Negotiation under the threat of an auction: friendly deals, *ex-ante* competition and bidder returns

by

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ABSTRACT

Observable (*ex-post*) competition in the merger and acquisition (M&A) market seems to be very low. In this paper, we focus on the role of *ex-ante* competition and show that, when this is taken into account, the M&A market is more competitive than it seems at first sight. We first provide a theoretical analysis where we model takeovers as a two-stage process. The initial stage corresponds to a one-to-one negotiation with the target. If the negotiation fails, there is a second stage in which either a takeover battle among rivals occurs, or the target firm organizes a competitive auction. One of the main empirical predictions is that the higher the anticipated competition in the second stage, the higher the bid offered in the first stage. We then provide an empirical test of this prediction using a dataset of friendly deals for which, by construction, no *ex-post* competition is observable. We use the deal frequency in a given industry as a proxy for *ex-ante* competition, and we show that this variable is negatively related to the share of the value creation kept by the acquirer. This result is significant even taking account evidence of a decreasing investment opportunity. The main conclusion that we can draw from our analysis is that the M&A market is fairly competitive, and that anticipated competition allows target shareholders to receive a reasonable premium even in friendly deals.

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"Sometimes we advise a client to use the threat of an auction as its lever to get a reasonable deal done with the best buyer."
Donald Meltzer (co-head of Global M&A, Credit Suisse First Boston LLC)
Source: CFO Magazine 2003

"The greatest obstacle in an auction is that strategic buyers with reasons to offer higher prices may refuse to participate. This usually occurs with companies that are market leaders in highly concentrated activities. The mere threat of an auction, however, is often enough to galvanize a strategic buyer into making a good preemptive offer."
Brian O'Hare (partner at CoramClairfield)
Source: Clairfield Review, Third Quarter 2006

Competition among rival bidders is a key ingredient in the market for corporate control to act as an effective external control mechanism over incumbent managers. According to Manne (1965, p. 113), "greater capital losses are prevented by the existence of a competitive market for corporate control". But the analysis of the merger and acquisition (M&A) market seems not to display strong evidence of competition among bidders. Andrade *et al.* (2001), studying a US sample of deals between listed companies in the period 1973−1998, show that the average number of bidders per deal is around 1.1. In Moeller *et al.* (2007) only 2.95 % of the 11,393 deals announced by US firms in the period 1980–2002 were competed for by rival firms. Competition does seem, however, to have been somewhat more pronounced during tender offers in the 1970s and 1980s, when hostile[1] bids were more frequent (see, e.g., Schwert (2000); Andrade *et al.* (2001)). Betton and Eckbo (2000) analyze the takeover contests in tender offers by US firms over the period 1971−1990. In a sample of 1,353 initial bids, 508 cases involved multiple-bid contests, and out of these, 214 cases were challenged by rival bidders immediately after the first bid. In other words, 845 initial bids were not challenged by rival companies. So even in this specific context, *ex-post* observable competition seems at best low.

Recent evidence on the private-takeover process is perhaps more encouraging. Quoting Varaiya (1988) and Moeller *et al.* (2004), Boone and Mulherin (forthcoming) argue that the number of bidders

[1] In the spirit of Manne's (1965) market for corporate control concept, hostility can be also seen as a measure of the degree of competition between management teams to obtain the control of target assets. But overall, the number of hostile deals in the M&A samples reported in the literature is limited, suggesting that, in this respect also, *ex-post* competition is low. For example, the percentage of hostile bids reported by Andrade *et al.* (2001) is 4.4% and that reported by Schwert (2000) is 7.4%.

is a noisy and incomplete measure of takeover competition. Elsewhere, these authors have analyzed the 400 takeovers in the 1990s representing over 1 trillion USD in deal value (Boone and Mulherin (2007)). Using merger documents from the US Securities and Exchange Commission (SEC), they built sophisticated proxies for competition based on how many potential bidders were contacted in the private sale process and how many actually submitted bids. The authors report that for about half the cases (202) the sale procedure was a private auction among multiple bidders, the remaining being direct bargaining with only one bidder. For private auctions, on average, 9.49 bidders were contacted and 1.13 eventually publicly announced a formal bid. Moreover we know that during the private-takeover process, the number of bidders is often voluntarily limited.[2] The evidence reported by Boone and Mulherin (2007) show that competition plays a role in one out of two cases (at least in their sample), even if no rival offer is observed *ex post*. But the results reported by Boone and Mulherin (forthcoming) question these encouraging results. They find no relation between bidders' cumulative abnormal returns (CAR) and the measure of competition constructed using information from the private-takeover process. This confirms previous results (e.g., Bradley *et al.* (1988); Varaiya (1988); Moeller *et al.* (2004)). If competition is really at play, this finding is clearly puzzling.

To sum up, the literature suggests that the number of *ex-post* observable bidders is low, that multiple-bid contests represent a minority of cases, that for private auctions no clear relation is found between the winning bidder's CAR and the number of rival bidders, and, finally, that one-to-one direct negotiation represents at least fifty percent of cases. So the question of whether the market for corporate control really lacks competition remains largely an open issue.

In this paper, we focus on so-called "friendly deals", for which no competition is observed *ex post*. Are the bidders in these friendly deals totally immune to competitive pressure? The question is important. The market for corporate control is a key external-control device to alleviate the agency

[2] Hansen (2001) provides a rational for this practice. The information divulged during the sale procedure is competitive in nature and if it were diffused too widely this would hurt the target value. There is therefore a trade-off between having a large number of bidders to stimulate competition, and restricting the diffusion of sensitive information.

problem between incumbent managers and shareholders.[3] Manne (1965) emphasizes that a vigorous and competitive market for corporate control is a credible alternative to direct regulation of M&As. As in any market, competition is a necessary condition to achieve an efficient allocation of resources. In the present case, competition is necessary to ensure that management teams with most value-creating investment opportunities acquire control of the targets' assets. Moreover, this efficient allocation of management teams is probably one of the best ways of protecting shareholders' rights and wealth creation within the economy. It is worthwhile stressing that the need for competition is even greater in the case of public targets. The property rights of private targets (e.g., family firms) being more concentrated, large shareholders can monitor the managers better (Shleifer and Vishny (1986)).[4] Shareholders of public firms, being more atomistic, are more exposed to incumbent managers' self-interest practices (Jensen and Meckling (1976); Fama (1980)).

An absence of competition in friendly deals also raises other intriguing questions:

- Why do the shareholders of target firms not systematically require competitive sale procedures? It is well known that competition increases the expected revenue of the seller. Bulow and Klemperer (1996) show, for example, that, in an English auction, the seller is always better off having one more bidder than engaging in a follow-on bargaining procedure with the winning bidder. If friendly deals are really free of competition, the observation of a high percentage of friendly mergers in the literature is definitely puzzling.
- Why do bidders have such low CARs? Early empirical results show that acquirers' CARs around the announcement date are at best equal to zero and may even be negative (Jensen and Ruback (1983)). Recent contributions (see, *inter alia*, Moeller *et al.* (2004)), by extending the analysis to much larger numbers of deals (more than 10,000), show that on average, acquirers' CARs are positive and significant, but economically small (around 1.1%).

[3] For example, Mitchell and Lehn (1990) show that bad bidders become good targets. It is also important to be clear that internal-control mechanisms also play an important role in disciplining the management of firms undertaking wealth-destroying acquisitions. For example, Lehn and Zhao (2006) show that the CEOs of bad bidders are often fired.

[4] See also Denis *et al.* (1997) for the monitoring role of large shareholders in the context of corporate diversifications.

Moreover, Moeller *et al.* (2004) report a clear size effect: large acquirers have lower announcement CARs than small acquirers. This is in clear contradiction to what auction theory tells us. In the standard independent private-value cases, assuming that bidder types are uniformly distributed between 0 and 1, the expected seller revenue is $N-1/N+1$ (Dasgupta and Hansen (2007)). Note that, by revenue equivalence, this result holds quite generally (first-price sealed-bid auctions, second-price sealed-bid auctions, English auctions and Dutch auctions, among others). This means that with two bidders, the seller captures only 1/3 of the winning-bidder valuation. With five bidders (far more than is usually observed in practice in the M&A field), the seller captures 2/3 of the winning-bidder valuation. So, the value kept by the winning bidder (the *ex-post* observed acquirer in the standard M&A database available to researchers) is large. We have to assume a highly competitive market for corporate control to understand, under the auction theory perspective, why the acquirers' CARs are so low.[5] Is the auction theory fundamentally missing some important features of the market for corporate control? Or is it that the market for corporate control is in fact far more competitive than what we think, but our measures of competition are fundamentally flawed?

In this paper, we argue that it is mainly *ex-ante* competition that matters in explaining acquirers' bidding behavior and their resulting CARs. In other words, it is the pressure of potential rivals that determines the acquirer's behavior. Therefore, competition pressure can also be present in friendly deals. Our argument is analogous to the theory of contestable markets (Baumol (1982)). Even if there is only one buyer, the buyer may be forced to act as if there were more. A perfectly contestable market is one in which entry and exit are absolutely costless. In such a market, competitive pressures, supplied by the perpetual threat of entry, as well as by the presence of actual rivals, induce competitive behavior. It is important to note that Boone and Mulherin (forthcoming) also recognize the role of potential competition: "Takeover competition has often been cited as an explanation of breakeven bidder returns [… as …] the presence of actual or *potential* competition leads to a pricing

[5] The free-riding argument provided by Grossman and Hart (1980) provides an alternative explanation of why most of the anticipated wealth from M&A deals accrues to target shareholders. However it assumes strictly atomistic shareholding.

of the target that results in zero profits to the winning bidder". But their empirical work focuses only on actual bidders participating in private-takeover processes. While focusing strictly on value-creating friendly deals, we try to go one stage further by analyzing the role of *ex-ante* competition on the bidding behavior of the friendly bidder.

We first provide a theoretical analysis of the role of *ex-ante* competition. The structure of the model is close to the one adopted in Betton *et al.* (2007). We model the acquirer's decision process in friendly deals as a two-stage extensive game with a finite horizon. The first stage is the bargaining stage, as in Betton *et al.* (2007). At this stage, the acquirer has to chose the bid he or she will propose to the target shareholders to acquire their shares. If the target shareholders accept the proposed bid, the game ends. If the target shareholders rebuff the bid, they will organize an auction to sell their shares.[6] This second stage refers either to the private-auction process highlighted by Hansen (2001) and Boone and Mulherin (2007) or, mainly for listed targets, to the fact that failed acquisition attempts attract other potential acquirers. The second stage is modeled as a second-price auction. The target shareholders' decision to accept or rebuff the initial acquirer's bid in the first stage depends on the bid level but also on the costs of organizing an auction in the second stage. These costs include direct costs such as financial intermediaries' fees and commissions, and communication and advertising expenses, and indirect costs such the time delay needed to complete the auction or the uncertainty over the number of bidders and their valuations. While direct costs may be estimated by the acquirer (e.g., by asking to an investment banker to provide some estimates), the indirect costs are function of the target shareholders' anxiousness to sell and are private knowledge. The acquirer's trade-off during the bargaining phase is therefore clear: choosing a high bid increases the probability of concluding the deal without being subject to competitive pressure in the second stage, but is costly. We solve the game by backward induction to identify the sub-game perfect equilibrium. The main restriction we impose to keep the problem tractable is the fact that the initial bidder is a high-value bidder: there is at most one other bidder who has a higher valuation of the target than that of the initial bidder. This seems to be a reasonable assumption in the light of the very high proportion of friendly

[6] In the Betton *et al.* (2007) model, after the first-stage negotiation, a second-stage auction takes always place. The expected payoffs of the rival is however different depending on the first-stage outcome.

deals that are completed. Note finally that we allow for *N-1* rivals at the second stage, which is essential to study the role of competition, while in the Betton *et al.* (2007) setup, there is only one rival at the second stage auction.

