On the determinants of the dynamic choice between mergers and tender offers*

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February 2020

Abstract

This paper builds on recent advances in the domain of option games under uncertainty and looks closer at determinants that drive the choice between mergers and acquisitions. Each firm calculates its payoff resulting from either a merger or tender offer that then serves as a credible threat when jointly negotiating the terms of a merger. The model suggests that the choice between tender offers and mergers is determined by the firms' relative size and uncertainty, depending on the relative synergies of each strategy. When tender offer synergies are low and when uncertainty is higher, tender offers are preferred by more asymmetric firms, whereas for more synergistic tender offers that relationship is nonlinear, with mergers being preferred for intermediate asymmetry and uncertainty levels.

Keywords: Mergers; Takeover; Real Options; Cooperative and Non-cooperative Bargaining
JEL codes: C73; D81; G34.

*Paulo J. Pereira and Artur Rodrigues acknowledge that this research has been financed by Portuguese public funds through FCT - Fundac ao para a Cincia e a Tecnologia, I.P., in the framework of the projects UIDB/04105/2020 and UID/ECO/04105/2019, respectively.

1 Introduction

Research on Merger & Acquisition (M&A) strategies, their performance and important determinants have constantly received considerable attention in the finance literature. To date, there is great consensus regarding some empirical features of M&A activity. First, M&As occur in waves where periods of low takeover activity are followed by periods of high takeover activity and second, merger activity within a wave is considerably clustered by industries (see e.g. Andrade et al. (2001); Rhodes-Kropf and Viswanathan (2004); Martynova and Renneboog (2008); Betton et al. (2008), among others). Alike, M&A activity happens in response to major shocks and is procyclical, i.e. the number of deals is higher in economics booms than in recessions. Yet, however, there is much about the M&A process we do not fully understand. One prominent issue is the choice between hostile takeovers and friendly mergers. Both types usually coexist within a merger wave but their importance varies from one merger wave to the other. Exemplary, while hostile takeovers triggered the M&A wave in 1980s their worldwide number dropped significantly during the subsequent M&A wave in the 1990s. While this trend has continued worldwide, it does not necessarily imply that hostile takeovers are becoming less important. Rather, examples like the EURO 190 billion takeover of the German firm Mannesmann by the British mobile operator Vodafone in early 2000 or the $162 billion takeover of US-media giant TimeWarner by America Online (AOL) the same year shows that despite their low numbers hostile takeovers account for the majority stake when comparing M&A activity by deal volume. In addition, hostile takeovers serve as credible threats in friendly merger negotiations and often induce managers to accept friendly mergers later on (Browne and Rosengren (1987)). Exemplary, the German steelmaker Krupp-Hoesch announcement in 1997 that it would seek to buy its far larger German rival Thyssen either friendly or unfriendly lead to a *David* versus *Goliath* battle in which Thyssen finally agreed to merge with the smaller contender. Only recently, a similar M&A battle started when Xeroxs $33 billion friendly merger bid was rejected by its larger US rival HP in November 2019 thereby prompting for a hostile bid directed to HP shareholders.[1] Finally, Continental Europe and Japan are recent examples where the number of hostile takeovers is rising against the overall worldwide trend thereby stoking fears of losing competitiveness to foreign bidders.

While previous literature in the domain of theoretical corporate finance has predominantly looked at the effect of uncertainty, synergies, means of payment, and debt level among others has on M&A outcome, less attention has been on the firms negotiation tactics and outside options and their impact on M&A outcome. In particular, how does the threat of a hostile bid affect merger bargaining and timing? Alike, does such a threat make friendly merger more likely? Under what circumstances are hostile takeovers superior over

[1] See *Forbes*, Jan 6, 2020: Xerox secures $24 Billion for hostile takeover bid of HP.

friendly mergers? And finally, how does uncertainty impact the negotiating tactics? This paper contributes to the M&A literature on dynamic bargaining under uncertainty and tries to provide answers to the aforementioned questions.

The paper unfolds as follows. Section 2 provides a brief overview of recent literature while Section 3 presents the derivation of the model. Section 4 analyses the optimal strategy choices and presents numerical results based on comparative-static analysis. Finally, Section 6 concludes.

2 Literature review

Even though the issue whether firms should choose to merge friendly or accept/launch hostile bids has gained less attention as opposed to other issues related to M&A waves it is not completely ignored in academia. In particular, finance research has revealed some empirical features that affect the choice. Exemplary, Betton et al. (2009) and Browne and Rosengren (1987), among others find that targets of tender offers tend to be larger than other publicity traded targets acquired in mergers while others find that takeover premiums are larger in tender offers as opposed to mergers (Schwert (1996); Moeller et al. (2004); Offenberg et al. (2014), among others). Alike, Jensen and Ruback (1983), Offenberg et al. (2014), and Sudarsanam and Mahate (2006) find that average synergies achieved in an M&A are greater for hostile takeovers than for mergers and that targets do better ex-post under tender offers. Furthermore, tender offers become more likely if firms are undervalued, prior investment ties exist, and are subject to governmental delays due to regulatory issues (Dong et al., 2006; Offenberg and Pirinsky, 2015). Moreover, the findings of Betton et al. (2008) indicate that greater concentration in an industry make it less likely that bidders are to select mergers over tender offers. Given expensive pre-takeover advertising cost, costlier ex-post integration and the fact that targets might opt for takeover defenses Schnitzer (1996) and McSweeney (2012) argue that transaction cost are generally higher for hostile takeovers than for mergers.

