# Holdups, Renegotiation, and Deal Protection in Mergers*

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### Abstract

This paper examines the contracting and negotiation process in mergers using an incomplete contracts framework. Our multi-period model allows for the arrival of new information and renegotiation subsequent to the signing of an initial merger agreement but prior to deal completion or termination. We show that a properly designed initial contract solves the holdup problem during renegotiation and induces higher deal-specific effort that increases expected payoffs from the merger. The contract grants an option to the target to terminate the merger, while the strike on the option compensates the acquirer's effort without imposing excessive costs on the target for pursuing non-merger alternatives. The option strike can be implemented by the use of deal protection devices, such as a target termination fee or an acquirer lockup. Employing a large sample of stock mergers, we find evidence supporting model predictions for the renegotiation of contracts, deal outcomes, and the use of deal protection devices.

**Keywords:** Holdup, renegotiation, merger, deal protection, termination fee, lockup.

***JEL* Classifications:** G34, C71, D8.

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## Abstract

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## I. Introduction

During much of the 1990s the U.S. experienced a wave of mergers and acquisitions, characterized by a large number of stock-based, friendly mergers. High valued stocks became the attractive method of payment in acquisitions (Shleifer and Vishny 2003), while higher volatility of the stocks generated much uncertainty in evaluating prospective mergers. The outcome of such a merger largely depends on the bilateral bargaining between the target and acquiring firms' executives and their advisors. After the signing of an initial merger agreement, the two firms, the market and investors continue to receive new information regarding deal and firm values as the negotiation process unfolds. Our paper shows that this new information has significant impact on the form of contracts used, the renegotiation process, and final outcomes of mergers.[1]

In this paper we examine contract features used in stock mergers, from the announcement of an initial definitive agreement to the final completion or termination of the deal, as well as the renegotiation process in between. Despite significant advances in the literature on mergers and acquisitions, researchers generally have not considered the complexities of the bargaining process in mergers, or the impact of new information revealed after the signing of an initial agreement. Given the length of time needed to complete a merger, and the fact that the parties cannot prevent renegotiation of the initial contract given new information, opportunistic behavior ("holdup") is expected to arise during the bargaining process. Utilizing the incomplete contracts framework, we build a multi-period model to examine the contracting and bargaining process of a (friendly) merger, and derive three main results. First, following the signing of an initial merger agreement and subsequent release of new information, renegotiation ensures the ex post efficiency of the final outcome. Second, in order to solve holdup problems, the optimal contract imposes a cost for either side to terminate the merger. This

[1] The average length between the signing of initial agreement to the completion/termination of a deal is six months. Recent papers (e.g., Mitchell and Pulvino 2001, 2002; Mitchell et al. 2004; Hsieh and Walkling 2004) show that the release of new information significantly affects the risk and returns of merger arbitrage.

provides a new rationale for the use of deal protection devices in initial merger agreements, including termination fees, lockup provisions and "no solicitation" clauses. An acquirer's toehold can also mitigate the target's holdup problem. Finally, the comparative statics of our model specify how the cost of deal termination, implemented by the use of protection devices, varies with firm and deal characteristics. Our empirical tests provide evidence on the renegotiation process and outcome, as well as the determinants of the use of protection devices, which supports our model predictions.

In our model, the acquirer exerts effort before the completion or termination of the deal, both to develop and improve the business/operation plans for the target and the acquirer, and to complete the due diligence task that reveals potential problems in the pending merger. As such, the acquirer's effort increases the expected synergy of the merger. This effort is also "deal-specific," in the sense that the information obtained is only useful in evaluating this specific merger. At the same time, similar effort by the target can also increase the expected value of her non-merger alternatives, which include merging with another firm or remaining stand-alone. Unlike previous theories that are based on one-period models, we allow for the arrival of new information that (partially) resolves the uncertainty surrounding merger synergy and the target's non-merger alternatives.

Following the release of new information, one or both firms may have the incentive to renegotiate part of or the entire initial contract. The optimal initial contract grants the target an (call) option to forego the merger with the acquirer and instead pursue her best alternative. However, the target's option to terminate the merger is not "free," because if she can walk away from the deal without a cost, she will behave opportunistically by, for example, demanding a much higher offer price after the realization of synergy and non-merger alternatives. This holdup problem reduces the acquirer's *ex ante* incentive to exert costly, deal-specific effort, which in turn lowers the expected merger synergy and payoffs of *both* firms.

To solve the holdup problem, and to ensure that the acquirer has the right incentive to complete the deal after the signing of the initial agreement, the target must compensate the acquirer if she decides to terminate the deal. This is the strike price on the target's option. The optimal strike balances between compensating the acquirer's deal-specific effort and not imposing excessive costs on the target to pursue her non-merger alternative. With the optimal contract in place, renegotiation between the merging firms leads to efficient *ex post* outcomes, in that a merger will be eventually completed if and only if the realized merger synergy is higher than the target's non-merger alternative.

These results provide guidance for our empirical tests, which are based on a sample of more than 1,100 U.S. stock mergers announced between 1994 and 1999. Our first set of tests examines the possible outcomes following the signing of an initial agreement: either the deal is completed without any revision of the initial agreement, the terms of the agreement are amended, or the deal is terminated. The release of new information has a significant impact on whether firms amend the initial contract or terminate the deal. Observed reasons for contract amendment and deal termination include the target receiving other offers, large positive or negative cumulative abnormal returns on one or both firms' stocks (between announcements of initial agreement and final outcome), and external factors such as adverse rulings by courts or regulatory agencies. For a subsample of deals that are terminated or in which the terms of the initial agreement are amended, we find that the final outcome of the merger agrees with the outcome predicted by our model in nearly 80% of the deals. These results support the hypothesis that, with optimal initial contracts, renegotiation ensures ex post efficiency.

Our second set of tests examines deal protection devices specified in initial agreements. We argue that the strike price of the option-like contract in our model can be implemented by any of several protection devices in practice. In fact, most deals in our sample are "protected" by one or more devices. First, the device that closely resembles the strike price of the target's option is a termination fee (TF hereafter) on the *target* side, or the amount the target must pay the acquirer upon a target initiated termination of the deal. In 56% of the deals, a target TF is included, while in 22% of deals an acquirer TF is included *in addition to* the target TF. Among the deals with (positive) target TFs, the mean size is 3% of the total deal amount, or $55 million in dollar terms. If the target also contributes to the merger synergy by exerting deal-specific effort, then the acquirer has an incentive to hold up the target's effort. However, in most cases the acquirer is the one who has investigated the prospects of the merger and approached the target with an offer. Therefore, the holdup problem is likely to be more severe on the target side.[2]

A second protection device that helps to solve the target's holdup problem is an *acquirer*'s lockup option. This allows the acquirer to purchase a fraction of either the target's stock (share lockup) or assets (e.g., a division or segment; asset lockup) at a specified price, and becomes valuable when, for example, a rival bidder enters the control contest. This option can be regarded as the target's payment for the acquirer's effort, serving a purpose similar to a *target* TF, in that with either device the target pre-commits not to hold up the acquirer during subsequent negotiation. In 36% of the deals, the acquirer has a lockup, while in less than 25% of deals neither a TF nor a lockup is used. The use of a lockup can (partially) substitute for a target TF in solving the target's holdup problem, when there are costs in imposing a large cash TF on the target. For example, we find that when the target is in banking industry, acquirer lockups are used more frequently than target TFs, in part because committing to cash TFs upfront is costly for targets, in terms of maintaining cash reserves needed to meet regulatory capital requirements.[3]

The third protection device we consider, not yet examined in the M&A literature, is the "no solicitation" clause (on the target side). With this clause, the target professes that she will not actively

[2] We find that when the target is not too small relative to the acquirer (and has enough bargaining power to holdup the acquirer), or when the acquirer is larger in size, has higher return on assets and lower standard deviation of stock returns prior to the merger, all of which proxy for better merger prospects, the deal is more likely to be "protected" by one or more devices. We also find that when the size of the target is comparable to that of the acquirer (e.g., merger of equals), TFs are more likely to be used on *both* sides.

[3] Another potential cost in using a target TF is litigation risk. Prior to the court's decision in favor of the use of a target TF in the case of Brazen (shareholder) vs. Bell Atlantic in 1997, most of the target TFs are less than 5% of deal size, as managers fear that a higher TF will trigger target shareholder lawsuits. In these cases, a lockup is used in addition to a target TF, in order to solve a severe holdup problem on the target side and implement the option strike of the model.

solicit outside bids during negotiation with the acquirer, reducing the likelihood of target-initiated termination of the initial agreement. Hence, it can be viewed as another means by which the target commits not to hold up the acquirer. We find that this clause is included in more than 98% of all deals. In more than 96% of deals, there is an additional clause stating that while the target does not solicit bids herself, she will enter into merger negotiations with *unsolicited* bidders, permitting the target to pursue, ex post, more efficient outcomes. Consistent with our model, the presence of these two clauses demonstrates the importance of commitment in the initial agreement.

Finally, though not specified in the initial agreement, an acquirer's toehold, or target shares purchased by the acquirer prior to the announcement of the merger, is another device to solve the target's holdup problem. The root of the holdup problem is that, by threatening to terminate the merger, the target shares the acquirer's deal-specific effort. With a toehold, the acquirer participates in the appreciation of the target stock even if the merger between these two firms fails, and thus the target's threat becomes less effective (and the holdup problem less severe). We find a negative relation between the existence of a toehold and the likelihood of seeing either a target TF or an acquirer lockup, although this relation is not significant due to the small number of deals with positive toeholds.[4]

The final set of tests examines our model's predictions as to how the strike price of the target's option varies with deal and firm characteristics. We perform cross-sectional analysis to examine the determinants of the size of the target TF (percentage of dollar TF over total deal value), controlling for the use of other protection devices. First, we find that the target TF increases when the acquirer's market capitalization and industry-adjusted, pre-merger return on assets increase, all of which proxy for a higher productivity of the acquirer's effort during the merger process. Second, we find that the target TF decreases when the acquirer has successfully completed another acquisition during the three-

[4] Theoretical examination of the small toehold anomaly includes Chowdhry and Jegadeesh (1994), Ravid and Spiegel (1999), and Goldman and Qian (2005). One reason that an acquirer foregoes toehold acquisition in a *friendly* merger is that toeholds create hostility with the target manager, which makes deal completion more difficult (e.g., Betton et al. 2005).

year window prior to the current merger, or when the target has less *intangible* assets. With more acquisition experience, the acquirer is better able to use his effort from one deal to another, and thus his effort in the current deal becomes *less* deal specific and the target's holdup problem becomes less severe. In contrast, the acquirer's effort, aimed at improving the performance of a target with more intangible assets, becomes more deal specific, and thus the target's holdup problem becomes greater. Third, we find that the target TF decreases when she has better expected non-merger alternatives, which are proxied by higher, pre-merger return on assets (industry-adjusted), lower (industry-adjusted) leverage and a lower (industry-adjusted) book-to-market ratio.[5] We also find the target TF size is negatively related to the size of acquirer's toehold and the use of a lockup. All of these results support the comparative static predictions of our model.

Our paper relates to and extends previous research on several issues in M&As. First, there is a strand of theoretical literature arguing that the *initial* bidder's investigation of a potential target creates a positive externality for the target to pursue alternative offers, as other bidders can free-ride on the initial bidder's information, which in turn reduces the initial bidder's incentive to engage in costly information acquisition (e.g., Easterbrook and Fischel 1982; Bebchuk 1982; French and McCormick 1984). Deal protection devices thus compensate for the positive externality that the initial bidder creates, which induces an optimal level of information gathering (e.g., Berkovitch et al. 1989; Gilson and Black 1995; Weston et al. 2004). While this prior research examines the initial bidder's costly search effort *before* discovering the target, we focus on this acquirer's deal-specific effort *after* the signing of the initial merger agreement and subsequent renegotiation of this agreement. In a *friendly* merger, it is unlikely that the acquirer can effectively evaluate the sources and channels of merger synergy between the two firms until the target agrees to the terms of the initial offer, and grants the

[5] During 1994 to 1999, with market-wide preference of growth firms over value firms, a target that has lower book-to-market ratio is more of a "growth/glamour" firm, and hence her non-merger alternative, including "perceived synergy" when merging with other firms, is better (e.g., Rhodes-Kropf and Viswanathan 2004; Rhodes-Kropf et al., 2004). Consistent with our model prediction, the target TF in the current deal is lower.

acquirer the access to nonpublic financial and accounting information. In addition, our empirical evidence demonstrates that new information revealed prior to deal completion or termination drives the renegotiation process and final outcomes of mergers.

Second, several recent empirical papers examine the determinants of the use of lockups (e.g., Burch 2001) or TFs (e.g., Bates and Lemmon 2003; Officer 2003). These papers focus on whether these devices reflect an agency problem in which self-interested target managers discourage competition in control contests. Their key finding is that the use of a TF or lockup does not lower target shareholders' payoffs at initial merger announcement or deter competing bids. In contrast, our work focuses on the role of these devices in the contracting process. We build a unified theory demonstrating that a number of protection devices observed in practice can be used to solve holdup problems. We show theoretically that the goal of designing ex ante contracts is to maximize total expected payoffs between both firms. We also model and empirically examine the renegotiation process, including the impact of new information, and the ex post efficiency of merger outcomes.

A quandary within the incomplete contracts literature is that due to the highly abstract nature of most of the models, there is almost no related empirical work examining real contracts.[6] In this regard, our paper contributes to both the M&A and incomplete contracts literature, in that we derive testable implications that describe the contract environment in practice, and empirically examine the renegotiation outcome and the determinants on the use of deal protection devices.

The rest of the paper is organized as follows. In Section II we first develop a general model to examine the merger process, and then derive closed-form solutions for the optimal contract and testable implications. We test the model predictions using our sample of stock mergers in Section III. Section IV concludes and the Appendix contain all the proofs.

