time, IM also addresses the revelation bias, which taints estimates of the gain to takeover in past market and accounting studies. A disadvantage of IM is that it relies heavily on the subsample in which an intervening event occurs such as arrival of a competing bid.

The main contributions of this paper are the development of the probability scaling and the intervention methods, and the use of these methods both to estimate value improvements from tender offers and to explore what economic factors affect takeover gains and revelation effects. We find that value improvements from tender offers are on average perceived by investors to be positive and substantially larger than estimates from previous studies. Conventional combined abnormal returns and the PSM estimate are positive in 71% of the sample (694 out of 976 transactions). In the competing bid subsample, the IM estimate is positive in over 93% of the sample (132 out of 141 competing bid transactions). In both the general and the competing bid samples, the conclusion that takeover improvements are on average positive and substantial is robust with respect to several alternative model specifications and plausible variations in the estimated parameters, and it holds in all subperiods. Using traditional event-period weighted-average returns as in Bradley et al. (1988), hereafter BDK-88, yields a combined mean (median) improvement of 5.3% (3.7%) of combined bidder-target value. PSM estimated value improvements tend to be considerably larger, a mean of 7.3% (median 4.6%) of combined value.

Estimated value improvements are particularly large in the competing bid subsample. The average estimated IM improvement in this sample is approximately 13.1% (12.4%) of combined bidder and target value. Using PSM, the average improvement is 14.7% (9.7%). Again these numbers are greater than the estimates of 9.0% (7.6%) using conventional combined abnormal returns in the competing bid subsample.[2]

Using a traditional announcement period estimation method, we find that bidders on average pay a significantly higher premium for the shares they purchase in the offer than the improvement in target share value under bidder control. In contrast, using both of the new methods developed here, we cannot reject the null hypothesis that the payment is on average fair.

Furthermore, our methods can disentangle more specifically than the traditional method how economic forces affect the takeover market. We find that friendly offers, equity offers, and diversifying offers are associated with lower combined

[2]Another reason that the traditional method can understate the true value improvement is that stock prices of acquirers could already reflect an expectation that acquirers will undertake new projects including mergers. For example, an acquisition could be part of a merger program, and market reaction to a takeover bid only captures the surprise relative to expectations (Schipper and Thompson, 1983). However, our probability scaling method shows that the portion of the value improvement that investors learn about at takeover announcement date is substantially underestimated by traditional methods.

bidder-target stock returns. A conventional interpretation would be that the gains from combination are smaller for firms involved with these types of transactions. However, our new methods indicate that these effects reflect differences in revelation about stand-alone value, not differences in the gains from combination.

For example, cash offers on average are associated with higher bidder, target, and combined abnormal returns than equity or mixed-payment offers. In contrast, based on the intervention method, cash offers do not create higher value improvements than mixed or equity offers. These findings indicate that the apparent superiority of cash offers in creating shareholder value is an illusory consequence of a more negative revelation effect for the bidder for equity or mixed offers than for cash offers. This suggests an adverse selection in the use of equity as a medium of exchange in takeovers. Also, our finding does not support the hypothesis that the use of cash reveals to investors a general propensity for the bidder's management to waste cash on bad projects.

Similarly, we find that the revelation effect is more favorable for hostile than for friendly offers. On average the market revises upward (downward) its stand-alone valuation of bidders that make hostile (friendly) bids. (The phrase "stand-alone" is used here to mean "not combined with the current target". It does not preclude the possibility that the market perceives bidder value as potentially coming from combination with a different target.) This is consistent with investors interpreting hostile bids as indicating that the bidder has strong cash flow prospects as a stand-alone entity or better alignment of managers' interests with shareholders' interests in the bidder firm or both.

Furthermore, conventional combined returns, PSM value improvements, and bidder returns tend to be lower in diversifying acquisitions. The finding of lower bidder returns indicates that the conclusions of Morck et al. (1990) continue to apply in a data set that includes the turn of the millennium. In sharp contrast, IM estimates of value improvements are similar across these categories. The relative superiority of same-industry acquisitions with PSM (which does not filter out revelation effects) compared with IM (which does) indicates that same-industry acquisitions are associated with more favorable revelation about the bidder than cross-industry acquisitions.

This finding suggests that investors perceive diversifying acquisitions as indicating poor investment opportunities within the bidder's own industry or that management is prone to more severe agency problems. It further suggests that updating about the quality of the bidder's investment opportunities or management, not about the advantages of the combination, leads to lower returns in diversifying transactions.

We also identify some factors that do affect the gains from combination, not just revelation about stand-alone value. For example, using all three approaches, acquisition of a smaller target by a large bidder on average creates a smaller value improvement, measured as a fraction of combined value, than combinations of similar-size firms. But measured relative to the value of the target, the mean estimated improvement is larger for such transactions. These findings are consistent with the importance of both synergies and target-specific improvements such as removal of bad management. Although the business press has raised concerns about combinations of similar-size firms, these two results do not give any clear indication that bidder-target parity in tender offers is a bad thing.

Furthermore, bidder announcement period returns and total value improvements are negatively related to bidder Tobin's Q. In the earlier samples of Lang et al. (1989) and Servaes (1991), returns to bidders and targets were higher when high Q bidders acquired low Q targets. Our finding is consistent with the finding of Dong et al. (2003) that bidders with low book equity/market equity ratios (which tend to be negatively correlated with Q) on average have more negative announcement period returns. Target announcement period returns are negatively related to target Q, consistent with previous literature.

In summary, the methods offered here affect several conclusions about tender offers. In addition to the quantitative conclusion that tender offers produce greater gains than previously estimated, our approach offers conclusions that contrast with those of conventional methods about how means of payment is related to value improvements; what offer hostility indicates about bidder agency problems; whether diversifying acquisitions harm value or just reveal adverse information about stand-alone firm prospects; and whether bidders pay too much. In other words, these methods affect qualitative as well as quantitative inferences about tender offers.

Section 2 develops an empirical measure of value improvements. Section 3 describes the tender offer data. Value improvement estimates of tender offers are presented in Section 4. Section 5 concludes.

2. Measurement of takeover value improvement

Before developing our empirical measure of value improvements, we note the motivation for our methods, and formulate the hypotheses.

2.1. Motivation

A large previous literature uses stock return data to estimate shareholder gains from takeovers, usually in the form of separate estimates of bidder or target gains. Such estimates reflect the gain from combination and also depend on how this surplus is divided between bidder and target.[3] To estimate the total gains from combination, BDK-88 examine a market value-weighted average of abnormal returns of paired bidders and targets in successful takeovers. They examine an event window that extends to five days after the initial announcement of the ultimately successful bid. Because substantial uncertainty remains about ultimate success of the bid, the short event window provides an estimate of only a fraction of the market's assessment of the total value gains from takeover. BDK-88 find that the market value-weighted average of bidder and target abnormal returns for successful

[3]Numerous studies find significant and large positive average abnormal returns for target shareholders. Jensen and Ruback (1983), Jarrell et al. (1988), and Schwert (1996) review this evidence. In contrast, abnormal returns or takeover bidders tend to average fairly close to zero.

takeovers during the period 1962–1984 is positive and stable over this period, with an average increase of 7.4% of combined bidder/target market value. This is their estimate of magnitude of synergistic gains from takeover.

Ideally, as recognized by BDK-88, an event window that extends from (well before) the initial announcement through final successful resolution should be used to capture the full value effects of takeover. Takeover contests often take as long as three to six months between first announcement and final resolution. Such long periods introduce a great deal of noise arising from random price movements and errors owing to misestimation of benchmark returns. Long periods also raise issues of the correct way to compound.[4] Empirically, Andrade et al. (2001, p. 110) report a slightly higher average return for the $[-20, \text{close}]$ announcement window than using a $[-1, +1]$ window. However, the return estimate becomes noisy as the window extends to the resolution of the takeover bid (with an average window length of 142 days), and this estimate cannot be reliably distinguished from zero.

A short post-announcement window minimizes such noise and benchmark error, because significant security-specific news arrives on a single day, whereas (if only factor risk is priced) the risk premium for a single day is negligible. However, a short window estimates only a fraction of the full value effect of a successful transaction.[5] This is the truncation dilemma.

Several authors have emphasized a second problem for estimating the value effects of takeovers (Bradley et al., 1983; Jensen and Ruback, 1983; Roll, 1986; Jovanovic and Braguinsky, 2002): The announcement of an offer and its form reveal bidder information not just about the gain from combination, but also about the bidder's stand-alone value. As a result, takeover-related returns do not provide a pure measure of the gain to shareholders from takeover.

For example, the occurrence of a bid could convey the good news that a bidder expects to have high cash flows, the bad news that the bidder has poor internal investment opportunities, or the bad news that the bidder's management has empire-building propensities.[6] Similarly, the premium offered can convey good or bad news about the bidder's stand-alone prospects. Also, the 'lemons problem' with equity issuance implies that the use of equity as a means of payment will convey bad news

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[4]The market model is biased to the extent that bids occur after the bidder has experienced abnormally good times (Franks et al., 1991). Barber and Lyon (1997) and Kothari and Warner (1997) study problems of misspecification associated with the use of long-horizon returns and the effectiveness of alternative benchmarks.

[5]A familiar problem, which is not our primary focus, is that a short pre-event window omits the effects of probability revisions associated with information leaking out prior to the official public announcement date. Furthermore, we estimate market perceptions of value improvements. These perceptions are sometimes incorrect; see, e.g., the model of Shleifer and Vishny (2003), tests of market misvaluation based upon post-acquisition long-run stock returns (Loughran and Vijh, 1997; Rau and Vermaelen, 1998; Mitchell and Stafford, 2000; Hou et al., 2000; Andrade et al., 2001; Moeller et al., 2004a,b), and through contemporaneous measures (Dong et al., 2003).

[6]See, e.g., Jovanovic and Braguinsky (2002). The Wall Street Journal (1998, p. C1) describes the viewpoint of analysts that "[e]xecutives who see slowing growth often look outside their companies for acquisition opportunities."

about the bidder's assets in place, and that the use of cash will convey good news.[7] In contrast, free cash flow and agency problems suggest that the announcement of a cash bid could reveal that the firm has excess cash flow relative to profitable internal investment needs and that management is likely to waste that cash on poor investments.

It follows that the market value-weighted average of bidder and target equity returns provides a biased estimate of the long-run total equityholder gain from takeover. We term the error in these estimates arising from managers' information about stand-alone value the revelation bias.

Revelation effects should be distinguished from signaling, the special case in which the bidder modifies his acquisition decision for the purpose of influencing short-term market perceptions. In general bidder actions will convey information to the market, regardless of whether the bidder seeks to alter market beliefs. Our approach can accommodate, but does not require, that signaling motives be an important consideration in the decision of whether to make an acquisition. Even if signaling motives are not relevant, the decision to make an offer will in general reveal information possessed by the bidder.[8]

This paper describes empirically abnormal stock returns associated with announcement of tender offers in a sample that extends to the turn of the millenium, and offers new methods of estimating value improvements from takeover which address the truncation dilemma and the revelation bias in stock market studies.[9] By controlling for these biases, our new methods imply much larger value effects than traditional techniques suggest, and imply different conclusions about the sources of takeover value improvements. These methods could be useful in other contexts as well for estimating the full value effects of corporate events and for disentangling revelation effects from value effects of discretionary corporate actions.

Both new approaches address the truncation dilemma. Suppose, for example, that the event window is truncated five days after announcement. Then the market price at the endpoint still reflects substantial uncertainty on the part of investors about ultimate success of the offer or of any follow-up offer. The problem the financial economist faces is to infer the total value improvement effect from this fragment of

[7]See Myers and Majluf (1984), Hansen (1987), Fishman (1989), and Eckbo et al. (1990), as well as the evidence of Travlos (1987) and Franks et al. (1991).

[8]An alternative to stock market evidence is to examine accounting or other performance measures following completed transactions. Several studies have drawn different conclusions about whether takeovers on average increase or decrease combined fundamental value (e.g., Mueller, 1985; Healy et al., 1992; Kaplan and Weisbach, 1991; Bhagat et al., 1990). Although such studies are informative, they usually do not quantify the total discounted value effect of takeovers. More important, these studies are potentially subject to problems of noise, benchmark error, and revelation bias analogous to those of stock market-based studies. For example, in regard to revelation bias, an offer could be associated with future accounting improvements, which would have occurred even without a takeover.

[9]Andrade et al. (2001) and Moeller et al. (2004a,b) have described several aspects of the returns to takeovers including recent years. Andrade et al. (2001) draw a similar overall conclusion to ours, that takeovers have on average been perceived as value increasing. Moeller et al. (2004a,b) also find positive mean returns, but emphasize the negative dollar returns of large bidders during the 1998–2001 period.

it, much as an anthropologist infers the height of a hominid based on a fossilized leg bone.

The probability scaling method (PSM) adjusts returns for the possibility that the transaction is not completed. Ex post data are used to estimate the probability, given that a bid has taken place, that the bidder ultimately succeeds in acquiring the target, and the probability that some other bidder ultimately takes over the target. Based on these probabilities, the announcement period returns of bidder and target are magnified to measure the total perceived value effect of a completed transaction. (For an independent development of a related approach, see Luo (2003). His study examines whether managers take into account stock price reactions to the initial offer in deciding whether to complete the transaction.)

The intervention method addresses both the revelation bias and the truncation dilemma by focusing on the returns at the time of a different event, the arrival of a competing bid. Because the arrival of a second bidder has a large effect on the probability of the initial bidder's success, the abnormal return observed for the initial bidder at this event implicitly reflects the size of the potential takeover value improvement. (The term "value improvement" in this paper refers to joint bidder and target shareholder gains. Owing to possible wealth redistributions among other stakeholders such as employees and customers, this need not coincide with value to society as a whole.) Furthermore, this event does not occur at the discretion of the initial bidder; it is an external intervention. This is crucial, because, as such, the arrival of a competing bid reveals little or nothing about the stand-alone value of the initial bidder. The intervention method calculates the value improvement implicit in the observed initial bidder return when a competing bid intervenes.

There are two key inputs to this calculation. The first is the amount by which the arrival of a competing bid reduces the probability that the first bidder succeeds in acquiring the target. The second is the amount that the arrival of a competing bid increases the expected price that the first bidder would pay should it win the contest. (A third relevant input, the initial shareholding of the first bidder in the target, turns out to be relatively unimportant.) Each of these quantities can be estimated from ex post data. Holding constant these parameters, the abnormal return at the time of arrival of a competing bid is a decreasing function of the size of the takeover improvement, i.e., it is worse to lose a big improvement than a small one. Inverting this relationship, the size of the takeover improvement can be inferred from the observed abnormal return. A numerical illustration is provided in Appendix A.

Intuitively, the challenge for estimating value improvements is that two very different possibilities are consistent with a negative move in the first bidder's stock price upon the arrival of a competing bid. First, the acquisition could increase the first bidder's value, and arrival of the second bid conveys the bad news that this value is less likely to be realized by the first bidder. Second, the acquisition could decrease the first bidder's value, but the arrival of the second bidder conveys the bad news that the first bidder will on average pay a higher premium in the event that he succeeds. To disentangle these effects, we model the relation between these parameters and stock prices.

The methods that we use require some simplifying assumptions. Conventional methods make even stronger assumptions, though these assumptions are not explicit. For example, to interpret returns as value improvements using conventional weighted average event-date returns implicitly assumes that a short window can capture the whole value effect, and that there is no revelation bias. In this respect our approach has an important virtue relative to the conventional approach: It makes assumptions explicit. Doing so allows us to quantify explicitly the robustness of the conclusions to relaxing different simplifying assumptions.

Intervention method estimates depend on how competition affects the likelihood of offer success and bid premiums. Several previous papers examine related issues. Betton and Eckbo (2000) estimate outcome probabilities in multiple bid tender offers as a function of offer premium, toehold, and the method of payment. An extensive theoretical literature considers the role of competing bidders in takeovers (Fishman 1988, 1989; Eckbo et al., 1990; Ravid and Spiegel, 1999; Bulow et al., 1999).

Also, some previous papers have examined stock price reactions to events that interfere with takeover completion. These have focused either on testing for collusion and the effects of antitrust enforcement or on documenting the abnormal returns associated with the interfering event. Eckbo (1983) finds negative abnormal stock returns in merger bidders and targets on the announcement of an antitrust complaint. Bradley et al. (1983) find a negative stock price reaction for a bidder upon announcement of a competing bid. Eckbo (1992) analyzes cross-sectional determinants of the market response to government antitrust challenges of merger bids. He does not find that such policies deter collusive takeovers. BDK-88 find that targets receive a greater share of the value gains since the enactment of federal and state takeover legislation, and that offers with competing bids are associated with a more negative bidder abnormal return. Hietala et al. (2003) estimate takeover gains in a case study of competition in the 1994 acquisition of Paramount by Viacom. In contrast with these papers, our focus here in developing the intervention method is on extracting the size of value improvements from stock price reactions in a large sample of tender offers.

2.2. Hypotheses

The primary issue to be examined is whether takeovers on average increase the joint value of the bidder and target firms. According to the Roll's (1986) hubris hypothesis, no value improvement results from takeover; takeovers occur because of positive valuation errors by bidding managers. Agency problems can also lead bidding managers to pay more for targets than they are worth (e.g., empire building, and misuse of free cash). We therefore call the hypothesis of zero value improvement the strong agency/hubris hypothesis. If the strong agency/hubris hypothesis obtains, the expected value of the target to the bidder is the pre-takeover market price of the target. If bidding costs are neglected, then the bidder makes negative profits equal in magnitude to the total premium paid for the purchased shares.