Other findings reveal that hostile takeovers become very likely when target firms perform poorly (Hasbrouck, 1985; Palepu, 1986; Morck et al., 1989; Mitchell and Lehn, 1990) thereby confirming the view that hostile takeovers act as a means to discipline management. Hence, economic theory has argued that disciplinary takeovers are mainly hostile takeovers while synergetic takeovers are mainly friendly Morck et al. (1988). While achieving synergies due to increases in market power, economies of scale and scope, among others is at the core of every merger attempt, disciplinary takeovers indicate the bidders preferences to replace the targets management because of their incapacity of maximizing shareholder wealth. This alternative view on M&A has emanated from the market for corporate control theory where according to Jensen and Ruback (1983) managers compete for the rights to control and manage corporate resources. Obviously, when such firms

operate sub-optimally they signal upside potential in profitability and hostile takeovers are an efficient means to capitalize on these efficiency gains. While in the extreme this lead to a complete replacement of the targets management even the threat can act as a disciplining instrument.

Surprisingly, only a few theoretical models in finance exist that look at these issues from a classical microeconomic perspective. Exemplary, Berkovitch and Khanna (1991); Betton et al. (2009); Aktas et al. (2010), and Calcagno and Falconieri (2014), among others present models of merger negotiations in which the outside option is a tender offer. The central assumption within this domain of literature is that merger negotiations take place privately while hostile takeover bids are announced publicly and signal synergy gains to outsider that might become potential additional bidders. The findings reveal that under such a threat a unique level of synergies exist in equilibrium that motivate bidders to refrain from attempting to take over the target by means of a hostile takeovers should replacing the management generate lower synergies. Alike, the findings also indicate that if a bidder has a toehold in the target firm it is very likely that she wins the auction but at the same time increase the propensity for the target management to reject hostile bids from such bidders. All of these papers, however, have in common that uncertainty is neglected.

On the other hand, the literature on investment under uncertainty has acknowledged that bargaining and negotiation are pivotal pieces of M&As and has analyzed how uncertainty affects dynamic decision making of the party's involved. In particular, several papers have used the real options approach to advance the analysis of contract design under uncertainty (Lambrecht, 2004; Morellec and Zhdanov, 2005; Alvarez and Stenbacka, 2006; Lambrecht and Myers, 2007; Thijssen, 2008; Lukas and Welling, 2012). The results have provided answers with respect to how hostile takeover negotiation and merger negotiation, respectively, have an impact on takeover timing and sharing of the surplus under uncertainty. Exemplary, Morellec and Zhdanov (2005) and Lambrecht (2004) model a friendly merger of two firms where the timing and terms of takeovers are endogenous and result from value-maximizing decisions. The findings reveal, that M&As are usually timed in periods of economic expansion and that competition among heterogeneous firms speeds up the acquisition process. Alike, Lambrecht and Myers (2007) show that M&As are not solely triggered by positive economic shocks but can also be efficient when industries decline. Recent papers have furthermore stressed the importance of takeover type, i.e. friendly or hostile, on timing and wealth distribution. The results indicate that hostile takeovers occur inefficiently late when compared with the friendly merger as being the first-best. However, the bidder can claim a majority stake in the new entity due to its first-mover advantage and thus improve his bargaining position (See e.g. Lambrecht, 2004; Lukas and Welling, 2012). To our best knowledge, the paper by Offenberg and Pirinsky (2015) is the only one in the domain of real options and M&A that -albeit in

a more qualitative way- focus on the choice between both M&A deal forms. Here, the authors propagate that the choice is driven by a trade-off between the benefits of faster completion, i.e. friendly mergers take more time than tender offers and the higher cost of hostile takeovers due to higher premiums. Similar to us, the intention is to show why some of the empirical results exist that drive the choice between tender offers and mergers and how they are tied together in the presence of uncertainty. Their findings reveal that tender offers are completed faster than mergers but are associated with higher premiums and targets in more volatile product markets are more likely acquired by means of a tender offer. Although the authors address real option reasoning as a viable tool to investigate the factors that drive these results, their model, however, falls short to account for a rigorous dynamic decision model under uncertainty that accounts for game-theoretic elements certainly immanent in M&A deal tactics. In particular, the model neither considers the positive value of waiting for new information when choosing an optimal deal form nor are the optimal choices impacted by any strategic behavior of the players, i.e. neither non-cooperative or cooperative bargaining are considered and thus the fraction of surpluses assigned to each entity is given exogenously. Consequently, our intention is to provide a more rigid modeling framework that links the choice between takeovers and mergers to the parties strategic behavior during deal negotiations. Furthermore, we believe that among other factors credible threats, as depicted by real world M&A cases of ThyssenKrupp and HP and Xerox, have a likewise prominent impact on the optimal deal form choice as uncertainty and synergies.

The goal of our paper is to bridge these two strands of literature, i.e. the real option view on M&A with the literature on market for corporate control. Hence, we build on the literature that hostile takeovers are an efficient means to replace target management and take advantage of upside potential. In particular, while we allow the takeover to generate synergies in general we add to this the possibility for the bidder to profit from additional synergy gains whenever the synergies due to replacing targets management are higher than conjoint control due to a friendly merger. In contrast to the beforementioned literature, however, we deviate from the assumption that hostile takeovers occur in the shadow of an auction. Neglecting competitive bidding, however, seems reasonable as empirical data indicates that only a few hostile takeovers suffer from bidding contests and the majority of hostile takeovers are single-bid contests (Betton et al., 2008). The bargaining process develops as follows: The raider has two options. It may either make a hostile bid for the target knowing that if the bid is not accepted subsequent friendly merger negotiations are still possible. On the other hand, the raider can enter into negotiating a friendly merger in the first round knowing that if negotiations fail subsequent hostile takeovers are still possible. Whether the parties become a target or a bidder in this subsequent hostile takeover game is derived endogenously.

The closest paper to ours is Thijssen (2008). Here, both the bidder and the target can

make a bid for the other firm at any time. The two firms maximize expected profits and face different, but correlated, risk. A friendly merger occurs when both simultaneous bid for the other firm. In contrast, no simultaneous bids indicate a hostile takeover. There are two important results: First, if the roles the player take up, i.e. bidder or seller, are determined endogenously then the value to delay the M&A disappears due to the threat of preemption. This is in contrast to situations where the roles are assigned exogenously. Here, an incentive for the parties arise to delay the merger. Second, merger can be observed in both declining and expanding industries.