[6] A recent exception is Kaplan and Stromberg (2004), who examine contracts and holdup problems between venture capitalists and entrepreneurs.

## II. The Model of a Friendly Merger

The process and features of mergers fit well with (but have not been examined within) the literature on incomplete contracts.[7] Pioneered and developed by the work of Klein et al. (1978), Williamson (1979), and Hart and Moore (1988), this literature concerns a bilateral trade of a product, where there are *relationship-specific* efforts that generate more value inside the trade than outside the trade. The main problem is that opportunistic behaviors concerning the distribution of the benefits from relationship-specific efforts (holdup problem) may arise after the realizations of the value and costs of production are observed and prior to the completion of the trade.

A solution to the holdup problem is to design binding contracts; the task of designing contracts becomes straightforward if both the effort and the uncertainty in the value and cost of the product can be fully specified and verified by a third party. However, these assumptions are often unrealistic, and the resulting *incompleteness* of contracts and opportunistic behavior leads to under-investment in relationship-specific efforts by one or both sides, which in turn lowers the payoffs of both parties. Recent models have shown that simple contracts observed in practice can solve the holdup problem. These ex ante contracts specify the sharing rule of the total expected surplus from trade and the renegotiation process after the uncertainty in trade conditions is resolved. Our model of mergers is based on some of the main developments in this recent literature.[8]

### II.1 Elements of the Model

Consider a risk-neutral acquirer and target, who are interested in completing a merger. The merger process is depicted in Figure 1 below. At t = 0, the acquirer and target decide whether and how to write a contract specifying the terms of merger that will take place at a future date t = 3. At t = 1,

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[7] See Tirole (1999) for a survey on incomplete contracts, and Holmstrom and Kaplan (2001) for a recent survey on M&As.
[8] There is also a strand of literature on the design of optimal legal remedies for breach of contracts (e.g., Shavell 1980; Rogerson 1984), which shows that the punishment for breaking a contract should not be excessive as it will induce over-investment in relationship-specific effort.

they both make effort choices. At t = 2, the realizations of merger synergy (*V*) and the target's non-merger alternative (*W*) are publicly observed, based on which renegotiation of the initial contract can take place. Finally, at t = 3, the firms decide whether to complete or terminate the merger, and payoffs to both firms are realized. The multi-period sequence of events, which allows for the release of new information and renegotiation following the signing of the initial contract, is an important distinction of our model from previous theories of mergers.

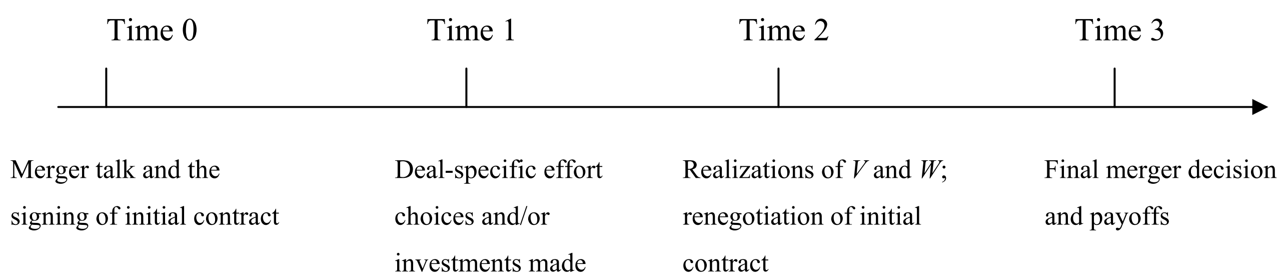


**Figure 1 Merger Timeline**

The expected synergy of the merger, above and beyond the combined market values of both firms, is denoted by $V(e_A, \theta)$: $e_A$ is the acquirer's *deal-specific* effort exerted at t = 1; $\theta$ is a random state variable following a cumulative distribution function (cdf) $F(\cdot)$ and its realization observed at t=2. By exerting effort, the acquirer can discover and evaluate possible sources and channels of merger synergy between the two firms, including both the development and improvement of business and operation plans for the combined firm, as well as the due diligence task that reveals potential problems in the merger. Since the synergistic gains will not be observed until Time 2, the acquirer's effort increases the expected synergy, *V*.

The above specification of *V* implies that the target does not contribute to expected synergy. As discussed earlier, the holdup problem on the target side is likely more severe than that on the acquirer side. This is true when the acquirer approaches the target with an offer and exerts deal-specific effort, and so that the acquirer has more (sunk effort) to lose during the bargaining process than the target. We therefore focus on the acquirer's deal-specific effort in our model, which leads to the target's holdup problem. However, our model can be easily extended to consider the holdup problem on both sides. This can occur when, for example, the target is not much smaller than the acquirer (e.g., merger of equals), and her importance in contributing to the success of the merger (in addition to the acquirer's contribution) cannot be ignored.

Although the target does not contribute to merger synergy, her effort, $e_T$, does improve the (expected) best alternative if *not* merging with the acquirer, above and beyond the current market value. We denote this non-merger alternative by $W(e_T,\omega)$, and it is increasing in $e_T$. The target's effort in exploring non-merger options is triggered by the initial merger talk, and includes remaining stand-alone and identifying other firms as merger partners.[9] The random state variable, $\omega$, follows a cdf $G(\cdot)$, and its realization will be observed at t = 2. Finally, $C(e_A)$ and $C(e_T)$ denote the strictly increasing and convex cost functions of the efforts.

We first examine the First Best solution of the merger process. This is equivalent to choosing optimal levels of efforts and maximizing the *joint* expected surplus of the merging firms, calculated before effort choices are made (t=1) and the realizations of *V* and *W* observed (t=2):

$$W^{FB} \equiv \underset{(e_A,e_T)}{Max}\left[\iint_{\theta\omega} \max[V(e_A,\theta),W(e_T,\omega)]dG(\omega)dF(\theta) - C(e_A) - C(e_T)\right]. \tag{1}$$

The first term (double integrals) in (1) denotes the total expected surplus between the two firms. As the "max" operator inside the integrals indicates, the First Best decision is to complete the merger if and only if the (realized) value of the synergy, *V*, is larger than *W*, the target's best alternative. The "Max" operator outside the bracket implies that optimal effort choices maximize joint total payoffs from the efficient merger outcome, net of costs. Once First Best effort choices $e_A^{FB}$ and $e_T^{FB}$ are made, lump sum transfers between the two firms can compensate for the cost of these efforts.

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[9] As stated above, the "no solicitation" clause should not prevent the target's effort in maximizing the expected value of her non-merger alternatives, including searching for outside bids. Boone and Mulherin (2004) find that in some deals the target solicits potential bids *prior to* committing to negotiating with a particular acquirer, but such effort from the target can extend beyond the signing of the initial agreement.

### II.2 Solution to the Holdup Problem in Second Best

In second best situations, each of the merging firms seeks to maximize their respective payoffs from the merger. The goal of designing contracts at t=0 is to ensure that, both the acquirer and target's efforts and the total expected payoff are as close to First Best as possible. The following assumption clarifies what are and are not contractible in our model.

**Assumption 1** *The following assumptions hold throughout the model:*

a) *Information on state variables* $\theta$ *and* $\omega$ *is* symmetric *to all parties at any point of time;*

b) $\theta$ *and* $\omega$ *are observable at t=2, but they are not* verifiable (*e.g., by a court*)*;*

c) *any and all parts of the initial contract signed at t=0 can be renegotiated at t=2, following the realizations of V and W; as long as both sides agree to the entirety of the renegotiated contract, the initial contract will be voided (by the court);*

d) *the court can verify* who *initiates a termination of the initial merger contract at t=2, but cannot verify* why *the termination is initiated.*

As seen in standard incomplete contracts models, we assume a symmetric information structure (Assumption 1a) to highlight the holdup problem on the acquirer's effort and its solutions. This assumption is also justified by the fact that during the (friendly) merger process, management teams from both firms hold extensive conversations and exchange information about each other, and it will be difficult for either side to hide significant information from the other. Similar to previous research, we assume that the two state variables are not verifiable, and thus ex ante contracts cannot be written contingent on future realizations of these variables (Assumption 1b). This assumption is justified by the complex nature of the M&A process and actual legal cases of disputes among merging firms and their shareholders. Assumption 1c) states that renegotiation of the initial contract, following the release of new information on *V* and *W,* cannot be prevented. Finally, Assumption 1d), similar to Noldeke and Schmidt (1995) and different from Hart and Moore (1988), implies that both sides know that inclusion of a contract feature such as a TF in the ex ante contract is enforceable at t=2.

If there is no ex ante contract, then the two sides can negotiate *after* the realizations of $\theta$ and $\omega$ are observed to decide whether to merge and how to split the total surplus (e.g., via Nash Bargaining). In Appendix B, we show that efforts made at t = 1 without any contract signed at t=0 (and sharing rule determined by ex post Nash Bargaining) will be less than First Best efforts, a result that is standard in the incomplete contracts literature. The interesting case in the second best situation, where the signing of a complete, state-contingent contract is not feasible, is to examine whether any simple contract can induce the First Best efforts and merger outcome. Aghion et al. (1994) provide the insight that one solution is to grant (ex ante) the right to make the "take-it-or-leave-it" offer and the *residual claim* of the total expected payoffs to the party that will exert the relationship-specific effort. Under this sharing rule, the marginal value created by the relationship-specific effort will not be shared by the other party, and hence the First Best effort choice will be made. Within the canonical buyer-seller model, Noldeke and Schmidt (1995) show that an option-like contract can implement this sharing rule. In their model, the seller has a *put* option to sell the product to the buyer for a fixed price (strike) when the cost of production is low relative market value of the product so that profits can be made. Applying the Aghion et al. (1994) sharing rule to our M&A framework, the acquirer, who exerts deal-specific effort that increases the expected merger synergy, makes the offer to purchase the target's equity and/or assets and owns the residual claim of total payoffs from the merger beyond the value of the option granted to the target. The target's option allows her to walk away from the merger, if doing so provides her with higher payoffs. Therefore, in our model the target has a *call* option with the underlying asset being the value of her best non-merger alternative ($W$).

The target's call option, however, is not free, because without any cost in terminating the deal, she will behave opportunistically after the realization of $V$ and $W$. For example, the target demands that the acquirer increases her share of the value of deal-specific synergy (created by the acquirer's effort), or else she will withdraw from the merger. This holdup problem reduces the acquirer's incentive to exert costly effort at t=1. Therefore, the time 0 contract must have the target compensate the acquirer upon terminating the deal at t=2. This is the strike price (denoted by *k*) on the call option granted to the target. On the one hand, the strike must be high enough to motivate the acquirer's (First Best) effort; on the other hand, the strike cannot be too high or else the target loses the incentive to exert effort that increases *W*, which is also part of the total payoff of the two firms (recall that the acquirer has the residual claim on this total payoff).

With an understanding of the option-like contract, we can now formally describe the initial contract signed at t=0. This contract includes the pair ($p_0$, *k*). First, $p_0$ is an initial constant payment to the target; a natural interpretation for $p_0$ is the initial offer premium (in dollars) paid by the acquirer to the target over the target's current market value. In our model of symmetric information, we focus on the holdup problem rather than how the initial offer price is determined, and treat $p_0$ as exogenously given like in other incomplete contracts models.[10] Second, the constant *k* is the strike price on the target's option. Given the option contract and ($p_0$, *k*), the target's expected payoff (prior to t=1), is:

$$U_T = \underset{e_T}{Max}\left[\int_{\omega} \max[W(e_T,\omega) - k, p_0]dG(\omega) - C(e_T)\right]. \tag{2}$$

The target maximizes her expected payoff by choosing the effort $e_T$. The first term in (2) indicates the value of the call option with strike *k*; since *k* is a constant and the value of synergy, *V*, is independent of $e_T$, the target's effort choice in second best is independent of the acquirer's. On the other hand, the acquirer's expected payoff (prior to t=1), given the target's option, is:

[10] As shown in Hart and Moore (1988) and Noldeke and Schmidt (1995), any division of the Time 0 total surplus can be achieved by choosing $p_0$ (can be as low as 0) appropriately, but it does not affect renegotiation or effort choices. In practice there are several forms of stock-based contracts, including collars, offered by the acquirer to the target. By offering different contract forms including collars, acquirers can signal both the value and risk of the synergy, and resolve problems of asymmetric information. For these reasons we control for offer types in our empirical tests. See Section III below for more details.

$$U_A = \underset{e_A}{Max}\left[\iint_{\theta\omega} \max[V(e_A,\theta),W(e_T,\omega)]dG(\omega)dF(\theta) - \int_{\omega} \max[W(e_T,\omega)-k,\, p_0]dG(\omega) - C(e_A)\right]. \quad (3)$$

As above, the acquirer owns the total expected surplus (the first integral in (3)), net of the value of the call option that he writes to the target (the second integral). It is also clear that the acquirer's problem of choosing $e_A$ to maximize his expected payoff depends on the target's effort choice $e_T$, which in turn depends on $k$.[11]

Next, we derive payoffs of merging firms *after* the realizations of $V$ and $W$ are observed (t=2; effort choices and costs of effort are sunk) and the outcome of merger (t=3).

**Lemma 1** *Given the time 0 option contract* ($p_0$, $k$) *and expected payoffs specified in (2) and (3),*

a) *the target's payoff at t=2 is given by:*

$$U_T = -C(e_T) + \begin{cases} p_0, & W - k < p_0; \\ W - k, & W - k \geq p_0. \end{cases} \quad (4)$$

b) *the acquirer's payoff at t=2 is given by:*

$$U_A = -C(e_A) + \begin{cases} W - p_0, & V < W, and\, W - k < p_0; \\ V - p_0, & V \geq W, and\, W - k < p_0; \\ k, & V < W, and\, W - k \geq p_0; \\ V - (W - k), & V \geq W, and\, W - k \geq p_0. \end{cases} \quad (5)$$

c) *the merger will be completed at t=3 if and only if* $V \geq W$.