Because tender offers are frequently for less than 100% of outstanding shares, estimated bidder profits will depend on the assumptions made about the price paid for remaining shares given that control is obtained. For two reasons, the most natural assumption is that the same price is paid for holdouts as for the shares purchased in the tender offer.[10] First, fair-price antitakeover amendments require paying at least this much to minority shareholders. Second, even if a successful bidder is able to expropriate minority shareholders, such dilution opportunities should be fully reflected in the initial bid price, so that holdout shareholders on average receive the same price as tendering shareholders (Grossman and Hart, 1980).

Let α refer to the fraction of the target's shares owned by the first bidder prior to the bid. Let V_0^{T} be the nontakeover value of the target. Let V^{C} be the combined post-takeover value of the first bidder and the target if the first bidder succeeds in acquiring the target, when this value is inclusive of any nonequity payments to shareholders as a result of the offer. Let the nontakeover value of the bidder be denoted V_0^{B}. Let V^{I} be the value improvement from takeover. Then

$$V^{\mathrm{I}} \equiv V^{\mathrm{C}} - V_0^{\mathrm{B}} - V_0^{\mathrm{T}}(1-\alpha). \tag{1}$$

The first term on the right-hand side is the total discounted value of cash flows going to bidder and target shareholders if the combination occurs. The last two terms subtract the total value if there is no takeover. This is the sum of the values of the bidder and the target less the value of the bidder's stake in the target (which would otherwise be double-counted).

Letting a bar denote an expected value, the strong/agency hubris hypothesis asserts that the average value improvement is zero, i.e.,

$$\bar{V}^{\mathrm{I}}(\theta) = 0, \tag{2}$$

where θ is the market's information set.

Some theoretical models predict that in the absence of dilution of minority shareholders, bidders will not on average profit on shares purchased in the offer (Grossman and Hart, 1980; Shleifer and Vishny, 1986; Hirshleifer and Titman, 1990). Even if a successful bidder loses money on these shares, he could still profit from the acquisition by increasing the value of the shares accumulated prior to the offer (Shleifer and Vishny, 1986). The prediction that the bidder profits on shares purchased in the tender offer is termed the underpayment hypothesis, as opposed to the overpayment hypothesis. The overpayment (underpayment) hypothesis implies that the bid price on average is greater (less) than the value of the target shares to the bidder. Let $(1-\alpha)B$ be the total amount ultimately paid (in the form of either cash or securities) by a successful first bidder for shares purchased in or subsequent to the tender offer. For convenient comparison, this definition scales B to be the notional price that would be paid if the bidder began with zero toehold and proceeded to purchase 100% of the firm. The amount paid by the bidder for the target (the price) includes the amount of cash paid to target shareholders and the market value of any security claims upon the combined firm given to target shareholders.

[10] Comment and Jarrell (1987) present evidence consistent with this assumption. More recently, it is not unusual for holdout investors to receive a package of securities with face value equal to the cash offer to initially tendering investors.

The overpayment and underpayment hypotheses can then be expressed as

$$(1-\alpha)(\bar{B}-V_0^{\mathrm{T}}) \gtrless \bar{V}^{\mathrm{I}}, \tag{3}$$

where $\bar{B}$ denotes the expected value of the amount the initial bidder pays should he succeed. Dividing both sides by $V_0^{\mathrm{C}} \equiv (1-\alpha)V_0^{\mathrm{T}} + V_0^{\mathrm{B}}$ gives

$$(1-\alpha)\left(\frac{\bar{B}}{V_0^{\mathrm{T}}}-1\right)\left(\frac{V_0^{\mathrm{T}}}{V_0^{\mathrm{C}}}\right) \gtrless \frac{\bar{V}^{\mathrm{I}}}{V_0^{\mathrm{C}}}. \tag{4}$$

This condition describes whether the bid premium exceeds the value improvement, both measured relative to the initial combined bidder and target value.

2.3. The probability scaling method of estimating value changes

Let θ_0 be all public information known prior to the first bid. Let θ_1 be all public information known just after the first bid. Let θ_2 refer to information known just prior to the arrival of a competing bid. Let θ_3 also contain the information conveyed by the competing bid. Let dates $t = 0, 1, 2$, and 3 refer to dates at which $\theta = \theta_0, \theta_1, \theta_2$, and θ_3, respectively. Subscripts of 0, 1, 2, and 3 will denote expectations formed conditional on these information sets.

Let $\bar{V}^{\mathrm{I}}$ be the post-takeover improvement in combined value, as described in Eq. (1), conditional on the first bidder succeeding. Let ϕ_t denote the probability of success of the first bidder in acquiring the target given θ_t (ϕ_0 is the probability of a first bidder appearing and succeeding). Let $\bar{B}_t$ be the expected price paid by the first bidder should he win as assessed at date t, let ϕ_t^{L} be the probability that a first bid occurs and a later bidder subsequently wins, and let $\bar{B}_t^{\mathrm{L}}$ be the expected price paid by such a winning bidder as foreseen at date t. A 1 subscript to variables indicates expected values formed after the arrival of the initial bid.

The conventional approach to estimating value improvements reflects the probabilities of acquisition by current or later bidders, ϕ_0 and ϕ_0^{L}, but does not estimate the probabilities. To provide meaning to this, some interpretation is needed. One possible interpretation that allows the conventional approach to be viewed as a value improvement is that the potential value improvements that would be brought about by the two potential bidders are equal, and that the probability that acquisition will be consummated by one or the other bidder is one. The latter assumption is strong and clearly counterfactual. In the probability scaling method, we will relax this assumption.

Let z be the sum of the stand-alone values of the first bidder and the target. As is implicit in the conventional approach, we assume that the average size of the improvement brought about by combination of a target with either the initial bidder or a later one is equal. Then the combined value of the first bidder and the target at date 0 is

$$V_0^{\mathrm{C}} = z + \phi^0 \bar{V}^{\mathrm{I}}, \tag{5}$$

where $\phi^0 \equiv \phi_0 + \phi_0^{\mathrm{L}}$ is the market's assessment of the probability that the target is acquired by a potential bidder in the future. For simplicity, in this analysis we consider date 0 to be far enough in advance of the initial bid announcement that little market anticipation of the offer exists. Thus, the ex ante probabilities that a bidder appears and wins (ϕ_0 and ϕ_0^{L}) are close to zero. This implies that the prior expected target payoff is just the stand-alone value V_0^{T}, and the prior expected bidder payoff is just the stand-alone value V_0^{B}. As documented by Palepu (1986), takeovers are low probability events that are hard to predict far in advance. More generally, the approach can be modified to allow for partial anticipation of offers, but given Palepu's evidence it is unlikely that doing so would affect the results substantially.

After the arrival of the initial bid, the market assigns a value $\phi_1 + \phi_1^{\mathrm{L}}$ to the probability that the target is acquired by a bidder. Therefore, the combined value of the first bidder and the target becomes

$$V_1^{\mathrm{C}} = z + (\phi_1 + \phi_1^{\mathrm{L}})\bar{V}^{\mathrm{I}}. \tag{6}$$

It follows that the combined fractional market value improvement in the bidder and target is

$$R_1^{\mathrm{C}} \equiv \frac{V_1^{\mathrm{C}} - V_0^{\mathrm{C}}}{V_0^{\mathrm{C}}} = \frac{(\phi_1 + \phi_1^{\mathrm{L}})\bar{V}^{\mathrm{I}}}{V_0^{\mathrm{C}}}, \tag{7}$$

so normalizing the value improvement by combined value,

$$\frac{\bar{V}^{\mathrm{I}}}{V_0^{\mathrm{C}}} = \frac{R_1^{\mathrm{C}}}{\phi_1 + \phi_1^{\mathrm{L}}}. \tag{8}$$

This formula provides a simple implementation of the probability scaling method. We refer to the value improvement on the left-hand side estimated from this PSM formula as the probability adjusted improvement ratio, or IR^{PSM}.

2.4. The intervention method of estimating value changes

We now describe the intervention method for estimating value improvements. The intervention method addresses the revelation bias as well as the truncation dilemma. However, it is based on a smaller subsample of returns (the competing bid subsample). The first step is to calculate the bidder's abnormal return between dates 1 and 3 in terms of the market's expectation of the value improvement $\bar{V}^{\mathrm{I}}(\theta_t)$ at these dates. Then (using empirical estimates of unconditional and conditional probabilities of success and expected premiums, abnormal returns, and other parameters) we invert the relationship to infer $\bar{V}^{\mathrm{I}}(\theta_t)$. For expositional simplicity, the model examines raw returns. For standard reasons, in implementing the model empirically abnormal returns are used.

Consider the arrival of the competing bid at date 3. Let the market's assessment of the component of bidder's value not derived from the takeover be y. y will not equal the pre-offer value of the bidder as assessed by the market if the initial offer conveyed information about the bidder. We assume that the arrival of a competing bid is uninformative about the stand-alone value of the first bidder, so that y is the same at dates 1, 2, and 3 (before and after the arrival of the competing bid). Let $R_3 \equiv (P_3 - P_1)/P_1$ be the date 3 return associated with information θ_3, where P_1 is the bidder's stock price just after the initial bid, and P_3 is the price based on θ_3 after a competing bid arrives. So,

$$P_3 = P_1(1 + R_3). \tag{9}$$

Let $\bar{V}^{\mathrm{I}}(\theta_1), \bar{V}^{\mathrm{I}}(\theta_3), \bar{B}(\theta_1)$, and $\bar{B}(\theta_3)$ be abbreviated as $\bar{V}^{\mathrm{I}}_1, \bar{V}^{\mathrm{I}}_3, \bar{B}_1$, and $\bar{B}_3$, respectively. To relate $\bar{V}(\theta)$ to the observables P_3 and P_1, note that

$$P_1 = y + \bar{\pi}_1$$

and

$$P_3 = y + \bar{\pi}_3, \tag{10}$$

where $\bar{\pi}_t$ is the bidder's expected profit from takeover conditional on information θ_t:

$$\bar{\pi}_1 = \phi_1[\alpha \bar{V}^{\mathrm{I}}_1 + (1-\alpha)(\bar{V}^{\mathrm{I}}_1 + V^{\mathrm{T}}_0 - \bar{B}_1)]$$

and

$$\bar{\pi}_3 = \phi_3[\alpha \bar{V}^{\mathrm{I}}_3 + (1-\alpha)(\bar{V}^{\mathrm{I}}_3 + V^{\mathrm{T}}_0 - \bar{B}_3)]. \tag{11}$$

We assume that the arrival of the competing bid at date 3 does not provide any information about the value improvement that the first bidder can effect through takeover.[11] Hence, $\bar{V}^{\mathrm{I}}_3 = \bar{V}^{\mathrm{I}}_1 = \bar{V}^{\mathrm{I}}$. The robustness of the results with respect to this assumption is analyzed in Section 4.5.[12] The unobservable y can be eliminated from Eq. (10), and the result combined with Eq. (11), giving

$$\bar{V}^{\mathrm{I}} = \frac{P_3 - P_1}{\phi_3 - \phi_1} - (1-\alpha)V^{\mathrm{T}}_0 + \frac{(1-\alpha)(\phi_3\bar{B}_3 - \phi_1\bar{B}_1)}{\phi_3 - \phi_1}. \tag{12}$$

Dividing both sides of Eq. (12) by V^{C}_0 gives

$$\frac{\bar{V}^{\mathrm{I}}}{V^{\mathrm{C}}_0} = \frac{R_3(P_1/V^{\mathrm{C}}_0)}{\phi_3 - \phi_1} + (1-\alpha)\left[\lambda\left(\frac{\bar{B}_1}{V^{\mathrm{T}}_0}\right) + (1-\lambda)\left(\frac{\bar{B}_3}{V^{\mathrm{T}}_0}\right) - 1\right]\left(\frac{V^{\mathrm{T}}_0}{V^{\mathrm{C}}_0}\right), \tag{13}$$

where

$$\lambda \equiv \frac{\phi_1}{\phi_1 - \phi_3}. \tag{14}$$

[11]This would obtain under the strong agency/hubris hypotheses. More generally, the arrival of either an initial bid or competing bid could reveal information about target value. However, the evidence regarding the information conveyed by an initial bid is mixed. Bradley et al. (1983) find that average cumulative abnormal returns of targets are approximately zero among targets of failed offers that are not later acquired. It is thus possible that no permanent informational revaluation is associated with the initial bid.

[12]This assumption is consistent with private information possessed by the second bidder. This could be information about a private component of its valuation of the target (e.g., a synergy unique to the second bidder). The second bidder can also possess information superior to that of investors about common value components (e.g., gains from remedying target management failure), so long as investors do not perceive the second bidder's information as adding to that of the first bidder.

We call the quantity on the left-hand side of Eq. (13) the intervention method improvement ratio, or IR^{IM}. It is the market's estimate of the percentage improvement in the combined value of the bidder and target. In principle, every parameter in Eq. (13) can be given an i superscript to denote the ith takeover contest. However, we begin by developing the method in its most basic form by estimating certain parameters as sample means under the assumption that they are the same across contests. Under this approach, the terms $\bar{B}_1/V_0^{\mathrm{T}}$ and $\bar{B}_3/V_0^{\mathrm{T}}$ can be estimated as

$$\bar{B}_1/V_0^{\mathrm{T}} = \frac{1}{n_1}\sum_{i=1}^{n_1}[B^i/(V_0^{\mathrm{T}})^i] \tag{15}$$

and

$$\bar{B}_3/V_0^{\mathrm{T}} = \frac{1}{n_3}\sum_{i=1}^{n_3}[B^i/(V_0^{\mathrm{T}})^i], \tag{16}$$

where n_1 is the number of initial offers and n_3 is the number of contests in which a competing bid occurs. Similarly, ϕ_1 and ϕ_3 can be estimated as the fraction of initial bids that succeed in the overall sample and in the subsample in which a competing bid occurs, respectively. A more sophisticated approach is to estimate separate transaction-specific expected bid premiums, by regression analysis, and probabilities of success using the logit model of Table 3 (see Section 4.2).

The model provides intuitively reasonable comparative statics. For example, assuming that the competing bid causes a drop in probability of success ($\phi_3 < \phi_1$), a more negative stock return on announcement of a competing bid indicates a larger value improvement. If the arrival of a competing bid implies that a much higher bid is needed to succeed, then for a given stock price reaction to the bid, the value improvement is smaller.

The quantities $R_3, P_1/V_0^{\mathrm{C}}$, and α can be calculated directly and are specific to the takeover contest, to derive the value improvement ratio IR^{IM}. The intervention method makes no assumption whatsoever as to whether improvements are specific to changes in the bidder or the target or involve joint synergies.

The strong agency/hubris hypothesis implies that this ratio is zero. The overpayment and underpayment hypotheses are tested by comparing the average bid premium with the average estimated improvement given in Eq. (4).

The conventional approach is based on a variety of strong assumptions. For example, the conventional approach assumes that combined bidder/target returns reflect only the gains from the specific transaction, instead of the possibility of other acquisitions should the given transaction fall through. The conventional approach also assumes that revelation effects of the initial bid are zero. Furthermore, a conventional short-window return approach in effect implicitly assumes that, immediately after the initial offer, investors believe the offer will succeed with certainty.

Our implementation of the intervention method also makes several simplifying assumptions, some of which could be closer to the truth than others. Where our approach differs from the conventional approach is in making the relevant assumptions explicit. Doing so has the virtue of allowing assumptions to be evaluated critically and suggesting how to test for robustness of the specification. The assumptions we apply are that the arrival of a competing bid does not cause investors to modify their assessment of the stand-alone value of the first bidder; that success of the initial bid is unrelated to the size of the value improvement; that a bidder whose offer fails is not able to locate and purchase another similar target at the same price; and that the unsuccessful initial bidder does not sell its toehold to a later bidder. Section 4.5 discusses and provides four modified versions of the model to evaluate quantitatively the effects of relaxing different assumptions. In brief, we find that the conclusion that value improvements are on average positive is highly robust.

The intervention method takes into account that an intervention sample (such as a competing bid sample) could have different characteristics from a general sample of bidders and targets. This is reflected in its allowing for firm-specific estimates of various input parameters. We control for ex ante differences between initial bidders that later are in competition with competing bids and initial bidders that are not using several bidder and offer characteristics. These include whether the offer is hostile, the bidder's initial toehold, the initial bid premium, and the relative size of the bidder and target (see Section 4). Nevertheless, if these controls are imperfect, a question remains of the extent to which value improvements in a competing bid subsample are representative of value improvements in a general sample.

3. Data

While the conventional method and the new methods developed here all apply to mergers as well as tender offers, in this paper we focus our empirical tests on a comprehensive sample of tender offers during 1962–2001. Our focus on tender offers is in the tradition of a large literature (e.g., Betton and Eckbo, 2000; Bhagat et al., 1990; Lang et al., 1989; Bradley et al., 1988).

The initial tender offer data set was constructed from two sources. The first consists of 559 tender offers that were announced during the period October 1958 through December 1984. "It contains almost every tender offer made in the 1958–1984 period where at least one firm (the target or a bidder) was listed on the NYSE or Amex ... at some time between July 1962 and December 1984".[13] This study investigates the wealth effects of a tender offer on both bidders and targets. We therefore restricted the sample to the 327 tender offers in which the bidder and target were both listed on the NYSE or Amex. Additional data-availability and data-consistency requirements reduced the sample size within the 1962–1984 subperiod to 292.[14]

[13]The quotation is from the write-up for the data set compiled by Michael Bradley, Robert Comment, Anand Desai, Peter Dodd, and Richard Ruback. We thank these authors for providing us with their data.