Our paper, however, differs in several ways. First, we endogenously derive an optimal synergy level which indicates when hostile takeovers are more profitable than friendly mergers for the raider. Consequently, both forms of M&A activity can occur in equilibrium. Moreover, we do not consider null threat values in friendly mergers. Rather, both firms can threaten the other party to either act as a bidder or target in a subsequent hostile takeover game. Our results indicate that friendly mergers are always first-best when there are little or no extra synergies achievable when replacing targets management in a hostile takeover. In such cases, however, the threat of a possible subsequent hostile takeover deters the sharing rule. In particular, the larger the weaker partner in a friendly merger the more likely hostile takeovers become should friendly negotiation fail. This is due to the fact that by doing so, the weaker partner can escape the curse of being weak and threaten to accept a hostile bid. As a consequence, the stronger partner will concede a higher equity share in the new entity to the weaker one in order to circumvent a suboptimal late hostile takeover. Greater uncertainty, however, mitigates the effect of threat value and in the extreme, i.e. for very high levels of uncertainty, subsequent hostile takeovers will never occur in response to a failed merger. On the contrary, should the raider be able to achieve considerably high synergies when replacing the targets management then hostile takeovers can become first-best. However, these additional gains have to surpass a critical level in order to eliminate the risk that the hostile bid will be rejected and the final outcome becomes a friendly merger. Our findings reveal that this threshold is sensitive to size, cost differential and uncertainty. In particular, the larger (smaller) the raider (the poor performing target) the more likely hostile takeovers become should the industry exhibit poor performing targets. Interestingly, at the same time the risk of rejected hostile bids, increases, too. In addition, the more volatile an industry the more likely friendly merger become, i.e. the higher the gains from replacing targets management to justify hostile takeovers.

3 The Model

We model a situation of two active firms labeled as B and T that have an option to form a new entity M by combining their assets and to profit from synergies. We will assume

that each firm's stand-alone value is proportional to it's capital stock K_i with $i \in \{B, T\}$, i.e.

$$V_i(t) = K_i x(t) \quad \text{with } i \in \{B, T\} \tag{1}$$

where $x(t)$ captures the randomness of $V_i(t)$ due to industry wide shocks. For the sake of simplicity, we will assume that $x(t)$ follows a geometric Brownian motion, i.e.:

$$dx(t) = \alpha x(t)dt + \sigma x(t)dz \tag{2}$$

where $\alpha \in \mathbb{R}$ denotes the instantaneous drift under the risk-neutral measure, $\sigma \in \mathbb{R}^+$ denotes the instantaneous volatility and dz denotes the standard Wiener increment. Both firms are risk-neutral and discount future cash-flows at the risk-free rate r and for conversion we assume that $r > \alpha$.

We allow two possible strategies by which both firms can combine their assets. First, a new entity can be formed by means of a tender offer (o). Here, one firm takes on the active role and offers a given premium to the shareholder of the other firm which in reaction has to choose when and whether to accept the offer. We preassign the roles, by assuming that firm B acts as a bidder and firm T acts as a target in such a case and follow previous literature that has suggested to model tender offers as a non-cooperative game a la Stackelberg (e.g., Lambrecht, 2004; Lukas and Welling, 2012; Lukas et al., 2019). Second, both firm can agree to jointly negotiate a merger (m). Here, we rely on cooperative game theory to determine each firm's stake in the new entity M. As opposed to other literature in the domain of M&A and real options, however, we do not assume a null threat ((Thijssen, 2008), among others) but rather allow for each player's outside options should negotiations fail . In particular, firm B credibly threats to take the role of a bidder while T may end-up as a target, in a tender offer if no agreement is achieved in the negotiations.

Since the primarily motive of our M&A activity is to profit from synergies, it is finally reasonable to assume that the new entity's firm value is affected by the type of deal, i.e. tender offer or merger via the potential level of synergies. In particular, one may argue that the synergies produced in a hostile tender offer are not smaller than those of a merger (i.e., $\omega_o \geqslant \omega_m$), for instance, due to the acquirer's power to substitute target's managers for a more efficient management team. These changes typically do not occur in mergers, where the incumbent managers normally stay in office, along with new managers designated by the acquirer.[2] Hence, upon merging, the value of the new entity M is given by:

$$V_{Mo,m}(t) = K_{Mo,m} x(t) = (\omega_{o,m} + K_B + K_T) x(t) \tag{3}$$

[2]The market for control literature refers to such takeovers as disciplinary takeovers. Here, bidder opt to replace the targets management because of their incapacity of maximizing shareholder wealth (Jensen and Ruback (1983); Morck et al. (1989)).

where $\omega_{o,m} > 0$ denotes synergies arising from the transaction.

3.1 The tender offer decision

$$f(x) = \max_{x_o^*(\psi)} \left[((\psi - 1)K_T x_o^*(\psi) - (1 - \epsilon_B)Y_o) \left(\frac{x(t)}{x_o^*(\psi)} \right)^{\beta_1} \right] \tag{4}$$

where $x_o^*(\psi)$ is the tender offer threshold for any given ψ, and $\beta_1 = \frac{1}{2} - \frac{\alpha}{\sigma^2} + \sqrt{\left(-\frac{1}{2} + \frac{\alpha}{\sigma^2} \right)^2 + \frac{2r}{\sigma^2}}$ is the positive root of the standard fundamental quadratic equation (see Dixit and Pindyck, 1994). Equation (4) indicates that at the threshold, i.e. when $x_o^* \leq x(t)$ for the first time, the target firm T will give control over the assets worth $K_T x_o^*$ by partially incurring the transaction cost, i.e. $(1 - \epsilon_B)Y_o$. In exchange, T is compensated by a lump sum payment worth $(\psi - 1)K_T x_o^*$.