The target's payoff is described in (4) of Lemma 1a). Whenever $W - k \geq p_0$, that is, when the value of her non-merger alternative is greater than the sum of initial offer premium and the strike price on the call option (of termination), she exercises the option and receives exactly $W - k$; when the reverse is true, the target receives the constant payment $p_0$. The acquirer's payoff, denoted in (5) of Lemma 1b),

[11] As discussed earlier, we only consider the holdup problem on the target side (and the call option granted to the target) in the model. In the case where there is also a holdup problem on the acquirer side, the solution will then be to also grant the acquirer an option to terminate the merger with a properly chosen strike. We numerically derive and verify the result that the strike on the acquirer's option increases with the degree of his holdup problem and the productivity of the target's effort in increasing deal synergy. Details are available upon request from the authors.

depends on whether the target exercises the option ($W - k \geq p_0$), and whether the merger is completed ($V > W$). Since the initial contract (specified in (3)) dictates that the acquirer holds the residual claim of the total payoffs, the sum of the merging firms' payoffs at t=3 is equal to either $V$ if the merger is completed, or $W$ if the merger is terminated.

The acquirer's payoffs when the target exercises her option (and receives $W - k$) are more straightforward (denoted in the bottom two rows of (5)), and we examine these first. When $V < W$ (third row of (5)), the merger is terminated and the acquirer receives the strike price ($k$) paid by the target. This case includes the possibility that the target receives an outside bid (after the signing of initial contract) that is higher than the realization of $V$. As noted before, the payment of $k$ must be made from the target and/or the outside bidder to the acquirer, or otherwise the acquirer loses the incentive to exert First Best effort ($e_A^{FB}$). Notice that if $V > k$, the *acquirer* may want to complete the merger and deviate from the payoff of $k$ specified in (5); since the target is guaranteed a payoff of $W - k$ by exercising her option, the acquirer must offer the same amount to convince the target to complete the deal (rather than terminating it), but this is not profitable because $V - (W - k) < k$ since $V < W$.

When $V > W > p_0 + k$ (last row of (5)), with a high realization of $V$ the acquirer can raise the final offer to the target from $p_0$ to $W - k$, the amount that the target would receive from her non-merger alternative, and convince her to complete the merger while capturing the residual claim of ($V - (W - k)$) himself. Since $V > W$, $V - (W - k) > k$, so by sweetening the deal and completing the merger the acquirer does better than allowing the target to terminate the deal.

Next, the top two rows of (5) represent the acquirer's payoffs when the target's option is not exercised (and receives the constant $p_0$). When $V > W$ but $W - k < p_0$ (second row of (5)), the merger is completed and the acquirer does not alter the initial offer of $p_0$, because the target's option is worthless. When $W > p_0$, the target may want to terminate the deal and earn $W$ instead; however, her (ex post) threat of termination is not credible, because she has to pay $k$ to the acquirer to break up the deal, but

$W - k < p_0$ so that her payoff of merging with the acquirer is actually higher than that of deal termination.

Finally, the case of $V < W$ and $W - k < p_0$ (first row of (5)) is more complicated. On the one hand, the merger should not be completed from the efficiency standpoint; on the other hand the target's option is not in-the-money so her (ex post) threat of termination is not credible. According to the option contract and the sharing rule that the acquirer receives the residual claim of the total payoff, the target receives $p_0$ while the acquirer earns $W - p_0$. Unlike the previous three cases, where we have shown there will be no ex post bargaining and thus no deviation from the payoffs specified in Lemma 1, both sides may have incentive to revise the initial contract in the current case (See Appendix A.1 for more details). For example, if $W > p_0$ the target has a strong incentive to renegotiate, because she is paying the acquirer an amount of $W - p_0$ even though the merger is terminated; when the opposite is true ($W < p_0$), the acquirer wants to renegotiate as he is paying the target an amount of $p_0$ while incurring a loss of $p_0 - W$ despite deal termination. In practice we observe the payoff pair of [0, $W$] when a deal is terminated: Effectively the acquirer withdraws the initial offer $p_0$ (and receiving 0) while imposes no penalty on the target to terminate the merger (and receiving $W$); an alternative interpretation of this payoff pair is that the acquirer's initial offer ($p_0$) is *conditional* on the *success* of the merger.

It is important to point out that while the payoff pair of [$W - p_0$, $p_0$] based on Lemma 1 yields the First Best effort choices and merger outcomes and is *ex ante* optimal, a payoff pair such as [0, $W$] as a result of ex post bargaining is not (unless $W = p_0$, in which case these two pairs are identical). I.e., if the merging firms know, at time 0, that the payoff pair of [$W - p_0$, $p_0$] will be renegotiated to [0, $W$] following realizations of $V$ and $W$ satisfying $V < W < p_0 + k$, the resulting efforts (exerted at time 1) are strictly *less* than the First Best levels; this is because the target's effort choice, based on (2) and given a strike price, is no longer independent of the acquirer's effort decision. We can solve for the effort levels under this alternative payoff and ex post bargaining structure (details are available from the authors upon request), and call them "third best."

To summarize, Lemma 1 provides payoffs and merger outcome following the ex ante option contract. If there is no ex post bargaining that leads to deviation of the payoffs specified in (4) and (5), then merging firms provide First Best efforts and the merger outcome coincides with that of First Best as well. In Section III, we empirically test the outcome of renegotiation for a sample of merger deals and verify the accuracy of model predictions, and in particular, those from Lemma 1.

Finally, we derive the optimal $k^*$ that induces first best efforts in second best. From the target's effort choice problem specified in (2), the first order condition yields her optimal effort choice as a function of $k$. We can equate this effort choice to that of the First Best effort choice, and find an optimal $k^*$ that induces the target to provide First Best effort. On the other hand, given that the optimal $k^*$ from the target's problem in (2) induces First Best target effort, i.e., $e_T(k^*) = e_T^{FB}$, in the Nash equilibrium the acquirer's best response is to choose $e_A = e_A^{FB}$ in (3). Consequently, the First Best surplus is achieved in second best. The proposition below summarizes the analysis for deriving $k^*$.

**Proposition 1** *There exists a unique $k^*$ such that effort choices on $e_A$ and $e_T$, under the option contract specified in Lemma 1, are the same as those in First Best. Moreover, any division of ex ante surplus of the total surplus can be achieved by choosing the constant, $p_0$, properly.*

**Proof:** Similar to the proof of Proposition 2 in Noldeke and Schmidt (1995).

**II.3 Equilibrium and Comparative Statics**

Having derived the general procedure to solve for the optimal strike price $k^*$ and effort choices, we next present a specific example of our model, and derive testable implications. The following assumptions specify the functional forms of model parameters.

**Assumption 2** *The synergy of the merger follows $V = l_A e_A + \theta$; the target's best alternative follows $W = h_T e_T + \omega$; and cost of effort $C(e_i) = ce_i^2/2$, where $e_i = \{e_A, e_T\}$.*

**Assumption 3** *State variables* $\theta$ *and* $\omega$ *follow Uniform distribution:* $\theta \sim Unif\,[0,\ \bar{\theta}\ ]$, *and* $\omega \sim Unif[0, \bar{\varpi}\ ]$; *and they are* independent.

**Assumption 4** $c\bar{\varpi} \geq 2\max\left(h_T^2, l_A^2\right)$; *and* $c\bar{\theta} \geq 2\max\left(h_T^2, l_A^2\right)$.

First, in Appendix A.2 we prove that when the acquirer's effort (target's effort) becomes relatively more important in increasing the total surplus $W^{FB}$, which can result from an increase in $l_A$ or $\bar{\theta}$ or a decrease in $\bar{\omega}$ (an increase in $h_T$ or $\bar{\omega}$ or a decrease in $\bar{\theta}$), the acquirer's *First Best* effort (the target's effort) increases in order to maximize $W^{FB}$. These results also help us understand our comparative statics for the second best contracts.

**Proposition 2** *The First Best efforts and payoffs can be achieved by choosing the option contracts specified in Lemma 1, with the optimal strike* $k^*$*:*

$$k^* = \frac{\bar{\theta}}{2} + \frac{l_A^2(c\bar{\theta} - 2h_T^2)}{2c(c\bar{\varpi} - l_A^2 - h_T^2)}.$$

**Proof:** See Appendix A.3.

Proposition 2 states that a properly chosen strike price on the target's option (second best contract) induces First Best efforts by solving the holdup problem. It is important to emphasize that in our model, the goal of designing time 0 contracts is to maximize expected joint surplus, not the probability of completing the merger. In particular, when the merger synergy is expected to be low relative to that of the target's non-merger alternative, the contract should not force her to merge with the acquirer or impose excessive costs on her to withdraw.

**Corollary 1** *The optimal strike,* $k^*$*,* increases *as* $\bar{\theta}$ *increases, or as* $l_A$ *increases.*

**Proof:** See Appendix A.4.

As $\bar{\theta}$ (twice the mean of the random component of merger synergy $V$) or $l_A$ (the productivity of acquirer's deal-specific effort) increases, the acquirer's role in increasing total surplus becomes more important because merger synergy is expected to be higher. Therefore, in order to induce the efficient

First Best efforts and outcome, the option contract should impose a higher cost, or a higher $k^*$, on the target to withdraw from the merger, so as to compensate the acquirer's effort. A higher strike also increases the probability of merger completion, ceteris paribus, but this is optimal because merger (rather than the target's non-merger alternatives) is more likely the First Best outcome.

**Corollary 2** *The optimal strike, $k^*$,* decreases *as $\bar{\omega}$ increases, or as $h_T$ increases.*

**Proof:** See Appendix A.4.

As $\bar{\omega}$ (twice the mean of the random component of target's alternative $W$) or $h_T$ (the productivity of target's effort) increases, the value of the target's non-merger alternative is expected to increase relative to merger synergy, and thus her role in increasing total surplus becomes more important. Therefore, the second best contract should impose lower costs on the target, or a lower $k^*$, for withdrawal in order to induce her First Best effort. A lower strike also decreases the likelihood of completion of the merger, but this is again optimal because the First Best outcome now more likely comes from the target's best non-merger alternative. In the next section, we provide empirical tests to examine predictions of Corollaries 1 and 2.

## III. Empirical Evidence

### III.1 Description of Data

Our sample is based on all mergers (in the U.S.) that are announced between January 1994 and December 1999 that are included in the Security Data Corporation (SDC) database. To ensure the accuracy of information, we also rely on the SEC's database of electronic company filings, which dates back to 1994, and the Dow Jones Interactive company filings database. We exclude all-cash mergers in this period, because many of these deals were hostile takeovers, in which a target's holdup opportunity would not exist. This results in an initial sample of 1,583 stock merger deals (Table 1). Unlike previous work, we exclude 90 deals that do not have an initial definitive agreement, with announcement date available from one of the above three databases. Without a formal agreement, there is no binding mechanism in place to prevent opportunistic behavior during negotiation. Not surprisingly, none of these 90 deals is completed. Our final sample, therefore, includes 1,104 deals.[12]

**Insert Table 1 and Figure 2 here.**

In our sample of friendly stock mergers, very few acquirers have a positive toehold at the date of initial agreement. When they do exist (31 deals), their average size is large (mean 20%, median 18.5%), and they range from 1% to 44%.[13] The last four columns in Table 1 describe the use of deal protection devices. First, target TFs are used in 56% of all deals, while acquirer TFs are included in 22% of all deals (acquirer TFs are never observed without a target TF). Both target and acquirer TFs are used more often in deals announced during 1997-1999 than those announced before 1997, possibly due to the outcome of several lawsuits filed by target shareholders in 1997, favoring the use of deal protection devices (see Coates and Subramanian (2000) for more details). In all of our subsequent tests, we include a dummy, "POST97," which equals to 0 if a deal is announced before 1997, to control for this effect. Figure 2 illustrates the distribution of all *non-zero* target TFs in our sample, as a fraction of deal size. While the distribution spreads from below 1% to as high as 15% of deal size, it is clustered between 1% and 4%. For these non-zero observations, the mean of target TF is 3.01% of deal size, or $55.32 million in dollar amount.

We also find that lockups are granted to the acquirer (both the share and asset lockups) in 36% of deals, and are used more often after 1997. Due to data limitation, we can only use a dummy variable indicating the use of a lockup in our tests. Since SDC does not provide information on the use of the target's "no solicitation clause," we manually search for it (and related clauses) in online SEC filings (forms 8-K or S-4) for each deal. Among the 960 deals for which we can find online filings, this clause

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[12] The financial and accounting information of both the target and the acquirer is obtained from the CRSP database and Compustat Annual files, while information on acquiring firms' CEO is collected from the ExecuComp database.
[13] We drop 17 deals in which the toehold is larger than 50% (of all target shares). Not surprisingly, all of these deals are completed, and neither a TF nor a lockup is used.

is included in 948 deals. Moreover, for more than 96% of these deals, there is an additional clause immediately following the "no solicitation" clause, stating that while the target does not solicit bids herself, she can enter into merger negotiations with unsolicited bidders and provide private information to the rival bidders. Consistent with our model, the combination of these two clauses can help the target to commit not to hold up the acquirer, but we do not include them in our tests due to the lack of variation across deals. All of our empirical results do not change when we exclude the few transactions without these provisions.