This model allows us to explore the impact of competition (the number of bidders in the second stage) on the equilibrium bidding strategy of the acquirer in the first stage. Our static analysis clearly shows that the higher the anticipated number of bidders in the second stage, the higher the bid the acquirer makes in the first stage (the bargaining phase) and the lower the bidder's equilibrium profit. This provides us our main hypothesis to test: the acquirer's bid during the bargaining phase should be an increasing function of the *ex-ante* competition (the anticipated number of bidders at the auction stage if the negotiations fail in the first stage). It also emphasizes the importance of using proxies for *ex-ante* competition to capture the effect of competition on the acquirer's behavior. Anticipating a potentially high number of bidders in the second stage, the acquirer will deter competition by increasing his or her bid in the first stage. This strategic behavior by acquirers makes the *ex-post* observed number of bidders a poor proxy of the *ex-ante* competition. In this respect, our argument is close to that used by Fishman (1988; 1989) in the context of jump bidding. Our analysis also stresses the importance of the costs of organizing the second-stage auction in explaining the target shareholders' decision to accept the acquirer's bid during the negotiation phase.

To test the effect of *ex-ante* competition on acquirers' expected profits, we focus on friendly deals, for which there is by definition no *ex-post* competition. We started by selecting completed transactions during the period 1995–2004 from the Thomson SDC database, with a deal size over 50 million USD and involving US-listed acquirers and targets. The various constraints we impose (in particular, we limit the sample to operations with a positive CAR, to control for the confounding effects of acquirer self-interest motivations such as empire building, hubris, entrenchment, etc., and we checked by hand, for each transaction, in the Wall Street Journal whether these transactions really were friendly) reduced our final dataset to 613 deals. Our dependent variable is the acquirer dollar CAR divided by the deal size, used as a proxy for the deal wealth-creation retained by the acquirer (we discuss in Section II why the use of the ratio between the acquirer dollar CAR and the deal dollar CAR, which at first sight seems to be a more natural choice, generates difficulties).

Our proxy for *ex-ante* competition is the deal frequency within the industry of the target, measured by the ratio of the number of deals in the industry to the number of firms in the industry during a given quarter. Since the number of contemporaneous observed deals in the industry could be endogenous to the acquirer dollar CAR, we also use a two-stage procedure to alleviate this concern. Indeed, Rosen (2006) shows that abnormal acquirer returns are more likely to be positive when a merger is announced in a hot merger market (i.e., if recent mergers by other firms have been well received by the market). Our instruments for *ex-ante* competition include market-wide variables (market average price-earnings ratio and commercial and industrial loan spreads, as in Harford (2005)) and industry-specific variables (past number of deals in the industry, target average CAR for past deals in the industry). Using a GMM two-stage estimator, our empirical results clearly confirm the role of *ex-ante* competition, even after controlling for the mode of payment, the strategic fit between the acquirer and target activities, and the uncertainty in the value of the target. Going one stage further, we also investigate whether the decreasing investment-opportunity set or target picking (see Harford (2005) and Klasa and Stegemoller (2007)) is at work. More specifically, by analyzing the behavior of the target dollar CAR divided by the deal size as a function of our proxy of *ex-ante* competition, we show that the investment-opportunity set seems to be shrinking (the target dollar CAR divided by the deal size decreases as the frequency of deals in the industry increases).[7] Therefore, we present a final robustness check where we show that the effect of *ex-ante* competition on bidder returns remains significant after controlling for this shrinking investment-opportunity set effect.

The contributions of our work to the existing literature are threefold:

- With respect to the effectiveness of the market for corporate control as an external control mechanism, we provide arguments showing that, on top of the *ex-post* observed competition, the *ex-ante* competition perceived by the bidder plays a significant role. Our empirical analysis confirms the negative impact of *ex-ante* competition on bidder returns, even for

[7] The lower target CAR for later deals in the industry could be also due to the 'acquisition probability hypothesis' (Song and Walkling (2000)). Once a deal is announced within an industry, the stock prices of other potential targets tend to increase, reflecting part of the subsequent acquisition premium.

friendly deals. In this respect, our paper complements previous studies (e.g., Mitchell and Lehn (1990); Masulis *et al.* (2007)) that have documented the effectiveness of the market for corporate control as an external control mechanism.

- The determinants of the acquirer CAR have received a great deal of attention in the M&A literature. Without being exhaustive, the most important determinants are the means of payment (Huang and Walkling (1987); Travlos (1987); Eckbo and Langhor (1989); Eckbo *et al.* (1990); Jennings and Mazzeo (1993)), the acquirer's free-cash flow (Jensen (1986); Lang *et al.* (1991)), the CEO's empire-building tendency and/or overconfidence (Morck *et al.* (1990); Aktas *et al.* (2007); Malmendier and Tate (forthcoming)), the deal size relative to the bidder's size (Loderer and Martin (1990); Eckbo and Thorburn (2000); Moeller *et al.* (2004)), the target's private/public status (Fuller *et al.* (2002)), the acquirer toehold (Betton and Eckbo (2000)), corporate governance variables (such as the role of anti-takeover provisions analyzed by Masulis *et al.* (2007)). We add *ex-ante* competition to this already-long list of determinants. This also helps us to better understand why we observe such a high proportion of friendly deals. As acquirer bids, even in a one-on-one friendly negotiation, integrate a premium for *ex-ante* competition, taking into account the direct and indirect costs of organizing competitive sales, the acceptance of direct negotiations may be a perfectly rational choice. It could even be argued that, by avoiding the costs associated with the second-stage auction, both parties will be better off in the end. This is probably the reason why Boone and Mulherin (2007) find that the wealth effect for target shareholders seems not to depend on the sales procedure (auction with multiple bidders versus negotiation with one bidder).
- The third stream of literature in which our work is rooted is the application of bargaining and auction-based models in corporate finance and more specifically in the M&A field. Using Samuelson's (1984) results, Hansen (1987) studied the role of the mode of payment in the context of asymmetric information. Hansen (1987) shows in particular that the use of stocks as a mode of payment may be a way of increasing the seller's expected revenues above what could be achieved with cash payments. Many other attributes of M&As have been analyzed using the auction-modeling setup: pre-emptive bidding (Fishman (1988); (1989)), toehold

(Burkart (1995); Bulow *et al.* (1999); Betton and Eckbo (2000); Betton *et al.* (2007)), optimal auction design when acquirers are asymmetric (Povel and Singh (2006)), to quote some of them. The role of potential bidders was explicitly taken into account recently by Houser and Wooders (2006). These authors analyzed auctions on eBay and introduced an interesting proxy of *ex-ante* competition: the duration of the auction. By analyzing the interconnection between a bargaining phase and an auction phase within the framework of an extensive game, like Betton *et al.* (2007), our model provides another evidence of the spectrum of potential applications of these theories in corporate finance. Central to our approach is the assumption that, by refusing the first-stage bid of the acquirer, target shareholders credibly commit to refusing any offer below this initial bid in the second stage. Their refusal reveals some private information to rival acquirers (and for public targets, to external investors). Rivals and outside investors use this new information to adjust their valuation. This interpretation of the failure of negotiations as a mechanism to reveal credible private information may find other applications.

The paper is organized as follows. Section I presents the two-stage theoretical model and highlights the effect of the anticipated second-stage competition on the first-stage bid. We focus on the main results and implications. All proofs are given in the appendix. Section II is devoted to the empirical tests. We first explain the construction of the sample. Then, we describe the variables and the econometric methods used before turning to the analysis of the empirical results. Section III summarizes and concludes the paper.

I. Bargaining and *Ex-ante* Competition

This section models the decision problems of the acquirer and target as a two-stage extensive game. The model is intended to capture the essential features of the following typical situation: a public firm is contacted by a potential acquirer, and a negotiation phase begins. If the negotiations succeed, the deal will typically be announced on a Monday morning, before the opening of the financial market. However, if they fail, the acquisition attempt will attract the attention of other potential bidders. These bidders will then engage in a second-stage takeover battle. *Ex-post*, when the first-stage negotiation is successful, the deal is reported in the financial press as being friendly. We note, however, that our model is general enough to capture other situations. For example, the sale of a firm may be at the request of its shareholders (e.g., family shareholders), who contact a financial intermediary. A potential acquiring firm is found, and a negotiation phase starts. Because the shareholders really want to sell, if the negotiations break down, the financial intermediary has the mandate to organize a private auction among multiple potential bidders. This corresponds to some of the situations described by Boone and Mulherin (2007). The essential nature of these situations is that there is a two-stage takeover process: first private negotiations and then, if the negotiations fail, a competitive procedure.

A. Negotiation under the Threat of an Auction

The structure of the game is the following: during the first stage (the negotiation phase), the initial prospective acquirer contacts the target firm and makes an acquisition offer b_1. If the target shareholders refuse this initial offer, the acquirer's rivals come into play (the failed negotiation attempt makes them aware of the investment opportunity). A takeover battle, with multiple bidders, begins. The initial acquirer makes an offer b_2 at this second stage. The game ends with the sale of the target. This is an extensive game with perfect information: each player knows the decisions taken previously by the other players. However in the first stage information is asymmetric. Organizing an auction in the second stage implies direct costs (such as financial intermediaries' fees and commissions, communication and advertising expenses, etc.) and indirect costs (such as the time delay needed to complete the auction or the uncertainty over the number of bidders and their valuations). These indirect costs are a function of the target shareholders anxiousness to sell. Therefore, while the direct costs are common knowledge, the indirect costs are private knowledge of the target shareholders. So, while the target knows the exact cost (denoted *c*) of organizing an auction or a takeover battle with multiple bidders, the acquirer has only imperfect knowledge of these costs. The costs associated with the organization of an auction in the second stage play, in our model, the same role as the costs of participating in a sale process in Bulow and Klemperer (2007), where the authors analyze the conditions under which auctions are the most efficient selling mechanism.

In the first stage (the initial negotiation), the acquirer is assumed to make a first and final offer. Not only does this assumption simplify the analysis (we do not have to model the intricacies of the negotiation procedure) but moreover, Samuelson (1984) has shown that it corresponds to the optimal behavior for a buyer bargaining with asymmetric information.[8] We model the second stage as a second-price auction. In our setup, by the revenue equivalence theorem (see Milgrom (2004)), equilibrium strategies and expected payoffs are equivalent to those obtained in an English auction and in a first price auction.[9] When there is a takeover battle, we assume that the rejected bid in the first stage becomes the minimum price at which the target shareholders agree to sell their shares (the seller's reserve price).[10] This makes sense as, by refusing the bid of the initial acquirer, the target shareholders reveal some private information to outside investors. Public investors update their valuations and a new market price emerges for the target firm. This market price becomes the natural lower bound for acquirers wishing to enter the takeover battle in the second stage.

The acquirer tradeoff in the first stage appears clearly. By increasing the first stage bid b_1 during the negotiation phase, the acquirer increases the probability that the target will accept the offer. But

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[8] To obtain this result, Samuelson (1984) assumes (i) information asymmetry between the buyer and the seller over the quality of the good, (ii) the absence of a credible way for the seller to transfer his or her information to the acquirer, and (iii) the impossibility of making the terms of the agreement contingent on the real value of the good.

[9] The English auction is more suited to modeling takeover battles, while the first-price auction is more often observed in private auction procedures (see Hansen (2001)).

[10] Note that this reserve price is not generally the optimal reserve price for the seller (Riley and Samuelson (1981); Myerson (1981)). Assuming that the target shareholders will choose the optimal reserve price raises the problem of *ex-post* commitment (see Dasgupta and Hansen (2007), Section 4.2.2, for a discussion of this point).

increasing the first stage bid is costly. Target shareholders will trade off the immediate and certain bid b_1 against the sale price they expect to receive by the end of the takeover battle and its associated cost. Note finally that we assume (as does Samuelson (1984)) that the target shareholders have no way of credibly communicating the cost c of organizing an auction. Relaxing this assumption would lead to a trivial solution for the acquirer decision problem during the negotiation phase: the acquirer would bid the expected outcome price of the takeover battle, minus the takeover battle cost to the target shareholders, plus one dollar.[11] The target shareholders would accept this bid, as it is greater than their expected profits if they refuse.