[14]Twelve tender offers were announced prior to July 1962. The daily Center for Research in Security Prices (CRSP) tape does not contain returns prior to this date. Our verification of tender offer announcements and name changes led to some minor changes in the database.

The second data source consists of all tender offers from 1985–2001, obtained from the Securities Data Company (SDC) Mergers and Acquisitions database. There were 778 tender offers with both the target and the acquirer publicly traded on the NYSE, Amex or Nasdaq. After excluding 33 offers, the resulting number of tender offers from 1985 to 2001 in our data set is 726.[15] All stock price data are obtained from CRSP and accounting data from Compustat.

To compile a history of the events that occur subsequent to a tender offer that might affect the probability of success of the bid, we manually searched the *Wall Street Journal Index* for the 292 target firms during 1962–1984 and used the online service *Dow Jones Interactive* to search the *Wall Street Journal* for information on the 726 target firms during 1985–2001, for a total of 1,018. For these 1,018 tender offers, we searched for the following information: litigation by the target firm or its shareholders, litigation by the bidding firm or its shareholders, and a second bidder.

Table 1 records the frequency of the 1,018 attempted tender offers during 1962–2001 (see also Fig. 1). Using the criterion of success considered by Bradley et al. (1983) that the bidder acquires at least 15% of target shares in the tender offer, 690 or 68% of these offers were successful. Out of these 1,018 offers, 221 were considered hostile by the target management. A second bidder entered the contest in 147 tender offers. Target management litigated in 232 cases. Finally, 731 of these 1,018 offers were all-cash offers.

Fig. 2 describes the percentage of successful and unsuccessful offers, the percentage of offers that had at least two bidders, the percentage offers considered hostile by target management, and the percentage of all cash offers during different periods.

3.1. Returns to bidders and targets

Table 2 summarizes the returns to bidder and target shareholders (with both companies listed on NYSE, Amex, or Nasdaq) during 1962–2001. Let the target and bidder returns be denoted R^{T} and R^{B}, respectively, and let

$$\omega \equiv \frac{(1-\alpha)V_0^{\mathrm{T}}}{V_0^{\mathrm{C}}}. \tag{17}$$

Then *CIBR*, the combined initial bid return, is a weighted average of bidder and target abnormal returns,

$$CIBR = \omega R^{\mathrm{T}} + (1-\omega)R^{\mathrm{B}}. \tag{18}$$

[15] In eight tender offers, the acquirer made a subsequent tender offer for the target, and in these cases only the initial tender offers were included. We also excluded 11 tender offers in which the bidder announced multiple takeovers at the same time. For both target and acquirer, the SDC firm names and Committee on Uniform Securities Identification Procedures (CUSIP) numbers were matched with firms in the CRSP database. For 33 of the tender offers, CRSP data were not available either because of the required time period (e.g. a firm was delisted prior to the tender offer event) or the failure to match the firm reported by SDC with a firm in the CRSP database.

Table 1
Number of attempted offers, successful offers, offers that involved two or more bidders, offers that were considered as hostile by target management, and offers in which the target litigated against the acquisition attempt

Year	Number of attempted tender offers	Number of successful offers (when the bidder acquired at least 15% of target shares)	Number of attempted offers that had at least two bidders	Number of attempted offers considered hostile by target management	Number of attempted offers in which the target litigated	Number of all cash offers
1962	1	0	0	0	0	1
1963	9	5	1	2	0	9
1964	4	3	0	1	0	4
1965	11	9	1	2	1	10
1966	13	7	2	4	1	12
1967	18	8	11	8	4	16
1968	31	20	13	9	8	16
1969	10	6	3	1	2	4
1970	8	6	0	2	3	6
1971	2	2	0	0	0	1
1972	8	5	0	1	2	6
1973	17	6	2	4	5	16
1974	22	9	5	6	5	21
1975	12	5	3	3	9	11
1976	19	8	3	6	6	17
1977	18	8	5	3	4	18
1978	21	6	5	6	7	14
1979	19	8	4	11	9	16
1980	4	2	2	2	1	4
1981	13	5	9	10	8	3
1982	13	12	0	2	3	2
1983	10	9	2	4	2	0
1984	9	8	1	2	0	1
1985	40	19	7	12	15	29
1986	59	38	8	14	15	51

Table 1 (*continued*)

Year	Number of attempted tender offers	Number of successful offers (when the bidder acquired at least 15% of target shares)	Number of attempted offers that had at least two bidders	Number of attempted offers considered hostile by target management	Number of attempted offers in which the target litigated	Number of all cash offers
1987	42	32	5	9	12	38
1988	73	43	17	23	29	61
1989	42	24	6	11	15	31
1990	20	12	1	1	5	15
1991	12	8	2	1	8	3
1992	10	8	0	1	3	7
1993	17	13	2	2	6	11
1994	34	25	4	9	10	30
1995	42	36	3	12	13	30
1996	46	41	2	6	6	30
1997	65	46	8	13	5	38
1998	56	46	2	6	5	42
1999	74	65	4	6	4	53
2000	61	51	1	5	1	37
2001	33	26	3	1	0	17
1962–2001	1,018	690	147	221	232	731

Sample contains tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001.

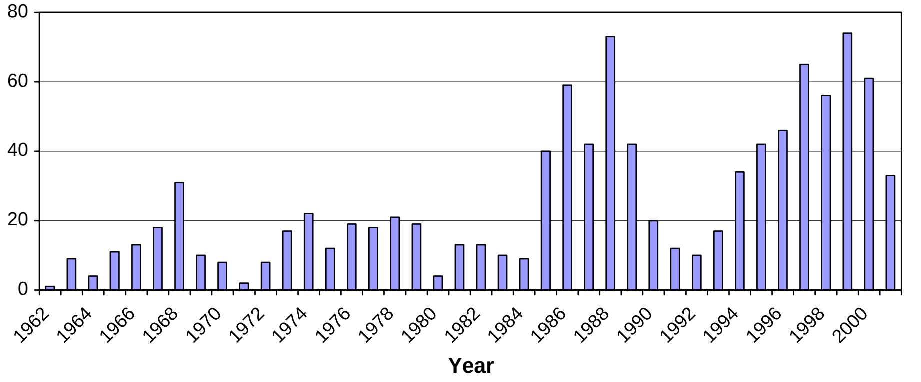

Fig. 1. Number of attempted tender offers. Sample includes 1,018 tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001.

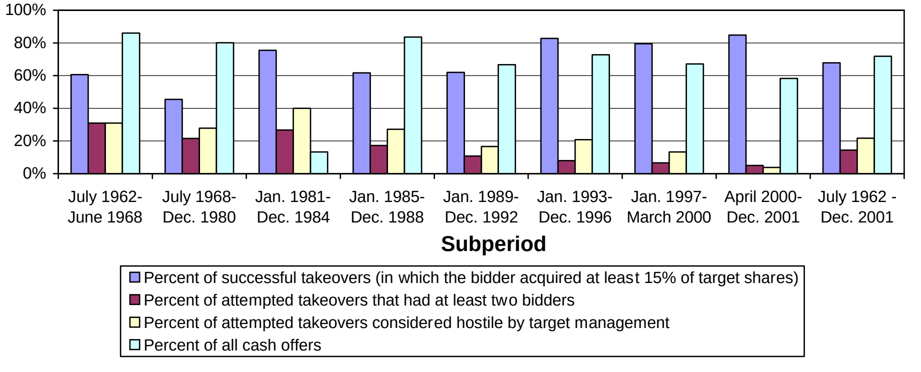

Fig. 2. Sample description. Sample contains 1,018 tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001.

This is based on a conventional short post-announcement window returns (day -5 to $+5$). We define the dollar return for the target as its market value six days before the first bid multiplied by the target cumulative abnormal return (CAR); similarly for the bidder and combined dollar returns. Statistical significance is measured using the parametric Z-test as described by Dodd and Warner (1983) and the nonparametric Fisher sign test.

During this 40-year period, the average return to bidding shareholders has been a statistically insignificant 0.18%. The bidder median dollar return is an economically insignificant $-\$1.2$ million. During this same 40-year period, target shareholders enjoyed a statistically and economically significant average return of 30.0% and median dollar return of \$41.2 million.

We describe returns to targets and bidders over various subperiods in Table 2 and Figs. 3 and 4. The first three subperiods are as in BDK-88: July 1962 through June 1968 is the pre-Williams Act period; July 1968 through December 1980 is the

Table 2
Stock returns over various subperiods in attempted tender offers

Statistics	Subperiod								Total
	July 1962–June 1968	July 1968–December 1980	January 1981–December 1984	January 1985–December 1988	January 1989–December 1992	January 1993–December 1996	January 1997–March 2000	April 2000–December 2001	July 1962–December 2001
Panel A: five-day stock returns									
Number of attempted tender offers	71	176	45	214	84	139	210	79	1,018
Bidder									
Mean CAR(%)	3.29	0.05	−1.42	−0.49	−1.78	0.98	0.97	−0.81	0.18
Z-statistic	5.47	0.48	−1.74	−1.00	−3.00	1.22	1.83	−1.01	0.91
Median CAR (%)	1.62	−0.17	−1.72	−1.15	−1.04	0.91	−0.30	−0.56	−0.30
% positive	63.6	48.8	31.8	44.4	41.7	52.9	48.3	46.8	47.8
Binomial *p*	0.04	0.81	0.02	0.12	0.16	0.55	0.68	0.65	0.17
Mean dollar return	15.1	23.3	−63.4	−53.4	−56.9	89.5	−190.0	−225.0	−59.2
Median dollar return	9.9	−0.7	−6.8	−2.9	−8.1	4.0	−2.0	−3.6	−1.2
Target									
Mean CAR (%)	17.96	27.97	31.90	25.61	29.08	31.92	33.18	44.78	30.01
Z-statistic	29.65	49.62	28.71	51.06	30.97	40.10	46.70	27.17	110.39
Median CAR (%)	17.79	22.99	31.61	21.89	28.25	29.27	29.46	39.81	26.10
% positive	94.0	93.6	93.3	93.0	89.2	94.2	96.2	97.4	94.0
Binomial *p*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mean dollar return	87.9	74.0	379.7	138.9	178.2	200.0	155.0	201.9	155.0
Median dollar return	51.2	32.3	91.1	37.3	27.9	44.1	46.2	47.2	41.2
Combined (CIBR)									
Mean CAR (%)	7.45	6.40	8.12	5.19	3.59	5.05	4.61	3.57	5.27
Z-statistic	10.60	11.64	8.04	11.73	4.48	8.78	8.31	2.25	23.57
Median CAR (%)	6.42	4.20	8.22	3.97	1.76	4.04	2.93	3.00	3.69
% positive	87.3	73.0	75.0	71.7	59.8	77.4	68.1	58.7	71.1
Binomial *p*	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.17	0.00

Mean dollar return	103.3	99.0	321.3	84.6	124.3	291.6	−248.6	−25.3	53.1
Median dollar return	77.9	26.7	44.2	22.8	5.4	55.5	35.4	21.3	32.0

Statistics	Window: from T days prior to the first bid announcement through one day after						
	$T=90$	$T=60$	$T=30$	$T=15$	$T=10$	$T=5$	$T=1$
Panel B. longer window stock returns							
Bidder							
Mean CAR (%)	−0.15	0.22	1.11	0.95	0.83	0.70	0.28
Z-statistic	0.81	0.96	2.81	2.94	2.96	3.24	2.31
Median CAR (%)	0.26	0.68	0.42	0.43	0.31	0.16	0.08
% Positive	50.4	51.3	51.2	53.0	52.1	50.6	50.7
Binomial p	0.82	0.43	0.47	0.06	0.19	0.73	0.68
Target							
Mean CAR (%)	38.92	38.47	36.39	33.06	31.27	28.89	24.47
Z-statistic	49.88	59.90	78.67	98.00	110.17	133.64	172.45
Median CAR (%)	37.04	35.35	32.79	29.01	28.21	24.68	20.07
% Positive	88.2	91.5	93.9	94.8	93.9	95.0	93.5
Binomial p	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Combined (*CIBR*)							
Mean CAR (%)	6.65	6.88	7.12	6.23	5.88	5.32	4.28
Z-statistic	11.28	13.49	18.68	22.26	24.90	29.42	36.57
Median CAR (%)	7.05	7.09	6.35	4.76	4.44	3.75	2.95
% Positive	62.9	67.2	70.7	72.6	73.4	72.4	74.8
Binomial p	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CAR is the market-model cumulative abnormal return for the target, bidder, or combined. The CARs are measured over the period five days before the first bid through five days after in Panel A, and over longer windows in Panel B. Target dollar return is target market value (six days before the first bid) times target CAR; similarly for bidder and combined dollar returns. Combined CAR (*CIBR*) is a weighted average of target and bidder CARs, where their weights are their market values as a fraction of the total target and bidder market value. Combined dollar return is the sum of target and bidder dollar returns. The target mean dollar return and the bidder mean dollar return in Panel A may not sum to the combined dollar return because of missing data for target or bidder in some cases. Binomial p is the significance level for the two-tail Fisher sign test that tests whether the median CAR is different from zero. Sample contains 1,018 tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001. All dollar figures are in millions of 2001 dollars.

post-Williams Act but pre-Reagan period; and 1981–1984. The four-year subperiods 1985–1988, 1989–1992, and 1993–1996 correspond roughly to presidential political cycles. Also, the 1981–1988 period was a highly active takeover market, aided perhaps by pro-merger policies of the Reagan administration. Some commentators have argued that the late 1980s and early 1990s, corresponding to our 1989–1992 subperiod, were a time when deals were not economically attractive but were being done for the sake of doing the deal. The Nasdaq and several other broad stock indexes peaked in March 2000, and many observers regard this period as close to the peak of the new economy stock bubble and a turning point of U.S. financial markets.

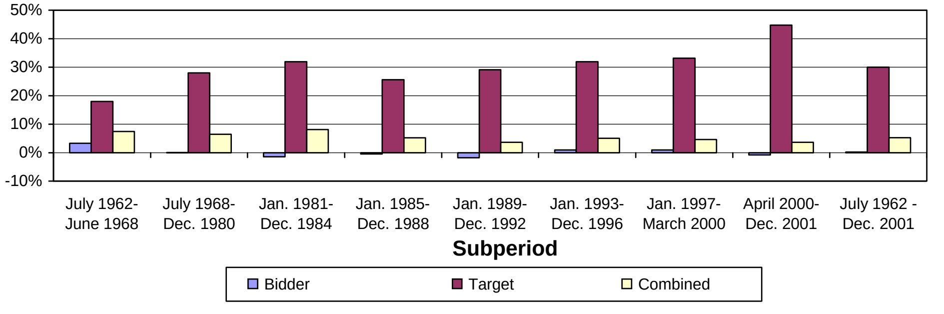

Fig. 3. Mean shareholder returns. Announcement period return is the market-model cumulative abnormal return for the target, bidder, or combined, over the period five days before the first bid through five days after. Combined return is the weighted average of target and bidder returns, when their weights are their market values as a fraction of the total target and bidder market value. Sample contains 1,018 tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001.

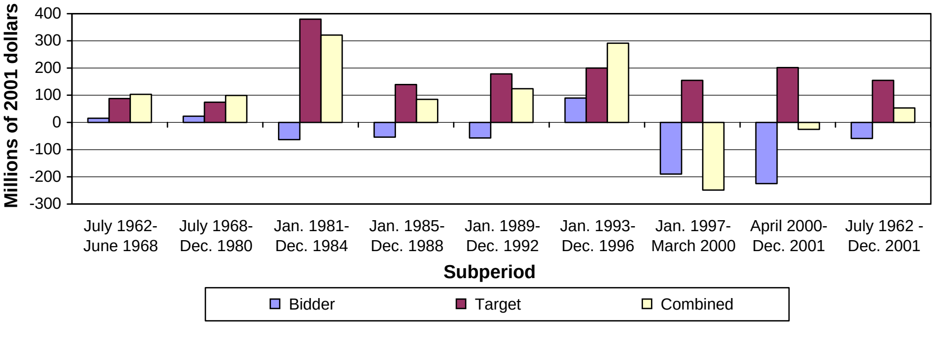

Fig. 4. Mean dollar returns. Target dollar return is target market value (six days before the first bid) multiplied by target CAR; similarity for bidder and combined dollar returns. CAR is the market-model cumulative abnormal return for the target, bidder, or combined, over the period five days before the first bid through five days after. Combined return is the weighted average of target and bidder CARs, when their weights are their market values as a fraction of the total target and bidder market value. Sample contains 1,018 tender offers in which both bidder and target were listexd on the NYSE, Amex, or Nasdaq during 1962–2001.

We therefore divide the most recent portion of our sample periods between January 1997–March 2000 and April 2000–December 2001 subperiods.

Our results for bidder returns, target returns, and a value-weighted average for bidders and targets (the combined return), for the first three subperiods (July 1962–June 1968, July 1968–December 1980, 1981–1984) are consistent with the findings of BDK-88. Table 2 indicates that during 1985–1988 the bidding shareholders earn a statistically insignificant mean return of −0.49% (median return of −\$2.9 million). During this same period, the target shareholders received a statistically and economically significant return of 25.61% (median return of \$37.3 million).