The bidder's problem consists of maximizing its acquisition option by choosing an optimal premium taking into account the target's reaction function $x_o^*(\psi)$. Consequently, B's objective function is given by:

$$\max_{\psi} \left[\left(\left(K_{Mt} - K_B - \psi K_T \right) x_o^*(\psi) - \epsilon_B Y_o \right) \left(\frac{x(t)}{x_o^*(\psi)} \right)^{\beta_1} \right] \tag{5}$$

where $K_{Mt} = \omega_o + K_B + K_T$ denotes the new entity's capital stock after the tender offer. The intuition follows analogously. Upon taking over the target at the optimal threshold, i.e. x_o^* the bidder receives an asset worth K_{Mt} in exchange for compensating the shareholder of T and partially bearing the transaction cost of size $\epsilon_B Y_o$.

Solving objective functions (4) and (5) recursively leads to the following results for the threshold, premium and firms' option values:

Proposition 1. *The tender offer takes place at the threshold:*

$$x_o^* \equiv x_o^*(\psi^*) = \frac{\beta_1}{(\beta_1 - 1)^2} \frac{(\beta_1 - \epsilon_B)Y_o}{\omega_o} \tag{6}$$

as a result of the optimal premium offered by B:

$$\psi^* = 1 + \frac{(\beta_1 - 1)(1 - \epsilon_B)}{\beta_1 - \epsilon_B} \frac{\omega_o}{K_T} \tag{7}$$

The tender offer option values, i.e. when $x(t) < x_o^*$, for B and T are:

$$A_B x^{\beta_1} = \frac{(\beta_1 - \epsilon_B)Y_o}{(\beta_1 - 1)^2} \left(\frac{x}{x_o^*} \right)^{\beta_1} \tag{8}$$

$$A_T x^{\beta_1} = \frac{(1 - \epsilon_B)Y_o}{\beta_1 - 1} \left(\frac{x}{x_o^*} \right)^{\beta_1} \tag{9}$$

Proof. See Appendix. □

3.2 The merger decision

Should the firms pursue a merger, we assume that after the merger, each firm holds a percentage equity stake γ_i with $i \in \{B, T\}$ of the new entity's equity value $K_{Mm} = \omega_m + K_B + K_T$. In exchange, both firms have to give up their pre-merger stand-alone values $V_i = K_i x(t)$ with $i \in \{B, T\}$. Analogous to the tender offer, we furthermore assume that merging is not costless and that both firms share the transactions cost Y_m, i.e. B bears ξ_B while T has to incur $1 - \xi_B$ percentage of the total cost. Consequently, each party's net gain in the merger amounts to:

$$(\gamma_B K_{Mm} - K_B)\, x(t) - \xi_B Y_m \tag{10}$$

for firm B shareholders, and

$$((1 - \gamma_B) K_{Mm} - K_T)\, x(t) - (1 - \xi_B) Y_m \tag{11}$$

for those of firm T, where $K_{Mm} = \omega_m + K_B + K_T$ denotes the size of M after incorporating the proper synergies arising from the merger.

It is important to note here, that we allow for strategic alternatives if both parties do not come to an agreement. Hence, should a merger fail B has still an option to acquire the target T by means of a tender offer. Consequently, we assume that the previous derived tender offer policy serves as a credible threat when negotiating the merger. Hence, each firm possess a certain disagreement point when bargaining with the partner that is given by the parties' tender offer option value as stated in Equation (9). For simplicity reasons, we will again exogenously fix the roles of the firms, i.e. B threatens to be a (credible) bidder while T ends-up as a target.

We apply the asymmetric Nash-Bargaining solution (NBS) to solve for the firm's optimal shares in the new venture, represented by the following optimization problem:[3]

$$\max_{0<\gamma_B<1} \Big[\Big((\gamma_B K_{Mm} - K_B)\, x(t) - \xi_B Y_m - A_B x^{\beta_1} \Big)^{\eta_B} \Big(((1 - \gamma_B) K_{Mm} - K_T)\, x(t) - (1 - \xi_B) Y_m - A_T x^{\beta_1} \Big)^{1-\eta_B} \Big] \tag{12}$$

where η_B and $(1 - \eta_B)$ represent the bargaining power of firm B and T, respectively. The generic terms $A_B x^{\beta_1}$ and $A_T x^{\beta_1}$ represent each firm's disagreement point, which correspond to the outside options available to B and T, respectively. As previously stated, these outside options act as latent alternatives that both firms will face if the cooperative

[3] This approach has been previously used e.g. by Alvarez and Stenbacka (2006) and Margsiri et al. (2008).

game brakes down: firm B, due to the strategic toehold position, threatens to be a (credible) bidder in a tender offer, and, consequently, T ends-up as a target. The following proposition summarizes the optimal merger policy:

Proposition 2. *The merger materializes when $x(t)$ hits the optimal timing threshold x_m^* from below:*

$$x_m^* = \frac{\beta_1}{\beta_1 - 1} \frac{Y_m}{\omega_m} \tag{13}$$

Firm B's optimal equity stake γ_B^* in the new entity upon merging amounts to:

$$\gamma_B^* = \frac{K_B}{K_{Mm}} + \frac{\omega_m}{K_{Mm}} \frac{((\beta_1 - 1)\xi_B + \eta_B)}{\beta_1} + \left(\frac{(1 - \eta_B)A_B - \eta_B A_T}{Y_m} \right) \times \left(\frac{\beta_1}{\beta_1 - 1} \frac{Y_m}{\omega_m} \right)^{\beta_1} \tag{14}$$

and, naturally, $\gamma_T^* = 1 - \gamma_B^*$. Both firms' ex-ante option values result to:

$$F_B(x) = \left((\gamma_B^* K_{Mm} - K_B)\, x_m^* - \xi_B Y_m \right) \left(\frac{x}{x_m^*} \right)^{\beta_1} \tag{15}$$

and for firm T:

$$F_T(x) = \left(((1 - \gamma_B^*) K_{Mm} - K_T)\, x_m^* - (1 - \xi_B) Y_m \right) \left(\frac{x}{x_m^*} \right)^{\beta_1} \tag{16}$$

Proof. See Appendix. □

From the above derived results, we can conclude that the timing of the merger is not affected by the firms' threat values. Rather, the threat values have an impact on the sharing rule ($\gamma_{B,T}^*$) and option values $F_{B,T}(x)$, respectively. In particular, the higher a firm's threat value the more shares it can capture from the overall equity value of the new formed entity which raises the attractiveness of merging expressed by the corresponding option value.