B. Formal Description

Game description. The player set for our extensive game is {acquirer, target}. We denote by Ø the start of the game, by b_1 the acquirer's bid during the negotiation phase, and by b_2 the initial acquirer's bid during the second stage takeover battle. The actions available to the target during the negotiation phase are {*Accept*, *Refuse*}. Terminal histories are (b_1, *Accept*) and (b_1, *Refuse*, b_2). The player function $P(.)$ is $P(Ø)$ = acquirer, $P(b_1)$ = target and $P(b_1, Refuse)$ = acquirer. The game encompasses three sub-games: $\Gamma(Ø)$, $\Gamma(b_1)$ and $\Gamma(b_1, Refuse)$.

Players' types and preferences. We assume risk neutrality, so the acquirer's and target's preferences are fully described by their expected payoffs. We denote by v_1 the target valuation of the initial acquirer (the acquirer starting the negotiation phase) and by v_i the valuation of a given acquirer i. v_i is a function of the market value of the target (common knowledge) and the synergies the acquirer anticipates. The synergies are private to the acquirer and define its type.[12] We note that v_i is strictly increasing in synergies. Rivals during the second-stage takeover battle are referred to as $i=2 \ldots N$ (there are therefore $N-1$ rivals at this stage). The acquirer and the target have imperfect knowledge of the

[11] Note that this is true in our private value setup. In a common value setup, taking into account the winner's curse, the bidder would bid less. So, even if c was common knowledge, the winner curse would leave scope for the target and the bidder to disagree about the true value. In some cases, the target would accept the discounted bid price (if its information about value were roughly in the same range) but not in all cases.

[12] This private value framework is more suited to strategic transactions, where the value creation is specific to the complementarities between the acquirer's and the target's activities, then to financial transactions, in which the value creation depends on factors available to any acquirer (see Bulow *et al.* (1999)).

valuations v_i of potential rivals acquirers. We denote the distribution of v_i by $F(.)$. Knowledge of $F(.)$, which responds to the conditions of a cumulative density function, is common to the acquirer and the target.[13] That amounts to assuming that rival valuations are independent and identically distributed. $v_{(i)}$ denotes the order statistic of v_i for the $N{-}1$ rivals. So, $v_{(1)}$ is the maximum of $(v_2, \ldots, v_N)$.

We assume that the initial acquirer (whose valuation is v_1) is a high-value bidder: at most one rival firm has a higher valuation. This means, in our notation, that $v_1 \geq v_{(2)}$. This assumption simplifies the analysis, in particular at Stage 2, and relaxing it does not change our results qualitatively. Moreover, this initial high-value bidder assumption captures one of the empirical features of takeover battles: the first mover frequently wins the competition. For example, Betton and Eckbo (2000) report, for a sample of 1,353 tender offers for the period 1971−1990, that the initial bidder won the contest in 864 (over 63%) of the cases, and a rival bidder in only 198 (less than 15%) of the cases.

Additional notations. We denote by Π_j^k the profit of player j at stage k; $j \in$ {acquirer, target}, and $k \in \{1,2\}$. p_j is the price at stage j. c represents the costs associated with a takeover battle for the target. c has the atomless distribution $K(.)$ in the eyes of the acquirer (information is asymmetric, as mentioned in Section I.A. above), with an upper bound $\bar{c}$ below the expected price in the second-stage takeover battle.[14] Finally, we denote by v_T the stand-alone value of the target firm in the eyes of its shareholders.

C. Equilibrium Analysis

We adopt the sub-game perfect equilibrium concept to study the outcome of the game, and restrict our analysis to pure strategies.[15] As we are dealing with a finite-horizon game, backward induction is used to identify the equilibrium. The game has a unique sub-game perfect equilibrium if, at each

[13] To be more precise, our approach adopts a distributional strategy (see Milgrom (2004)). If t_i denotes the acquirer type, we assume that t_i follows a [0,1] uniform distribution and that $F(.)$ is some invertible function defined by $v_i = F^{-1}(t_i)$, the inverse of the valuation function.

[14] If the costs of letting the takeover battle take place are higher than the expected price at this second stage, target shareholders will not refuse the first-stage offer, and indeed, assuming that they really want to sell, any positive offer made during the negotiations will be accepted.

[15] A discussion of the potential existence of equilibrium mixed strategies and their implications for the equilibrium concept used is presented in Appendix A.

stage, each player has a unique optimal decision. We note also that sub-game perfect equilibriums are Bayesian Nash equilibriums, and that, by the revelation principle (Myerson (1981)), only truthful reporting is compatible with a Bayesian Nash equilibrium.

C.1. Second Stage Analysis: The Takeover Battle

As mentioned in Section I.A, we model the takeover battle as a second-price auction with a reserve price set to the rejected first-stage negotiation offer b_I. In our independent private-value setting, thanks to Vickrey's (1961) seminal contribution, second-price auctions with reserve prices are known to be revenue equivalent to English auctions with reserve prices (see Matthews (1995); Milgrom (2004)). As shown in Table I, there are three possible outcomes at this second stage:

- *Case 1* – $v_{(1)} \leq b_I$: the maximum valuation of rivals is below the target shareholders' reserve price (the rejected offer in the first stage). Target shareholders then sell their shares to the initial acquirer at price b_I (the reserve price plays the role of the second best bid as in second-price auctions with reserve prices). The target shareholders profit is $\Pi_2^{Target} = b_I - v_T - c$. The initial acquirer's profit is $\Pi_2^{Acquirer} = v_I - b_I$. We denote by φ_1 the probability of the occurrence of Case 1.

[Insert Table I About Here]

- *Case 2* – $b_I < v_{(1)} \leq v_I$: the maximum valuation of rival acquirers is above the target shareholders' reserve price b_I but below the initial acquirer's valuation v_I. So, the initial bidder wins the auction and pays $\widetilde{v}_{(1)}$, the second-best offer. Note that, at this stage, $\widetilde{v}_{(1)}$ is a random variable. The target shareholders profit is $\Pi_2^{Target} = \widetilde{v}_{(1)} - v_T - c$. The initial acquirer's profit is $\Pi_2^{Acquirer} = v_I - \widetilde{v}_{(1)}$. We denote by φ_2 the probability of the occurrence of Case 2.
- *Case 3* – $v_{(1)} > v_I$: the maximum valuation of rivals $v_{(1)}$ is higher than the initial acquirer's valuation v_I. The rival wins the auction and pays v_I. The target shareholders profit is $\Pi_2^{Target} =$

$v_1 - v_T - c$. The initial acquirer fails to acquire the target and so makes no profit. We denote by φ_3 the probability of the occurrence of Case 3.

φ_1 is the probability that the maximum valuation of the $N-1$ rivals will be below b_1. The probability that a given rival valuation will be below b_1 is $F(b_1)$. Under the assumption that the private valuations are independent with a cumulative density function of $F(.)$, the probability that the $N-1$ rivals' valuations will all be below b_1, is $F(b_1)^{N-1}$. We follow the same argument to obtain φ_2 and φ_3. So, the probability of Cases 1, 2 and 3 arising are respectively:

$$\text{Case 1: } \varphi_1 = F(b_1)^{N-1}; \tag{1}$$

$$\text{Case 2: } \varphi_2 = F(v_1)^{N-1} - F(b_1)^{N-1}; \tag{2}$$

$$\text{Case 3: } \varphi_3 = 1 - F(v_1)^{N-1}. \tag{3}$$

Note that, by definition, $\varphi_1 + \varphi_2 + \varphi_3 = 1$ and that, as we are in a second-price auction, by the revelation principle, the dominant strategy of acquirers (either the initial acquirer or its rivals) is to bid their own valuation.

The expected price at this Stage 2 takeover battle is the average price at each possible outcome, weighted by the corresponding probability:

$$E(p_2) = \varphi_1 b_1 + \varphi_2 E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} > b_1, \tilde{v}_{(1)} \le v_1\right) + \varphi_3 v_1. \tag{4}$$

The only unknown term in Equation (4) is $E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} > b_1, \tilde{v}_{(1)} \le v_1\right)$. Using Equations (1) to (3), this conditional expectation is:

$$E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} > b_1, \tilde{v}_{(1)} \le v_1\right) = \int_{b_1}^{v_1} v \frac{(N-1)F(v)^{N-2} f(f)}{F(v_1)^{N-1} - F(b_1)^{N-1}} dv. \tag{5}$$

Combining Equations (1) to (5), the expected price of the takeover battle can be rewritten as:

$$E(p_2) = F(b_1)^{N-1} b_1 + \int_{b_1}^{v_1} v(N-1)F(v)^{N-2} f(v) dv + (1 - F(v_1)^{N-1}) v_1. \tag{6}$$

Note that,

- $(N-1)F(v)^{N-2}f(v)$ is the density of the rivals best valuations;
- A direct investigation of Equation (6) shows that $E(p_2)\geq b_1$.[16] The initial acquirer's first-stage offer b_1 is a lower bound of the expected price at Stage 2. This is reminiscent of Bulow and Klemperer's (1996) result: competitive procedures always increase the expected revenue of the seller, compared to direct negotiation. In our model, the target shareholders' tradeoff arises from the costs of letting the takeover battle take place;
- $\partial E(p_2)/\partial b_1 = F(b_1)^{N-1}\geq 0$: an increase in the negotiation phase offer b_1 increases the takeover battle's expected payment, but the greater the competition in the second-stage takeover battle (the larger N), the lower is this effect. Competition increases indeed the probability that at least one rival will have a valuation above b_1.

From Equation (6) we obtain the expected profit of the target shareholders at Stage 2 as:

$$E(\Pi_2^{\text{Target}}) = E(p_2) - v_T - c. \tag{7}$$

The initial acquirer's expected profit at the end of the takeover battle is the average profit at each possible outcome weighted by the corresponding probabilities. Using the outcome profits reported in Table I, the probabilities of each outcome from Equations (1) to (3) and the conditional expectation of the highest rival valuation given in Equation (5), we obtain:

$$E\left(\Pi_2^{\text{Acquirer}}(v_1)\right) = F(b_1)^{N-1}(v_1-b_1) + \left(F(v_1)^{N-1} - F(b_1)^{N-1}\right)\left(v_1 - E\left(\tilde{v}_{(1)}\middle|\tilde{v}_{(1)} > b_1, \tilde{v}_{(1)} \leq v_1\right)\right). \tag{8}$$

The first part of this expression corresponds to the profit when the rival maximum valuation is below the initial acquirer's bid at the negotiation phase; the second part corresponds to the profit if the rival maximum valuation is above the initial acquirer's bid at the negotiation phase, but below the initial acquirer's valuation. These profits are weighted by the probabilities of their occurrence. Note that $\partial E\left(\Pi_2^{\text{Acquirer}}(v_1)\right)/\partial b_1 = -F(b_1)^{N-1}\leq 0$: an increase in the first-stage negotiation offer reduces the

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[16] $E(p_2)-b_1$ equals $(1-F(b_1)^{N-1})(v_1-b_1)+\int_{b_1}^{v_1} v(N-1)F(v)^{N-2}f(v)dv$. By the participation constraint, we see that $v_1\geq b_1$. $(1-F(b_1)^{N-1})$, being a probability, is positive. The same holds for *F(v)* and *f(v)*. Note finally that, by definition, b_1 and v_1 are also positive.

initial acquirer's second-stage expected profit by the exact amount of the increase in the second-stage takeover battle expected price (see Equation (6)).

C.2. First-Stage Analysis: The Negotiation

Having derived the expressions for the expected profit of the target shareholders and the initial acquirer in the second-stage takeover battle, we can now turn to the analysis of the first-stage negotiation phase. It is worth first noting that in Equations (6) and (8), b_1, the initial acquirer's first-stage offer, appears in the term $F(b_1)^{N-1}$. Unless $N = 2$ and $F(.)$ is linear (uniform distribution), there is therefore no hope of deriving a closed-form formula. Stating the target shareholders' and the initial acquirer's decision problems and expected profits at this first stage negotiation is, however, enough for us to study the role of competition (see Section I.D).