**III.2 Empirical Tests on the Renegotiation Process and Ex Post Efficiency**

Our first set of tests concerns the renegotiation process, and both the determinants and ex post efficiency of final outcomes of the deals. Following the signing of initial definitive agreement, we observe one of three possible outcomes: 1) the deal is completed *without* amendment of the initial agreement; 2) the deal is terminated; or 3) terms of the initial agreement are amended and subsequently the deal is either completed or terminated. Due to imperfect reporting to SDC, we again manually examine 8-K and S-4 filings of each deal to verify the amendments to the initial agreement.[14] This process yields 96 deals in which terms of the initial agreement are amended and 83 terminated deals. Our subsample of *terminated* deals is smaller than that of Bates and Lemmon (2003) and Officer (2003) because we exclude deals without an initial definitive agreement, all of which are terminated.

Tables 2-A and 2-B contain information collected from various online news agencies or final merger agreements on the reasons for deal termination and contract amendment. From Table 2-A, the most common reasons for termination are related to information released subsequent to the announcement of initial agreement. These include adverse price changes or news (about target and/or acquirer), competing bids for the target, and exogenous factors such as rulings by courts or regulation

[14] For example, SDC does not differentiate cases in which the offer prices are revised during negotiation between the two firms from those in which changes in offer prices result from stock splits and dividend payments during the merger process. If there is more than one amendment to the original contract, we record the information from the *final* amendment as the reason for renegotiation and how the terms are revised.

agencies. When the target receives a competing bid higher than the offer from the acquirer, she initiates termination in all 15 cases; in 12 of these 15 cases, the target TF is paid by the winning bidder. Accordingly to our model, the payment (target TF) from the rival (winning) bidder to the acquirer is economically sensible, because without the TF the rival bidder can (partially) free-ride on the acquirer's deal-specific effort, which in turn would reduce the acquirer's incentive to exert effort. On the other hand, when a deal is struck down by a court or regulator, in 6 out of 8 deals, both sides agree to terminate the deal and the TFs are waived. The enforcement and waiver of the TFs in these terminated deals demonstrates efficient ex post bargaining. Table 2-B summarizes the reasons for amending terms of the initial merger agreement, and similar to those included in Table 2-A, they are related to information announced after the announcement of the initial agreement. More than 90% of the amended deals are eventually completed.

**Insert Tables 2-A, 2-B, 3 and 4 here.**

In Table 3 we examine factors determining the outcome of deals following the signing of initial definitive agreement, using multinomial logistic regressions. The *default* outcome (dependent variable = 0) is "completed without amendment," while the alternative outcomes (dependent variable = 1) are "Terminated" without amendment (Columns 1 and 3), or "Amended" (Columns 2 and 4). The first set of explanatory variables is obtained *after* the announcement of initial agreement but before deal completion or termination. A key assumption of our model is that the uncertainty about synergy is not resolved until after the initial contract is signed and effort choices are made, and that this new information directly triggers renegotiation and affects the final outcome of the merger.[15]

The dummy variable "COMPETE," which equals 1 if the target receives competing bid(s) after the initial agreement is announced, has a substantial impact on the likelihood of deal termination or amendment (positive and significant at 1% in all regressions). In terms of implied probabilities, with

[15] Existing evidence also illustrates that corporate insiders learn and update their knowledge about merger prospects from the market reaction to the announcement of initial agreement (e.g., Luo 2004).

competing bids the likelihood of deal termination increases by about 17%, while the probability of deal amendment increases by about 35%, as compared to single acquirer cases. Second, the variable "ΔTRETSD" (ΔARETSD) measures the *change* in the standard deviations of the target (acquirer) daily stock returns over a three-month period before versus after the announcement of the initial agreement. An increase in one of these two variables implies that additional uncertainty regarding the firm and the merger arises after the deal is announced, and leads to a higher probability that the deal is either terminated (significant at 1%) or amended. In terms of marginal effects, when the ΔARETSD increases by 10% from the sample mean, the probability of deal termination increases by 7.6% to 8%, while the probability of deal amendment increases by 8.8% to 10.6%.

Third, the variable "A-CAR" ("T-CAR") is the cumulative abnormal stock returns of the acquirer (target) after the announcement of initial agreement and before the completion or termination date. If the market reassesses the target stock (and merger synergy) downward following the initial announcement (a lower T-CAR), the deal is more likely to be terminated or amended (both significant at 1%). In terms of economic significance, the probability of deal termination and amendment both increase by 0.7% when T-CAR falls by 10% from the sample mean. Overall, consistent with our model assumptions and predictions, the variables that measure new information revealed after the signing of initial agreement significantly affect the likelihood of whether the initial contract is renegotiated and whether the deal is ultimately completed.

The second set of explanatory variables is deal and firm characteristics observed *prior to* or at the time of the initial agreement, considered to be determinants of deal completion in previous studies. When the (log) ratio of acquirer's market capitalization over that of the target ("LRSIZE") increases, the deal is more likely to be completed than terminated. The impact of both the acquirer and the target's pre-announcement industry adjusted return on assets ("A-ROA" and "T-ROA") on deal outcome differs across models. Given the significance of post-announcement variables above, it is important to point out that pre-announcement measures alone do not determine the final outcome of the merger. Conditional on the post-announcement information (and interaction between pre- and post-announcement variables), we find, in Columns (3) and (4), that the acquirer per-merger ROA has no impact on deal outcome, while a higher target pre-merger ROA reduces the probability of deal amendment.[16] The terms of the initial offer including "Premium" (initial offer price, per share, over target price) or the percentage of the payment being cash ("PCTCASH"; cash is also used as part of the method of payment in 24% of all deals) seems to affect the outcome of the deal. Finally, if the target is in the banking industry ("TBANK" dummy equals to 1), the deal is more likely to be completed. This is caused by deregulation both at state (in 1980s) and federal levels (in 1997) in banking industry, which makes it possible to complete interstate bank mergers (e.g., DeLong 2001). All of our main empirical results are robust to tests performed on all non-bank mergers.

The third and final set of explanatory variables in Table 3 relates to contract features of the initial agreement, including offer types and the use of deal protection devices. Not reported in Table 1, we find that by far the most frequently used offer type is the *Fixed Exchange Ratio* (FEX) offer, in which each share of the target stock is exchanged for a fixed number of acquirer shares, while the least frequently used offer type is *Fixed Payment* (FP) offer, in which the total amount of the transaction is fixed but the exchange ratio floats. In about 30% of deals, a collar, which specifies how the target's payoff depends on the acquirer's stock prices, is used to modify either a FEX contract (a FEX collar, or FEXC) or a FP contract (a FP collar, or FPC). Relative to the FEX contract (default contract type), the use of FP contract increases the probability of deal completion (insignificant) and deal amendment (significant at 10%). The use of both types of collars increases the probability of deal amendment (e.g., the use of FP collar increases the probability of amendment by 7%), while the inclusion of a collar to

[16] We interact the pre-announcement acquirer ROA with market reaction on the target stock (Negative-TCAR is a dummy variable that equals 1 if T-CAR is negative), and similarly we interact T-ROA with A-CAR. A positive coefficient on AROA∗Negative-TCAR (Column 3) indicates that when the market reacts negatively toward target stock, the deal is much more likely to be terminated regardless of the acquirer's ROA prior to the merger. Similarly, the deal is more likely to be amended if the market reacts negatively toward the acquirer (Column 4).

the FEX contract leads to a higher probability that the deal is terminated than without it. Overall, these results are consistent with Officer (2004), who argues that the inclusion of collars in initial agreement facilitates deal completion by avoiding the (costly) renegotiation of initial offer prices. In contrast, we examine the holdup problem in merger, resulting from the *inability* to prevent renegotiation following the arrival of new information, and propose deal protection devices as a solution.

Among the various devices (target and acquirer TFs, acquirer lockups and toeholds), which can mitigate the holdup problem, only the acquirer TF has a statistically significant impact on deal completion: the marginal effect of the use of acquirer TF reduces the probability of termination, relative to completion, by 2%. The use of target TF actually *increases* the probability of deal termination (but not significant), in contrast to what previous papers find. The difference of the impact of the target TF is again due to whether terminated deals without a formal initial agreement are included in the sample.[17] The insignificance of deal protection devices is consistent with our model: The goal of designing time 0 contracts is to maximize expected joint payoffs in the presence of holdup problems, not to maximize the probability of completing the merger. When the merger synergy is expected to be low relative to that of the target's non-merger alternative, the contract should not force her to merge with the acquirer or impose excessive costs on her to withdraw.

Finally, we consider the ex post efficiency of the final merger outcome by comparing the actual outcome to the prediction of the model, and the results are presented in Table 4. Since our goal is to examine the outcome of renegotiation, we do not include deals that are completed without any revision of the initial contract, leaving us with the deals that are either amended or terminated (presented in Tables 2-A and 2-B). The reason that we include the subsample of terminated deals (Table 2-A) in our test is because the decision to terminate should follow *unsuccessful* renegotiation. Our final

[17] We exclude these deals (90 from Table 1) in our sample, but when we add these deals back we find qualitatively similar results as Bates and Lemmon (2003) and Officer (2003); in particular, the use of target TF *increases* the probability of deal completion.

renegotiation sample includes 145 deals.[18]

Recall that the optimal contract in the model (Lemma 1) allows for renegotiation, which leads to an efficient final outcome of the merger. Specifically, at the time of deal termination or completion, a completed merger is ex post efficient if $V \geq W$, where $V$ ($W$) is the *updated* value of synergy (target's non-merger alternative) during the renegotiation period, otherwise the merger should be terminated. Since the final, total offer price is the total payment that the acquirer is willing to pay the target to complete the merger, it is a reasonable measure for the (lower bound of) updated value of merger synergy. To measure target's non-merger alternative, we use the *maximum* of target's market value at the time of merger completion or termination and the highest competing outside bid (if available).[19]

Using this procedure, Table 4 shows that $V \geq W$ in 100 out of the 145 deals. Our model predicts that these deals should be completed as a result of ex post efficient renegotiation. In fact, 78 of the 100 deals are completed, suggesting that our model prediction has an accuracy of 78%. In some cases, the target received outside bids following the signing of initial agreements, but in the end the (initial) acquirer revised the initial bid upward and the deal was completed. This corresponds to the case of $V > W > p_0 + k$ (last row of (5)) in Lemma 1.[20] For the remaining 45 deals, we observe that $V < W$, and according to our model these should be terminated; 35 deals are in fact terminated (an accuracy of 77.8%). One empirical difficulty, which can potentially explain the less-than-perfect accuracy of our model prediction, is that we only have a lower bound for $V$ (namely, the offer price). However, in order to examine the efficiency of termination decision we also need to know the upper bound (or the

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[18] An additional 25 terminated deals are excluded from this sample because the termination is either unknown or caused by external factors such as the ruling of a court or regulatory agency (reasons 4, 5, and 6 listed in Tables 2-A and 2-B).

[19] In our model $V$ ($W$) is net of the sum of the two firms' combined stand alone values (target's stand alone value) prior to the announcement of the initial agreement, while in the empirical tests we use gross values for $V$ and $W$ that can be obtained by a change of variable and consistent with the model notations (see Appendix A.3).

[20] As an example of this calculation, Bethlehem Steel Corp. entered an agreement to acquire Lukens Inc. in December 1997. The agreed on price was \$25 per target share, and the target termination fee was approximately \$1 per target share. Following the signing of this agreement, Lukens received a competing bid of \$28 per share from Allegheny Teledyne Inc. Bethlehem Steel eventually raised their bid to \$30 per share (which is higher than $W$, \$28, minus $k$, \$1), and the deal was approved by the Lukens' Board of Directors.

average) for *V* and determine if it is less than *W*. The other reason for the deviation from merger outcomes predicted by Lemma 1 lies in (possible) inefficient ex post bargaining. For example, there are cases where the deal was approved by the target Board despite the acquirer's final offer was below that of the outside bids.[21]

Overall, for our sample of 145 renegotiated deals, our model correctly predicts the final outcome in 113 deals, an overall accuracy of 77.9%. These results are consistent with ex post efficiency following renegotiation of an initial contract. Along with the fact that deal protection devices have no significant impact on final outcomes (Table 3), our results indicate *efficient contracting* between the merging firms, in that the use of protection devices and the rules of renegotiation specified in the initial agreement solve holdup problems and induce efficient ex post outcomes.

**III.3 Empirical Tests on the Use of Deal Protection Devices**

Our second set of tests examines the use of deal protection devices (excluding the "no solicitation" clause) in the initial merger agreements. Table 5 presents summary statistics on these devices, including target and acquirer TFs and acquirer lockups, and associated firm characteristics. We first group the deals by whether they are "protected" (by either a TF or an acquirer lockup) or "unprotected" (Panel A); in Panel B, we group the deals by the use of TFs (there is no deal in which only the acquirer TF is used); in Panel C the deals are sorted by whether an acquirer lockup is used.

As mentioned above, 75% of all deals are protected by either a TF or an acquirer lockup; in 56% of deals a target TF is used and in 22% of deals an acquirer TF is also used; in 36% of deals an acquirer lockup is used. The average size of an acquirer's toehold is larger for protected deals than for unprotected deals, although as Table 1 indicates in most deals the acquirer has a zero toehold. In terms

[21] One such example was Dominion Resources, Inc.'s acquisition of Consolidated Natural Gas Company in Feb. 1999. The initial offer was $64.22 per target share and the target termination fee was approximately $2.08 per target share. After the signing of the initial agreement, Columbia Energy Group launched a competing bid of $70 per share. Dominion Resources, Inc.'s final offer was $66.60 per share, which is less than *W*, $70, minus *k*, $2.08, or $67.92.

of the mean and median of market values of equity ("MV"; similar results also hold for total assets, not reported in the table), both the acquirer and the target are larger in the protected group than those in the unprotected group (Panel A). The median size of targets in the unprotected group ($86 million) is significantly less than that of the protected group ($211 million). Since the relative size of the merging firms' market values proxies for their bargaining positions in the stock-based merger, the holdup problem is not likely to be severe in the unprotected group, as the targets do not have enough bargaining power to make credible threats to (hold up) the acquirers.