3.3 When do tender offer bids take place?

In the following, we want to analyze under which conditions one M&A alternative is preferable to the other.

Let us begin with analyzing an extreme scenario first. Obviously, if $\omega_o = \omega_m = \omega$ and $Y_o = Y_m = Y$ it is straightforward to show that the results reflect common knowledge in the domain of game theory, i.e. the inefficiency of a non-cooperative game induced outcome when compared to the outcome of a cooperative game. In particular, the inefficiency in our setting is related to the timing policy of both alternatives, i.e. mergers occur sooner than tender offers, i.e., $x_m^*(\omega, Y) < x_o^*(\omega, Y)$.[4] If, however, the level of synergies is different

[4]This timing inefficiency of tender offer bids as already been discussed extensively in the literature (Lukas et al., 2019), among others.

such that $\omega_o \neq \omega_m$, tender offers can be optimally accepted either earlier or later than mergers. Thus, in the following we will differentiate between early and late tender offers.

3.3.1 Early tender offers

A closer look at Equations (6) and (13) reveals that very high tender offer specific synergies may lead to a reversed order of the corresponding timing thresholds. Hence, the following proposition summarizes the conditions under which early tender offers materialize.

Proposition 3. *If the synergy level associated with a tender offer is larger than a critical synergy level (ω_t) early tender offers are conceivable, i.e. $x_o^* < x_m^*$:*

$$\omega_o > \omega_t = \frac{\beta_1 - \epsilon_B}{\beta_1 - 1} \frac{Y_o}{Y_m} \omega_m \, (> \omega_m) \tag{17}$$

where $Y_o \geqslant Y_m$ ensures that $\omega_t > \omega_m$.

Proof. See Appendix. □

However, a lower threshold could not be sufficient enough to motivate the bidder to place an optimal bid. The synergies associated with the tender offer must furthermore assure that at the timing threshold the bidder's intrinsic value he receives from the tender offer has to be greater than B's foregone option value associated with the merger alternative. Hence, the following proposition states under which condition a tender offer is a dominant choice for B.

Proposition 4. *If the synergy level associated with a tender offer ω_o is larger than ω_t and surpasses a critical synergy level (ω_{e_B}) early tender offers are optimal for the bidder:*

$$\omega_o > \omega_{e_B} = \left(\frac{(\beta_1 - 1)\eta_B}{\beta_1 - \epsilon_B} \frac{Y_m}{Y_o} \right)^{1/\beta_1} \omega_t < \omega_t \tag{18}$$

Proof. See Appendix. □

Since $\omega_{e_B} < \omega_t$ an early takeover timing ensures that the value of the tender offer dominates always the value of the merger for the bidder.

While these results provide information when tender offers can be considered earlier than mergers and under which conditions they become valuable for the bidder inducing him to place a tender offer bid, we have to analyzed the target firm's reaction in order to conclude whether early tender offers finally materializes. In particular, given the structure of our non-cooperative game, should $x(t)$ hit $x_o^*|_{\omega_o > \omega_t}$, the bidder firm offers the optimal premium $\psi^*(\omega_o)$ (see Equation (7)) to the shareholders of the target firm, which, in turn, will decide on their own best interest. Two outcomes are plausible: First, the target firm's shareholder accept the bid and the game ends. Second, the target firm's shareholder refuse

the bid and wait for $x(t)$ to hit $x(t) = x_m^*$ which will trigger a subsequent merger. Hence, the shareholders of T will only accept the bid if the tender offer's synergies lead to an intrinsic value that is larger than the option to wait for the merger. Thus, the following proposition presents the critical synergy threshold that induce the firms to commit to early tender offers.

Proposition 5. *If the synergy level associated with a tender offer ω_o is larger than ω_t and surpasses a critical synergy level (ω_e) the shareholders of the target will accept the bid and early tender offers materialize:*

$$\omega_o > \omega_e = \max\left[\left(\frac{1-\eta_B}{1-\epsilon_B}\frac{Y_m}{Y_o}\right)^{1/\beta_1}, 1\right]\omega_t \tag{19}$$

Proof. See Appendix. □

Against this background, a second result becomes obvious. Shouldn't the synergies be high enough to stimulate T's shareholders to accept the bid, i.e. if $\omega_t < \omega_o < \omega_e$ then it is still possible for both firms to reach an agreement. In particular, since $x = x_m^* > x_o^*|_{\omega_m<\omega_t<\omega_o<\omega_e}$ firm B and T optimally opt for a merger with lower synergies in the future as soon as $x(t)$ hits x_m^* from below.[5]

3.3.2 Late tender offers

Finally, we need to consider that merger might be timing efficient, i.e. they occur earlier but they are less valuable than late tender offers because the continuation value of the tender offer reveals to be more valuable ($A_B(x_m^*) > F_B(x_m^*), A_T(x_m^*) > F_T(x_m^*)$ for both parties. Again, we can define a critical synergy level that indicates when such a scenario materializes.

Proposition 6. *If the synergy level associated with a tender offer ω_o is larger than ω_l i.e.,:*

$$\omega_o > \omega_l = \left(\frac{\beta_1 - 1}{(\beta_1 - 1) + \beta_1(1-\epsilon_B)}\frac{Y_m}{Y_o}\right)^{1/\beta_1}\omega_t < \omega_t \tag{20}$$

but smaller than $\omega_o < \omega_l < \omega_t$ both firms will favor leave the merger option unexercized and opt for a tender offer.

Proof. See Appendix. □

It is possible to show that the condition ω_l applies both for bidder and target firms, as natural result of the NBS.

[5]For modeling purposes, no threat values are considered in the case of this subsequent negotiation, as the threshold for the tender offer has already been achieved.