The target decision problem during the negotiation phase can be expressed as:

$$\underset{x \in \{0,1\}}{Max}\, x(b_1 - v_T) + (1-x)E(\Pi_2^{\text{Target}}) \ , \tag{9}$$

where x is a binary variable taking the value 1 if accepted and 0 if refused. Using Equation (7) and denoting the optimal decision as x^*, the target shareholders' expected profit is:

$$E(\Pi_1^{\text{Target}}) = x^*(b_1 - v_T) + (1-x^*)\left[E(p_2) - v_T - c\right] . \tag{10}$$

The target shareholders will reject the initial acquirer offer if $(b_1 - v_T) \le E(\Pi_2^{\text{Target}})$, this is to say if $c \le E(p_2) - b_1$. This happens with probability $K\big(E(p_2) - b_1\big)$ in the eyes of the initial bidder. As expected, the higher the expected price at Stage 2, the higher the probability that the initial acquirer's offer is rejected. Increasing the first stage negotiation bid b_1 increases the probability of acceptance. Note also that c determines the sub-game perfect equilibrium that will emerge:

- If $c < E(p_2) - b_1$ the sub-game perfect equilibrium is b_1^*, the optimal bid for the initial acquirer at the negotiation stage (see below). *Refuse* is the rational choice for the target shareholders and v_1 the dominant bidding strategy for the initial acquirer during the second stage takeover battle.

- If $c > E(p_2) - b_1$ the sub-game perfect equilibrium is defined by b_1^*, *Accept* and v_1 (even if the takeover battle does not take place.
- If $c = E(p_2) - b_1$ there are two sub-game perfect equilibriums, both of which are potential solutions of the game.

The initial acquirer's decision problem at this negotiation phase is

$$\underset{b_1}{Max}\left(1 - K\left(E(p_2) - b_1\right)\right)(v_1 - b_1) + \left(K\left(E(p_2) - b_1\right)\right)E\left(\Pi_2^{\text{Acquirer}}(v_1)\right) \tag{11}$$

and the expected payoff of the initial acquirer is given by

$$E\left(\Pi_1^{\text{Acqiorer}}(v_1)\right) = \left(1 - K\left(E(p_2) - b_1^*\right)\right)(v_1 - b_1^*) + \left(K\left(E(p_2) - b_1^*\right)\right)E\left(\Pi_2^{\text{Acquirer}}(v_1)\right). \tag{12}$$

We show in Appendix A that b_1^* exists, and discuss the conditions under which it is unique.

D. The Role of Competition

The model developed in the preceding sub-sections allows us to study the effect of competition in the second-stage takeover battle (here captured by *N–1*, the number of rivals in the second stage) on the equilibrium bid b_1^* that will emerge from the negotiation phase, the target expected profit, the probability of b_1^* refusal and the initial acquirer's expected profit. This will allow us to derive the main proposition that we test in Section II. We start by analyzing the effects of competition on the Stage 2 takeover-battle equilibrium outcome. We then return to the Stage 1 negotiation phase.

D.1. The Role of Competition in the Takeover Battle

Central to the analysis of competition in the takeover equilibrium is the effect of the number of rivals on the expected price in the second stage, i.e., the effect of *N–1* on $E(p_2)$. Using Equation (6), we show in Appendix B that *N–1* increases $E(p_2)$. Since the target shareholders' expected profit is $E(\Pi_2^{\text{Target}}) = E(p_2) - v_T - c$ (see Equation (7)), an increase in *N-1* leads to an increase in $E(\Pi_2^{\text{Target}})$. As the initial acquirer's expected profit $E(\Pi_2^{\text{Acquirer}})$ is by definition the probability of winning the takeover battle times the acquirer's valuation v_1 minus the expected payment, $E(\Pi_2^{\text{Acquirer}})$ is decreasing in *N–1*. This leads to our first proposition:

> *Proposition 1. An increase in the number of rivals in the second-stage takeover battle increases both the equilibrium expected price* $E(p_2)$ *and the equilibrium expected profit of the target shareholders* $E(\Pi_2^{\text{Target}})$*, and decreases the equilibrium expected profit of the acquirer* $E(\Pi_2^{\text{Acquirer}})$.

D.2. The Role of Competition in the Negotiation

We first focus on the effect of competition on the first stage optimal offer b_1^*. We show in Appendix C that the expected initial acquirer payoff in the first stage negotiation $E\left(\Pi_1^{\text{Acquirer}}\right)$ satisfies the strict single-crossing differences condition. By the application of the monotonic selection theorem (Milgrom (2004, p. 102)), b_1^*, the optimal offer by the initial acquirer during the negotiation, is a non-decreasing function of *N–1*, the number of rivals. This leads us to our second proposition:

> *Proposition 2. An increase in the number N–1 of rivals in the second-stage takeover battle increases the equilibrium initial acquirer offer* b_1^* *during the negotiation phase.*

Proposition 2 allows us to explore the consequences of an increase in the number of rivals in the second-stage takeover battle on the first stage probability of refusal, initial acquirer and target expected profits (for ease of discussion, we consider *N–1* as a continuous variable):[17]

- At the first stage, the target shareholders' decision problem is to choose between $(b_1 - v_T)$ and $\left[E(p_2) - v_T - c\right]$ (see Equation (9)) and as, according to Propositions 1 and 2, both terms are increasing in *N–1*, we conclude that $E(\Pi_1^{\text{Target}})$ is increasing in *N–1*.

[17] *N-1* can be dealt with as a discrete variable, using the same approach as in Appendix B, but this is somewhat tedious. An alternative approach is to interpret *N–1* as the *ex-ante* perception of the potential competition strength in the second stage. Our results do not depend on this simplifying assumption.

- The probability of the initial acquirer's offer being rejected is $K\left(E(p_2)-b_1^*\right)$. It's derivative with respect to *N–1* is $\frac{\partial K(E(p_2)-b_1^*)}{\partial(E(p_2)-b_1^*)}\times\left[\frac{\partial E(p_2)}{\partial(N-1)}-\frac{\partial b_1^*}{\partial(N-1)}\right]$. The first term is the probability density function corresponding to *K(.)* and is therefore positive. By Proposition 1, $\frac{\partial E(p_2)}{\partial(N-1)}$ is positive. By Proposition 2, $\frac{\partial b_1^*}{\partial(N-1)}$ is also positive. So, $\left[\frac{\partial E(p_2)}{\partial(N-1)}-\frac{\partial b_1^*}{\partial(N-1)}\right]$ can be either positive or negative depending on the magnitude of the two derivatives. If the derivative of the initial acquirer's offer dominates, the increase in b_1^* is a form of preemptive bidding. To summarize, the effect of *N–1*, the number of rivals in the second-stage takeover battle, on the probability of the target shareholders rebuffing the initial acquirer's first-stage offer is ambiguous. The expected price in the second stage increases but the equilibrium bid b_1^* also increases. Which effect will dominate depends on *K(.)* (the distribution of the second-stage takeover battle costs as perceived by the initial acquirer) and *F(.)* (the distribution of the potential rivals' valuations in the second-stage takeover battle, as anticipated by both the initial acquirer and the target's shareholders). This ambiguous relation between *ex-ante* competition and the probability of the negotiations failing may be one of the elements explaining why it is difficult to empirically find a negative relation between the ex-post observed number of bidders and the acquirer's abnormal returns (see Boone and Mulherin (forthcoming)). The initial acquirer's expected profit is given by Equation (12). An increase in *N–1* lowers both the payoff in the event of successful negotiations $(v_1-b_1^*)$, and the payoff in the event of a takeover battle ($E\left(\Pi_2^{\text{Acquirer}}\right)$). So, the initial acquirer's expected profit clearly (and intuitively) decreases as the number of rivals in the takeover battle increases.

Proposition 3 summarizes these results:

Proposition 3. In the first-stage negotiation phase, an increase in the number N–1 of rivals in the second-stage takeover battle increases the equilibrium target-shareholders expected profit

$E(\Pi_1^{\text{Target}})$, decreases the initial acquirer's expected profit $E\left(\Pi_1^{\text{Acquirer}}\right)$ and has an ambiguous impact on the probability of the offer being refused $K\left(E(p_2)-b_1^*\right)$.

We now turn to comparing our predictions with the real world situation.

II. Empirical Evidence

We start by explaining the procedure used to build our M&A sample. We then discuss the choice of dependent, independent and control variables. This gives us the opportunity to pinpoint econometric difficulties that must be tackled in order to investigate the implications of the model introduced in the previous section properly. Finally we present the main results.

A. Sample

Friendly deals, defined as deals between parties that both consent to the wedding, provide a particularly interesting setup for testing whether competition is effectively present in the market for corporate control. Friendly deals are the least subject to obvious competition, as the parties voluntarily enter into direct private negotiations. So, if competition appears to be at work for friendly deals, *a fortiori*, it can not be rejected that it is at work in other forms of transactions. To constitute a significant sample of friendly deals, we extracted from the Thomson Securities Data Company (SDC) database all deals between 1995 and 2004[18] corresponding to the following criteria:

- deal size over 50 million USD;
- US listed acquirer and target;
- deal attitude reported by Thomson SDC as friendly;
- number of bidders reported by Thomson SDC as one;
- one hundred percent of the target acquired.

These selection criteria yield an initial sample of 3,073 deals. We then filter this group further and keep only deals complying with the following additional requirements:

[18] Note that the period chosen includes the end of the 1990s M&A wave and the beginning of the 21st century M&A market slowdown. These two periods correspond to a bull and a bear stock market, respectively.

- the data necessary to compute the acquirer, target and deal CARs[19] at the announcement date must be available from the CRSP (Center for Research in Security Prices) database;
- the deal CAR must be positive. The rational for this is (i) to avoid as far as possible deals motivated by agency and/or hubris-based reasons; and (ii) to focus on deals for which both parties have something to gain (an *a priori* more favorable context for friendly relations between the parties).

These two criteria reduced the dataset to 1,033 deals. We finally checked the Wall Street Journal (using the Proquest database) by hand to ensure that each deal included in the sample has indeed been "friendly." The search period was from twelve months before to one month after the announcement date. This excludes 238 more deals. Taking into account the missing data for control variables (described in Section II.B below), the final dataset includes 613 deals.

Table II presents characteristics of the deals. For each 5-year sub-period (the first corresponding to a hot M&A market and the second to a cold one), we report the number of deals, the average and median deal sizes, the percentage of cash deals, the average price-earnings ratio of the targets, and the percentage of intra-industry deals. Our sample is somewhat more concentrated in the 1995−1999 sub-period, as expected in the light of the wave of M&As at the end of the 1990s. The significant differences between the average and median deal sizes emphasize the impact of a few huge deals. The median deal sizes themselves show that we are looking at economically significant deals: over the whole period, 50% of our deals were larger than 367 million USD. The percentage of cash deals almost doubled between 1995−1999 and 2000−2004, which is consistent with the idea that acquirers use stock as a medium of payment when they are highly valued (see, *inter alia*, Travlos (1987)). Again as expected, the average target price-earnings ratio is smaller in the later sub-period. However the percentage of horizontal deals stays almost constant across the period.

[Insert Table II About Here]

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[19]The deal CAR is the value weighted average of the bidder's CAR and the target's CAR at the deal announcement date.

It is worth noting two important implications of the way we constituted our dataset. First, since the deals are all friendly, there is (almost) no uncertainty about the deal completion at the announcement date. In this respect, the investors' reaction to the deal announcement represents a cleaner estimation of the deal value effect than when there is uncertainty about the deal completion. Second, as we focus only on value-creating deals, the correlation coefficient between the acquirer's CAR and the target's CAR is, in a somewhat unusual way,[20] positive (0.016 for our sample). This is consistent with Berkovitch and Narayanan's (1993) findings. According to these authors, a positive correlation is expected between acquirer and target CARs if the main motive of the deal is synergy.

B. Variables and Methods

This sub-section is devoted to a description of the variables and empirical methods. First, we discuss the choice of the dependent variable. Then, we present in detail the proxy used for *ex-ante* competition, which is our variable of interest. Finally, we discuss the control variables.