The late 1980s and early 1990s (1989–1992) were not kind to bidders; mean return of −1.78% (median dollar return of −\$8.1 million). Bidding shareholders generally fared better in the 1993–1996 subperiod; mean return of 0.98% (median dollar return of \$4.0 million). The mean combined returns during 1993–1996 was 5.05% (median dollar return of \$55.5 million). In the most recent subperiods, bidders suffered wealth losses, although targets realized gains. The mean combined dollar returns were negative in the two post-1997 subperiods (−\$248.6 million and −\$25.3 million, respectively), apparently because of big losses among bidders that were relatively large. Moeller et al. (2004a,b) find even larger losses to large bidders in their mergers and tender offers sample during 1998–2001. They have relatively few tender offers in their large loss sample.) The 1997–2000 mean dollar losses in our tender offer sample are of the same order of magnitude as the dollar gains in the 1993–1996 period.

4. Estimates of value improvements

This section describes the estimation procedures for value improvements using the probability scaling and intervention methods, and discusses the determinants of value improvements.

4.1. Parameter inputs for the probability scaling and intervention methods

We start with estimation procedures for parameter inputs for the probability scaling and intervention methods. Both methods require an estimate of the probability that the first bidder is successful. The intervention method further requires inputs of the average price (relative to the target's pre-offer price) at which the first bidder wins, the size of the bidder relative to the initial combined value, the size of the target relative to the initial combined value, and the fraction of the target's equity owned by the first bidder.

4.1.1. Probability of first bidder success

To use the probability scaling method, we need to estimate the probability that the first bidder is successful. Furthermore, because one of our objectives is to address the revelation bias, we need to identify an intervention that changes the probability of the first bidder succeeding, and that is not at the discretion of the first bidder.

Litigation by the target, entry of a second bidder, and objection by a regulatory agency are examples of such exogenous events. Our focus is on the arrival of a competing bid, which is a major event for the initial bidder.

To estimate how the market's perception of probability of success is affected by the arrival of a competing bid, we need estimates of the market's perception of probability of success both prior to the competing bid (an unconditional estimate) and subsequent to the bid (a conditional estimate). We therefore estimate both a logit model that conditions only on information known to the market prior to the arrival of the competing bid and a logit model that, in addition, conditions on the arrival of the bid.

Table 3 provides estimates of such models. The dependent variable equals one if the first bidder is successful and zero otherwise. The explanatory variables include the dummy variables for litigation, competing bid, and hostile, the first bidder's toehold α, effective bid premium, and the relative size of the bidder and target. Walkling (1985) and Schwert (2000) find some of the variables used here to be significant determinants of tender offer success.

Model A does not condition on whether a competing bid has occurred; Model B does. In measuring bidder returns, we consider both a shorter and a longer window. The short window consists of the period one day before and the day of the first competing bid announcement for the target. The long window consists of the period one day after the first bid to the day of the first competing bid announcement for the target. For the short window, the market is likely by this time to have learned about the occurrence of litigation related to the initial bid if such litigation was going to occur. At the start of the longer window that begins immediately after the arrival of the initial bid, the market is unlikely to have observed the occurrence of litigation even if it later occurs. Thus, for the short window Model A1 is appropriate, and for the longer window Model A2 is appropriate.

The results indicate that target management opposition, entry of a second bidder, and the effective premium are determinants of bidder success (opposition and competition having negative effects) and, with somewhat lower significance, target litigation and relative size. Thus, the arrival of a competing bid does have an important effect on offer success. Because target opposition is a matter of degree (see Schwert, 2000), whereas the arrival of a competing offer is a discrete event, the latter seems a more appropriate subject for the intervention method.

4.1.2. Parameter inputs for the probability scaling method

Estimating the probability scaling method improvement ratio IR^{PSM} requires that returns be grossed up by the sum of the probabilities that the first bidder succeeds and that a later bid succeeds. This requires the following inputs: ϕ_1 is the probability of success of the first bidder. In the full sample of 1,018 cases the first bidder is successful in 690 instances. For both PSM and IM, we apply transaction-specific estimates using Logit Model A2 in Table 3. ϕ_1 can also be estimated globally as 0.6778 using a simple sample average. ϕ_1^{L} is the probability that a later bid succeeds in acquiring the target. We derive an estimate of this probability from Betton and Eckbo (2000) to be 0.1463.

Table 3
Logit model estimates of the probability of success of the first bidder unconditionally (Models A1 and A2) and conditional on whether a competing bid occurs (Model B)

Independent variable	Coefficient	p-value
Model A1		
Litigation	−0.488	0.012
Hostile	−1.655	0.000
Alpha	−0.349	0.432
Effective premium	0.011	0.000
Relative size	0.003	0.052
Constant	0.936	0.000
Pseudo $R^2 = 0.1460$		
Percentage predicted = 76.8%		
Model A2		
Hostile	−1.885	0.000
Alpha	−0.449	0.309
Effective premium	0.011	0.000
Relative size	0.003	0.042
Constant	0.881	0.000
Pseudo $R^2 = 0.1408$		
Percentage predicted = 75.4%		
Model B		
Litigation	−0.321	0.114
Competing bid	−1.751	0.000
Hostile	−1.404	0.000
Alpha	−0.614	0.168
Effective premium	0.012	0.000
Relative size	0.002	0.100
Constant	1.101	0.000
Pseudo $R^2 = 0.1969$		
Percentage predicted = 79.9%		

Sample size is 1,018 and contains tender offers during 1962–2001 in which both target and bidder were listed on NYSE, Amex or Nasdaq. Hostile equals one if the target management opposes the first bidder, zero otherwise. Alpha is fraction of the target held by the first bidder. Effective premium is initial bid price offered relative to the pre-bid market price of the target, multiplied by the percentage of target shares sought by the bidder through the tender offer. Litigation equals one if the target files a lawsuit against the first bidder, zero otherwise. Competing bid equals one if a competing bidder arrives, zero otherwise. Relative size is bidder pre-bid market value relative to target pre-bid market value excluding bidder's toehold.

4.1.3. Parameter inputs for the intervention method

The intervention method value improvement ratio IR^{IM} is estimated based on Eq. (13). We consider bidder abnormal returns around the announcement of a competing bid. The abnormal returns are computed using the market model as the benchmark. For the short return cumulation window used here, the choice of benchmark is unlikely to affect results materially (Brown and Warner, 1985). The market model is estimated using returns from day -170 through day -21, where day 0 is the announcement of the first bid in the *Wall Street Journal*. The equally weighted CRSP index is used as the market index.

During a two-day period consisting of the day of the publication of the news of the second bid in the *Wall Street Journal* and the day before, the mean abnormal return for the first bidder is −0.44% (median, minimum, and maximum are −0.42%, −11.71%, and 12.57%, respectively). The mean return for the period from one day after the publication of the news of the first bid in the *Wall Street Journal* to the day of the publication of the news of the second bid is −3.58% (median, minimum, and maximum are −1.96%, −99.81%, and 40.31%, respectively).

The two-day mean average abnormal return on the date of arrival of a competing bid is close to zero. But as we have shown, the arrival of a competing bidder has powerful effects on mean premiums and on success probabilities. The event-date return reflects two offsetting effects. The higher average premium a winning first bidder will have to pay given a competing bid is bad news, but the reduced probability of success resulting from a competing bid can be good news if the market expects a successful bidder to overpay. Because the intervention method disentangles these possibilities, a zero return, for example, can map into substantial value improvements.

If the market is efficient, and if no news about a competing bid arrives until the day that the bid occurs, then the abnormal return expected from date 1 (immediately after the initial bid) through date 2 (just before the competing bid) will on average be zero. Thus, Eq. (13), which gives IR^{IM} in terms of R_3, the return from date 1 through date 3, also applies with a return from date 2 through date 3, or by choosing some starting date between date 1 and date 2.

There is a trade-off in using different periods. If news about a competing bid sometimes arrives between date 1 and 2, calculating the return based on the earlier starting point has the advantage of including the effects of such anticipation of the event. However, calculating the abnormal return over a longer period has the disadvantage of introducing noise arising from normal stock price fluctuations and from benchmark estimation errors. We therefore estimate the return to be substituted for R_3 in Eq. (13) based on the two different periods: the two-day event period (mean −0.43%) and the period from immediately after announcement of the initial bid through announcement of the second bid (mean −3.58%).

We require the following further inputs (all transaction-specific except as otherwise indicated): P_1/V_0^{C} in Eq. (13) is the size of the bidder relative to initial combined value. The mean (median) figure is 0.656 (0.690). $V_0^{\mathrm{T}}/V_0^{\mathrm{C}}$ in Eq. (13) is the size of the target relative to combined value prior to the initial offer. The mean (median) figure is 0.368 (0.327). ϕ_1 is the probability of success of the first bidder. In our sample the first bidder is successful in 690 out of 1,018 contests. Hence ϕ_1 is estimated as $690/1,018 = 0.6778$. We also apply alternative transaction-specific estimates using Logit Model A1 or A2 in Table 3. ϕ_3 is the probability of success of the first bidder given the arrival of a competing bidder. In our sample, there are 147 cases in which a competing bidder arrives, with the first bidder successful in 38 instances. Hence ϕ_3 is estimated as $38/147 = 0.2585$. We also apply alternative transaction-specific estimates using Logit Model B in Table 3. α is the fraction of the target's equity owned by the first bidder. For the 141 tender offers in our competing bid subsample to which we can apply IM, the mean (median) α is 2.41% (0%). For our whole sample of tender offers, the mean bidder ownership is 6.13%, the median ownership is 0%, and only 220 of the 1,018 bidders own any shares in the target at the time they make the bid. $\bar{B}_1/V_0^{\mathrm{T}}$ is the average price (relative to the target's pre-offer price) at which the first bidder wins in the full sample, and we also employ alternative transaction-specific estimates derived by using a regression technique. The estimate based on sample mean is 1.407. Finally, $\bar{B}_3/V_0^{\mathrm{T}}$ is the average price at which the first bidder wins given the arrival of a competing bidder, and we also employ alternative transaction-specific estimates derived by using a regression technique. The estimate based on sample mean is 1.514.

4.2. Estimated value improvements

In the competing bid subsample, we use several alternative methods to estimate input parameters for IM. The calculations apply Eq. (13) using estimated parameters ϕ_1, ϕ_3, $\bar{B}_1/V_0^{\mathrm{T}}$, and $\bar{B}_3/V_0^{\mathrm{T}}$. When these parameters are estimated using sample means and R_3 in (13) is estimated over the two-day event period as described above (hereafter, the baseline parameter specification), the mean (median) IR^{IM} is 13.1% (12.4%). The discounted combined value as assessed by the market thus is 13.1% more valuable as a result of the takeover. This evidence is inconsistent with the strong agency/hubris hypothesis of zero value improvements in tender offers. Given that the distribution of IR^{IM} is not especially skewed, and 132 of 141 IR^{IM}s are greater than zero, the conclusion that the expected value improvement is significantly greater than zero is highly robust ($p<0.001$ by a sign test). A histogram of IR^{IM} is provided in Fig. 5.

We also estimate separate transaction-specific probabilities of success using the logit model of Table 3 to obtain individual probability estimates for each of the 147 transactions. Similarly, instead of assuming that the expected bid premium that will be paid (relative to pre-offer price) in the event that the first bidder succeeds is independent of the transaction, we estimate regression models relating the price paid in successful transactions to the same independent variables used in Logit Models A1, A2, and B (excluding effective premium). This generates a corresponding set of regression models.

These results (unreported) are consistent with the conclusion that value improvements on average differ from zero and are generally positive. For example, when ϕ_1 and ϕ_3 are, respectively, estimated using Logit Model A1 and A3 in Table 3, and $\bar{B}_1/V_0^{\mathrm{T}}$ and $\bar{B}_3/V_0^{\mathrm{T}}$ are estimated using regression models similar to Model A1 and B in Table 3 (excluding effective premium), the mean (median) value improvement is 14.8% (13.8%), which is similar to the estimates obtained using our baseline parameter specification. Appendix B further verifies the robustness of this conclusion with respect to alternative estimates of the input parameters. In what follows, we draw our numerical inference on the IM estimate using our baseline parameter specification.

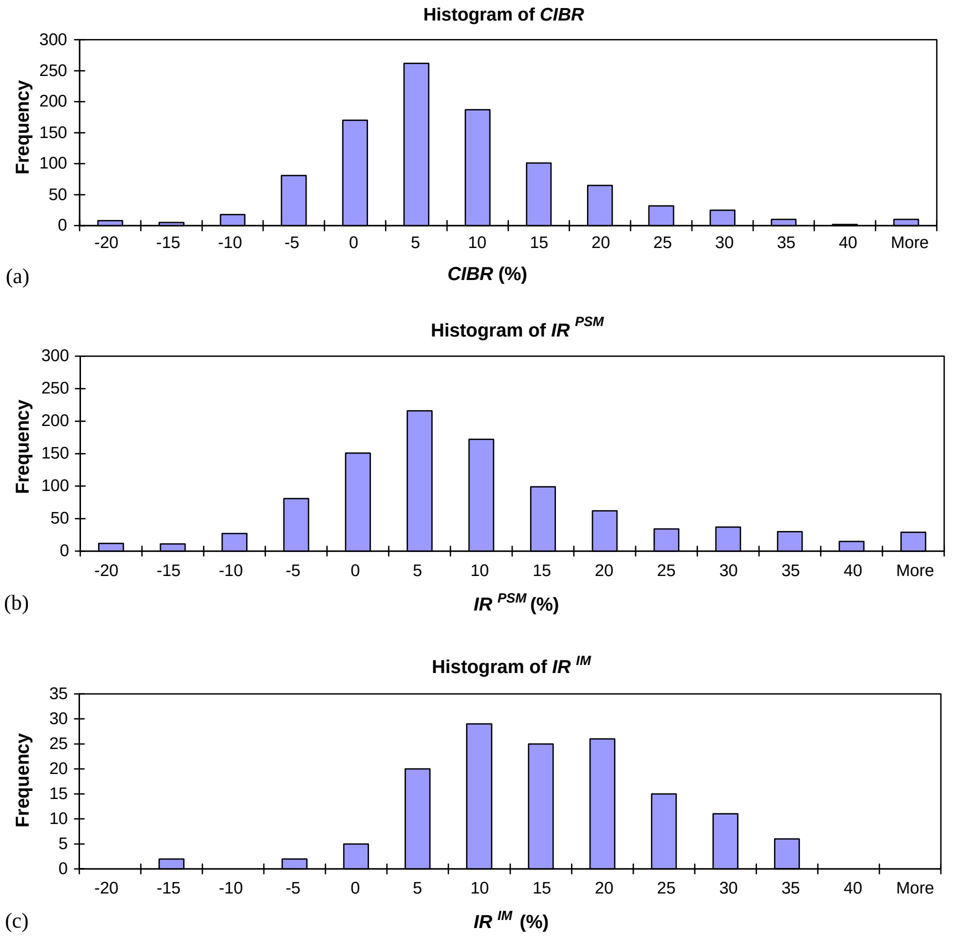

Fig. 5. Histograms of value improvement measures. Sample contains 1,018 tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001. In addition, for IR^{IM} the sample is restricted to cases in which there was a competing bid for the target. $CIBR =$ Combined initial bid return. IR^{PSM} = Improvement ratio based on probability scaling method. IR^{IM} = Implicit market estimates of the value to the bidder of the takeover.

In Table 4, market-based estimates of the expected combined value improvement from takeover (relative to combined bidder-target value) are labeled *CIBR*, IR^{PSM}, and IR^{IM}. The average estimated *CIBR* associated with the arrival of an initial bid during 1962–2001 is approximately 5.27% (median of 3.69%) of combined bidder/target value.

Using PSM, the average estimated value improvement, IR^{PSM} is larger, approximately 7.28% (median of 4.63%) of combined bidder/target value. The average difference between the IR^{PSM} and *CIBR* estimates relative to combined value is 2.02% (median of 0.22%), with 63.4% of the differences being positive.