4 Comparative statics and empirical predictions

In this section we present a comparative statics of the main drivers of merger and acquisitions strategies, i.e. when mergers and tender offers become optimal.

Let us assume that the bargaining power is proportional do the firms' size ($\eta_B = K_B/(K_B + K_T)$) and that the bidder share of the transactions costs is proportional to its size in a merger ($\xi_B = K_B/(K_B + K_T)$), but it is bigger for a tender offer ($\epsilon_B > K_B/(K_B + K_T)$).

Early tender offer bids are only acceptable for the target if condition (19) holds. The level of synergies that the acquisition needs to produce must induce a smaller threshold than the merger threshold and at least compensate the target firm for loosing its bargaining power in a later merger. Early tender offers become optimal if they occur sooner than mergers ($\omega_e < \omega_t$) if

$$(1 - \eta_B)Y_m < (1 - \epsilon_B)Y_o. \tag{21}$$

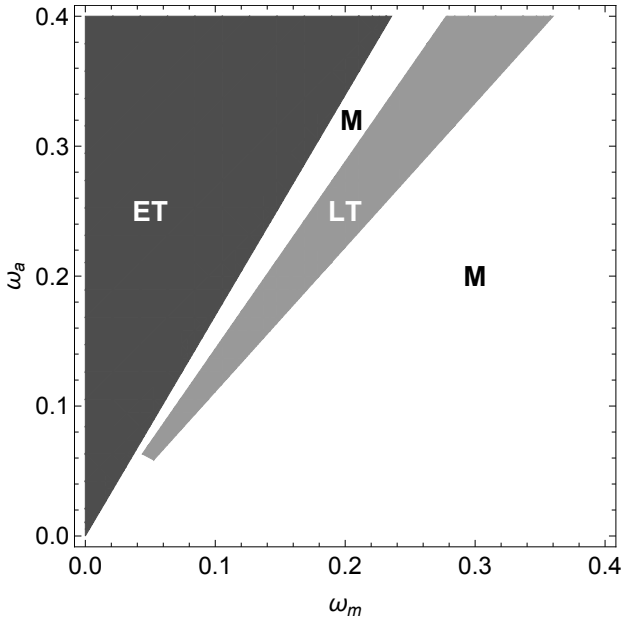
showing that it is sufficient for early tender offers to be accepted that the target's transaction costs ($(1-\epsilon_B)Y_o$) are smaller than those of a merger weighted by the target bargaining power ($(1-\eta_B)Y_m$). Assuming that the bargaining power is proportional to size and that the target's tender offer transactions costs are less than proportional, tender offers are preferable if their costs are not sufficiently greater that those of a merger. If the transaction costs are sufficiently greater, mergers are only optimal if the condition for late tender offers does not hold (Equation (20)), meaning that mergers are only optimal if tender offers do not produce significantly greater synergies.

Figure 1 illustrates these two cases. In the dark gray area an early hostile tender offer is accepted because the target benefits from a premium induced by higher bidder tender offer synergies ($\omega_o > \omega_e > \omega_t > \omega_m$), even considering possibly higher tender offer costs, when compared to the less synergistic friendly merger, albeit possibly less expensive. In the light gray area, late tender offers become optimal as both firms firms benefit from the more synergistic hostile acquisition. In the white area the tender offer synergies are not sufficient to make the hostile tender offer optimal.

Figure 1(a) shows that three boundaries exist (equations (19), (17) and (20)), allowing for nonlinear effects: mergers are preferable for both high and moderate synergies.

4.1 The effect of the firms' bargaining power and size

As before let us assume that the bargaining power in a merger are proportional to firms' size, i.e. $\eta_B = K_B/(K_B + K_T)$, and that the transaction costs in a merger are also proportional to firms' size ($\epsilon_B = \eta_B$) while in a tender offer they are more than proportional for the bidder firm ($\xi_B > \eta_B$). The effect of the firms' size under these assumptions can be studied as the effect of the bargaining power η_B



(a)

$K_B = 2$, $K_T = 1$, $Y_o = 0.12$, $Y_m = 0.1$, $\xi_B = \eta_B$, $\epsilon_B = \eta_B + 0.4(1 - \eta_B)$, $\eta_B = K_B/(K_B + K_T)$, $r = 0.04$, $\alpha = 0$, $\sigma = 0.2$.
ET = Early tender offer; LT = Late tender offer; M = Merger.

Figure 1: Optimal M&A strategy: sensitivity to the synergies

Corollary 1. *The effect of the size reveals to be non-monotonic as both early and late tender offers are more likely to occur the larger the (good performing) bidder is* ($\partial\omega_e/\partial\eta_B = \partial\omega_e/\partial\eta_B + \partial\omega_e/\partial\epsilon_B \times \partial\epsilon_B/\partial\eta_B < 0$ *where* ω_e *is as Equation* (19)*), but mergers are also more likely to occur when tender offer synergies are moderately greater than the merger synergies* ($\partial\omega_t/\partial\eta_B = \partial\omega_t/\partial\epsilon_B \times \partial\epsilon_B/\partial\eta_B < 0$*, where* ω_t *is as in* (17)*).*

Figure 2 illustrates effects presented in Corollary 1.