B.1. Dependent Variable

Acquirer. Proposition 3 in Section I has clear implications for the impact of *ex-ante* competition on the initial acquirer and the target shareholders' expected profits. A natural candidate for the dependent variable is the proportion of wealth creation (in monetary value) captured by the parties. For the acquirer, this ratio would be:

$$Acquirer\ \%CAR = \frac{CAR^{A} \times MV^{A}}{\left(CAR^{A} \times MV^{A}\right) + \left(CAR^{T} \times MV^{T}\right)}, \tag{13}$$

where, *MV*, *A* and *T* denote the market value, the acquirer and the target, respectively. To estimate the acquirer and target CARs, we use a standard event-study procedure. The estimation window goes from day −230 to day −30 relative to the announcement date given in the Thomson SDC database. The event window encompasses 11 days centered on the announcement date. We use the market

[20] Generally speaking, an increase in the price paid by the acquirer leads to an increase in the target's CAR and a decrease in the acquirer's CAR, everything else being constant.

model as a return-generating model, with the CRSP equally-weighted index as a proxy for the market portfolio. However, the use of *Acquirer %CAR* is not without serious empirical difficulties. Despite the fact that we focus on a sample of value-creating deals, the value creation for a significant proportion of deals is very low. This means that the behavior of *Acquirer %CAR* is very erratic. Figure 1 displays the scatter plot of *Acquirer %CAR* (y-axis) and the value creation of the deal measured in million USD (x-axis). To ease the visualization, *Acquirer %CAR* has been truncated to −1.1 and 1.1. The erratic behavior of *Acquirer %CAR* as the deal's value creation nears zero is clearly apparent.

To overcome this difficulty, we have chosen to use the ratio between the acquirer's dollar CAR and the deal size[21] as the dependent variable:

$$Acquirer\ CAR_{INV} = \frac{\left(CAR^{A} \times MV^{A}\right)}{Deal\ size}. \tag{14}$$

This ratio gives a measure of the wealth captured by the acquirer per invested dollar, as perceived by investors, which is a sort of rate of return. As the deal size never nears zero (by construction), the statistical behavior of *Acquirer* CAR_{INV} does not raise specific concerns.

[Insert Figure 1 About Here]

Target. Capturing the wealth effects of *ex-ante* competition on the target shareholders raises more serious difficulties. Since the introduction of the acquisition probability hypothesis by Song and Walkling (2000), we know that the share price of the target incorporates a premium which is a function of the probability of its being acquired. So, part of the wealth effect due to the acquisition is included in the target's share price well before the announcement date. Moreover, the acquisition probability premium is itself clearly a function of the potential competition among bidders to acquire the target: the higher the number of potential acquirers, the higher the acquisition probability

[21] Deal size is defined by SDC as the total value of consideration paid by the acquirer (in million USD), excluding fees and expenses.

premium. Capturing the effects of *ex-ante* competition on the target shareholders' wealth by analyzing the wealth effects around the announcement date is therefore doomed to failure. The use of the long-term abnormal return approach might be a way of accounting for the role of *ex-ante* competition for target shareholders but this raises other serious difficulties. The estimation of long-term abnormal returns has been subject to extensive debate in the literature (see, for example, Barber and Lyon (1997); Fama (1998); Lyon *et al.* (1999)). In their recent review article, Kothari and Warner (2007, p. 21) emphasize this point by stressing that, "whether the apparent abnormal returns are due to mispricing, or simply the result of measurement problems, is a contentious and unresolved issue among the financial economists".

B.2. Variable of Interest

Competition in the market for corporate control is not observable *per se*. But the stronger the competition to acquire targets in a given industry, the more often we expect to observe M&A operations. Our proxy of competition is constructed on the basis of this intuition. We compute the deal frequency in a given industry as the ratio between the number of deals in the industry and the number of firms in that industry:

$$Deal\ frequency = \frac{Number\ of\ deals\ in\ the\ industry}{Number\ of\ \ firms\ in\ the\ industry}\ . \tag{15}$$

As *deal frequency* plays a central role in our empirical analysis, some discussion is worthwhile. *Deal frequency* is measured quarterly, as a compromise between having enough observable deals in each industry and using a time-period short enough to capture changes in the competitive environment. We adopt the Fama/French 49 industry classification.[22] This provides a balance between the homogeneity of firms' activities and the size of the industries. Firms are allocated to industries using their historical CRSP standard industrial classification (SIC) codes. The number of firms in each industry is computed at the beginning of each quarter, using the whole CRSP universe.

[22] The Fama/French industry classification is available at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Deal frequency is a proxy for competition, based on *ex-post* observable data. This raises two difficulties:

(i) There might be an endogenous relationship between the *ex-post* observable number of deals in a given industry and acquirers' CARs: the more positively investors welcome the announcement of deals in a given industry, the more rivals might be tempted to enter the M&A market. The high *ex-post* observable number of deals might therefore be, at least partially, driven by *ex-post* observation of the positive acquirers' CARs. *Deal frequency* is certainly a proxy for potential competition, but it may be also correlated with this momentum effect (see Rosen (2006)).

(ii) As M&As happen in waves (Andrade *et al.* (2001); Harford (2005)), not only can the number of deals per period be expected to be quite a persistent variable, but, as time goes on, the number of potential targets in a given industry can be expected to decline. This gives rise to the notion of a time-varying investment-opportunity set (see Klasa and Stegemoller (2007)). The increasing rarity of potential targets may lead to target-picking behavior by acquirers: good targets are bought first. As the number of deals increases, only less attractive targets remain. A decline in acquirers' CARs might be generated by this shrinking of the investment-opportunity set. This is certainly an issue to be taken into account as, in our sample, *Deal CAR* and *Deal frequency* have a negative correlation of –0.058 which, despite its small size, is statistically significant at the 5% level.

To tackle these two methodological issues, we adopted the following procedure: as independent variables we use not only the contemporaneous deal frequency but also the predicted deal frequency. This is obtained using the first-stage regression

$$\begin{aligned} & \textit{Deal frequency}_{Q,I} = \alpha_0 + \alpha_1 \textit{Deal frequency}_{Q-1,I} + \alpha_2 \textit{Market PER}_{Q-1} \\ & + \alpha_3 \textit{Average target CAR}_{Q[-4,-1],I} + \alpha_4 \textit{Spread}_{Q-1} + \varepsilon_{Q,I} \end{aligned} , \qquad (16)$$

where Q is the quarter index ($Q[-4,-1]$ denotes the period from quarter −4 to quarter −1, relative to the quarter of the M&A announcement date), I is the industry index, $\textit{Market PER}_{Q-1}$ gives the market price-earnings ratio at quarter −1 (computed as the equally-weighted average of the 49 Fama/French industry price-earnings ratios), *Average target* $CAR_{Q[-4,-1],I}$ is the equally weighted average of the target CARs in industry *I* for deals announced between quarter –4 and quarter –1 relative to the quarter of the M&A announcement date, and $Spread_{Q-1}$ is a proxy for low capital liquidity (as in Harford (2005)) and corresponds to the difference at quarter –1 between the average rate charged for commercial and industrial loans and the Fed funds rate (as reported in the US Federal Reserve Bank's Survey of Terms of Business Lending).[23]

The results of the estimation of Equation (16) are presented in Section II.C. Panel A of Table III gives yearly summary statistics. As expected, the average deal frequency follows the shape of the latest wave of M&As. The peak of the average target CAR is at the end of the so-called internet bubble. The market price-earnings ratio displays a sharp increase during the first period covered by our data. The peak is, however, reached in 1998, two years before the end of the stock market euphoria. This might seem surprising, but it is probably due to the specific definition that we adopted for *Market* PER_{Q-1}. Remember that it is an equally-weighted average across all Fama/French industries. So, internet- and information-technology-based industries only have a limited impact on its evolution. Note finally that capital liquidity in the market dropped steadily throughout the period we analyzed, as shown by the increase in the *Spread* variable.

[Insert Table III About Here]

To control for the potential decrease in the investment-opportunity set, we added the ratio between the target dollar CAR and the deal size as a control variable in our regression:

$$Target\,CAR_{INV} = \frac{\left(CAR^{T} \times MV^{T}\right)}{Deal\,size}\ . \tag{17}$$

The *Target* CAR_{INV} variable is correlated with the quality of the investment-opportunity set (as we know that target shareholders capture most of the value creation). Including *Target* CAR_{INV} in the

[23] We thank J. Harford for providing us with this data series.

regression therefore allows us to check whether the impact of *Deal frequency* on *Acquirer* CAR_{inv} remains significant once we have controlled for the change in the investment-opportunity set.

To sum up, our regressions take one of the two following forms:

$$\begin{gathered} Acquirer\ CAR_{INV,i} = \beta_0 + \beta_1 Deal\ frequency_i + \beta_2 Target\ CAR_{INV,i} \\ + \gamma\ Control_i + \eta_i \end{gathered}, \tag{18}$$

and

$$\begin{gathered} Acquirer\ CAR_{INV,i} = \beta_0 + \beta_1 Predicted\ deal\ frequency_i + \beta_2 Target\ CAR_{INV,i} \\ + \gamma\ Control_i + \eta_i \end{gathered}, \tag{19}$$

where i denotes an observation in our sample (a deal), *Target* CAR_{INV} corresponds to the target dollar CAR divided by the deal size, *Control* is a set of control variables (defined in Section II.B.3 below) and γ is the vector of associated coefficients. The variable of interest is either the contemporaneous *Deal frequency* or the *Predicted deal frequency*. *Predicted deal frequency* is the expected *Deal frequency* estimated using Equation (16). If *ex-ante* competition plays a role, we expect the coefficient β_1 to be negative and significant. If there is an endogenous relationship between the number of deals observed *ex-post* in a given industry and the acquirers' CAR, we expect β_1 to be more significant using *Predicted deal frequency* (Equation (19)) than using *Deal frequency* (Equation (18)).

B.3. Control Variables

Our empirical setup already controls for several factors:

- since the dependent variable *Acquirer* CAR_{INV} is obtained by dividing the acquirer's CAR in dollars by the deal size (see Equation (14)), the deal size, which is known to be a determinant of the acquirer's CAR (Moeller *et al.* (2005)) is controlled;
- since the focus is on friendly deals only, the deal attitude and the number of bidders are controlled by construction;
- the sample only includes listed targets, so the target's status (Faccio *et al.* (2006) is controlled;

- only acquisitions of 100% of the target shares are used, so toeholds (Betton and Eckbo (2000)) are not at play by construction;
- finally, by including only value-creating deals, the potential influence of hubris and agency-driven motives (see Berkovitch and Narayanan (1993)) are mitigated as much as possible.

In addition to the above factors that are taken into account by construction, the following four control variables are included in regressions 18 and 19:

- The payment method: this is known to be an important determinant of acquirer abnormal returns (Travlos (1987)). We include the *CASH* variable, which takes the value 1 when the payment method is 100% cash, and 0 otherwise.
- Horizontal deal: Morck *et al.* (1990) show that acquisitions driven by diversification result in lower returns to the acquirer. We include the *RELATED* variable, which takes the value 1 when the acquirer and the target are from the same Fama/French industry.
- Target price-earnings ratio: in the spirit of the acquisition probability hypothesis (Song and Walkling (2000)), the higher the target valuation, the more expensive the acquisition. We include *Target PER* in our set of control variables. This is computed using Compustat DataItem 24 for price and Compustat DataItem 58 for earnings.
- Target intangibles: intangibles are difficult to value and create information asymmetries between the acquirer and the target. As shown by Officer *et al.* (2006), information asymmetry has an impact on acquirers' returns. We therefore include the ratio between *Target intangibles* (Compustat Data Item 33) and *Target total assets* (Compustat Data Item 6) as an additional control variable. We use an industry-adjusted ratio by subtracting from the initial ratio the average value of the intangibles/total assets ratio in the industry of the target.

Panel B of Table III presents year by year summary statistics for these four control variables. The proportion of cash deals increases steadily through the period. The proportion of horizontal deals remains stable through time. The target-price earnings ratio tracks the variation of market price-earnings ratio quite accurately, as reported in Panel A. *Target intangibles* seem to be somewhat lower than their respective industry average during the middle of the sample period.

Finally, we note that all the reported standard errors are robust to heteroskedasticity, and that the results for the predicted deal frequency were obtained using a GMM estimator in order to take into account the additional source of variance due to the estimation of Equation (16).