The difference in relative size of deals in Groups 1 and 2 in Panel B is also noticeable. In terms of mean MVs, the acquirers are more than 15 times the target size in Group 2, while they are less than three times the target size in Group 1, with many of these deals being "mergers of equals." When the size of the target is comparable to that of the acquirer, her contribution to merger synergy cannot be ignored and the acquirer has an incentive to hold up the target. Thus the TFs are used on both sides (Group 1). When the acquirer is much larger than the target, the holdup problem likely exists on the target side only, as the acquirer plays a dominant role in determining synergy. Accordingly, TFs are used only on the target side (Group 2).

Table 5 also presents statistics on three sets of firm characteristics (prior to deal announcement), all of which are industry adjusted. First, a firm with high (low) book-to-market ratio ("B/M") is more value (growth) oriented. On average the acquirer (target) is more likely to be a growth (value) firm. This is not surprising given the time period of our sample coincides with the rise of growth firms, and firms take advantage of their high valued equity to acquire (value) targets. Second, both the acquirers and targets on average have higher return to assets (ROA) in protected deals than in unprotected deals. Third, both the acquirer and target's leverage ratios ("LEV") are higher in protected deals than in unprotected ones.

**Insert Tables 5, 6 and 7 here.**

Next, we test comparative statics of our model (Corollaries 1 and 2) by studying the determinants of the size of target TFs, which is not examined in previous papers. As discussed above, our model provides the optimal strike of the target's option, which we argue is implemented by protection devices including TFs and lockups and through toeholds. Since the target TF is the most widely used device, we use the percentage of the target TF ($) over initially announced deal size as the dependent variable, and include the lockup (dummy) and toehold as controls. All the other firm and deal characteristics are obtained prior to or at the announcement of the initial agreement. We run both an OLS model and a Tobit model (to control for the potential selection bias problem) on the whole sample (Columns 1 and 2 in Table 6). We then perform the same tests on a smaller sample of deals with information on whether merging firms are incorporated in Delaware (Columns 3 through 6), and information on the acquirers' CEO (Columns 5 and 6). Finally, we employ a simultaneous equation model that treats the (initial offer) premium and the target TF as endogenous variables (Column 7).

The first set of variables measures the productivity and degree of specificity of the acquirer's effort. We first observe a positive relation between the (log) acquirer's size (A-LMV) or his return on assets (A-ROA) and the size of the target TF, with the coefficients on A-ROA statistically significant in every model. Both of these characteristics measure the acquirer's productivity and relative importance in determining the expected synergy, and thus are proxies for the parameter $l_A$ in the model. There is also a negative relation (significant at 5% in Column 6) between the standard deviation of the acquirer's stock returns (ARETSD), which measures the risk of the acquirer, and the size of the TF. If we extend our model to include *risk-averse* agents, higher risk corresponds to a lower certainty equivalent value for a given level of risk aversion. With this interpretation, a higher standard deviation implies a lower expected, risk-adjusted synergy level (a lower $l_A$ or $\bar{\theta}$).

Second, there is a negative (positive) relation between "APastDeals" ("TIntangible") and the size of target TF. When the acquirer has successfully taken over more targets prior to the current merger (an increase in APastDeals), he is better able to use his current effort to future deals, regardless of the outcome of the current deal. Thus his effort is *less* deal specific and the target's holdup problem becomes less severe. Consistent with our model, the size of the target TF is smaller, and coefficients are significant at 1% in all the models. However, when the target has more *intangible* assets (TIntangible increases), which, by nature, are firm specific, the acquirer's effort in the current deal becomes *more* deal specific, and thus the size of the target TF is larger. Another proxy for the specificity of the acquirer's effort is whether the merger is related or diversifying ("Correlation" between monthly stock returns of the two firms prior to the merger), but the coefficient on "Correlation" is not statistically significant.

Third, both the size of the acquirer's toehold and the use of an acquirer lockup have a negative impact on the size of the target TF. A toehold can (partially) solve the target's holdup problem by making the target's threat of termination less effective, and hence is a substitute for a target TF. A lockup can be regarded as a payment from the target to the acquirer for his deal-specific effort, and can serve the similar purpose as a target TF. In cases where there are costs in using a target TF, a lockup can be used as a (partial) substitute. The substitution effect between lockup and target TF is especially prominent for bank mergers (TBANK dummy is significant at 5% or 1%), which we further discuss in Table 7 below.

The second set of variables measures the productivity of the target's effort in improving her non-merger alternatives. When the target has higher return on assets (T-ROA), or lower leverage (T-LEV), or lower book-to-market ratios (T-B/M), the size of the target TF decreases. Higher target ROA implies a higher productivity of her effort, or a higher $h_T$ in the model. It is well known from the takeover literature that a firm with low leverage is more likely to become a target and attract more potential bidders (e.g., Safieddine and Titman 1999). Therefore, a lower LEV corresponds to a higher $\overline{\varpi}$ in the model. To understand the result on target's B/M ratio, recall that during our sample period, the market prefers growth stocks (low B/M ratios) to value stocks (high B/M ratios). As a growth firm, the target's non-merger alternative, $\overline{\omega}$, including "perceived synergy" by investors and the market, is expected to be higher (e.g., Rhodes-Kropf and Viswanathan 2004; Rhodes-Kropf et al., 2004). Overall, all the above results provide support for the comparative static results of our model.

Among other control variables, we include a measure for the degree of agency problems in the acquirer, namely, the tenure of the acquirer CEO (ACEOtenure). It has no significant impact on the size of target TF, challenging the agency problem-driven motive for using a target TF. Interestingly, the size of the target TF increases if either merging firm is incorporated in Delaware (dummies = 1). If merging firms understand that a properly designed target TF provides the correct incentives for both firms to complete the merger, then Delaware firms, known to design corporate charters to facilitate takeovers (e.g., Daines 2001), will do that to achieve their common goal. This result is again inconsistent with the hypothesis that agency problems drive the use of the target TF.

Finally, we observe a negative relation between the initial offer premium over target's market price ("Premium") and the size of the target TF.[22] Since our model is based on symmetric information, it does not provide any implication on the offer premium (recall the parameter $p_0$ is a constant). However, since offer premium is likely an endogenous variable in the merger deal along with the target TF, we also utilize a simultaneous equation approach to examine premium and the size of target TF, similar to previous empirical work.[23] From Column 7, we do not observe a significant relation between premium and the target TF, while all of our previous results on target TFs are robust to this model specification.

Our final set of tests examines the relative degree of holdup problems and the *joint* use of deal

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[22] We also find that as the deal size increases the target TF as a percentage of deal size decreases (the coefficient on Log(dealv) is significant in 4 out of 6 models in Table 6). Since deal size is highly correlated with target's market value (of equity), we do not include the latter in the regressions.

[23] In Column (7) we report the Amemiya Generalized Least Squares estimators for the Tobit regressions on the target TF (% of deal value) with endogenous regressor of "Premium," while ARETSD and TRETSD are treated as instrumental variables. See Maddala (1983, pp. 247-252) for more details.

protection devices (excluding the "no solicitation" clause), and results are presented in Table 7. First, in Panel A the dependent variable is a dummy that equals 1 if either a TF or a lockup is used (default outcome is "unprotected"). Since protection devices are mostly used on the target side, our results confirm the intuition that these devices are not needed when the target's holdup problem is not likely to exist. This occurs when the target is small relative to the acquirer (LRSIZE increases), or when the acquirer has low leverage (A-LEV) or includes cash as part of the payment (CASH dummy = 1) to preempt competing bids (e.g., Fishman 1989) and proclaim hostility in the merger offer. In these cases, the target is in a vulnerable position during negotiation. Similarly, when the acquirer shows poor merger prospects, proxied by a smaller size (A-LMV), inferior pre-merger performance (A-ROA), or higher risk (ARETSD), the target does not have much to gain from holding up the acquirer. These results are inconsistent with the agency problem hypothesis, which implies that target managers tend to use these protection devices to block better outside bidders in order to merge with an inferior acquirer. However, we find that in protected deals the acquirer appears to have solid merger prospects, indicating that the use of these devices is to provide incentive for the acquirer to complete the deal.

Second, we perform *multinomial* logistic tests to examine the joint use of a target TF and an acquirer lockup to solve the target's holdup problem (Panel B; default outcome is "no device is used"). In Column 1, we find the acquirer's market cap (A-LMV), return to assets (A-ROA), and experience in the M&As (APastDeals) to be significant (at 1%) predictors for the outcome of both a target TF and an acquirer lockup included in the initial agreement. The impact of the same variables on the outcome in which only one device is used (Columns 2 and 3) is less significant. These results indicate that, in deals where the target's holdup problem is severe *and* there is (possibly) an upper bound on the use of target TFs (Column 1), the acquirer lockup (partially) *complements* a target TF to solve the holdup problem.

We argue that lockups are used when there are costs in imposing a large TF on the target side. One potential cost is the fear of target shareholders' lawsuits, for example, if the target TF is higher than 5% of deal value. Another potential cost is related to the fact that the TF must be paid in cash. From Panel B, we find that an important factor in determining whether a target TF is used is whether the target belongs to the banking industry (TBANK = 1), while the TBANK dummy has the exact opposite impact on the use of acquirer lockup (Columns 2 and 3). We find that in 55% of bank mergers an acquirer lockup is used, while in only 33% of bank mergers a target TF is used; by contrast, 69% of non-bank mergers have target TFs while only 23% of them use lockups. The Glass-Steagal Act of 1934 requires that commercial banks can only merge with other commercial banks or financial services companies. Promising to pay a large amount of cash (TFs) to the acquiring bank (upon deal termination) is costly for the target, in terms of maintaining cash reserves to meet regulatory capital requirements. In this regard, lockups offer a non-cash alternative to solve the holdup problem.

Finally, we examine the joint determination of acquirer and target TFs in order to solve holdup problems on both sides (Panel C; default outcome is "TFs used only on the target side"). First, results from Column 1, in which we compare the outcome of "no TFs used" to that of "TF used on the target side only," confirm those from Panels A and B. More importantly, an acquirer TF is significantly more likely to be used when the size of the target increases (a decrease in LRSIZE indicates an increase in target size given the size of the acquirer). As indicated before, among the deals in which TFs are used on both sides, many of them are "merger of equals," in which the sizes of the two firms are comparable. In these cases the role of the target in contributing to merger synergy cannot be ignored, and thus the acquirer has an incentive to hold up the target, which can be overcome by the use of an acquirer TF. We also observe a negative relation between APastDeals and the use of acquirer TF (Column 2 in Panel C). An acquirer with more (successful) past experience in M&As probably has the right incentive to complete the current deal, and is less likely to hold up the target.[24]

[24] Similar to Table 6, we also examine the determinants of the size of acquirer's TF (results are available upon request). We find that when measures for the acquirer's contribution to synergy are lower and thus raise the degree of acquirer's holdup problem, the acquirer TF is higher to protect the *target's* incentive to provide effort to improve merger synergy.

## IV. Summary and Conclusion

Our paper is the first to utilize the incomplete contracts framework to examine the renegotiation process and holdup problems in mergers. We first develop a model demonstrating that the signing of an initial contract can solve holdup problems and induce higher deal-specific effort that increases the expected synergy of the merger. This contract grants the target a call option to withdraw from the merger, while the strike price compensates the acquirer's deal-specific effort without imposing excessive costs on the target for pursuing non-merger alternatives. In practice, the optimal strike on target's option can be implemented by the use of deal protection devices including termination fees, lockups, and no-solicitation provisions.

Using a large sample of stock mergers from 1994 to 1999, we provide empirical evidence supporting our model predictions. First, we document the frequency and reasons for renegotiation of the initial merger agreement, and provide evidence consistent with ex post efficient outcomes. Understanding the nature of information revealed subsequent to the signing of the initial agreement is extremely important in explaining final deal outcomes. Second, we examine the characteristics of deal protection devices, and find that they are used more frequently on the target than on the acquirer side because the holdup problem on the target side is more severe. Controlling for the use of other protection devices, we find that the size of the target termination fee is larger when the holdup problem is likely to be more severe. Finally, we show that the use of one or more protection devices is more likely when a transaction requires more deal-specific effort on the part of the acquirer. Overall, our model and evidence demonstrate how efficient contracts can be designed and implemented in light of the complexities of the bargaining and renegotiation process in mergers.

## Appendix A

**A.1 Ex post bargaining in the case of** $V < W$ **and** $W - k < p_0$ **(Lemma 1)**

We first consider the case $W > p_0$. As noted in Section II.2, the *target* requests a renegotiation because the deal should be terminated but she is paying the acquirer a net amount of $W - p_0$, while the acquirer may be compelled to do so since $V < W$ and $W$ is the outcome of the target's effort, not the acquirer's. If $V << p_0 < W$ then the merger should definitely be terminated, while the payoff pair can be of the form $[0 + \varepsilon, W - \varepsilon]$, where $\varepsilon$ is a small number/transfer so that the acquirer's payoff is strictly higher than 0. On the other hand, if $p_0 < V \cong W$, then the merger can be completed, since $V$ is not much lower than $W$, and payoffs can take on the form $[V - p_0 - \varepsilon, p_0 + \varepsilon]$ with $\varepsilon$ again being a small transfer. Notice in the second scenario a *suboptimal* merger outcome occurred ($V < W$ but the merger is completed), while under both scenarios, the target's payoff increases following ex post bargaining from her ex ante payoff specified in Lemma 1.

In the case of $V < W < p_0$, the *acquirer* requests a renegotiation because he incurs a loss of $p_0 - W$ while paying the target $p_0$; the target may feel compelled to do so because she cannot simply cut ties with the acquirer as her option is out-of-money. In this case, the merger is unlikely to be completed (which agrees with the efficient outcome), because doing so requires the acquirer to lower the initial offer of $p_0$ to $V$, a transaction that is highly unlikely to be approved by the target board and shareholders (unless $V$ is very close to $W$). Hence the payoffs will look like $[0 + \varepsilon, W - \varepsilon]$, with the size of $\varepsilon$ depending on how close is $V$ to $W$. Notice that any non-negative payoff to the acquirer is an improvement over what he is receiving according to Lemma 1.