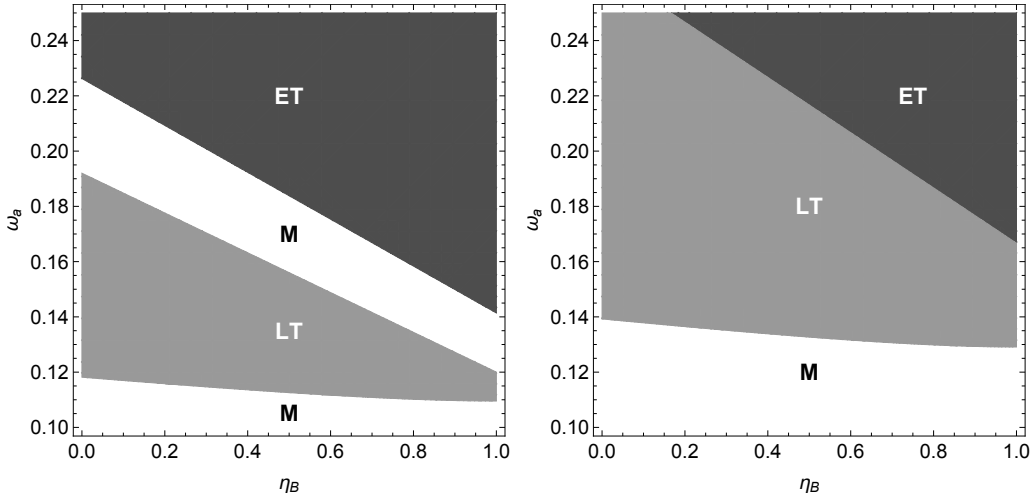
Based on our results, the following hypothesis can be set:

Hypothesis 1a The firms' relative size has a non-monotonic effect on the choice of tender offers over mergers when tender offers are not significantly costlier than mergers, with mergers being more likely to occur for intermediate relative sizes.

Hypothesis 1b Takeovers occur more frequently when the relative size of the bidder increases for tender offers sufficiently more synergistic than mergers.

4.2 The effect of uncertainty

Regarding the effect of uncertainty and noting that $\partial\beta_1/\partial\sigma < 0$, the following corollary holds:



(a) $Y_o = 0.12$ (b) $Y_o = 0.167$

$\omega_m = 0.1$, $K_B = 2$, $K_T = 1$, $Y_m = 0.1$, $\xi_B = \eta_B$, $\epsilon_B = \eta_B + 0.4(1 - \eta_B)$, $r = 0.04$, $\alpha = 0$, $\sigma = 0.2$.
ET = Early tender offer; LT = Late tender offer; M = Merger.

Figure 2: Optimal M&A strategy: sensitivity to the bargaining power

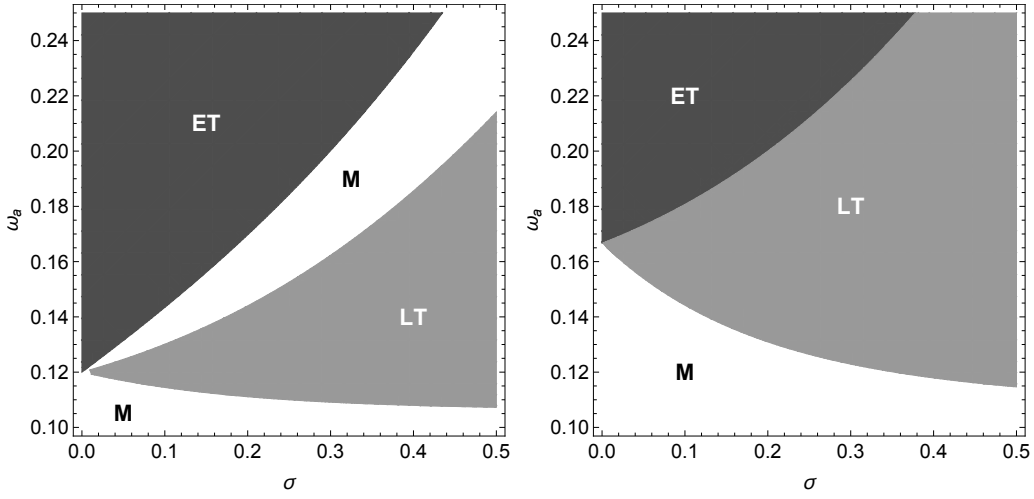
Corollary 2. *More costly tender offers are more likely to occur the higher the uncertainty, since late tender offers are more likely to occur as they require lower synergies* ($\partial\omega_l/\partial\sigma < 0$). *The effect of uncertainty is non-monotonic as both early tender offers are less likely to occur the bigger the good performing bidder is* ($\partial\omega_e/\partial\sigma > 0$), *and mergers are also more likely to occur when tender offer synergies are moderately greater than the merger synergies* ($\partial\omega_t/\partial\sigma > 0$).

Figure 3 illustrates this corollary. When the costs of tender offers are not significantly different from the costs of mergers, firms operating in moderate volatile industries or periods will tend to enter more in mergers, preferring tender offers for both low and volatilities (Figure 3(a)). Costlier tender offers induce firms to choose more frequently tender offer when uncertainty increases (Figure 3(b)).

Hypothesis 2a The effect of uncertainty on the choice of tender offers over mergers is non-monotonic when tender offers are not significantly costlier than mergers, with mergers being more likely to occur for intermediate levels of uncertainty.

Hypothesis 2b Takeovers occur more frequently when uncertainty increases for takeovers sufficiently more synergistic than mergers.

The hypothesis arising from our theoretical model are going to be tested in the next section.



(a) $Y_o = 0.12$ (b) $Y_o = 0.167$

$\omega_m = 0.1$, $K_B = 2$, $K_T = 1$, $Y_m = 0.1$, $\xi_B = \eta_B$, $\epsilon_B = \eta_B + 0.4(1 - \eta_B)$, $\eta_B = K_B/(K_B + K_T)$, $r = 0.04$, $\alpha = 0$.
ET = Early tender offer; LT = Late tender offer; M = Merger.

Figure 3: Optimal M&A strategy: sensitivity to uncertainty

5 Empirical analysis

To be added.