C. Results

We start by presenting the results for the deal-frequency model estimation (Equation (16)). Table IV presents two models. The first one includes all four determinants (the past-deal frequency *Deal frequency*$_{Q-1}$, the average past target CAR *Average target CAR*$_{Q[-4,-1]}$, the market price-earnings ratio *Market PER*$_{Q-1}$, and the spread between the average rate charged for commercial and industrial loans and the Fed funds rate *Spread*$_{Q-1}$). The fit of the model is very good, with an R^2 of 45%. The past-deal frequency coefficient is positive and highly significant, confirming that M&As happen in waves at the industry level. The coefficient of *Market PER*$_{Q-1}$ is positive and highly significant. At first sight this might seem counter-intuitive: higher average values should discourage acquirers' initiatives. This probably indicates that hot M&A markets happen in periods of good financing conditions, thanks to high market valuations. The coefficients of the two remaining variables (*Average target CAR*$_{Q[-4,-1]}$ and *Spread*$_{Q-1}$) are not significant. As a robustness check, Model 2 presents the results obtained without *Deal frequency*$_{Q-1}$. The R^2 drops dramatically from 45% to 4.1% but the model remains significant (with a Fisher of 8.58). The *Average target CAR*$_{Q[-4,-1]}$ becomes significant, with a negative coefficient. This makes sense: high premiums paid for targets in a given industry in the past discourage future acquisitions.

[Insert Table IV About Here]

We know turn to the empirical investigation of the predictions of the model we developed in Section I. Does competition affect the value creation kept by acquirers? Panel A of Table V starts the exploration using the contemporaneous deal frequency. Remember that, as discussed in Section II.B.2 above, the contemporaneous deal frequency could be contaminated by two phenomena: a feedback effect from acquirers' CARs to deal frequency at the industry level, and a shrinking investment-opportunity set. Model 1 of Panel A in Table V shows that the univariate relation between *Acquirer* CAR_{INV} and *Deal frequency* is negative and significant: the higher the pressure of competition (proxied by *Deal frequency*), the lower *Acquirer* CAR_{INV}. However when we introduce our control variables, the negative coefficient does not quite reach the 10% level of significance (in Model 2 the value of the coefficient is −8.53 with a p-value of 0.11). Note that each control variable plays a significant role:

- The *Target PER* ratio has a negative coefficient: investors seem to react negatively to the acquisition of highly valued targets.
- The *CASH* dummy variable has the expected positive coefficient: by using stock as a method of payment instead of cash, acquirers signal over-valuation (Travlos (1987)).
- The *RELATED* dummy variable has a negative coefficient. One possible explanation of this is that related deals have the potential to attract more competition within the industry because they increase the competitive power of the acquirer if they go through. So, the *RELATED* variable could also pick up some of the *ex-ante* competition or preemptive bidding effects;
- The *Target intangibles* variable has a negative coefficient, suggesting that investors' reactions are more negative when it is more difficult to assess the value of the asset being bought.

[Insert Table V About Here]

In Model 3 of Panel A of Table V, we introduce *Target* CAR_{INV} to control for changes in the investment-opportunity set. The negative relation between *Acquirer* CAR_{INV} and *Deal frequency* becomes completely insignificant. Could the effect of competition really just be an artifact of the shrinking investment-opportunity set?

In Panel B of Table V we control for any feedback effect from *Acquirer* CAR_{INV} to contemporaneous *deal frequency* by using the *Predicted deal frequency* as the variable of interest. The univariate evidence (Model 1) is similar to that shown in Panel A. However Models 2 and 3 show us that, using *Predicted deal frequency*, the negative relation between *Acquirer* CAR_{INV} and our proxy of competition remains clearly significant, even after controlling for the shrinking investment-opportunity set. It is also worth noting that all the control variables keep their sign and, with the exception of *Target PER* in Model 2 and CASH in Model 3, remain significant. The positive coefficient of *Target* CAR_{INV} is a consequence of our focus on value-creating deals: the more value there is to share, the better for both parties, which is consistent with the result reported by Berkovitch and Naranayan (1993).

To summarize our results: Panels A and B of Table V show that, after controlling for the potential feedback effect from acquirers' CAR to deal frequency at the industry level and the shrinking investment-opportunity set, the proxy of *ex-ante* competition does indeed negatively affect the acquirer's cumulative abnormal returns per dollar invested. This result clearly supports the prediction of the model in Section I. Moreover, the statistically significant result, despite using a two-stage estimation procedure, suggests that the effect is probably quite strong. Two-stage procedures add noise because the estimated independent variable used in the second stage is at best a proxy correlated with the phenomenon being analyzed.

III. Conclusion

The market for corporate control plays an important role as an external control device for firms. Competition is essential for the efficient allocation of management teams among firms. However, based on previous evidence in the financial literature, observable competition seems to be at best low.

This paper has emphasized the role of *ex-ante* competition, which is not easily observable. Even if competition seems largely absent *ex-post*, the existence of potential competitors propels bidders toward more competitive actions. To capture this idea, we modeled the takeover process as a two-stage procedure. The first stage is a one-to-one negotiation with the target, conducted under the threat of an auction. If the negotiations fail, either a takeover battle among rivals takes place, or an auction is organized by the target. This model captures an important feature of the M&A market, and more specifically of so-called friendly deals. Indeed, the threat of an auction is stressed during the negotiation phase by the intermediaries that advise target companies.

Next, we turn to the empirical test of the main prediction of the model: the higher the probability of a takeover battle or the target starting a second-stage competitive auction process, the higher the bid in the first stage, and therefore the lower the wealth kept by the acquirer. This prediction is tested using a specific dataset. Focusing on friendly value-creating deals, and using the frequency of deals in the industry as a proxy for *ex-ante* competition, we show that the higher the M&A activity in an industry the lower the return for the acquirer. This result is significant even taking account evidence of a decreasing investment opportunity. It suggests that the M&A market is fairly competitive, and that competition allows target shareholders to receive a reasonable premium even in friendly deals.

Our results also throw some light on some puzzling features of the M&A market. Why do targets' shareholders so frequently accept negotiated deals, if they would be better of with competitive procedures? Why do acquirers keep a so small fraction of the value creation even in the absence of competition? The effect *ex-ante* competition offers an explanation of these facts. The absence of an *ex-post* relation between the observed number of bidders and the acquirers' abnormal returns found by Boone and Mulherin (forthcoming) can also be better understood in the light of *ex-ante* competition. It may be that, as the perceived pressure of competition increases, initial acquirers preempt takeover battles by increasing their initial offer to target shareholders.

Appendix A

The Existence and Uniqueness of the Acquirer's First Stage Offer

To proof existence, we first note is that $b_1 \in [0, v_1]$: no negative bids are allowed and negative expected payoffs are incompatible with equilibrium. We then evaluate the acquirer's expected profit at Stage 2 when bidding v_1 and 0. From Equation (8), we can write:

$$E\left(\Pi_2^{\text{Acquirer}}(v_1, b_1)\right) = F(b_1)^{N-1}(v_1 - b_1) + \left(F(v_1)^{N-1} - F(b_1)^{N-1}\right)\left(v_1 - E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} > b_1, \tilde{v}_{(1)} \le v_1\right)\right). \quad \text{(A1)}$$

For $b_1 = v_1$, we obtain:

$$E\left(\Pi_2^{\text{Acquirer}}(v_1, v_1)\right) = F(v_1)^{N-1}(v_1 - v_1) + \left(F(v_1)^{N-1} - F(v_1)^{N-1}\right)\left(v_1 - E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} > v_1, \tilde{v}_{(1)} \le v_1\right)\right), \quad \text{(A2)}$$

which is equal to 0.

For $b_1 = 0$, we obtain:

$$E\left(\Pi_2^{\text{Acquirer}}(v_1,0)\right) = F(0)^{N-1}(v_1) + \left(F(v_1)^{N-1} - F(0)^{N-1}\right)\left(v_1 - E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} > v_1, \tilde{v}_{(1)} \le v_1\right)\right). \quad \text{(A3)}$$

Equation (A3) can be rewritten as:

$$E\left(\Pi_2^{\text{Acquirer}}(v_1,0)\right) = \left(F(v_1)^{N-1}\right)\left(v_1 - E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} \le v_1\right)\right). \quad \text{(A4)}$$

which is (unsurprisingly, as the acquirer is bidding nothing during the negotiation phase), the expected profit of the bidder in a second-price auction. By the participation constraint, Equation (A4) must be positive at equilibrium.

We now turn to the acquirer's expected profit at Stage 1. By Equation (12), this is equal to:

$$E\left(\Pi_1^{\text{Acquirer}}(v_1,b_1)\right) = \left(1 - K\left(E(p_2) - b_1^*\right)\right)(v_1 - b_1^*) + \left(K\left(E(p_2) - b_1^*\right)\right)E\left(\Pi_2^{\text{Acquirer}}(v_1,b_1^*)\right). \quad \text{(A5)}$$

For $b_1 = v_1$, we obtain:

$$E\left(\Pi_1^{\text{Acquirer}}(v_1,v_1)\right) = \left(1 - K\left(E(p_2) - v_1\right)\right)(v_1 - v_1) + \left(K\left(E(p_2) - v_1\right)\right)E\left(\Pi_2^{\text{Acquirer}}(v_1,v_1)\right). \quad \text{(A6)}$$

By Equation (A2), $E\left(\Pi_2^{\text{Acquirer}}(v_1,v_1)\right) = 0$. So Equation (A6) is equal to 0.

For $b_1 = 0$, we obtain:

$$E\left(\Pi_1^{\text{Acquirer}}(v_1,v_1)\right) = \left(1 - K\left(E(p_2)\right)\right)(v_1) + \left(K\left(E(p_2)\right)\right)E\left(\Pi_2^{\text{Acquirer}}(v_1,0)\right). \quad \text{(A7)}$$

Using Equation (A4) gives:

$$E\left(\Pi_1^{\text{Acquirer}}(v_1,v_1)\right) = \left(1 - K\left(E(p_2)\right)\right)(v_1) + \left(K\left(E(p_2)\right)\right)\left(F(v_1)^{N-1}\right)\left(v_1 - E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} \le v_1\right)\right). \quad \text{(A8)}$$

As by assumption $E(p_2) > \bar{c}$ (see Footnote 12), $K(E(p_2)) = 1$. So

$$E\left(\Pi_1^{\text{Acquirer}}(v_1,v_1)\right) = \left(F(v_1)^{N-1}\right)\left(v_1 - E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} \le v_1\right)\right). \quad \text{(A9)}$$

It is now clear that Equation (A9) is positive.

Finally we note that $E\left(\Pi_1^{\text{Acquirer}}(v_1,b_1)\right)$ is continuous, as it is the sum and product of continuous functions. The extreme value theorem therefore applies. We know that for $b_1 \in [0, v_1]$, $E\left(\Pi_1^{\text{Acqiorer}}(v_1,b_1)\right)$ has at least one maximum and one minimum in the range of b_1.

Uniqueness. The uniqueness of b_1^* will be assured if the first-order condition of the acquirer's maximization problem has a unique solution. The acquirer's maximization problem is (see Equation (11)):

$$\underset{b_1}{Max}\left(1-K\left(E(p_2)-b_1\right)\right)(v_1-b_1)+\left(K\left(E(p_2)-b_1\right)\right)E\left(\Pi_2^{\text{Acquirer}}(v_1)\right). \tag{A10}$$

Let us denote $K(E(p_2)-b_1)$ as $K(.)$, $\frac{\partial K(E(p_2)-b_1)}{\partial b_1}$ as $K'(.)$, $E(\Pi_2^{\text{Acquirer}}(v_1))$ as $E(\Pi_2)$ and $\frac{\partial E(\Pi_2^{\text{Acquirer}}(v_1))}{\partial b_1}$ as $E'(\Pi_2)$. Equation (A10) can be written as:

$$\underset{b_1}{Max}\left(1-K(.)\right)(v_1-b_1)+K(.)E\left(\Pi_2\right). \tag{A11}$$

The corresponding first-order condition is:

$$-K'(.)(v_1-b_1)-\left(1-K(.)\right)+K'(.)E(\Pi_2)+K(.)E'(\Pi_2)=0. \tag{A12}$$

Solving this first order linear differential equation leads to:

$$K(E(p_2)-b_1)=\frac{b_1+D}{E(\Pi_2^{\text{Acquirer}}(v_1,b_1))+b_1-v_1}, \tag{A13}$$

where D is a constant of integration. Using the fact that $K(E(p_2))=1$ by assumption (see footnote 7), D is equal to $D=E(\Pi_2^{\text{Acquirer}}(v_1,b_1)+b_1-v_1)$. Plugging this result into Equation (A13), we obtain the condition that any maximum must fulfill:

$$K(E(p_2)-b_1)=\frac{b_1}{E(\Pi_2^{\text{Acquirer}}(v_1,b_1))+b_1-v_1}+1. \tag{A14}$$

So, uniqueness requires Equation (A14) to have a unique root. We first note that the derivative of the left side is negative:

$$\frac{\partial K(E(p_2)-b_1)}{\partial b_1}=k(E(p_2)-b_1)\times\left(F(b_1)^{N-1}-1\right)\leq 0, \tag{A15}$$

as $k(E(p_2)-b_1)$ is the probability density function corresponding to $K(.)$ and $F(b_1)^{N-1}$ is bounded by 0 and 1. So, to guarantee the existence of a unique optimum, by the single crossing condition (see Milgrom (2004)), the derivative of the right side of Equation (A14) must be positive.