Table 4
Implicit market estimates of the value improvement as a result of the takeover (IR^{IM}), combined initial bid returns (*CIBR*), and probability-adjusted combined initial bid returns (IR^{PSM}) by subperiod

Statistics	Subperiod								Total
	July 1962–June 1968	July 1968–December 1980	January 1981–December 1984	January 1985–December 1988	January 1989–December 1992	January 1993–December 1996	January 1997–March 2000	April 2000–December 2001	July 1962–December 2001
IR^{IM}									
Mean (%)	15.62	12.90	12.09	14.48	11.54	10.86	10.49	10.98	13.05
Median (%)	15.79	12.33	8.51	14.26	9.24	9.99	9.70	11.48	12.38
% Positive	100.0	100.0	91.7	89.2	88.9	90.9	85.7	100.0	93.6
Binomial *p*	0.00	0.00	0.01	0.00	0.04	0.01	0.01	0.13	0.00
Sample size	18	36	12	37	9	11	14	4	141
CIBR									
Mean (%)	7.45	6.40	8.12	5.19	3.59	5.05	4.61	3.57	5.27
Median (%)	6.42	4.20	8.22	3.97	1.76	4.04	2.93	3.00	3.69
% Positive	87.3	73.0	75.0	71.7	59.8	77.4	68.1	58.7	71.1
Binomial *p*	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.17	0.00
Sample size	63	159	44	212	82	137	204	75	976
IR^{IM}-*CIBR*									
Mean (%)	7.06	4.94	−3.30	3.21	6.53	7.43	0.66	9.05	4.04
Median (%)	8.57	4.53	−2.37	3.71	7.36	8.37	2.66	4.47	3.74
% Positive	83.3	66.7	41.7	56.8	77.8	72.7	64.3	50.0	64.5
Binomial *p*	0.01	0.07	0.77	0.51	0.18	0.23	0.42	1.00	0.00
Sample size	18	36	12	37	9	11	14	4	141
IR^{PSM}									
Mean (%)	11.01	8.86	13.24	7.82	5.07	6.38	5.82	3.82	7.28
Median (%)	8.42	5.49	8.82	5.16	2.07	5.19	3.22	3.17	4.63

Table 4 (*continued*)

Statistics	Subperiod								Total
	July 1962–June 1968	July 1968–December 1980	January 1981–December 1984	January 1985–December 1988	January 1989–December 1992	January 1993–December 1996	January 1997–March 2000	April 2000–December 2001	July 1962–December 2001
% Positive	87.3	73.0	75.0	71.7	59.8	77.4	68.1	58.7	71.1
Binomial *p*	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.17	0.00
Sample size	63	159	44	212	82	137	204	75	976
IR^{PSM}-*CIBR*									
Mean (%)	3.57	2.46	5.12	2.63	1.47	1.33	1.21	0.25	2.02
Median (%)	1.25	0.46	1.08	0.35	0.01	0.38	0.10	0.00	0.22
% Positive	81.0	63.5	75.0	67.0	51.2	74.5	56.9	42.7	63.4
Binomial *p*	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.09	0.00
Sample size	63	159	44	212	82	137	204	75	976
IR^{PSM}–IR^{IM} (*estimated revelation bias*)									
Mean (%)	−2.75	−2.14	17.25	5.10	−1.53	−6.65	6.11	−7.88	1.67
Median (%)	−4.98	−1.71	15.90	2.94	−5.35	−5.45	4.79	−3.88	1.10
% Positive	44.4	44.4	83.3	62.2	44.4	27.3	57.1	50.0	52.5
Binomial *p*	0.81	0.62	0.04	0.19	1.00	0.23	0.79	1.00	0.61
Sample size	18	36	12	37	9	11	14	4	141

All improvement ratios are expressed as a percent of target and bidder market values. *CIBR* = target CAR* (target market value/target and bidder market values) + bidder CAR* (bidder market value/target and bidder market values). CAR is the market-model cumulative abnormal return for the target or bidder over the period five days before the first bid through five days after. IR^{PSM} = *CIBR*/(probability the first bidder succeeds unconditionally + probability a later bidder succeeds). The probability of success of the first bidder is estimated from Logit Model A2 in Table 3. The probability that a later bid succeeds is estimated from Betton and Eckbo (2000) and is 0.1463. Parameter inputs for IR^{IM} are estimated using sample means (the baseline specification). Binomial *p* is the significance level for the two-tail Fisher sign test that tests whether the median is different from zero. Sample contains tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001. In addition, for IR^{IM} the sample is restricted to cases in which there was a competing bid for the target.

We also use a proxy for the revelation bias, the difference $IR^{PSM} - IR^{IM}$. IR^{PSM} reflects the change in underlying value that would be associated with takeover success but also includes revelation effects. IR^{IM} contains only the underlying value effect, not the revelation effect. The difference is therefore a proxy for the revelation bias. According to Table 4, the overall revelation bias is not significantly different from zero. However, there is variation in revelation effects across time, degree of hostility, and means of payment.

4.3. Determinants of value improvements and revelation effects

We describe several possible determinants of value improvements, and the variables we use as proxies for these determinants. In Tables 5–7, we present univariate results of how value improvements are related to these determinants. In Table 8, we present multivariate regression results.

4.3.1. Friendly versus hostile offers

Academics and other commentators have proposed two different economic roles for takeovers: discipline/removal of bad target managers and exploitation of business synergies. Hostile offers are supposed to be associated with removal of bad target managers, and friendly offers with exploitation of business synergies. To examine these issues we include the hostile dummy defined in Section 3 as an independent variable.

Panels A and B of Table 5 indicate that combined returns to bidders and targets, as measured by *CIBR* and IR^{PSM}, are on average considerably higher in hostile than in friendly offers. In the overall sample (Panel A), the mean *CIBR* of hostile offers is 8.43%, versus 4.38% for friendly offers. The mean IR^{PSM} of hostile offers is 16.34%, versus 4.75% for friendly offers. For both measures, the difference between hostile and friendly offers is significant at the 1% level. However, Table 5 indicates that hostile bidders earn lower announcement period returns than friendly bidders.[16] Target announcement period returns in hostile offers are also not higher than in friendly offers. This suggests that hostile bidders that are large (small) relative to targets earn higher (lower) announcement period returns.

The difference between friendly and hostile offers is much larger for IR^{PSM} than for *CIBR* because hostile bids are less likely to succeed. In consequence, the traditional *CIBR* method biases returns toward zero more for hostile bids more than for friendly bids. Thus, the probability scaling method indicates an even greater difference between friendly and hostile bids than what is indicated by traditional methods. Large friendly/hostile differences in IR^{PSM} are also present in the competing bid subsample of Panel B. The multivariate results in Table 8 also confirm that IR^{PSM} is significantly positively related to hostility (we do not run regressions with IR^{IM} as the dependent variable, owing to the small competing bid sample size).

[16]The hostile coefficient in the bidder CAR regression in Table 8 is negative but not significant at conventional levels, consistent with Schwert (2000) and Moeller et al. (2004a,b).

Table 5
Implicit market estimates of the value improvement as a result of the takeover (IR^{IM}), combined initial bid returns (*CIBR*), and probability-adjusted combined initial bid returns (IR^{PSM}) and cumulative abnormal returns (CAR) for hostile and nonhostile; cash, stock and mixed payments; pre-Williams Act (pre-July 1968) and post-Williams Act; and pre-March 2000 and post-March 2000. The value improvement estimates *CIBR*, IR^{PSM}, IR^{IM} and CAR are defined in the legend of Table 4. In Panel A, the sample contains 1,018 tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001. In Panel B, the subsample contains tender offers with a competing bid for the target. The mean estimated revelation bias (IR^{PSM}–IR^{IM}) does not necessarily equal the difference in means between the IR^{PSM} and IR^{IM} entries because of different sample size for IR^{PSM} and IR^{IM}. The median of IR^{PSM}–IR^{IM} generally does not equal the difference in medians between the IR^{PSM} and IR^{IM} entries. *t*-statistic is the student's *t* value that tests whether the mean is different from zero. Binomial *p* is the significance level for the two-tail Fisher sign test that tests whether the median revelation bias is different from zero.

Statistics	Hostile	Non-hostile	Cash	Mixed	Stock	Pre-Williams Act	Post-Williams Act	Pre-March 2000	Post-March 2000
Panel A									
CIBR									
Mean (%)	8.43***	4.38***	5.79$^{\#,***}$	4.42$^{\#,\blacklozenge\blacklozenge\blacklozenge}$	−0.54$^{\blacklozenge\blacklozenge\blacklozenge,***}$	7.45*	5.11*	5.41	3.57
Median (%)	7.06***	3.04***	4.14$^{\#,***}$	3.12$^{\#,\blacklozenge\blacklozenge\blacklozenge}$	−0.40$^{\blacklozenge\blacklozenge\blacklozenge,***}$	6.42***	3.52***	3.78*	3.00*
Sample size	213	763	701	202	39	63	913	901	75
IR^{PSM}									
Mean (%)	16.34***	4.75***	7.97$^{\#,***}$	5.83$^{\#,\blacklozenge\blacklozenge\blacklozenge}$	−0.50$^{\blacklozenge\blacklozenge\blacklozenge,***}$	11.01**	7.02**	7.57**	3.82**
Median (%)	13.68***	3.27***	5.30$^{\#,***}$	3.72$^{\#,\blacklozenge\blacklozenge\blacklozenge}$	−0.45$^{\blacklozenge\blacklozenge\blacklozenge,***}$	8.42***	4.41***	4.78**	3.17**
Sample size	213	763	701	202	39	63	913	901	75
Bidder CAR									
Mean (%)	−0.95**	0.49**	0.76$^{\#\#,**}$	−0.77$^{\#\#}$	−2.73**	3.29***	−0.04***	0.27	−0.81
Median (%)	−1.15**	−0.17**	0.05$^{\#\#,**}$	−0.78$^{\#\#}$	−1.68**	1.62***	−0.44***	−0.29	−0.56
Sample size	214	782	716	205	41	66	930	917	79
Target CAR									
Mean (%)	28.80	30.35	31.60$^{\#,***}$	28.26$^{\#,\blacklozenge\blacklozenge\blacklozenge}$	12.35$^{\blacklozenge\blacklozenge\blacklozenge,***}$	17.96***	30.86***	28.77***	44.78***
Median (%)	25.99	26.10	28.14$^{\#,***}$	25.52$^{\#,\blacklozenge\blacklozenge\blacklozenge}$	11.52$^{\blacklozenge\blacklozenge\blacklozenge,***}$	17.79***	28.01***	25.30***	39.81***
Sample size	220	787	723	205	44	67	940	929	78

Panel B									
IR^{IM}									
Mean (%)	13.59	12.31	13.49	10.99	16.55	15.62	12.68	13.11	10.98
Median (%)	14.03	10.94	13.64$^{\#}$	9.59$^{\#,\blacklozenge}$	16.28$^{\blacklozenge}$	15.79	11.69	12.38	11.48
Sample size	82	59	100	24	8	18	123	137	4
CIBR									
Mean (%)	10.35*	7.19*	9.52	7.20	3.72	8.56	9.08	9.22	1.94
Median (%)	10.46**	6.41**	7.81*	5.81	−1.18*	8.26	7.65	7.65	6.01
Sample size	82	60	101	24	8	18	124	138	4
IR^{PSM}									
Mean (%)	19.65***	7.93***	15.50*	11.63	3.34*	12.87	14.96	15.03	3.10
Median (%)	18.30***	7.08***	10.64**	6.73$^{\blacklozenge}$	−1.21$^{\blacklozenge,**}$	9.32	10.50	10.10	6.60
Sample size	82	60	101	24	8	18	124	138	4
IR^{PSM}–IR^{IM} (*estimated revelation bias*)									
Mean (%)	6.06***	−4.42***	2.06**	0.64$^{\blacklozenge}$	−13.21$^{\blacklozenge,**}$	−2.75	2.32	1.95	−7.88
t-statistic	2.98	−2.75	1.24	0.18	−2.70	−0.81	1.50	1.36	−0.72
Median (%)	5.42***	−4.01***	1.77***	−3.38$^{\blacklozenge\blacklozenge}$	−11.76$^{\blacklozenge\blacklozenge,***}$	−4.98	1.70	1.10	−3.88
Binomial *p*	0.02	0.07	0.37	0.54	0.29	0.81	0.47	0.61	1.00
Sample size	82	59	100	24	8	18	123	137	4
Bidder CAR									
Mean (%)	−1.51**	1.74**	−0.20	1.75	−4.15	2.63	−0.58	−0.14	0.04
Median (%)	−1.43**	0.71**	−0.59**	0.75$^{\blacklozenge\blacklozenge}$	−5.15$^{\blacklozenge\blacklozenge,**}$	0.46	−0.95	−0.79	5.95
Sample size	83	61	102	25	8	20	124	140	4
Target CAR									
Mean (%)	30.68	28.48	31.99***	25.61$^{\blacklozenge\blacklozenge}$	8.00$^{\blacklozenge\blacklozenge,***}$	19.75**	31.35**	29.18*	49.89*
Median (%)	28.77*	22.40*	28.37$^{\#,***}$	21.47$^{\#,\blacklozenge\blacklozenge}$	3.78$^{\blacklozenge\blacklozenge,***}$	21.06**	28.37**	27.37	33.94
Sample size	84	61	103	24	9	20	125	141	4

*,**, and *** indicate significant difference between the two subgroups (hostile and non-hostile, cash and stock, pre- and post-Williams Act, pre- and post-March 2000) at the 10%, 5%, and 1% levels, respectively. #, ##, and ### indicate significant difference between cash and mixed subgroups at the 10%, 5%, and 1% levels, respectively. ◆, ◆◆, and ◆◆◆indicate significant difference between stock and mixed subgroups at the 10%, 5%, and 1% levels, respectively.

Table 6
The effect of diversification on value improvements. Same industry is measured two ways. First, the same four-digit Compustat standard industrial classification (SIC) codes for the target and bidder. Second, the same three-digit Compustat SIC codes for the target and bidder. The implicit market estimates of the value improvement as a result of the takeover (IR^{IM}), combined initial bid returns (*CIBR*), probability-adjusted combined initial bid returns (IR^{PSM}), and cumulative abnormal returns (CAR) are defined in the legend of Table 4. In Panel A, the sample contains 1,018 tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001. In Panel B, the subsample contains tender offers with a competing bid for the target. The mean estimated revelation bias (IR^{PSM}-IR^{IM}) does not necessarily equal the difference in means between the IR^{PSM} and IR^{IM} entries owing to the different sample size for IR^{PSM} and IR^{IM}. The median of IR^{PSM}-IR^{IM} generally does not equal the difference in medians between the IR^{PSM} and IR^{IM} entries. *t*-statistic is the student's *t* value that tests whether the mean is different from zero. Binomial *p* is the significance level for the two-tail Fisher sign test that tests whether the median revelation bias is different from zero.

Statistics	Four-digit SIC		Three-digit SIC	
	Same industry	Cross industry	Same industry	Cross industry
Panel A				
CIBR				
Mean(%)	6.23*	4.96*	6.20*	4.87*
Median (%)	4.62**	3.31**	4.60**	3.26**
Sample size	254	715	307	662
IR^{PSM}				
Mean (%)	8.26	6.97	8.17	6.91
Median (%)	5.39*	4.12*	5.37**	4.02**
Sample size	254	715	307	662
Bidder CAR				
Mean (%)	0.76	0.00	0.87	−0.11
Median (%)	0.92**	−0.47**	0.77**	−0.51**
Sample size	260	729	314	675
Target CAR				
Mean (%)	29.45	30.34	30.84	29.77
Median (%)	28.37	25.84	29.18*	25.19*
Sample size	263	736	317	682
Panel B				
IR^{IM}				
Mean (%)	12.65	13.16	12.29	13.33
Median (%)	12.77	11.88	12.47	12.14
Sample size	31	109	38	102
CIBR				
Mean (%)	11.01	8.51	11.66*	8.10*
Median (%)	12.13	7.28	11.81**	6.98**
Sample size	31	110	38	103
IR^{PSM}				
Mean (%)	19.13	13.52	20.16**	12.76**

Table 6 (*continued*)

Statistics	Four-digit SIC		Three-digit SIC	
	Same industry	Cross industry	Same industry	Cross industry
Median (%)	14.17*	8.96*	16.46**	8.33**
Sample size	31	110	38	103
IR^{PSM}–IR^{IM} (*estimated revelation bias*)				
Mean (%)	6.48*	0.39*	7.87***	−0.55***
t-statistic	1.91	0.25	2.63	−0.35
Median (%)	5.72*	−0.02*	6.52***	−1.17***
Binomial *p*	0.15	1.00	0.07	0.77
Sample size	31	109	38	102
Bidder CAR				
Mean(%)	1.25	−0.50	2.01*	−0.90*
Median (%)	1.53*	−0.95*	1.74**	−0.99**
Sample size	31	112	38	105
Target CAR				
Mean (%)	29.55	29.95	30.39	29.67
Median (%)	30.91	25.85	30.22	24.67
Sample size	31	113	38	106

*, **, and *** indicate significant difference between same- and cross-industry tender offers at the 10%, 5%, and 1% levels, respectively.

In contrast with the large friendly/hostile differences in IR^{PSM}, in Panel B of Table 5 the intervention method measure (IR^{IM}) indicates that hostile offers are not associated with significantly higher value improvements than friendly offers. Because IM estimates filter out revelation effects, the different behavior of the IR^{PSM} and IR^{IM} estimates indicates that friendly and hostile offers convey different information to investors about bidder stand-alone value.

Panel B of Table 5 indicates that hostility is related to a larger (more positive) revelation effect $IR^{PSM} - IR^{IM}$ (significant at the 1% level). There is a positive revelation effect of hostile offers (6.06%, significant at the 1% level) and a negative revelation effect of friendly offers (−4.42%, significant at the 1% level). The average upward revision in the market's assessment of the stand-alone value of hostile bidders is consistent with the hypothesis that hostile bids are taken by the market as an indicator of strong cash flow prospects or organizational capabilities on the part of the bidder.[17] Alternatively, the negative revelation about friendly bidders and the positive revelation about hostile bidders may derive from the fact that

[17]Despite the favorable revelation about stand-alone value, investors presumably understand that successful hostile offers can be very expensive for the bidder, so no presumption is made that the announcement period returns for hostile offers are positive. See Footnote 16.

Table 7
The relation between value improvements and relative size

	Ratio of bidder size to target size			
	<0.7	0.7–1.5	1.5–5.0	>5
Panel A				
CIBR				
Mean (%)	14.95	11.79	6.87	1.40
Median (%)	12.79	11.88	6.19	1.51
Sample size	85	126	240	525
IR^{PSM}				
Mean (%)	22.06	17.19	9.11	1.68
Median (%)	16.68	15.45	7.03	1.73
Sample size	85	126	240	525
Bidder CAR				
Mean (%)	3.75	2.26	−1.16	−0.47
Median (%)	1.74	1.81	−1.53	−0.41
Sample size	85	127	240	526
Target CAR				
Mean (%)	18.96	21.92	29.21	34.59
Median (%)	16.92	20.02	25.11	30.22
Sample size	85	126	241	527
Panel B				
IR^{IM}				
Mean (%)	25.87	16.74	9.71	5.93
Median (%)	26.73	16.75	9.64	5.39
Sample size	22	31	61	27
CIBR				
Mean (%)	16.77	12.01	7.69	2.13
Median (%)	19.08	11.61	6.29	2.12
Sample size	22	32	61	27
IR^{PSM}				
Mean (%)	27.51	20.10	12.16	3.60
Median (%)	26.40	14.83	8.14	3.40
Sample size	22	32	61	27
Bidder CAR				
Mean (%)	1.22	0.97	−1.34	−0.50
Median (%)	−0.10	−0.25	−2.08	0.05
Sample size	22	32	61	27
Target CAR				
Mean (%)	22.25	23.30	32.36	38.65
Median (%)	23.82	21.36	30.09	30.62
Sample size	22	32	61	27

The implicit market estimates of the value improvement as a result of the takeover (IR^{IM}), combined initial bid returns (*CIBR*), probability-adjusted combined initial bid returns (IR^{PSM}), and cumulative abnormal returns (CAR) are defined in the legend of Table 4. In Panel A, the sample contains 1,018 tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001. In Panel B, the subsample contains tender offers with a competing bid for the target.