**A.2 Efforts in First Best of the Benchmark Model:** *The First Best efforts are,*

$$e_A^{FB} = \frac{l_A(c\overline{\theta} - 2h_T^2)}{2c(c\overline{\varpi} - h_T^2 - l_A^2)}, \qquad \text{and} \qquad e_T^{FB} = \frac{h_T\left(2c\overline{\omega} - c\overline{\theta} - 2l_A^2\right)}{2c(c\overline{\varpi} - l_A^2 - h_T^2)}.$$

Moreover, $\frac{\partial e_A^{FB}}{\partial l_A} > 0$, $\frac{\partial e_A^{FB}}{\partial \overline{\theta}} > 0$, $\frac{\partial e_A^{FB}}{\partial \overline{\omega}} < 0$; and $\frac{\partial e_T^{FB}}{\partial h_T} > 0$, $\frac{\partial e_T^{FB}}{\partial \overline{\theta}} < 0$, $\frac{\partial e_T^{FB}}{\partial \overline{\omega}} > 0$.

**Proof:** The problem of the acquirer and the target at date 0 is to design a contract that implements efficient efforts that maximizes expected total surplus:

$$W^{FB} \equiv \underset{(e_A, e_T)}{Max}\, EU = \underset{(e_A, e_T)}{Max}\left[\iint_{\theta\omega} \max[V(e_A, \theta), W(e_T, \omega)]dG(\omega)dF(\theta) - C(e_A) - C(e_T)\right]$$

$$EU = \int_\theta \left[\int_0^{\omega^*(e)} [V(e_A, \theta)]dG(\omega) + \int_{\varpi^*(e)}^{\overline{\varpi}} W dG(\omega)\right] dF(\theta) - c(e_A) - c(e_T)$$

$$\textit{where} \quad W^*(e_T, \omega) = V(e_A, \theta) \Rightarrow \omega^*(e_T) = V(e_A, \theta) - h_T e_T.$$

Given Assumptions 1-3, we have:

$$EU = \frac{\overline{\omega}}{2} + h_T e_T + \frac{(l_A e_A - h_T e_T)^2 + (l_A e_A - h_T e_T)\overline{\theta}}{2\overline{\omega}} + \frac{\overline{\theta}^2}{6\overline{\omega}} - \frac{1}{2} c e_T^{\ 2} - \frac{1}{2} c e_A^{\ 2}.$$

The optimal effort levels under first-best situation are:

$$e_T^{FB} = \frac{h_T\left(2c\overline{\omega} - c\overline{\theta} - 2l_A^2\right)}{2c(c\overline{\varpi} - h_T^2 - l_A^2)}, \quad e_A^{FB} = \frac{l_A(c\overline{\theta} - 2h_T^2)}{2c(c\overline{\varpi} - h_T^2 - l_A^2)}.$$

The following comparative statics on optimal effort levels are obtained based on Assumption 4:

$\frac{\partial e_T}{\partial l_A} \propto 4cl_A h_T \cdot (2h_T^2 - c\overline{\theta}) < 0$; $\frac{\partial e_T}{\partial h_T} \propto (c\overline{\varpi} - l_A^2 + h_T^2) \cdot (2c\overline{\varpi} - c\overline{\theta} - 2l_A^2) > 0$ if $c\overline{\varpi} > c\overline{\theta}$; and

$\frac{\partial e_T}{\partial \overline{\varpi}} \propto (c\overline{\theta} - 2h_T^2) > 0$; $\frac{\partial e_T}{\partial \overline{\theta}} \propto (-ch_T) < 0.$ ***QED***

**A.3 Proof of Proposition 2**

In this setting, acquirer offers target a call option to walk away from the merger and receive *W* instead, after paying a TF of *k*; the acquirer has all the residual claim (i.e., he owns the total expected surplus between the two firms, minus the value of call, and cost of effort); both sides will renegotiate after $\theta$ and $\omega$ are realized to ensure that only when $V > W$ will the merger occur ex post (that is, there will be ex post lump sum transfers to make sure that this is the case).

The expected utilities of the acquirer and the target are given by:

$$EU_A = \iint_{\theta\omega} \max[\mathrm{V}(\mathrm{e_A}, \theta), \mathrm{W}] dG(\omega) dF(\theta) - \int_{\omega} [W(e_T, \omega) - k, p_0] dG(\omega) - c(e_A),$$
$$EU_T = \int_{\omega} \max[W(e_T, \omega) - k, p_0] dG(\omega) - c(e_T).$$

If we redefine $V - p_0$ as $\widetilde{V}$, and redefine $W - p_0$ as $\widetilde{W}$, then:

$$EU_A = \iint_{\theta\omega} \max[\widetilde{V}, \widetilde{\mathrm{W}}] dG(\omega) dF(\theta) - \int_{\omega} [\widetilde{W} - k, 0] dG(\omega) - c(e_A)$$
$$EU_T = \int_{\omega} [\widetilde{W} - k, 0] dG(\omega) - c(e_T) + p_0.$$

Since the newly defined $\widetilde{V}$ and $\widetilde{W}$ are simply linear transformation from *V* and *W*, they should take the same functional forms as *V* and *W* (specified in Assumption 2). For simplicity, we drop the notation "~" from $\widetilde{V}$ and $\widetilde{W}$ in the following proofs, while we keep the original definition for *V* and *W* in the main text. Given an option contract $p_0$ and k, the target chooses $e_T$ to solve

$$\underset{e_T}{Max}\left[\int_{\omega} \max[W(e_T, \omega) - k, 0] dG(\omega) - C(e_T) + p_0\right].$$

The solution to the above problem is $e_T^{call} = \frac{(\overline{\varpi} - k)h_T}{c\overline{\varpi} - h_T^2}$. By setting $e_T^{call} = e_T^{FB}$, we can solve for *k*,

$$k^* = \frac{\overline{\theta}}{2} + \frac{l_A^2(c\overline{\theta} - 2h_T^2)}{2c(c\overline{\varpi} - h_T^2 - l_A^2)}.$$

And since the first-order condition with respect to $e_A$ is the same as that in first-best situation, the acquirer's optimal effort level in the second-best situation, $e_A^{call}$, is the same as $e_A^{FB}$. Therefore,

$$e_A^{call} = \frac{l_A(c\overline{\theta} - 2h_T^2)}{2c(c\overline{\varpi} - h_T^2 - l_A^2)}.$$

Thus, first-best effort levels are achievable in the second-best situation by properly choosing the strike price of the call option (termination fee), $k^*$.

**A.4 Proof of Corollaries 2 and 3**

The following comparative statics on optimal termination fee are obtained based on Assumption 4:

$$\frac{\partial k^*}{\partial \overline{\theta}} \propto 2c^2(c\overline{\varpi} - h_T^2 - l_A^2)(c\overline{\varpi} - h_T^2) > 0; \qquad \frac{\partial k^*}{\partial l_A} \propto 4cl_A(c\overline{\theta} - 2h_T^2)(c\overline{\varpi} - h_T^2) > 0;$$

$$\frac{\partial k^*}{\partial \overline{\varpi}} \propto -2c^2 l_A^2(c\overline{\theta} - 2h_T^2) < 0; \qquad \frac{\partial k^*}{\partial h_T} \propto c \cdot l_A^2 \cdot h_T(c\overline{\theta} - 2(c\overline{\varpi} - l_A^2)) < 0, \text{ if } c\overline{\theta} < 2(c\overline{\varpi} - l_A^2).$$ ***QED***

## Appendix B: Effort choices and merger outcome *without* ex ante contract

For a given realization of state variable $\theta$ and $\omega$, the following is known: Total gain: $\max[V,W]$.
Assume target gets $\alpha$ sharing of the total gain and acquirer gets the rest, 1-$\alpha$:

Target receives: $\alpha \cdot \max[V,W]$, and Acquirer receives: $(1-\alpha) \cdot \max[V,W]$.

Target solves the following problem by choosing $e_T$,

$$U_T \equiv \underset{e_T}{Max}\left[\iint_{\theta\omega} \alpha \cdot \max[V(e_A,\theta), W(e_T,\omega)]dG(\omega)dF(\theta) - C(e_T)\right], \text{ and}$$

the acquirer solves the following problem by choosing $e_A$,

$$U_A \equiv \underset{e_A}{Max}\left[\iint_{\theta\omega} (1-\alpha) \cdot \max[V(e_A,\theta), W(e_T,\omega)]dG(\omega)dF(\theta) - C(e_A)\right].$$

By taking the first-order condition with respect to $e_T$ and $e_A$ separately, we obtain, in the Nash Equilibrium:

$$e_T^{NC} = \frac{h_T(2c\overline{\varpi} - c\overline{\theta} - l_A^2)}{2c(2c\overline{\varpi} - h_T^2 - l_A^2)} \text{ and } e_A^{NC} = \frac{l_A(c\overline{\theta} - h_T^2)}{2c(2c\overline{\varpi} - h_T^2 - l_A^2)}.$$

Comparison of effort levels between no contract and First best:

$$e_A^{FB} - e_A^{NC} = \frac{l_A(c^2\overline{\theta}\overline{\varpi} + h_T^2(l_A^2 + h_T^2 - 3c\overline{\varpi}))}{2c(2c\overline{\varpi} - h_T^2 - l_A^2)(c\overline{\varpi} - h_T^2 - l_A^2)} > 0 \quad \text{if} \quad c\overline{\theta} > (3 - \frac{h_T^2 + l_A^2}{c\overline{\varpi}})h_T^2,$$

$$e_T^{FB} - e_T^{NC} = \frac{h_T(l_A^4 + c\overline{\varpi}(2c\overline{\varpi} - c\overline{\theta} - 3l_A^2) + h_T^2 l_A^2)}{2c(2c\overline{\varpi} - h_T^2 - l_A^2)(c\overline{\varpi} - h_T^2 - l_A^2)} > 0 \quad \text{if} \quad 2c\overline{\varpi} - c\overline{\theta} > (3 - \frac{h_T^2 + l_A^2}{c\overline{\varpi}})l_A^2.$$

Since call option contract can induce first best effort, the optimal effort levels in call option contract (same as those in FB) are higher than those in no ex ante contract situation.

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## Table 1 Merge Sample Description

This table presents the distribution of our sample of stock mergers announced between 1994 and 1999 (excluding all-cash mergers), and summary statistics on the use of deal protection devices.

*Distribution of stock mergers 1994 – 1999*

| Ann. Year | Initial Sample | Deals *without* Agreement | Final Sample w/ Agreement | Toehold ( < 50%) | Deal Protection Devices | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | *Termination Fees* | | *Acquirer Lockup* | *No Solicitation Clause** |
| | | | | | Target TF | Acquirer TF | | |
| 1994 | 186 | 18 | 120 | 6 | 54 | 14 | 33 | 67 |
| 1995 | 211 | 17 | 151 | 6 | 63 | 25 | 42 | 108 |
| 1996 | 228 | 15 | 150 | 5 | 58 | 35 | 31 | 137 |
| 1997 | 323 | 17 | 223 | 5 | 136 | 55 | 94 | 202 |
| 1998 | 333 | 14 | 248 | 5 | 168 | 64 | 106 | 229 |
| 1999 | 302 | 9 | 212 | 4 | 138 | 50 | 89 | 205 |
| Total | 1583 | 90 | ***1104*** (100%) | 31 (2.81%) | 617 (55.9) | 243 (22.0%) | 395 (35.8) | 948* (98.7%) |

*: Among deals with merger agreement available online (960), 948 of them (98.7%) have a "no solicitation" clause in the initial merger agreement.