Using Equation (8), the sign of the derivative of the right side of Equation (A14) depends on the sign of:

$$F(v_1)^{N-1}\left(v_1 - E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} > b_1, \tilde{v}_{(1)} \leq v_1\right)\right) + F(b_1)^{N-1} E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} > b_1, \tilde{v}_{(1)} \leq v_1\right) - b_1 . \qquad \text{(A16)}$$

The sign of Equation (A16) itself depends on the form of $F(.)$. If it is positive, Equation (A14) has a unique root and unicity is guaranteed. If it is negative, unicity will depend on specific assumptions about $K(.)$.

The case of a uniform $F(.)$ and N=2 is easily analyzed. Equation (A16) becomes:

$$v_1\left(v_1 - E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} > b_1, \tilde{v}_{(1)} \leq v_1\right)\right) + b_1 E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} > b_1, \tilde{v}_{(1)} \leq v_1\right) - b_1 .$$

As N=2 and the distribution of the valuation is uniform, $E\left(\tilde{v}_{(1)} \middle| \tilde{v}_{(1)} > b_1, \tilde{v}_{(1)} \leq v_1\right) = \frac{v_1 - b_1}{2}$. Equation (A16) is therefore equal to $v_1\left(v_1 - \frac{v_1 - b_1}{2}\right) + b_1 - b_1$, or $v_1^2 - v_1 b_1$, which is positive because b_1 must be below v_1 at equilibrium. Uniqueness is therefore guaranteed whatever the form *K(.)* (as long as it is a cumulative density function).

We conclude by noting that if Equation (A14) has multiple roots, this is to say if there are multiple b_1^* s among which the acquirer is indifferent, he or she will adopt a mixed strategy. In this case we have to substitute the concept of weak sequential equilibrium for the concept of sub-game perfect equilibrium. However numerical simulations show that for most classical distributions (uniform, Gaussian, exponential), b_1^* is unique in the $[0, v_1]$ range.

Appendix B

The Impact of Competition on the Expected Price at Equilibrium in the Stage 2 Takeover Battle

We use $E(p_2^{N-1})$ to denote the expected price at Stage 2 with *N–1* competitors, φ_1^{N-1}, φ_2^{N-1} and φ_3^{N-1} to denote the probabilities defined in Equations (1) to (3) with *N–1* competitors and

$E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)^{N-1}$ to denote the conditional expectation defined in Equation (5) with *N–1* competitors. For any given $N > 3$, the effect of an increase in the number of rivals is:

$$\Delta E(p_2) = E(p_2^N) - E(p_2^{N-1}), \tag{B1}$$

where Δ denotes the variation from Ñ1 to N rivals. Using Equation (4), we obtain:

$$\Delta E(p_2) = \varphi_1^{N1} b_1 + \varphi_2^N E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)^N + \varphi_3^N v_1$$

$$- \varphi_1^{N-1} b_1 - \varphi_2^{N-1} E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)^{N-1} - \varphi_3^{N-1} v_1$$

or, more compactly:

$$\Delta E(p_2) = \Delta\varphi_1 b_1 + \Delta\left(\varphi_2 E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)\right) + \Delta\varphi_3 v_1. \tag{B2}$$

Noting that $\Delta\left(\varphi_2 E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)\right) = \Delta\varphi_2 E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)^N + \varphi_2^{N-1} \Delta E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)$,

Equation (B2) can be written as:

$$\Delta E(p_2) = \Delta\varphi_1 b_1 + \Delta\varphi_2 E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)^N + \varphi_2^{N-1} \Delta E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right) + \Delta\varphi_3 v_1. \tag{B3}$$

We note that, by first order stochastic dominance: $\Delta\varphi_1 = F(b_1)^N - F(b_1)^{N-1} < 0$;

$\Delta\varphi_3 = \left(1 - F(v_1)^N\right) - \left(1 - F(v_1)^{N-1}\right) > 0$; and $\varphi_2^{N-1} \Delta E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right) > 0$. $\Delta\varphi_2$ can be either negative or positive.

We analyze the case $\Delta\varphi_2 < 0$ (the case $\Delta\varphi_2 > 0$ is solved by symmetric arguments). The arguments are the following: Since $\varphi_2^{N-1} \Delta E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)$ is positive, $\Delta E(p_2)$ is positive if

$\Delta\varphi_1 b_1 + \Delta\varphi_2 E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)^N + \Delta\varphi_3 v_1$ is positive. By definition, $\Delta\varphi_3 = -\Delta\varphi_1 - \Delta\varphi_2$ and $v_1 \geq Max\left(b_1, E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)^N\right)$. Therefore,

$$\Delta\varphi_3 v_1 = -\Delta\varphi_1 v_1 - \Delta\varphi_2 v_1 \geq -\Delta\varphi_1 Max\left(b_1, E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)^N\right)$$
$$- \Delta\varphi_2 Max\left(b_1, E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)^N\right)$$

We conclude that $\Delta\varphi_3 v_1 \geq -\Delta\varphi_1 b_1 - \Delta\varphi_2 E\left(\widetilde{v}_{(1)} \middle| \widetilde{v}_{(1)} > b_1, \widetilde{v}_{(1)} \leq v_1\right)^N$.

Appendix C

The Role of Competition on the Acquirer's Offer at Equilibrium in the First-Stage Negotiation

To analyze the impact of an increase in the number of rivals in the second-stage takeover battle on the first-stage initial acquirer's optimal offer, we start from the expression for the initial acquirer's expected profit:

$$E\left(\Pi_1^{\text{Acquirer}}\right) = \left(1 - K\left(E(p_2) - b_1\right)\right)\left(v_1 - b_1\right) + \left(K\left(E(p_2) - b_1\right)\right)E\left(\Pi_2^{\text{Acquirer}}\right)\right). \tag{C1}$$

We first note that $E\left(\Pi_1^{\text{Acquirer}}\right)$ is a function of b_1 and *N–1*, the number of rivals in the second stage. To emphasize this fact, we adopt the following notation: $E\left(\Pi_1^{\text{Acquirer}}\right) = E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right)$.

The initial acquirer's expected profit $E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right)$ satisfies the strict single-crossing differences condition (see Milgrom, 2004, p. 99) if

$$\begin{aligned} &\forall (N-1)' > (N-1) : \left(E\left(\Pi_1^{\text{Acquirer}}(b_1', N-1)\right) - E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right)\right) \geq 0 \\ &\Rightarrow \left(E\left(\Pi_1^{\text{Acquirer}}(b_1', (N-1)')\right) - E\left(\Pi_1^{\text{Acquirer}}(b_1, (N-1)')\right)\right) > 0 \end{aligned} \tag{C2}$$

Consider the case $b_1' > b_1$. If $E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right)$ satisfies the strict single-crossing differences condition, by the monotonic selection theorem (see Milgrom (2004, p. 102)), every optimal selection $b_1^* \in \arg\max_{b_1} E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right)$ is non-decreasing in *N–1*.[24]

The key is therefore to show that $E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right)$ satisfies the strict single-crossing differences condition (Equation (C2)). To do so, we rewrite the second part of Equation (C2) as:

$$\begin{aligned} &\left(E\left(\Pi_1^{\text{Acquirer}}(b_1', (N-1)')\right) - E\left(\Pi_1^{\text{Acquirer}}(b_1', (N-1))\right)\right) \\ &+ \left(E\left(\Pi_1^{\text{Acquirer}}(b_1', (N-1))\right) - E\left(\Pi_1^{\text{Acquirer}}(b_1, (N-1))\right)\right) \\ &+ \left(E\left(\Pi_1^{\text{Acquirer}}(b_1, (N-1))\right) - E\left(\Pi_1^{\text{Acquirer}}(b_1, (N-1)')\right)\right) \end{aligned} \tag{C3}$$

By Equation (C2), $\left(E\left(\Pi_1^{\text{Acquirer}}(b_1', (N-1))\right) - E\left(\Pi_1^{\text{Acquirer}}(b_1, (N-1))\right)\right)$ is positive. To study the sign of $\left(E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right) - E\left(\Pi_1^{\text{Acquirer}}(b_1, (N-1)')\right)\right)$, it is useful to remember Proposition 1: an increase in the number of rivals increases the second-stage expected price $E(p_2)$ and decreases the

[24] Note that, strictly speaking, the monotonic selection theorem, as introduced in Milgrom (2004, p. 102), applies to [0,1] parameter space. In our setup, *N* can be re-scaled to lie between zero and one by dividing the number of rivals in the second-stage takeover battle by some maximum number of rivals.

second-stage initial acquirer's expected profit ($E\left(\Pi_2^{\text{Acquirer}}\right)$. Equation (C1) tells us that the first-stage initial acquirer's expected profit $E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right)$ is a weighted average between the payoff from successful negotiations $\left(v_1 - b_1\right)$ (which does not depend on *N–1*), and the payoff if the offer is refused ($E\left(\Pi_2^{\text{Acquirer}}\right)$) (which is decreasing in *N–1*). As the probability of the offer being refused is increasing in *N–1*, we conclude that $E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right)$ is decreasing in *N–1*. So, $\left(E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right) - E\left(\Pi_1^{\text{Acquirer}}(b_1, (N-1)')\right)\right)$ is positive. By the same argument, $\left(E\left(\Pi_1^{\text{Acquirer}}(b_1', (N-1)')\right) - E\left(\Pi_1^{\text{Acquirer}}(b_1', N-1)\right)\right)$, the first term of Equation (C3) is negative.

A sufficient condition for Equation (C3) to be positive is therefore:

$$\begin{aligned}&\left(E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right) - E\left(\Pi_1^{\text{Acquirer}}(b_1, (N-1)')\right)\right)\\ &> \left(E\left(\Pi_1^{\text{Acquirer}}(b_1', N-1)\right) - E\left(\Pi_1^{\text{Acquirer}}(b_1', (N-1)')\right)\right)\end{aligned}. \tag{C4}$$

Equation (C4) implies that $E\left(\Pi_1^{\text{Acquirer}}(b_1, N-1)\right)$ satisfies the single-crossing differences condition when the marginal impact of the competition decreases into b_1. Going back once again to Equation (C1), we see that the marginal impact of the competition is governed by the effects of *N–1* on $E(p_2)$ and $E\left(\Pi_2^{\text{Acquirer}}\right)$. As the acquirer's expected profit $E(\Pi_2^{\text{Acquirer}})$ is by definition the probability of winning times the acquirer's valuation v_1 minus the expected payment, the effect of *N–1* on $E\left(\Pi_2^{\text{Acquirer}}\right)$ is itself a function of the effect *N–1* on $E(p_2)$ (this argument has already been used to derive Proposition 1). So, if the effect of an increase in *N–1* on $E(p_2)$ is decreasing in b_1, Equation (C4) is fulfilled. We first compute the effect of a variation of *N–1* on $E(p_2)$. From Equation (6) we get

$$E(p_2) = F(b_1)^{N-1} b_1 + \int_{b_1}^{v_1} v(N-1)F(v)^{N-2} f(v)dv + (1 - F(v_1)^{N-1})v_1 . \tag{C5}$$

The variation in $E(p_2)$ when the number of firms goes from *N–1* to *N* is

$$\Delta_{N-1,N}E(p_2) =$$

$$F(b_1)^{N-1}b_1 + \int_{b_1}^{v_1} v(N-1)F(v)^{N-2} f(v)dv + (1-F(v_1)^{N-1})v_1 \quad . \tag{C6}$$

$$- F(b_1)^{N-2}b_1 - \int_{b_1}^{v_1} v(N-2)F(v)^{N-3} f(v)dv + (1-F(v_1)^{N-2})v_1$$

The derivative of Equation (C6) with respect to b_1 is given by the following equation:

$$\frac{\partial\Delta_{N-1,N}E(p_2)}{\partial b_1} =$$

$$(N-1)F(b_1)^{N-2} f(b_1)b_1 + F(b_1)^{N-1} - b_1(N-1)F(b_1)^{N-2} f(b_1) \quad . \tag{C7}$$

$$-(N-2)F(b_1)^{N-3} f(b_1)b_1 - F(b_1)^{N-2} + b_1(N-2)F(b_1)^{N-3} f(b_1)$$

This simplifies to:

$$\frac{\partial\Delta_{N-1,N}E(p_2)}{\partial b_1} = F(b_1)^{N-1} - F(b_1)^{N-2}. \tag{C8}$$

Equation (C8) is clearly negative. This completes the proof.