Table 8
Least squares regression results of combined initial bid returns (*CIBR*), probability-adjusted combined initial bid returns (IR^{PSM}), and cumulative abnormal returns (CAR) against various takeover-specific variables (*t*-statistics in parentheses). The value improvement estimates *CIBR* and IR^{PSM} are defined in the legend of Table 4. Industries are classified according to three-digit Compustat standard industrial classification (SIC) codes. Sample contains tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001. Hostile equals one if the offer is viewed as hostile by target management, zero otherwise. Cash equals one if the offer is all cash, zero otherwise. Stock equals one if the offer is all stock, zero otherwise. Pre-Williams Act equals one if the offer was made prior to July 1968, zero otherwise. Post-March 2000 equals one if the offer was made after March 2000, zero otherwise. Same industry equals one if the bidder and target are in the same three-digit Compustat SIC code industry, zero otherwise. Relative size = acquirer market value/target market value. Tobin's Q = (market value of equity + long-term debt + short-term debt + preferred stock)/total assets.

Variable	Dependent variable					
	CIBR	IR^{PSM}	*CIBR*	IR^{PSM}	Bidder CAR	Target CAR
Hostile	0.50	6.93	1.05	7.63	−1.63	5.93
	(0.63)	(6.62)	(1.12)	(6.00)	(−1.83)	(2.46)
Cash	2.31	3.17	2.69	3.86	2.28	2.77
	(2.97)	(3.12)	(3.05)	(3.22)	(2.71)	(1.22)
Stock	−5.12	−6.34	−4.81	−5.20	−2.41	−16.05
	(−3.14)	(−2.96)	(−2.20)	(−1.76)	(−1.16)	(−2.86)
Pre-Williams Act	1.00	1.55	2.98	7.18	4.54	−1.04
	(0.76)	(0.89)	(0.84)	(1.49)	(1.34)	(−0.11)
Post-March 2000	2.74	3.24	2.31	2.48	−0.05	11.22
	(2.37)	(2.14)	(1.72)	(1.36)	(−0.04)	(3.24)
Same industry	1.60	1.85	1.37	1.47	2.11	0.79
	(2.42)	(2.13)	(1.78)	(1.42)	(2.89)	(0.40)
Log of relative size	−2.74	−3.35	−2.53	−3.10	−0.36	3.58
	(−14.51)	(−13.53)	(−11.14)	(−10.06)	(−1.69)	(6.13)
Log of target size	−0.69	−0.65	−0.65	−0.50	−0.61	−1.16
	(−3.05)	(−2.21)	(−2.41)	(−1.38)	(−2.40)	(−1.69)
Bidder Tobin's Q			−0.28	−0.39	−0.38	−0.16
			(−2.66)	(−2.73)	(−3.72)	(−0.57)
Target Tobin's Q			0.12	0.14	0.13	−0.97
			(0.74)	(0.62)	(0.83)	(−2.26)
Constant	11.78	12.61	11.64	11.93	2.71	28.47
	(7.27)	(5.93)	(6.13)	(4.63)	(1.50)	(5.84)
Sample size	935	935	634	634	636	635
Adjusted R^2	0.2206	0.2699	0.2242	0.2751	0.0530	0.1147

hostile offers are more prone to be cash and friendly offers more prone to be equity or mixed payment. We discuss revelation effects associated with means of payment below.

Although there are differences in stockholder returns between friendly and hostile offers, the thrust of this evidence is that both hostile and friendly offers are associated with substantial value improvements in takeovers. Thus, overall, this evidence indicates that both disciplinary synergistic roles for takeover are important.

4.3.2. Cash versus mixed versus equity offers

In general, as in Myers and Majluf (1984), issuance of equity can convey adverse information about the firm's existing assets in place. Several models of means of payment in takeovers imply an adverse selection problem associated with greater use of equity. Under an adverse selection approach, the use of cash could provide the favorable revelation that equity is not used. On the other hand, a cash offer could reveal that the firm has cash in excess of its internal investment needs and is likely to squander that cash on poor investments should the bid fail (Jensen, 1988; Stulz, 1990). This implies a negative revelation effect. An alternative story is that paying with cash indicates a good management that is willing to commit itself to discipline in future investments. This would imply a favorable revelation about managerial quality.

Table 5 indicates an ordering in which cash offers on average create greater *CIBR* and IR^{PSM} value improvements than mixed offers, and mixed offers greater than stock offers. Most of the comparisons are significant at the 1% level. Similarly, in the multivariate analysis of Table 8, in the regressions with dependent variables *CIBR* and IR^{PSM}, the coefficient on cash (equity) is significantly positive (negative).

Owing to the smaller sample sizes in Panel B, there is less power to detect differences. Nevertheless, a pattern that emerges clearly is that the value improvement difference between equity and mixed payment offers is much smaller using the intervention method. In consequence, the revelation bias $IR^{PSM} - IR^{IM}$ is much more negative for stock than for cash offers (difference in means significant at the 5% level, difference in medians significant at the 1% level), and more negative for stock than for mixed offers (difference in means significant at the 10% level, difference in means significant at the 5% level). The point estimates also indicate a more negative revelation bias for mixed offers than for cash offers (substantial for medians), though the difference is not significant. In other words, greater use of equity is associated with more negative revelation about bidder stand-alone value. Thus, our evidence is consistent with the adverse selection theory's implication that the use of equity is an adverse indicator of firm value, and is not consistent with the argument that the use of cash reveals a propensity of bidding management to waste free cash flow.

4.3.3. Focused versus diversifying transactions

We define an acquisition as same-industry versus cross-industry (i.e., nondiversifying versus diversifying) according to whether the target firm has the same or a different SIC code from the bidder. We consider both three- and four-digit Compustat SIC codes.

A large literature debates the extent to which diversifying acquisitions are associated with more severe bidder agency problems. The agency theory of diversification suggests lower true value improvements, and especially lower bidder returns, in cross-industry transactions than in same-industry transactions.

The data provide support for the notion that same-industry acquisitions create greater value than cross-industry acquisitions. In Table 6, bidder returns and value improvement measures are generally lower in diversifying acquisitions. Similarly, in the multivariate analysis of Table 8, the coefficient estimates for the same-industry dummy are significantly positive for most of the value measure columns.

The evidence for bidder returns confirms that the conclusions in the earlier sample of Morck et al. (1990) extend to the turn of the millennium. The finding for combined value improvements indicates that the lower bidder returns in diversifying acquisitions do not derive solely from redistribution to targets. The results also indicate that the greater gains to same-industry acquisitions identified in stock mergers by Maquieira et al. (1998) applies in tender offers. Our findings provide an interesting contrast with those of Moeller et al. (2004a,b), who find diversification to be insignificant as a predictor of bidder announcement period returns in public acquisitions. The sample of Moeller et al. (2004a,b) includes mergers as well as tender offers, and our study covers a longer sample period. Also, they define industry using SDC SIC codes, whereas we define industries using Compustat SICs. Kahle and Walkling (1996) argue that Compustat SIC codes are better specified than CRSP SIC codes.

Although Table 6 indicates same-industry acquisition are generally associated with higher bidder and combined returns than cross-industry acquisitions, Panel B indicates that IR^{IM} is about the same in the two groups, indicating similar value improvements from combination. The $IR^{\mathrm{PSM}} - IR^{\mathrm{IM}}$ block indicates the reason: Same-industry acquisitions are associated with more favorable revelation than cross-industry acquisitions. This suggests that investors perceive diversifying acquisitions as indicating that management is prone to agency problems such as wasteful investment, whereas same-industry acquisitions indicate managerial discipline and expertise. These results do not indicate any great pessimism on the part of investors about the value of combination in diversifying transactions. Instead, they indicate that the low returns associated with these transactions derive from adverse updating about the quality of the bidder and its management.

4.3.4. Relative market values of bidder and target

Some argue that so-called mergers of equals are hard to implement successfully.[18] This suggests that acquisitions of small targets by large bidders will tend to generate greater improvement per dollar spent on acquisition than combinations of similar-size firms. It could also be argued that in unequal acquisitions, the business benefits of possessing the target can be leveraged across a larger set of operations, again yielding greater gains per dollar spent on acquisition.

In the univariate analysis, we place transactions in four relative size categories: bidder/target market value ratio <0.7 (small bidder), $0.7<X<1.5$ (same relative size), $1.5<X<5.0$ (big relative size), and $5.0<X$ (largest relative size). We use a continuous variable, the logarithm of relative size, in the regressions.

[18]See, e.g., *The Economist*, January 9, 1999, p. 15: "Nor does it [success] require similarity of size: mergers of equals seem to be especially tricky, perhaps because they disrupt two strong corporate cultures, and they often throw up intractable problems of leadership". (The use of the term mergers in the quoted remark seems to be generic, not exclusive of tender offers.)

Table 7 shows that acquisitions in which the bidder is relatively large compared with the target improve value (as a fraction of combined value) significantly less. The regression results in Table 8 confirm this finding: Value improvement measures are inversely related to the relative size of the bidder versus the target. In contrast, when takeover gains are measured relative to the value of the target (not reported here), the mean estimated improvement is largest when a target is acquired by a much larger bidder. Despite concerns raised in the business press about mergers of equals, it is not clear from these two pieces of evidence that parity of bidder and target size in a tender offer is a bad thing.

Previous research on relative size has focused on its effects on bidder returns. Asquith et al. (1983) find that merger bidder returns decrease with the relative size of the bidder versus target. In a recent sample, Moeller et al. (2004a) report that, after controlling for bidder size, relative size is unrelated to the returns of bidders acquiring public firms. Our evidence indicates that relative size is also related to total (combined) value improvements.

If the gains from combination are derived solely from target improvements such as removal of bad management, then a larger relative size of the bidder would not increase the gains relative to the size of the target. Thus, our finding suggests that there are gains from combination involving synergies between bidder and target. Something about the target, perhaps a unique technology, can be leveraged to provide a firm-wide benefit to the bidder. However, the fact that greater relative size of the bidder implies smaller value gains relative to combined value suggests that there are limits to this leveraging. To some extent the gains do seem to come from changes specific to the target instead of general synergies.

4.3.5. *Tobin's Q*

Lang et al. (1989) and Servaes (1991) find that takeover gains are related to bidder and target Q ratios. Following Martin (1996), we define Q as the sum of market value of equity, long-term debt, short-term debt, and preferred stock divided by book value of equity, calculated as of the fiscal year-end preceding the takeover announcement date.

To investigate how value improvements are related to bidder and target Tobin's Q ratios, we run value improvement regressions, including Q ratios in the list of independent variables, as well as separate regressions of bidder and target returns on takeover characteristics. The results are reported in the last four columns of Table 8. Bidder announcement period returns (CAR) and total value improvements are negatively related to bidder Q, and target announcement period CAR is negatively related to target Q. The effect of Q in our sample is economically significant. In Table 8, the coefficient of bidder Q is -0.38, meaning for an increase of 1 unit of bidder Q, bidder return decreases by -0.38%. Because the standard deviation of Q is 3.26 (the average bidder Q is 1.88), Q is associated with non-negligible variation in return. Our results are robust to winsorizing bidder and target Q's.

Our bidder returns finding is consistent with the fact (e.g., Travlos, 1987; Brown and Ryngaert, 1991; Fuller et al., 2002, Moeller et al. (2004a,b)) that stock bidders have lower announcement period returns, because stock bidders tend to have higher Q (Martin, 1996) and lower book/market ratios (e.g., Dong et al., 2003).

However, this finding is different from those of Lang et al. (1989) and Servaes (1991). In their earlier sample, bidder returns were higher when high Q bidders acquired low Q targets. The difference in results suggests that the takeover boom of the 1990s had a different character from that of the 1980s. Our finding also contrasts with that of Moeller et al. (2004a,b) that there is no economically significant relation between bidder Q and returns in acquisitions of public firms. Their sample differs from ours in several ways. It includes only successful acquisitions, includes merger bids as well as tender offers, and covers a shorter time period than our sample.

Also, Table 8 indicates that higher target Tobin's Q is associated with lower target announcement stock returns. This is consistent with recent findings for target book/market ratios (see Dong et al., 2003), and with earlier findings of Lang et al. (1989) and Servaes (1991).

4.3.6. *Time dependence of value improvements*

The Williams Act of 1968 and associated legislation requiring disclosure and delaying completion of tender offers makes it easier for competitors to investigate the target after an initial bid (Jarrell and Bradley, 1980). One would expect, as a result, that the set of bidders who are willing to make an initial offer would be narrower. Post-Williams transactions thus should be associated with higher value improvements. Several authors have shown large changes in premiums and several other takeover-related variables beginning at approximately this time (though explanations differ as to the source of these changes). To assess the effect of the Williams Act, we create a dummy variable for pre-Williams (July 1962–June 1968) and post-Williams subperiods.

In addition, commentators have claimed that the U.S. financial market environment has changed after March 2000, when the Nasdaq and several other broad stock indexes peaked. We examine whether a shift in value gains occurred after March 2000 by using a dummy for pre- and post-March 2000.

Based on Table 4, it appears that 1989–1992 was a period of unusually low value improvements from takeover (based on *CIBR* and IR^{PSM}; the sample size for IR^{IM} for this period is too small to be meaningful). There is no indication that the takeover boom of the mid-1990s was associated with high percentage value improvements. Based on our estimates, the dollar value increase associated with the mid-1990s transactions was large. However, transactions in the late 1990s and the post-March 2000 period were associated with large wealth losses, because of the tremendous value losses to some relatively large bidders. These results are broadly consistent with the findings of Moeller et al. (2004a) (whose focus was on absolute bidder size).

In Table 5, it appears that value improvements were higher prior to the Williams Act than subsequent to the act. However, based on Table 8, there is no significant difference between the pre- and post-Williams amendment periods under any of the two value improvement measures. This suggests that the difference in takeover gains between these subperiods found in Table 5 was likely the result of shifts in takeover characteristics that are captured as explanatory variables in the multivariate analysis, such as a relatively high proportion of cash offers and smaller bidders prior to the Williams Act.

Table 5 also indicates a massive increase in target announcement period abnormal returns in the post-March 2000 period: from 28.77% to 44.78% (means), and from 25.30% to 39.81% (medians). This finding is reinforced by the target return regression in Table 8, in which the coefficient on the post-March 2000 category variable is substantial ($11.24, t = 3.24$). This indicates that the increase in target returns goes above and beyond what would be predicted by shifts in the regression explanatory variables.

Table 5 also indicates (significant with the PSM measure) that, after March 2000, combined returns (*CIBR* and IR^{PSM}) decreased. In contrast, the first two regressions in Table 8 suggest that combined returns increased after March 2000. However, as the next two regressions indicate, after controlling for bidder and target Tobin's *Q*'s, the post-March 2000 dummy is not significant for *CIBR* or IR^{PSM}. These findings indicate that the post-March 2000 decrease in combined returns can be explained fully by shifts in the explanatory variables.

4.3.7. Do bidders pay too much?

To measure over- or underpayment, it is convenient to measure bid premiums relative to combined bidder/target value, according to the overpayment condition Eq. (4). The results in Table 9 highlight that the new methods have an important effect on inferences. If we estimate value improvements using *CIBR*, the combined abnormal stock return, we find that in the competing bid subsample bidders on average significantly overpaid, by 5.1% (median 3.0%), with almost 65% of the 135 observations indicating overpayment. This difference is significant at the 1% level. However, *CIBR* captures only a fraction of the total takeover gains and is subject to revelation bias. Using either the intervention method or the probability scaling method, the mean value improvement is not statistically different from the mean premium paid in these multiple bidder offers. So we cannot reliably reject the null that the payment is on average fair. In the competing bid subsample, both of the new methods developed here indicate that about half of the 135 initial bidders overpaid. Because value improvements are large, it appears that most of the bid premiums can be explained by value improvements.

There is a possible sample selection bias in the intervention method. The intervention method examines initial bidder returns when a competing bidder enters, but if the initial bidder offers too much on his first bid, this will tend to discourage competitors from arriving. Thus, a bidder who offers a generous initial offer will possibly not end up in the multiple-bidder sample. On the other hand, other things equal, the arrival of a competitor raises the amount that a first bidder with given valuation will have to pay. Thus, we doubt that there is more overpayment in single-bidder contests than in multiple bidder contests. This view is consistent with evidence on competitors' stock returns (see BDK-88).