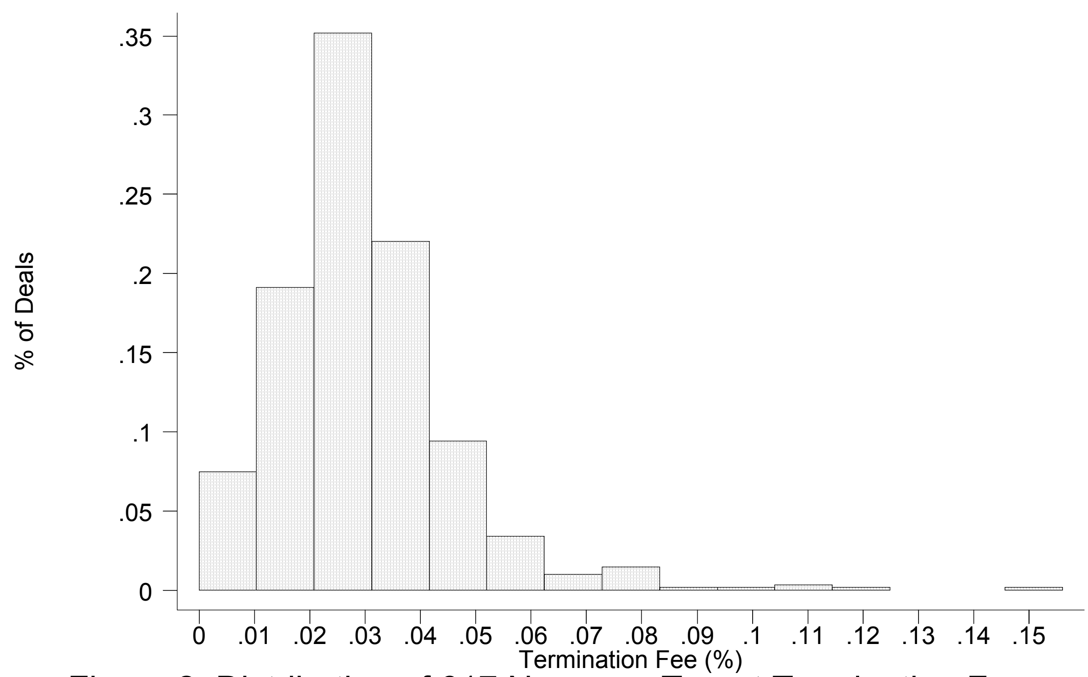


Figure 2: Distribution of 617 Non-zero Target Termination Fees

## Table 2-A Reasons for Deal Termination

Table 2-A examines the frequencies of and reasons for the termination of a deal, while Table 2-B lists the frequencies of and reasons for revising terms of the initial merger agreements. Information on TFs in initial merger agreements as well as the payment of the fees is also reported.

| Reasons for Termination | Fre-quency | Who initiated termination | # deals with T-TF in initial agreement | # deals with T-TF and A-TF | TF paid or not upon termination |
|---|---|---|---|---|---|
| 1. Price changes or A's price reached termination range | 9 | A: 2, T: 2; Mutual: 4; Unknown: 1 | 4 | 1 | 1 T-TF paid, 3 unknown |
| 2. Bad news about firms | 9 | A: 3, T: 2; Mutual: 4 | 2 | 1 | 1 T-TF not paid, 1 unknown |
| 3. Competing bid and/or T merged with other firm | 15 | **Target: 15** | 15 | 6 | **12 T-TF paid,** 1 T-TF not paid[a] 2 unknown |
| 4. Outside factors block merger[b] | 15 | A: 2, T: 1; **Mutual: 9;** Unknown: 3 | 9 | 5 | 1 A-TF paid; 1 T-TF not paid, 3 T-TF & A-TF not paid; 4 unknown |
| 5. Other reasons* | 25 | A: 6, T: 4; Mutual: 15 | 16 | 6 | 3 T-TF paid, 4 not paid; 4 A-TF & T-TF not paid; 5 unknown |
| 6. Unknown | 10 | A: 1, T: 3; Mutual: 3 Unknown: 3 | 5 | 3 | 1 T-TF paid, 1 A-TF paid, 3 unknown |
| Total | 83 | A: 14, T: 27; Mutual: 35 Unknown: 7 | 51 | 22 | 17 T-TF paid, 7 T-TF not paid; 2 A-TF paid, 7 both TFs not paid, 18 unknown |

Notes: [a]: a lawsuit involved A and T; [b]: reasons include merger blocked by court or regulatory agency, or shareholders' failure to approve merger; *: including tax consequences of merger; acquirer is acquired by another acquirer; potential regulation risk; market interest rate increases (acquisition becomes costly); acquirer cannot secure financing on time, etc.

## Table 2-B Reasons for Contract Amendment

| Reasons for contract amendment | Frequency | # of deals completed |
|---|---|---|
| 1. Price change | 16 | 14 |
| 2. Good or bad news about firms | 25 | 21 |
| 3. Competing bid | 15 | 12 |
| 4. Price moves beyond collar or reaches termination condition, if any | 6 | 6 |
| 5. Closing conditions not satisfied | 3 | 2 |
| 6. Other reasons* | 12 | 12 |
| 7. Unknown | 23 | 23 |
| Total | 100** | 90 |

*: including tax consequences of merger changes; acquirer is acquired by another acquirer; to increase the size of board; to avoid the scrutiny of regulators, etc; **: No. of deals with amendment = 96; in 4 deals there are 2 reasons for amendment.)

## Table 3 Determinants of Deal Outcome Following the Signing of Initial Agreement

The dependent variable in the following multinomial logistic regressions is the 3 possible outcomes following the signing of the initial agreement: "Completed as initially contracted" (default), "Terminated" or "Amended." COMPETE is a dummy that equals to 1 if there is at least one competing bid after the deal announcement and before the deal completion/termination. ΔARETSD (ΔTRETSD) is the change in the acquirer's (target's) daily stock return standard deviation for a 3-month period before vs. after the announcement of initial agreement. A-CAR (T-CAR) is acquirer's (target's) cumulative abnormal returns between the initial agreement date and completion date, withdrawn date or effective date. LRSIZE is the log value of ASIZE/TSIZE. PCTCASH is a continuous variable that indicates the cash portion of the whole deal value. TBANK is a dummy variable that equals to 1 if target is in banking industry. A-TF (T-TF) is a dummy variable equals 1 if there is acquirer (target) TF clause in the agreement. Robust t-statistics are in parentheses.

| | (1) Terminated | (2) Amended | (3) Terminated | (4) Amended |
|---|---|---|---|---|
| Constant | -1.709 | -2.014 | -1.753 | -2.004 |
| | (-5.01)*** | (-6.42)*** | (-4.99)*** | (-6.31)*** |
| COMPETE | 2.994 | 2.617 | 2.981 | 2.622 |
| | (5.54)*** | (5.65)*** | (5.50)*** | (5.63)*** |
| Δ ARETSD | 32.908 | 15.510 | 31.419 | 13.226 |
| | (3.12)*** | (1.58) | (3.00)*** | (1.33) |
| Δ TRETSD | 25.164 | 7.025 | 25.293 | 6.892 |
| | (3.04)*** | (0.95) | (3.01)*** | (0.93) |
| A-CAR | 0.483 | -0.062 | 0.609 | -0.197 |
| | (0.85) | (-0.13) | (1.02) | (-0.43) |
| T-CAR | -2.837 | -1.088 | -2.898 | -1.050 |
| | (-5.68)*** | (-2.45)** | (-5.76)*** | (-2.29)** |
| LRSIZE | -0.644 | -0.156 | -0.629 | -0.164 |
| | (-4.40)*** | (-1.59) | (-4.26)*** | (-1.64) |
| A-ROA | 1.833 | 1.530 | -1.503 | 0.654 |
| | (1.74)* | (1.46) | (-0.76) | (0.38) |
| T-ROA | -1.185 | -0.968 | 0.562 | -2.947 |
| | (-1.93)* | (-1.68)* | (0.28) | (-2.76)*** |
| A-ROA∗Negative-TCAR | -- | -- | 4.223 | 1.035 |
| | -- | -- | (1.94)* | (0.49) |
| T-ROA∗Negative-ACAR | -- | -- | -1.774 | 2.693 |
| | -- | -- | (-0.86) | (2.03)** |
| A-B/M | 0.503 | 0.121 | 0.530 | 0.013 |
| | (0.88) | (0.24) | (0.93) | (0.03) |
| T-B/M | -0.567 | 0.199 | -0.569 | 0.224 |
| | (-1.42) | (0.68) | (-1.40) | (0.76) |
| PREMIUM | 0.395 | -0.026 | 0.368 | -0.133 |
| | (0.83) | (-0.06) | (0.76) | (-0.31) |
| PCTCASH | -1.671 | 0.737 | -1.561 | 0.682 |
| | (-1.29) | (1.11) | (-1.21) | (1.02) |
| TBANK | -1.268 | -0.484 | -1.287 | -0.466 |
| | (-3.03)*** | (-1.63) | (-3.07)*** | (-1.56) |
| FP | -0.208 | 0.780 | -0.219 | 0.810 |
| | (-0.24) | (1.78)* | (-0.25) | (1.83)* |
| FEXC | 1.084 | 0.641 | 1.157 | 0.708 |
| | (2.41)** | (1.62) | (2.55)** | (1.78)* |
| FPC | 0.461 | 0.797 | 0.426 | 0.827 |
| | (1.00) | (2.51)** | (0.92) | (2.57)** |
| A-TF | -0.950 | -0.233 | -0.987 | -0.181 |
| | (-2.30)** | (-0.65) | (-2.39)** | (-0.49) |
| T-TF | 0.266 | -0.325 | 0.345 | -0.350 |
| | (0.72) | (-1.10) | (0.93) | (-1.17) |
| ALockup | -0.260 | -0.364 | -0.213 | -0.381 |
| | (-0.72) | (-1.23) | (-0.59) | (-1.28) |
| TOEHOLD | -16.357 | 2.369 | -17.043 | 2.435 |
| | (-0.63) | (1.11) | (-0.61) | (1.15) |
| Predicted Prob. | 0.026 | 0.079 | 0.026 | 0.077 |
| Observations | N=947, Pseudo $R^2$=0.214 | | N=947, Pseudo $R^2$=0.223 | |

***, **, *: significant at the 1%, 5%, or 10% levels, respectively.

**Table 4 Efficiency of Final Outcome of Renegotiation**

This table estimates the precision of model prediction for the final outcome of renegotiation. Based on the model, a merger is *ex post efficient* if it is completed when $V > W$ and terminated otherwise (at the time of renegotiation/termination), where $V$ ($W$) is the value of synergy (target's non-merger alternative). The *lower bound* of $V$ is proxied by the offer price, while $W$ is proxied by the maximum of target's market value and the highest outside competing bid (if any). $V$ and $W$ in our model are values net of firms' stand alone assets; in these tests we use gross values including the firms' own stand alone asset values.

| Comparing values | No. of deals | No. of deals with outcome predicted by model | Precision of model prediction |
|---|---|---|---|
| $V \geq W^*$ | 100<br>(T-TF used in 53 deals) | 78[a]<br>(T-TF used in 40 deals) | 78% |
| $V < W$ | 45<br>(T-TF used in 24 deals) | 35[b]<br>(T-TF used in 22 deals) | 77.8% |
| Total | 145 | 113 | 77.9% |

Notes: *(1) There are an additional 25 deals in the $V \geq W$ category, but they were terminated due to exogenous forces such as the ruling of a court or regulatory agency (reasons 5, 6, and 7 listed in Tables 2-A and 2-B). These deals are excluded when we measure the precision of model prediction; (2) There are also 9 deals that belong to both the contract amendment sample and the deal termination sample.

[a]: In some cases**,** the target received outside bids following the signing of initial agreements, but the (initial) acquirer revised the bid upward and the deal was eventually completed. This *efficient* renegotiation process yields the First Best merger outcome, corresponding to the case of $V > W > p_0 + k$ (last row of (5)) in Lemma 1.

[b]: There are cases where the deal was approved by the target despite the fact that acquirer's final offer was below that of outside bids, in contrast to the efficient outcome (deal termination) predicted by Lemma 1.

**Table 5 Summary Statistics on the Use of Deal Protection Devices**

This table presents summary statistics (mean, median, and observations) of our sample of stock mergers from 1994 to 1999 grouped by the use of protection devices in the initial definitive agreement. In Panel A, in each of the “Protected” deals either a TF or an acquirer’s lockup is used (we do not consider target’s “no solicitation” clause as a protection device), while neither a TF or a lockup is used in “Unprotected” deals. In Panel B we group deals by TFs: In Group 1 TFs are included for both the acquirer and target; in Group 2 a TF is only included on the target side; in Group 3 TFs are not used on either side. In Panel C we group the deals by whether an acquirer lockup is used or not. A-TF (T-TF) is the amount of TF on the acquirer side (target side), measured in $ millions. “Duration” measures the number of days between the signing of definitive merger agreement to deal completion or deal withdrawal. “Toehold” is the fraction of the target’s stock held by the acquirer prior to merger announcement. A-MV (T-MV) is the acquirer’s (target’s) *market* value of *equity*, measured in $ millions. A-B/M (T-B/M) is the industry-adjusted book-to-market ratio for the acquirer (target). A-ROA (T-ROA) is the industry-adjusted return on assets prior to merger announcement for acquirer (target). A-LEV (T-LEV) is industry-adjusted leverage ratio (long-term debt/book assets) for the acquirer (target). All the accounting data are obtained from Compustat for the fiscal year prior to the initial merger definitive agreement date.

| | Stats | A-TF ($ mil) | T-TF ($ mil) | Toehold | A-MV ($ mil) | T-MV ($ mil) | A-B/M | T-B/M | A-ROA | T-ROA | A-LEV | T-LEV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Panel A: Protected vs. Unprotected Deals* | | | | | | | | | | | | |
| **Full Sample** | Mean | 21.32 | 30.97 | 0.0058 | 7,495 | 1,246 | -0.069 | 0.044 | 0.016 | -0.014 | 0.210 | 0.258 |
| **(N=1104)** | Median | 0 | 1.50 | 0 | 1,289 | 169 | -0.103 | -0.008 | 0.003 | 0.002 | 0.032 | 0.013 |
| Protected | Mean | 28.39 | 41.25 | 0.0045 | 8,196 | 1,316 | -0.079 | 0.0406 | 0.023 | -0.011 | 0.226 | 0.265 |
| (N = 829) | Median | 0 | 5 | 0 | 1,484 | 211 | -0.113 | 0.0001 | 0.003 | 0.002 | 0.024 | 0.013 |
| Unprotected | Mean | -- | -- | 0.0096 | 5,382 | 1,036 | -0.036 | -0.054 | -0.004 | -0.021 | 0.163 | 0.237 |
| (N = 275) | Median | | | 0 | 786 | 86 | -0.083 | 0.027 | 0.003 | 0.001 | 0.058 | 0.007 |
| *Panel B: Sorting the Deals by Termination Fees* | | | | | | | | | | | | |
| 1. TFs on both | Mean | 97.25 | 98.80 | 0.0058 | 7,252 | 2,800 | -0.046 | 0.045 | 0.016 | -0.014 | 0.187 | 0.191 |
| sides (N=242) | Median | 15.50 | 20.00 | 0 | 1,206 | 511 | -0.072 | 0.016 | 0.006 | 0.003 | –0.001 | 0.011 |
| 2. Target TF | Mean | -- | 27.42 | 0.0054 | 9,876 | 637 | -0.076 | 0.072 | 0.041 | -0.019 | 0.165 | 0.273 |
| only (N=375) | Median | | 7.50 | 0 | 1,830 | 170 | -0.116 | 0.010 | 0.015 | 0.008 | 0.013 | 0.009 |
| 3. No TFs | Mean | -- | -- | 0.0062 | 5,786 | 944 | -0.075 | 0.022 | -0.002 | -0.009 | 0.256 | 0.280 |
| (N = 487) | Median | | | 0 | 1,111 | 107 | -0.109 | -0.030 | 0.001 | 0.001 | 0.072 | 0.025 |
| *Panel C: Sorting the Deals by Acquirer Lockups* | | | | | | | | | | | | |
| 1. With Lock- | Mean | 23.27 | 34.10 | 0.0012 | 11,658 | 1,444 | -0.113 | -0.016 | 0.033 | 0.007 | 0.271 | 0.278 |
| up (N = 395) | Median | 0 | 0 | 0 | 1,864 | 216 | -0.131 | -0.039 | 0.002 | 0.001 | 0.040 | 0.022 |
| 2. No Lockup | Mean | 20.23 | 29.23 | 0.0084 | 5,181 | 1,135 | -0.044 | 0.078 | 0.007 | -0.025 | 0.176 | 0.247 |
| (N = 709) | Median | 0 | 2.0 | 0 | 1,047 | 141 | -0.080 | 0.008 | 0.004 | 0.003 | 0.027 | 0.008 |