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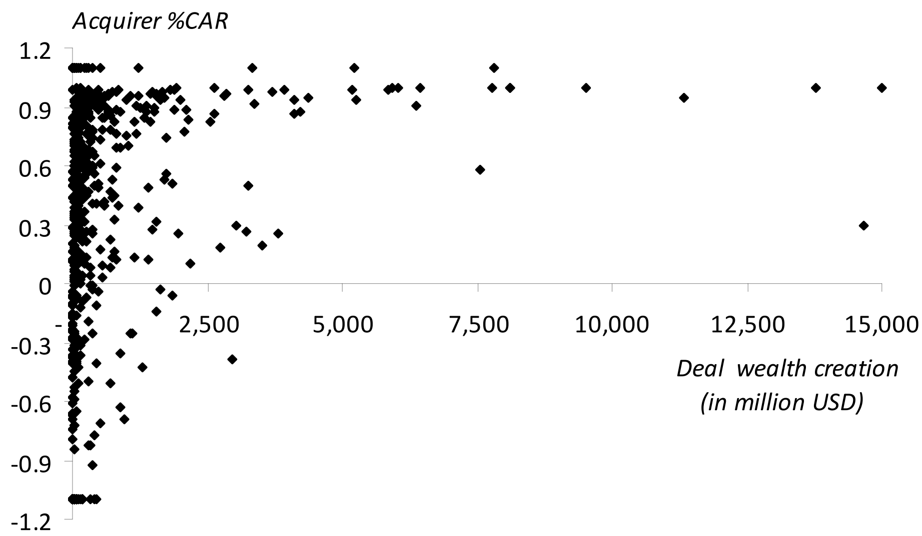

Figure 1. The percentage of the value creation kept by the acquirer as a function of the deal's wealth creation. This figure presents the behavior of *Acquirer %CAR* (the proportion of the dollar value-creation kept by the acquirer), as a function of the deal's wealth creation (measured in million USD). *Acquirer %CAR* is truncated at −1.1 and 1.1.

Table I

The Outcomes of the Second-Stage Takeover Battle

The table presents the possible outcomes of the second-stage takeover battle. Under the assumptions introduced in Section I, three outcomes are possible: the rival highest valuation can be below the initial acquirer's bid (Case 1); or it can be between the initial acquirer's bid and the initial acquirer's valuation (Case 2); or it is above the initial acquirer's bid (Case 3). For each case, the outcome price p_2, the target shareholders profit Π_2^{Target}, the initial acquirer's profit $\Pi_2^{Acquiret}$, and the probability of occurrence φ_i are reported.

	Case 1 Rival highest valuation below initial acquirer bid $v_{(1)} \leq b_1$	**Case 2** Rival highest valuation between initial acquirer bid and initial acquirer valuation $b_1 < v_{(1)} \leq v_1$	**Case 3** Rival highest valuation above initial acquirer valuation $v_{(1)} > v_1$
Price	$p_2 = b_1$	$p_2 = \tilde{v}_{(1)}$	$p_2 = v_1$
Target profit	$\Pi_2^{Target} = b_1 - v_T - c$	$\Pi_2^{Target} = \tilde{v}_{(1)} - v_T - c$	$\Pi_2^{Target} =$ "$v_1 - v_T - c$
Initial acquirer's profit	$\Pi_2^{Acquirer} = v_1 - b_1$	$\Pi_2^{Acquirer} = v_1 - \tilde{v}_{(1)}$	$\Pi_2^{Acquirer} = 0$
Probability	$\varphi_1 = F(b_1)^{N-1}$	$\varphi_2 = F(v_1)^{N-1} - F(b_1)^{N-1}$	$\varphi_3 = 1 - F(v_1)^{N-1}$

Table II

Sample Description

The table presents some summary statistics on the sample of 613 friendly deals analyzed in Section II for the 1995–1999 and 2000–2004 sub-periods. The average and median *deal size* are in million USD. *% cash deals* is the number of deals for which the payment is 100% cash divided by the number of deals in the corresponding period. *Target PER* is the target price-earnings ratio, computed as described in Section II.B. *% horizontal deals* is the number of deals for which the acquirer and target industry are the same (see Section II.B for industry definition) divided by the total number of deals in that period.

	1995–1999	2000–2004	Total
Number of deals	398	215	613
Average deal size	1,743	1,528	1,668
Median deal size	382	266	367
% cash deals	13%	25%	17%
Average target PER	11.15	9.06	10.42
% horizontal deals	68%	72%	69%

Table III

Control Variables

Panel A presents yearly summary statistics for the set of variables used to estimate *predicted deal frequency* by industry and quarter (see Equation (16)). *Average deal frequency* is the yearly average of *deal frequency,* which is the ratio between the number of deals in a given Fama/French industry during a given quarter and the number of firms in the same industry at the beginning of the quarter (see Equation (15)). *Average Target CAR* is the yearly average of the targets' cumulative abnormal returns in the industry. *Market PER* is the yearly average of the equally weighted average of Fama/French industry price-earnings ratios. *Spread* is the difference between the average rate charged for commercial and industrial loans and the Fed funds rate, as reported in the US Federal Reserve Bank's Survey of Terms of Business Lending. Panel B presents yearly summary statistics on the control variables that enter into the regressions of the ratio between *acquirer dollar CAR* and *deal size* (*acquirer* CAR_{INV}) on *deal frequency* and *predicted deal frequency* (see Equations (18) and (19)). The *CASH* variable takes the value one when the payment is 100% cash. The *RELATED* variable takes the value one if the acquirer and target are in the same Fama/French industry. The figures reported for *CASH* and *RELATED* are year by year proportions. *Target PER* is the average price-earnings ratio of targets acquired during the year. *Target intangibles* is the average industry-adjusted ratio of intangibles to total assets of targets acquired that year.

Panel A. Determinants of deal frequency

Year	Average deal frequency	Average target CAR	Market PER	Spread
1995	6.1%	11.5%	11.41	1.31%
1996	6.8%	9.8%	12.39	1.22%
1997	8.5%	10.8%	13.17	1.35%
1998	8.8%	10.3%	14.25	1.42%
1999	10.9%	12.8%	11.03	1.69%
2000	8.0%	17.0%	9.17	1.80%
2001	5.7%	19.6%	7.13	1.72%
2002	5.1%	14.0%	7.49	1.85%
2003	5.7%	13.0%	9.75	1.94%
2004	7.3%	11.0%	14.11	2.07%

Panel B. Acquirer dollar CAR to deal size control variables

Year	CASH	RELATED	Target PER	Target intangibles
1995	0.0%	70.3%	11.64	0.34%
1996	11.5%	68.9%	11.98	1.81%
1997	11.0%	75.2%	12.41	–0.94%
1998	14.6%	65.6%	11.92	–0.25%
1999	22.5%	62.9%	8.03	–0.80%
2000	9.2%	73.8%	9.32	–0.80%
2001	25.0%	68.2%	6.79	–0.83%
2002	34.6%	76.9%	7.68	–1.16%
2003	22.2%	72.2%	7.34	–0.56%
2004	40.9%	70.5%	13.18	1.33%

Table IV

Determinants of Deal Frequency

The table presents the regression of deal frequency on a set of determinants. *Deal frequency* is the ratio between the number of deals in a given Fama/French industry during a given quarter and the number of firms in the same industry at the beginning of the quarter (see Equation (15)). *Average target* $CAR_{[Q\text{-}4,Q\text{-}1]}$ corresponds to the average target cumulative abnormal returns in the corresponding Fama/French industry for deals realized in a period from quarter –4 to quarter −1, relative to the quarter of the deal-announcement date. *Market PER* is the yearly average of the equally weighted average of Fama/French industry price-earnings ratios. *Spread* is the difference between the average rate charged for commercial and industrial loans and the Fed funds rate, reported in the US Federal Reserve Bank's Survey of Terms of Business Lending. *Q-1* refers to quarter −1 relative to the deal announcement and *[Q–4,Q–1]* identifies the period from quarter −4 to quarter −1, relative to the quarter of the deal announcement.

	Model 1			Model 2		
Variable	Coeff.	t-stat	p-value	Coeff.	t-stat	p-value
Constant	–0.007	–0.58	0.56	0.051	3.26	0.00
Deal frequency$_{Q\text{-}1}$	0.244	14.61	0.00			
Market PER$_{Q\text{-}1}$	0.001	2.33	0.02	0.002	3.23	0.00
Average target CAR$_{[Q\text{-}4,Q\text{-}1]}$	–0.004	–0.18	0.86	–0.112	–4.18	0.00
Spread$_{Q\text{-}1}$	0.003	0.66	0.51	0.008	1.34	0.18
R^2	45.3%			4.1%		
Fisher	125.87		0.00	8.58		0.00

Table V

Determinants of Acquirer Dollar CAR per unit of Dollar Invested

The table presents the results of three regressions where the dependent variable is the acquirer's dollar CAR per unit of dollar invested (denoted *Acquirer* CAR_{INV}). *Deal frequency* is the ratio of the number of deals in a given Fama/French industry during a given quarter to the number of firms in the same industry at the beginning of the quarter (see Equation (15)). *Target* CAR_{INV} is the target cumulative abnormal return divided by the deal size (see Equation (17)). *Target PER* is the target price-earnings ratio, computed as described in Section II.B. The *RELATED* variable takes the value one if the acquirer and the target are from the same Fama/French industry. *Target intangibles* is the average industry-adjusted ratio of intangibles to total assets of the target. Panel A reports estimates using the contemporaneous deal frequency and Panel B using the predicted deal frequency.

Panel A – Contemporaneous deal frequency

	Model 1		Model 2		Model 3	
Variable	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Constant	2.680	0.00	5.206	0.00	3.245	0.02
Deal frequency	–9.660	0.07	–8.539	0.11	–5.339	0.30
Target CAR_{INV}					11.556	0.02
Target PER			–0.121	0.10	–0.112	0.12
CASH			3.275	0.03	2.673	0.08
RELATED			–2.774	0.01	–2.840	0.01
Target intangibles			–8.255	0.01	–7.706	0.01
R^2	0.3%		6.5%		8.1%	
Fisher	1.74	0.19	8.46	0.00	8.86	0.00

Panel B – Predicted deal frequency

	Model 1		Model 2		Model 3	
Variable	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Constant	2.478	0.00	5.300	0.00	3.984	0.01
Predicted deal frequency	–13.683	0.06	–15.275	0.03	–11.142	0.09
Target CAR_{INV}					10.601	0.03
Target PER			–0.113	0.13	–0.119	0.10
CASH			2.027	0.07	1.644	0.16
RELATED			–2.320	0.01	–2.812	0.00
Target intangibles			–5.948	0.03	–6.709	0.01
Over-identification test	5.20	0.16	3.52	0.32	1.99	0.58