Table 9

The difference between value improvement measures and toehold-adjusted bid premium. Value improvement measures include the implicit market estimates of the value improvement as a result of the takeover (IR^{IM}), combined initial bid returns (*CIBR*), and probability-adjusted combined initial bid returns (IR^{PSM}). These value improvement estimates are defined in the legend of Table 4. *p*-value of mean is the significance level for the student's *t* value that tests whether the mean is different from zero. Binomial *p* is the significance level for the two-tail Fisher sign test that tests whether the median is different from zero. The difference between value improvement and toehold-adjusted bid premium (*ToePrem*) is equal to the difference between the right-hand side and the left-hand side of Eq. (4) in the text. $ToePrem = (1-\alpha)^{*}$ (bid premium) * target market value/combined bidder and target market value, where α is the fraction of pre-bid target shares held by the bidder. Sample contains tender offers in which both bidder and target were listed on the NYSE, Amex, or Nasdaq during 1962–2001. In addition, for IR^{IM} the sample is restricted to cases with a competing bid for the target. All improvement ratios are expressed as a percentage of combined target and bidder market value.

Statistics	Subperiod								Total
	July 1962–June 1968	July 1968–December 1980	January 1981–December 1984	January 1985–December 1988	January 1989–December 1992	January 1993–December 1996	January 1997–March 2000	April 2000–December 2001	July 1962–December 2001
CIBR-ToePrem (*full sample*)									
Mean (%)	−0.11	−4.41	−2.34	−4.26	−3.53	−1.05	−1.53	−1.96	−2.66
Median (%)	0.35	−2.33	−4.73	−3.13	−2.61	0.57	−1.62	−0.84	−1.93
% positive	54.2	34.5	27.3	31.8	30.9	54.7	42.2	47.3	40.0
p-value of mean	0.91	0.00	0.31	0.00	0.00	0.21	0.02	0.20	0.00
Binomial *p*	0.60	0.00	0.00	0.00	0.00	0.31	0.03	0.73	0.00
Sample size	59	145	44	211	81	137	204	74	955
IR^{PSM}-*ToePrem* (*full sample*)									
Mean (%)	3.70	−1.71	2.77	−1.62	−2.04	0.29	−0.33	−1.70	−0.59
Median (%)	3.46	−0.23	−1.82	−1.59	−1.04	1.19	−0.93	−0.78	−0.48
% Positive	64.4	49.0	45.5	42.2	39.5	58.4	45.6	47.3	48.0
p-value of mean	0.02	0.17	0.32	0.07	0.06	0.74	0.67	0.28	0.14
Binomial *p*	0.04	0.87	0.65	0.03	0.07	0.06	0.23	0.73	0.22
Sample size	59	145	44	211	81	137	204	74	955
IR^{IM}-*ToePrem* (*competing bid sub-sample*)									
Mean (%)	5.46	0.03	−2.47	−7.27	3.86	−0.90	−3.38	7.79	−1.45

Table 9 (*continued*)

Statistics	Subperiod								Total
	July 1962–June 1968	July 1968–December 1980	January 1981–December 1984	January 1985–December 1988	January 1989–December 1992	January 1993–December 1996	January 1997–March 2000	April 2000–December 2001	July 1962–December 2001
Median (%)	6.42	1.67	−7.09	−3.82	2.32	3.14	−2.07	6.64	−0.07
% Positive	82.4	58.1	16.7	29.7	66.7	54.5	42.9	100.0	49.6
p-value of mean	0.00	0.99	0.76	0.02	0.21	0.84	0.30	0.08	0.27
Binomial *p*	0.01	0.47	0.04	0.02	0.51	1.00	0.79	0.13	1.00
Sample size	17	31	12	37	9	11	14	4	135
CIBR-ToePrem (*competing bid sub-sample*)									
Mean (%)	−1.15	−3.51	0.83	−10.48	−2.67	−8.32	−4.03	−1.26	−5.06
Median (%)	−0.62	−1.74	−7.04	−5.74	−1.64	−5.60	−3.14	4.47	−2.95
% Positive	47.1	35.5	33.3	27.0	33.3	36.4	42.9	50.0	35.6
p-value of mean	0.67	0.04	0.92	0.00	0.26	0.12	0.19	0.89	0.00
Binomial *p*	1.00	0.15	0.39	0.01	0.51	0.55	0.79	1.00	0.00
Sample size	17	31	12	37	9	11	14	4	135
IR^{PSM}-*ToePrem* (*competing bid sub-sample*)									
Mean (%)	3.41	−0.25	14.78	−2.17	2.33	−7.55	2.73	−0.10	0.91
Median (%)	3.34	0.37	6.50	−1.13	−0.48	−5.24	2.98	5.06	0.56
% Positive	58.8	54.8	75.0	48.6	44.4	45.5	57.1	50.0	54.1
p-value of mean	0.37	0.90	0.09	0.52	0.63	0.17	0.50	0.99	0.56
Binomial *p*	0.63	0.72	0.15	1.00	1.00	1.00	0.79	1.00	0.39
Sample size	17	31	12	37	9	11	14	4	135

4.4. Robustness of IM, PSM and traditional measures to window length

All of the methods we apply are influenced by the length of the window selected. Longer windows capture more fully any anticipation of the event and a greater fraction of the effects of event-resolution. The cost of a longer event window is greater noise and benchmark error. To evaluate whether the value improvements derived by IM and PSM are higher than those implied by traditional approaches, we consider different window lengths.

Using traditional methods, with a $(-5,+5)$ event window where date 0 is the date of the initial bid, the mean (median) weighted average of the bidder and target returns using value weights is 5.27% (3.69%), with 71% of the returns being positive (see Table 2, Panel A). In the older sample of BDK-88, the mean initial return relative to combined market value is 6.93%. Thus, there was a decline in mean returns in the decade following the BDK study.

A reasonable starting point that would account for pre-public announcement anticipation of the event would be in the order of 30 to 40 days. See, e.g., Fig. 1 of Schwert (1996). Using a longer window that begins 30 days prior to the initial offer and runs through final announcement of the transaction, we obtain a mean (median) bidder and target weighted return of 7.12% (6.35%). The corresponding measure beginning 90 days prior to the initial offer is 6.65% (7.05%).

The combined CARs for these initial returns for different windows are summarized in Table 2, Panel B. Even with long event windows prior to the event, the mean CAR based on the initial bid is at most only 7.1%, as compared with 13.1% using the intervention method. These results imply that the gains from takeover are considerably greater than the (already substantial) gains estimated in previous studies.

The use of a long window such as 60 or 90 days is probably suboptimal. While such a window ensures that any pre-event information leakage is captured in the return, it also greatly increases noise. In this case, as we lengthen the window, the mean CAR increases up to a 30-day window. But moving from a 15- to a 30-day window leads to a smaller fraction of positive abnormal returns, suggesting that the problem of noise starts to become severe in the longer window.

Furthermore, the use of a $(-1,0)$ window by IM for the arrival of the competing bid also potentially misses some runup. In unreported results, we find that a longer pre-competing bid window is associated with even higher IR^{IM} estimate.

4.5. Robustness with respect to model specifications

We next consider the robustness of our conclusions about value improvements with respect to our model specifications.

4.5.1. Competing bidder information

The arrival of a competing bid may convey information about either the stand-alone value of the target or its value to the initial bidder, a different kind of revelation effect (see Section 2.4). This is likely to have only a minor effect on IM estimation (see Footnotes 11 and 12). More important, the intervention method mitigates this problem relative to previous studies by focusing on competing bids, because much of the private information possessed by bidders about targets likely already is conveyed by the initial offer.

If the arrival of a competing bid causes an upward revision in the assessed valuation of the first bidder, then ceteris paribus the first bidder's abnormal return R_3 will be higher. By constraining $\bar{V}_3 = \bar{V}_1$, our estimates would tend to wrongly attribute any such higher abnormal return to the reduced probability of the initial bidder succeeding. Thus, the estimated value improvement would be biased downward, providing a conservative estimate. Thus, the inference that takeovers are on average associated with positive underlying value improvements is strengthened.

To analyze this issue directly, suppose that $\bar{V}_3^{\mathrm{I}} = K\bar{V}_1^{\mathrm{I}}$, $K \geqslant 1$, i.e., the arrival of a competing bid causes an upward revision in the assessed valuation by the first bidder of owning the target. We abbreviate $\bar{V}_1^{\mathrm{I}}$ as $\bar{V}^{\mathrm{I}}$ in the following. Substituting into Eqs. (9), (10)–(11), and solving gives

$$\frac{\bar{V}^{\mathrm{I}}}{V_0^{\mathrm{C}}} = \frac{R_3(P_1/V_0^{\mathrm{C}})}{K\phi_3 - \phi_1} - (1-\alpha)\left(\frac{\phi_3 - \phi_1}{K\phi_3 - \phi_1}\right)\left(\frac{V^{\mathrm{T}}}{V_0^{\mathrm{C}}}\right) + (1-\alpha)\left(\frac{V^{\mathrm{T}}}{V_0^{\mathrm{C}}}\right)\frac{\left[\phi_3\left(\frac{\bar{B}_3}{V_0^{\mathrm{T}}}\right) - \phi_1\left(\frac{\bar{B}_1}{V_0^{\mathrm{T}}}\right)\right]}{K\phi_3 - \phi_1}. \tag{19}$$

As suggested in Section 2.4, K is likely to be close to one. The implied IR^{IM} estimates, which are increasing in K, are provided in the first two columns of Table 10. This simulation supports the conclusion of positive average value improvements; large values of K lead to implausibly high values for $\bar{V}^{\mathrm{I}}/V_0^{\mathrm{C}}$.

4.5.2. Future acquisitions

The basic analysis assumes that success or failure of the offer has no effect on any future acquisitions that the bidder could make. More generally, if the first bidder fails to acquire the target, a similar target could thereafter be successfully acquired at a price similar to what he would have paid if he had been successful in acquiring the original target. If so, the stock price reaction to failure of the initial bid would be muted. A bidder whose offer fails is not certain to make an additional acquisition as a consequence of failure. (No difficulty arises if the bidder intends to make other acquisitions regardless of the outcome of the first contest. The calculation of the stock price reaction associated with the arrival of a competing bid needs modification only if future acquisitions depend on the success or failure in the current contest.) We model this possible dependence by allowing for some probability that failure of the offer will cause the bidder to try to acquire another comparable target at the same expected price.

There are several possible reasons why this probability is less than one. First, alternative targets may seem less attractive to bidding management. For example, under Roll's hubris hypothesis, a bidder's first offer will be to the target he

Table 10
This table provides a sensitivity analysis for IR^{IM}, the value improvement as a result of the takeover, with respect to parameter values in several variations of the basic model

K (1)	IR^{IM} (%) mean/median (2)	γ (3)	IR^{IM} (%) mean/median (4)	$Pr(S^2\|\theta_3)$ (5)	IR^{IM} (%) mean/median (6)	IR^{IM} (%) mean/median (7)
1.00	14.8/13.8	0.0	14.8/13.8	0.0	14.8/13.8	13.2/12.1
1.10	15.8/15.2	0.2	14.5/13.5	0.1	14.9/13.8	14.1/12.7
1.20	17.5/16.9	0.4	14.3/14.1	0.3	15.3/14.2	15.7/14.1
1.30	18.4/19.0	0.6	14.0/14.6	0.5	15.6/14.3	17.1/16.0
1.40	19.0/20.8	1.0	13.4/14.3	0.7	15.9/14.8	18.5/18.2

Columns 1 and 2 describe the effects of varying K, the ratio of the expected post-takeover value of the target to the first bidder conditional on a competing bid arriving to the unconditional expected value. Columns 3 and 4 vary γ, the probability that after failure the first bidder will seek and acquire an identical target. Columns 5 to 7 vary $Pr(S^2|\theta_3)$, the probability that a second bidder wins given that he enters the contest, to allow for the benefits derived by a defeated first bidder from selling his initial shareholding to a competing bidder. Column 6 is based on the actual first bidder initial shareholding, and Column 7 is based on an initial shareholding of 0.15. Parameter inputs for computation of IR^{IM} are derived from regression/logit Models A1 and B (see Table 3).

overvalues the most. Second, a manager may change his mind about the desirability of acquisition. Third, he may retire or be replaced before he locates another target. Fourth, if acquisition is undesirable, the initial offer may rouse large shareholders or the board to oppose further attempts.

Suppose that value improvements in takeovers are positive. Then when the arrival of a competing bid reduces the probability of success, the bidder has a good chance of succeeding in another acquisition, so the actual bidder return will be greater than that implied by the basic model of Section 2. This higher return implies that IR^{IM} will underestimate the actual improvement. Similarly, if value improvements are negative, IR^{IM} will overestimate the improvement. So long as failure could lead to another comparable acquisition, the basic method biases IR^{IM} toward zero but leaves its sign unchanged. (More generally, the sign could be incorrect, but this requires a rather special scenario. For example, if the improvement is always zero in the initial contest, but after an initial failure the bidder always makes a negative net present value acquisition, then the stock return will be lower than the calculation in Section 2. The negative stock return, in combination with the reduction in probability of success associated with the arrival of a competing bid, would tend to be attributed to a positive value improvement.) A robustness check is provided by reestimating IR^{IM} in a model in which, given failure, there is a probability γ that the bidder will make another acquisition attempt of equal quality to the first.

Suppose that the first bidder can find another identical target with probability γ after failure to acquire the first target. Then Eq. (11) becomes

$$\bar{\pi}_1 = [\phi_1 + \gamma\phi_1(1-\phi_1)][\alpha\bar{V}^{I} + (1-\alpha)(\bar{V}^{I} + V_0^{T} - \bar{B}_1)] \tag{20}$$

and

$$\bar{\pi}_3 = [\phi_3 + \gamma\phi_1(1-\phi_3)][\alpha\bar{V}^{\mathrm{I}} + (1-\alpha)(\bar{V}^{\mathrm{I}} + V_0^{\mathrm{T}} - \bar{B}_3)]. \tag{21}$$

So,

$$\frac{\bar{V}^{\mathrm{I}}}{V_0^{\mathrm{C}}} = \frac{R_3(P_1/V_0^{\mathrm{C}})}{\delta_2} - (1-\alpha)\left(\frac{V_0^{\mathrm{T}}}{V_0^{\mathrm{C}}}\right) + (1-\alpha)\left[\left(\frac{\delta_1+\delta_2}{\delta_2}\right)\left(\frac{\bar{B}_3}{V_0^{\mathrm{T}}}\right) - \left(\frac{\delta_1}{\delta_2}\right)\left(\frac{\bar{B}_1}{V_0^{\mathrm{T}}}\right)\right]\left(\frac{V_0^{\mathrm{T}}}{V_0^{\mathrm{C}}}\right), \tag{22}$$

where $\delta_1 \equiv \phi_1[1+\gamma(1-\phi_1)]$ and $\delta_2 \equiv (\phi_1-\phi_3)(\gamma\phi_1-1)$. IR^{IM} decreases as a function of γ, but the effect is weak. As shown in Columns 3 and 4 of Table 10, the estimated value improvement is still positive and substantial for plausible values of γ. The effect of γ on IR^{IM} would be stronger if, after a second failure, the bidder again had a probability of turning to a third target and so on.

4.5.3. Sale of shares to another bidder

We now allow for the possibility that an unsuccessful initial bidder can sometimes profit by selling his holdings to a successful competing bidder. Let $Pr(S^2|\theta)$ denote the probability of arrival and success of the second bidder, and let β denote the expected winning bid of the second bidder. Then so long as $\beta > V_0^{\mathrm{T}}$ (so that it pays for the unsuccessful initial bidder to sell to the later bidder),

$$\bar{\pi}_1 = \phi_1[\alpha\bar{V}^{\mathrm{I}} + (1-\alpha)(\bar{V}^{\mathrm{I}} + V_0^{\mathrm{T}} - \bar{B}_1)] + \alpha\, Pr(S^2|\theta_1)(\beta - V_0^{\mathrm{T}}) \tag{23}$$

and

$$\bar{\pi}_3 = \phi_3[\alpha\bar{V}^{\mathrm{I}} + (1-\alpha)(\bar{V}^{\mathrm{I}} + V_0^{\mathrm{T}} - \bar{B}_3)] + \alpha\, Pr(S^2|\theta_3)(\beta - V_0^{\mathrm{T}}). \tag{24}$$

So,

$$\frac{\bar{V}^{\mathrm{I}}}{V_0^{\mathrm{C}}} = \frac{R_3(P_1/V_0^{\mathrm{C}})}{\phi_3-\phi_1} - (1-\alpha)\frac{V_0^{\mathrm{T}}}{V_0^{\mathrm{C}}} + (1-\alpha)\frac{[\phi_3(\bar{B}_3/V_0^{\mathrm{T}}) - \phi_1(\bar{B}_1/V_0^{\mathrm{T}})]}{\phi_3-\phi_1}\left(\frac{V_0^{\mathrm{T}}}{V_0^{\mathrm{C}}}\right) - \left\{\frac{\alpha\left(\frac{\beta}{V_0^{\mathrm{T}}}-1\right)[Pr(S^2|\theta_3) - Pr(S^2|\theta_1)]}{\phi_3-\phi_1}\right\}\left(\frac{V_0^{\mathrm{T}}}{V_0^{\mathrm{C}}}\right). \tag{25}$$

As a rough approximation, we replace β with our estimates of the expected price paid by a successful first bidder conditional on the arrival of a competing bidder, $\bar{B}_3$. The unconditional probability of a second bidder winning is the probability that a second bidder arrives multiplied by the probability given arrival that the second bidder wins, $Pr(S^2|\theta_1) = Pr(\text{Competing bid occurs})\, Pr(S^2|\theta_3)$. $Pr(\text{Competing bid occurs})$ is estimated as 147/1,018. Thus, only one of the other two probabilities is a free variable. IR^{IM} for different possible values of $Pr(S^2|\theta_3)$ is given in Columns 5–7 of Table 10. A benchmark value for this variable is 0.5, the case in which, given the arrival of a competing bidder, the first and second bidder have equal probabilities of winning. Column 6 gives the estimated improvement ratio with the bidders' actual initial shareholdings in the target. Column 7 provides alternative numbers assuming larger initial shareholdings. For plausible parameter values, the estimated value improvement is robust with respect to the possibility of sale of the initial bidder's toehold.