## Table 6 Determinants of Optimal Target Termination Fees (% of deal size)

The dependent variable is the target TF as percentage of deal value. We run OLS regressions in Models (1), (3) and (5), Tobit regressions in Models (2), (4) and (6). In Model (7), we treat “Premium” as an endogenous variable and “ARETSD” and “TRETSD” as instruments, and results from the Amemiya GLS estimators for the Tobit regressions on the target TF are reported. All variables are as defined in previous tables. Robustness t-statistics are in parentheses.

| | (1) OLS | (2) TOBIT | (3) OLS | (4) TOBIT | (5) OLS | (6) TOBIT | (7) TOBIT w/ End. Premium |
|---|---|---|---|---|---|---|---|
| Constant | 0.021 | 0.008 | 0.024 | 0.013 | 0.023 | 0.016 | 0.015 |
| | (6.46)*** | (1.41) | (6.92)*** | (2.27)** | (3.69)*** | (1.55) | (1.05) |
| A-LMV | 0.001 | 0.002 | 0.000 | 0.000 | 0.001 | 0.001 | 0.002 |
| | (2.10)** | (1.93)* | (0.71) | (0.57) | (0.85) | (0.87) | (2.12)** |
| A-ROA | 0.010 | 0.019 | 0.010 | 0.018 | 0.021 | 0.032 | 0.019 |
| | (2.31)** | (2.55)** | (2.27)** | (2.40)** | (1.97)** | (1.89)* | (2.53)** |
| ARETSD | -0.006 | -0.016 | -0.012 | -0.027 | -0.025 | -0.069 | -- |
| | (-0.65) | (-0.93) | (-1.22) | (-1.58) | (-1.56) | (-2.07)** | -- |
| APastDeals | -0.001 | -0.002 | -0.001 | -0.002 | -0.001 | -0.004 | -0.002 |
| | (-3.03)*** | (-4.23)*** | (-2.75)*** | (-4.06)*** | (-3.13)*** | (-3.96)*** | (-4.03)*** |
| AIntangible | -- | -- | -- | -- | -0.006 | -0.003 | -- |
| | -- | -- | -- | -- | (-0.70) | (-0.24) | -- |
| TIntangible | -- | -- | -- | -- | 0.017 | 0.020 | -- |
| | -- | -- | -- | -- | (2.12)** | (1.64) | -- |
| Correlation | 0.002 | 0.004 | 0.003 | 0.004 | 0.005 | 0.010 | 0.004 |
| | (1.11) | (1.06) | (1.12) | (1.09) | (1.53) | (1.65) | (1.03) |
| TOEHOLD | -0.012 | -0.020 | -0.002 | 0.000 | -0.007 | -0.019 | -0.032 |
| | (-0.88) | (-0.84) | (-0.12) | (0.02) | (-0.27) | (-0.49) | (-1.08) |
| ALockup | -0.004 | -0.008 | -0.004 | -0.009 | -0.005 | -0.009 | -0.007 |
| | (-2.88)*** | (-3.55)*** | (-3.19)*** | (-4.16)*** | (-2.17)** | (-2.56)** | (-3.35)*** |
| TBANK | -0.011 | -0.020 | -0.011 | -0.020 | -0.005 | -0.010 | -0.021 |
| | (-7.59)*** | (-8.07)*** | (-7.29)*** | (-7.76)*** | (-2.05)** | (-2.42)** | (-6.94)*** |
| T-ROA | -0.005 | -0.007 | -0.008 | -0.010 | -0.004 | -0.001 | -0.007 |
| | (-1.45) | (-1.29) | (-1.98)** | (-1.60) | (-0.55) | (-0.05) | (-1.24) |
| TRETSD | -0.002 | 0.000 | -0.003 | -0.001 | -0.007 | 0.001 | -- |
| | (-0.23) | (0.00) | (-0.33) | (-0.08) | (-0.45) | (0.03) | -- |
| T-LEV | 0.001 | 0.002 | 0.001 | 0.002 | 0.002 | 0.004 | 0.002 |
| | (1.90)* | (1.79)* | (1.36) | (1.53) | (2.08)** | (2.12)** | (1.84)* |
| T-B/M | 0.003 | 0.006 | 0.002 | 0.003 | 0.001 | 0.000 | 0.009 |
| | (2.20)** | (2.16)** | (1.01) | (1.02) | (0.37) | (0.08) | (1.65)* |
| ACEOtenure | -- | -- | -- | -- | 0.000 | 0.000 | -- |
| | -- | -- | -- | -- | (0.88) | (0.77) | -- |
| T_Delaware | -- | -- | 0.002 | 0.004 | 0.005 | 0.009 | -- |
| | -- | -- | (1.66)* | (1.99)** | (2.43)** | (2.83)*** | -- |
| A_Delaware | -- | -- | 0.003 | 0.005 | 0.003 | 0.006 | -- |
| | -- | -- | (2.27)** | (2.79)*** | (1.54) | (1.99)** | -- |
| PREMIUM | -0.003 | -0.005 | -0.003 | -0.005 | -0.006 | -0.010 | -0.037 |
| | (-1.81)* | (-1.70)* | (-1.55) | (-1.46) | (-1.86)* | (-1.85)* | (-0.87) |
| Log(dealv) | -0.001 | -0.001 | -0.001 | -0.001 | -0.002 | -0.002 | -0.002 |
| | (-3.11)*** | (-1.41) | (-2.77)*** | (-1.25) | (-2.24)** | (-1.92)* | (-1.37) |
| PCTCASH | -0.004 | -0.005 | -0.007 | -0.010 | -0.008 | -0.009 | -0.006 |
| | (-1.04) | (-0.79) | (-1.79)* | (-1.51) | (-1.23) | (-0.91) | (-0.87) |
| POST97 | 0.009 | 0.016 | 0.009 | 0.016 | 0.007 | 0.013 | 0.016 |
| | (7.32)*** | (7.45)*** | (6.83)*** | (7.17)*** | (3.40)*** | (3.87)*** | (6.31)*** |
| A-B/M | 0.002 | 0.002 | 0.003 | 0.003 | 0.011 | 0.019 | 0.001 |
| | (1.01) | (0.50) | (1.08) | (0.67) | (2.10)** | (2.19)** | (0.34) |
| A-LEV | 0.001 | 0.002 | 0.001 | 0.002 | -0.002 | -0.004 | 0.002 |
| | (1.84)* | (1.83)* | (1.55) | (1.61) | (-0.96) | (-1.27) | (1.33) |
| Observations | 1072 | 1072 | 946 | 946 | 396 | 396 | 1072 |
| R-squared | 0.18 | -- | 0.21 | -- | 0.22 | -- | -- |

***, **, *: significant at the 1%, 5%, or 10% levels, respectively.

**Table 7 Logistic Tests on the Use of Deal Protection Devices**

This table presents results from Logistic regressions for the use of protection devices. In Panel A, the dependent variable is whether a deal is protected by either a TF or an acquirer lockup (default outcome is "unprotected"). In Panel B we perform multinomial Logit regressions, where the dependent variable represents the choice among 4 possible combinations of protection devices on the target side: "No target TF or acquirer lockup" (default outcome), "only target TF," or "only acquirer lockup," and "both target TF and acquirer lockup." In multinomial Logit regressions in Panel C, the dependent variable is the choice among 3 possible combinations of TFs used on both sides: "Neither T-TF or A-TF", "TF on the target side only" (default outcome), and "Both A-TF and T-TF." All other variables are as defined in the previous tables. Robust t-statistics are in parentheses.

| | *Panel A* | *Panel B* | | | *Panel C* | |
|---|---|---|---|---|---|---|
| | **Protected** | **1. Both T-TF and ALockup** | **2. T-TF only** | **3. ALockup Only** | **1. Neither T-TF or A-TF** | **2. Both A-TF and T-TF** |
| Constant | -0.057 | -4.124 | 0.194 | -2.714 | 1.302 | 0.681 |
| | (-0.10) | (-5.51)*** | (0.33) | (-3.49)*** | (2.48)** | (1.16) |
| A-LMV | 0.145 | 0.368 | 0.078 | 0.149 | -0.071 | 0.141 |
| | (1.86)* | (3.86)*** | (1.00) | (1.49) | (-1.01) | (1.85)* |
| LRSIZE | -0.221 | -0.219 | -0.215 | -0.230 | -0.093 | -0.738 |
| | (-2.76)*** | (-2.14)** | (-2.51)** | (-2.16)** | (-1.21) | (-7.61)*** |
| A-ROA | 1.466 | 4.219 | 1.217 | 0.531 | -2.439 | -1.155 |
| | (2.69)*** | (3.62)*** | (1.83)* | (0.40) | (-2.94)*** | (-1.35) |
| T-ROA | -0.620 | -0.572 | -0.713 | 1.361 | 0.230 | -1.321 |
| | (-0.98) | (-0.72) | (-1.06) | (1.00) | (0.36) | (-2.20)** |
| ARETSD | -2.385 | -1.515 | -3.193 | -1.085 | 1.215 | -3.274 |
| | (-2.01)** | (-0.77) | (-1.91)* | (-0.45) | (0.88) | (-1.64) |
| TRETSD | 0.829 | 0.211 | 0.630 | 1.614 | -0.030 | 0.629 |
| | (0.57) | (0.11) | (0.41) | (0.71) | (-0.02) | (0.40) |
| A-LEV | 0.289 | 0.241 | 0.307 | 0.328 | -0.146 | 0.002 |
| | (1.68)* | (0.99) | (1.53) | (1.62) | (-1.28) | (0.02) |
| T-LEV | 0.136 | 0.273 | 0.127 | 0.069 | -0.161 | -0.355 |
| | (1.18) | (1.58) | (0.92) | (0.48) | (-1.42) | (-2.08)** |
| A-B/M | -0.569 | 0.158 | -0.504 | -1.609 | 0.022 | 0.049 |
| | (-1.44) | (0.29) | (-1.20) | (-2.49)** | (0.05) | (0.12) |
| T-B/M | 0.302 | -0.011 | 0.467 | 0.199 | -0.160 | 0.244 |
| | (1.14) | (-0.03) | (1.70)* | (0.44) | (-0.62) | (0.89) |
| APastDeals | -0.059 | -0.233 | -0.115 | 0.008 | 0.144 | -0.168 |
| | (-1.14) | (-3.09)*** | (-1.94)* | (0.15) | (2.89)*** | (-1.99)** |
| ALockup | -- | -- | -- | -- | 0.669 | 0.121 |
| | -- | -- | -- | -- | (3.40)*** | (0.53) |
| TBANK | 0.138 | 0.172 | -0.759 | 2.421 | 1.137 | -0.412 |
| | (0.57) | (0.54) | (-2.92)*** | (6.78)*** | (4.97)*** | (-1.47) |
| TOEHOLD | 0.211 | -10.802 | 1.192 | -3.955 | -0.465 | -0.884 |
| | (0.10) | (-1.21) | (0.54) | (-0.81) | (-0.20) | (-0.35) |
| Correlation | 0.450 | 0.729 | 0.263 | 0.666 | -0.010 | 0.376 |
| | (1.28) | (1.51) | (0.68) | (1.37) | (-0.03) | (0.97) |
| PREMIUM | -0.246 | -0.268 | -0.289 | -0.209 | 0.125 | -0.523 |
| | (-0.90) | (-0.69) | (-0.98) | (-0.44) | (0.44) | (-1.46) |
| CASH | -0.541 | -0.519 | -0.201 | -1.826 | -0.357 | -0.367 |
| | (-2.70)*** | (-1.87)* | (-0.93) | (-4.85)*** | (-1.69)* | (-1.67)* |
| POST97 | 1.359 | 1.891 | 1.222 | 1.003 | -1.269 | -0.205 |
| | (7.35)*** | (6.60)*** | (5.93)*** | (3.88)*** | (-6.35)*** | (-0.87) |
| A-Delaware | 0.209 | 0.640 | 0.287 | -0.230 | -0.501 | -0.004 |
| | (1.11) | (2.56)** | (1.43) | (-0.86) | (-2.74)*** | (-0.02) |
| T-Delaware | 0.215 | 0.450 | 0.208 | 0.154 | -0.342 | -0.207 |
| | (1.22) | (1.85)* | (1.07) | (0.62) | (-1.93)* | (-1.03) |
| | N=946, Pseudo $R^2$=0.11 WaldChi2(20)=88.7 | N=946, Pseudo $R^2$=0.210 Wald Chi2(60)=524.98 | | | N=946, Pseudo $R^2$=0.209 Wald Chi2(42)=422.75 | |

* Significant at 10%; ** significant at 5%; *** significant at 1%.