4.5.4. Valuation/success correlation

Finally, the success of the initial bidder is likely to be positively correlated with the value improvement, because a high valuation first bidder will probably be willing to offer more. The logit-based probability estimates, which generated similar results to simple estimates based on ex post sample fractions, address this issue to the extent that explanatory logit variables such as the initial bid premium are correlated with the first bidder's valuation. In any case, the potential bias is a subtle one, because IM estimates are based on the change in probability of success when a competing bid occurs. Even if probabilities were misestimated across transactions, it is not clear that there would be any important, systematic misestimation in the changes in probabilities.

The most plausible presumption is probably that the arrival of a competitor has a smaller impact on probability of success when the valuation is high. Then for a high valuation first bidder, the drop in probability of success is overestimated, which implies that IR^{IM} is an underestimate. (The negative abnormal return is attributed excessively to the drop in probability of success instead of to a large value improvement.) Conversely, for low (but positive) valuation firms, the drop in probability of success is underestimated, so that IR^{IM} is an overestimate. Under these conditions, this potential bias changes the relative magnitude of IR^{IM} for different firms, but it does not imply any obvious bias in overall sample averages.

Similarly, it can plausibly be argued that if improvements are common across bidders, a high value improvement increases the probability that a competing bid arrives. Again, the potential bias implied by this effect is subtle, because the ex ante probability of a competing bid is overestimated for some contests and underestimated for others. (If the true improvement is high, the arrival of a competing bid would be less of a surprise than our calculations indicate. For such contests, the improvement is underestimated. If the true improvement is low, the arrival of a competing bid would be more of a surprise than our calculations indicate. For such contests, the improvement is overestimated. The effect on overall sample averages is unclear.) It therefore seems unlikely that these effects would have much effect on inferences about value improvements.

In summary, several robustness checks with respect to several possible modeling variants confirm that the conclusion of positive average value improvements provided using the basic model is highly robust. For plausible parameter values, all estimates of the average value improvement are positive and substantial.

5. Summary and conclusions

Despite an extensive literature, the issue of whether tender offers increase or decrease combined average bidder and target value has remained unresolved. Past stock market-based studies have provided valuable information consistent with positive average improvements. However, the conventional event study approach is subject to two estimation problems. The first, the truncation dilemma, arises when the announcement of the event does not ensure successful completion of the event. This forces the investigator to choose between truncated event windows that measure only a part of the value effect of a successful transaction and long windows that introduce severe noise and benchmark errors.

The second problem is that event-related returns are infected with a bidder revelation bias (Bradley et al., 1983; Jensen and Ruback, 1983; Roll, 1986; Jovanovic and Braguinsky, 2002). Tender offer bids are sometimes announced concurrently with other disclosures, and a bid could in itself reveal information about the value of the bidder not arising from the combination, such as the bidder's stand-alone cash flow prospects or the empire-building propensities of management.

This paper estimates whether and by how much tender offers are perceived by investors as improving combined equity value. We offer an approach to estimating perceived value improvements, the probability scaling method, that addresses the truncation dilemma. Furthermore, we offer an approach that addresses both the truncation dilemma and the bidder-revelation bias. This approach, the intervention method, is based on a model of the stock returns of an initial bidder when a competing bid occurs.

We apply both the traditional method and the two new methods to a sample of tender offers during 1962–2001. Perceived value improvements are much larger than traditional methods indicate. As a result, even though the conventional method indicates that bidders on average overpay, using our new methods we cannot reject the hypothesis that bidders on average pay fair prices for targets.

Furthermore, our methods provide more specific guidance than the traditional method about how economic forces affect the takeover market. We identify several effects (higher combined bidder-target stock returns for hostile offers, lower for equity offers, and lower for diversifying offers) that reflect differences in revelation about bidder stand-alone value, not gains from combination. In other words, it is not that investors perceive that combination creates less underyling value in equity than in cash transactions, but that payment with equity is bad news about bidder stand-alone value (in the spirit of the adverse selection model of Myers and Majluf (1984), but inconsistent with the hypothesis that cash payment reveals a general propensity for the bidder management to waste cash). It is not that investors perceive hostile transactions as creating greater underlying value than friendly ones, but that the announcement of a hostile offer is better news about the quality of bidder management than announcement of a friendly one. And it is not that investors perceive diversification as reducing underlying value, but that diversification conveys bad news about the bidder's stand-alone prospects (such as poor internal investment opportunities).

We also identify some economic factors that do affect the gains from combination, not just revelation about stand-alone value. Using all three approaches, acquisition of a smaller target by a large bidder on average creates a smaller value improvement, measured as a fraction of combined value, than combinations of similar-size firms. But measured relative to the value of the target, the mean estimated improvement is larger for such transactions. These findings are consistent with the importance of both synergies and target-specific improvements such as removal of bad management.

Furthermore, bidder announcement period returns and total value improvements are negatively related to bidder Tobin's Q, in contrast with evidence from the earlier samples of Lang et al. (1989) and Servaes (1991). Target announcement period returns are negatively related to target Q, consistent with previous literature.

All else equal, the evidence of positive value improvements, and that improvements are larger than estimates based on traditional methods, tends to oppose highly restrictive regulation of takeovers. There are, however, other important policy considerations related to takeovers, such as possible errors in market perceptions, possible redistributions of wealth from stakeholders such as customers and employees, the disciplinary or distortive effects of the ex ante threat of takeover, and the ex ante costs of locating targets.

The probability scaling method and the intervention method can be applied to test the relation of value improvements to other possible determinants. For example, these methods could be used to address whether the arrival of white knights blocks superior hostile acquisitions. These new methods could also be applied to other corporate activities that are announced but are not always carried through, such as repurchase programs, planned asset sales, planned development of new products, and acquisition programs.

Appendix A. Numerical illustration of the probability scaling and intervention methods

The basic ideas of the probability scaling method (PSM) and intervention method (IM) can be illustrated by numerical examples.

A.1. The probability scaling method

Consider a bidder who does not own any shares of the target. Suppose that the stand-alone value of the target is 100, the stand-alone value of the bidder is 200, and the transaction will create a value improvement of 40. Suppose that prior to the initial bid the market assesses the probability of a bid to be close to zero and that just after the initial bid the probability of offer success is perceived to be 0.6. Then the stock market's assessment of the combined bidder-target expected value prior to the initial bid is approximately $100 + 200 = 300$.

Just after the initial bid, this assessment is revised to $100 + 200 + 0.6(40) = 324$. The combined bidder-target equity return is therefore $324/300 - 1 = 8.0\%$. This is only a fraction of the percentage value improvement associated with a completed takeover, which is $40/300 = 13.\bar{3}\%$ of combined value.

The PSM grosses up the equity return by the probability of success, which gives the total value gain of a virtual completed transaction, $8.0\%/0.6 = 13.\bar{3}\%$ of combined bidder-target value.

The actual implementation of PSM also takes into account that the target return reflects the market's belief about the likelihood that the target will be acquired by any bidder, not just the first bidder. Section 2.3 derives PSM in detail.

A.2. The revelation bias

We now illustrate the revelation bias inherent in the conventional approach to estimating takeover value improvements. To begin with, let there be no value improvement from successful takeover, so that stand-alone and post-takeover discounted value of target cash flows are both \$100. Suppose that prior to the initial bid, the market estimates the stand-alone value of the bidder to be \$200. Suppose that a bid reveals favorable news to the market about stand-alone bidder value, so that the post-initial bid market assessment of stand-alone bidder value is \$250. The \$50 discrepancy is the effect the bid has on the market's assessment of stand-alone value.

The stock market's assessment of combined bidder-target value prior to the initial bid is $100 + 200 = 300$. Just after the initial bid, this assessment is revised to $100 + 250 = 350$. The combined bidder-target equity return will therefore be $350/300 - 1 \approx 16.7\%$. If the revelation effect of the initial bid is ignored, the researcher will wrongly attribute this return to an expected value improvement of $0.166\times$ \$300 = \$50 (50% of target value), when in fact the improvement is zero. As Roll (1986) points out, even a modest revelation bias for the bidder can create a large overestimate of the value improvement from takeover measured relative to target value, because on average bidders are much larger than targets.

A.3. The intervention method

Given that competition reduces a first bidder's probability of success, ceteris paribus its stock price will drop if its value improvement is large compared with the expected price that will be paid, and will rise if the value improvement is less than the expected purchase price. Thus the stock price reaction to a competing bid provides information about the value improvement. However, holding probability of success constant, competition should hurt the first bidder to the extent that he is forced to pay more when he wins. The challenge for the intervention method is to disentangle these two effects.

After the initial bid, the market's assessment of stand-alone bidder value is \$250. We will compare a case of positive value improvement, in which the value of the target managed by the bidder is \$140, with the case of zero improvement, in which the post-takeover net present value of target cash flows if managed by the bidder is \$100.

A.3.1. Positive value improvement

Suppose that, at the time of the initial offer, the probability of the initial bidder succeeding is 0.6, but that, if a competitor makes a bid, this probability is only 0.4. (These overall probabilities take into account the possibility that a competing bid could be forthcoming.) Suppose that, at the time of the initial offer, the expected price that the first bidder will have to pay if he succeeds is \$120, but that, if a competitor arrives, this expected price paid by the first bidder rises to \$130. We assume that, regardless of the bidder's method of payment, the expected price (\$120 or \$130) refers to the actual price paid by the bidder at the time of completion of the deal. Based on this information, the stock price of the bidder after announcing his offer rises to $250 + 0.6(140 - 120) = 262$. If a competitor appears, the first bidder's stock price retreats to $250 + 0.4(140 - 130) = 254$. Thus, the first bidder's stock return on the arrival of a competing bidder is $(254 - 262)/262 \approx -3\%$.

The initial bidder's stock return reflects the facts that, when a competing bid arrives, (1) the first bidder will have to pay more if he succeeds, and (2) the first bidder has a lower probability of succeeding. Clearly point (1) contributes negatively to the first bidder's return. Point (2) also contributes negatively to the stock return here, because a lower probability of success prevents the bidder from realizing profits. These profits are the difference between the improvement brought about by the first bidder and the expected price paid. Thus, the first bidder's stock return on the arrival of a competing bid reflects the market's assessment of the value improvement that the first bidder can bring about. Specifically, the larger the improvement, ceteris paribus, the more negative the return. And if the improvement is smaller than the expected price, then point (2) will contribute positively to the bidder's return.

A.3.2. Zero value improvement

These points are illustrated by making one change in the example. Suppose that the takeover does not improve value, so the value of the target when acquired is the same as its stand-alone value of \$100. Replacing \$140 with \$100 in the above calculations shows that the bidder's stock return on the arrival of a competing bidder is 0%. The negative effect of the higher price that will be paid in the event of success is offset by the positive effect of an increased probability of failure.

The intervention method uses ex post data to estimate the various parameters of this numerical example: the unconditional probability of success of an initial bidder, the probability of success given the arrival of a competitor, the unconditional expected price paid by an initial bidder given that he succeeds, and the expected price he pays if he succeeds given that a competing bid occurs. Given these parameters (along with the initial shareholding of the bidder in the target), the value improvement from the takeover implies a specific stock return for the first bidder. It is therefore possible to infer the size of the value improvement from the observed stock return.

The above discussion is based on the distinction between creation of value and revelation of information about value. An action can create value as a direct result of revealing value; this in no way obviates the need to distinguish the two concepts. For example, if a takeover bid conveys to the market the idea that the bidder's prospects are good, customers or suppliers could be more willing to deal with the firm (e.g., Titman, 1984). If so, even a manager whose sole objective is to maximize fundamental value could expend resources to reveal information. Nevertheless, the value created by a corporate action is in general different from the value revealed. Generally, these quantities can have different orders of magnitude and need not have the same sign. Thus, the increase in stock price associated with a corporate action is an invalid measure of the effect of that action on underlying value. Furthermore, even if the announcement of a takeover bid makes market perceptions more favorable, and this change in perceptions in turn increased underlying value significantly, this value increase is not an actual benefit from combination, but a benefit of favorable revelation.[19] The intervention method accommodates, but does not require, possible effects of value revelation on fundamental value; it accommodates, but does not require, signaling motivations; and it estimates only those value improvements that result from combination of the two firms, not those that result from revelation about stand-alone value.

Appendix B. Robustness of IM results with respect to alternative parameter estimates

We analyze the robustness of the conclusion that the mean value improvement ratio is positive with respect to the parameter estimates for $\bar{R}_3$, $\phi_1, \phi_3, \bar{B}_1/V_0^{\mathrm{T}}$, and $\bar{B}_3/V_0^{\mathrm{T}}$. We conduct two experiments. First is a sensitivity analysis of IR^{IM} with respect to the probability of success unconditionally, ϕ_1, and conditional on a competing bid, ϕ_3; with respect to the expected price paid unconditionally, $\bar{B}_1/V_0^{\mathrm{T}}$, and conditional on a competing bid, $\bar{B}_3/V_0^{\mathrm{T}}$; and with respect to the mean first bidder stock return on announcement of a competing bid, $\bar{R}_3$. Second, we compare our results with those implied by samples studied by Bhagat et al. (1990) and Betton and Eckbo (2000).

We examine the effect of shifting each of these estimated parameters simultaneously in the direction of lower IR^{IM}. This check is stringent, because there is no reason to expect estimation errors all to boost the IR^{IM}. The results indicate that the conclusion that value improvements are on average positive is not very sensitive to shifts in parameter estimates. Even if all four of the estimated parameters are shifted by 12% of their respective mean values, the mean estimated IR^{IM} remains positive.

A limitation of the intervention method is that it provides value estimates only in those contests for which the intervention (competing bid) actually occurs. If contests that did not enter the intervention sample are different, the returns to the first bidder in such contests upon arrival of a competing bid would be systematically different from the first bidder returns in the actual competing bid sample. While it is

[19] In the numerical example, the increase in the market's stand-alone valuation of bidder from 200 to 250 could reflect not the direct effect on expectations of more favorable information, but the fact that the bidder's higher stock price could in itself help it to generate greater cash flows as a stand-alone entity.

impossible to address this issue conclusively, the conclusion of positive value improvements with respect to the estimated stock returns is extremely robust. The sensitivity to $\bar{R}_3$ provides an indication of whether the conclusions we derive are likely to be sample-specific. We recalculated IR^{IM} substituting fictional alternative values for $\bar{R}_3$ for all first bidders. Both the mean and median value improvements remain positive even for an abnormal return as high as +3.5%, and a majority are positive even for an abnormal return as high as +7%. (Intuitively, the reason that the estimates remain positive even when intervention returns are high is that the mean bid premiums are substantial. Thus, even if the value improvement is positive, if it is smaller than the expected price to be paid, the arrival of a competing bid and the associated reduction in the probability of the first bidder succeeding can be good news.) These robustness checks support the conclusion that value improvements are on average positive and substantial.

The conclusion of positive average value improvements applies in other samples as well. Bhagat et al. (1990) (BSV) analyze an exhaustive sample of hostile takeover contests in the U.S. during 1984 through 1986 when the purchase price was $50 million or more. Their sample consists of 61 contests: 50 targets were acquired and 11 remained independent. The first bidder was successful in 29 of the 61 contests. Competing bids were observed in 30 of the 61 contests. The first bidder prevailed in the face of a competing offer in nine instances.

The above figures indicate that in the BSV sample, ϕ_1, the probability of success of the first bidder in the full sample, is 29/61 or 0.4754. Also, ϕ_3, the probability of success of the first bidder in the presence of a competing bidder, is 9/30 or 0.3000. Similarly, we estimate $\bar{B}_1/V_0^{\mathrm{T}}$, and $\bar{B}_3/V_0^{\mathrm{T}}$ implied by the BSV sample. We then substitute these parameter estimates into the IR^{IM} formula transaction by transaction in our full data set to generate an alternative set of IR^{IM}'s.

The estimated input parameters from the BSV sample period (1984–1986) are fairly similar to those of this study. When the BSV sample parameter estimates are substituted into the IR^{IM} formula Eq. (13), the inference about IR^{IM} is unchanged, that the mean IR^{IM} is positive. Simultaneously substituting the BSV estimates for $\bar{B}_1/V_0^{\mathrm{T}}$, $\bar{B}_3/V_0^{\mathrm{T}}$, ϕ_1, and ϕ_3 with other mean parameters generates a mean (median) IR^{IM} of 9.0 (9.9).

Betton and Eckbo (2000) examine a sample of tender offers from 1971 to 1990. They report that, in their sample, the unconditional probability of bidder success was 0.6386 and conditional on a competing bid was only 0.1682. The unconditional expected premium was 56.96% and conditional on a competing bid was 85.60%. Applying these figures to our overall sample transaction by transaction in the IR^{IM} formula gives an average IR^{IM} of 17.5% (15.3%). This is somewhat higher than the estimates of about 13–15% using our own sample.

To summarize, in this appendix we have performed robustness checks by varying estimated parameters, both individually and simultaneously, and by using parameter estimates obtained from the BSV and the Betton and Eckbo (2000) samples. These analyses all confirm that value improvements were on average positive.

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