6 Conclusions

Given the increasing prominence of M&A deals in todays global economy, their increasing valuation levels, and their strategic importance for firms? competitiveness it is surprising how little about their trends and in particular their dynamics has been explored in depth. The paper at hand builds on recent advances in the domain of option games under uncertainty and looks closer at determinants that drive the choice between friendly mergers and hostile takeovers. In particular, the model considers two firms that independently commit themselves to grow by means of M&A. Given that the outcome is uncertain, each firm calculates its payoff resulting from either a friendly merger or hostile takeover thereby taking into account that a friendly merger can be followed by a hostile takeover and vice a versa. Consequently, the paper advances recent literature by explicitly considering both takeover strategies simultaneously and accounts for the associated threat values during negotiation. Our results indicate that friendly mergers are always first-best when there are little or no extra synergies achievable when replacing targets management in a hostile takeover. However, the threat of a possible subsequent hostile takeover deters the sharing rule significantly and weaker firms can improve its position the larger they are. Alike,

the importance of threat values is higher the lower the industrys uncertainty becomes. Similar to e.g. Berkovitch and Khanna (1991), we determine an optimal synergy level that motivate raiders to refrain from attempting to merge friendly should replacing the management generate higher synergies. Consequently, in the presence of poor performing targets, hostile takeovers are more likely to be observed when the raider is bigger and the M&A activity is clustered in less volatile industries.

Of course, our paper is not without limitations. Exemplary, we do not consider the risk, that a merger is not approved by governmental authorities. In addition, the hostile bid does not induce competitive bids by other firms nor do we explicitly model the shareholder-manager conflict that could arise in such a setting. Hence, these aspects represent fruitful avenues that might motivate further research in this domain.

References

Aktas, N., de Bodt, E., and Roll, R. (2010). Negotiations under the threat of an auction. *Journal of Financial Economics*, 98(2):241–255.

Alvarez, L. H. R. and Stenbacka, R. (2006). Takeover timing, implementation uncertainty, and embedded divestment options. *Review of Finance*, 10(3):417–441.

Andrade, G., Mitchell, M., and Stafford, E. (2001). New Evidence and Perspectives on Mergers. *Journal of Economic Perspectives*, 15(2):103–120.

Berkovitch, E. and Khanna, N. (1991). A theory of acquisition markets: Merger versus tender offers, and golden parachutes. *Review of Financial Studies*, 4(1):149–174.

Betton, S., Eckbo, B. E., and Thorburn, K. S. (2008). Corporate Takeovers. In Eckbo, B. E., editor, *Handbook of Corporate Finance: Empirical Corporate Finance*. Elsevier, Academic Press, North-Holland.

Betton, S., Eckbo, B. E., and Thorburn, K. S. (2009). Merger negotiations and the toehold puzzle. *Journal of Financial Economics*, 91(2):158–178.

Browne, L. E. and Rosengren, E. S. (1987). Are hostile takeovers different? In *Federal Reserve Bank of Boston*, pages 199–242.

Calcagno, R. and Falconieri, S. (2014). Competition and dynamics of takeover contests. *Journal of Corporate Finance*, 26:36–56.

Dixit, A. K. and Pindyck, R. S. (1994). *Investment under uncertainty*. Princeton University Press.

Dong, M., Hirshleifer, D., Richardson, S., and Teoh, S. (2006). Does investor misevaluation drive the takeover market. *Journal of Finance*, 61:725– 762.

Hasbrouck, J. (1985). The characteristics of takeover targets q and other measures. *Journal of Banking and Finance*, 9(3):351–362.

Jensen, M. C. and Ruback, R. S. (1983). The market for corporate control. *Journal of Financial Economics*, 11(1-4):5–50.

Lambrecht, B. (2004). The timing and terms of mergers motivated by economies of scale. *Journal of Financial Economics*, 72(1):41–62.

Lambrecht, B. and Myers, S. (2007). A Theory of Takeovers and Disinvestment. *The Journal of Finance*, 62(2):809–845.

Lukas, E., Pereira, P. J., and Rodrigues, A. (2019). Designing optimal m&a strategies under uncertainty. *Journal of Economic Dynamics and Control*, 104:1–20.

Lukas, E. and Welling, A. (2012). Negotiating M&As under uncertainty: The influence of managerial flexibility on the first-mover advantage. *Finance Research Letters*, 9(1):29–35.

Margsiri, W., Mello, A. S., and Ruckes, M. E. (2008). A dynamic analysis of growth via acquisition. *Review of Finance*, 12(4):635–671.

Martynova, M. and Renneboog, L. (2008). A century of corporate takeovers: What have we learned and where do we stand? *Journal of Banking & Finance*, 32(10):2148–2177.

McSweeney, B. (2012). Takeover Strategies, Competitive Bidding, and Defensive Tactics. In Faulkner, D., Teerikangas, S., and Joseph, R. J., editors, *The Handbook of Mergers and Acquisitions*, pages 285–319. Oxford University Press.

Mitchell, M. L. and Lehn, K. (1990). Do Bad Bidders Become Good Targets ? *Journal of Political Economy*, 98(2):372–398.

Moeller, S., Schlingemann, F., and Stulz, R. (2004). Firm size and gains from acquisitions. *Journal of Financial Economics*, 73:201–228.

Morck, R., Shleifer, A., and Vishny, R. W. (1988). Characteristics of hostile and friendly takeover targets. In Auerbach, A. J., editor, *Corporate Takeovers: Causes and Consequences*, volume I, pages 101–136. University of Chicago Press.

Morck, R., Shleifer, A., and Vishny, R. W. (1989). Alternative Mechanisms for Corporate Control.

Morellec, E. and Zhdanov, A. (2005). The dynamics of mergers and acquisitions. *Journal of Financial Economics*, 77(3):649–672.

Offenberg, D. and Pirinsky, C. (2015). How do acquirers choose between mergers and tender offers. *Journal of Financial Economics*, 116:331–348.

Offenberg, D., Straska, M., and Waller, H. (2014). Who gains from buying bad bidders. *Journal of Financial and Quantitative Analysis*, 49:513–540.

Palepu, K. G. (1986). Predicting takeover targets. A methodological and empirical analysis. *Journal of Accounting and Economics*, 8(1):3–35.

Rhodes-Kropf, M. and Viswanathan, S. (2004). Market valuation and merger waves. *The Journal of Finance*, LIX(6):2685–2718.

Schnitzer, M. (1996). Hostile versus Friendly Takeovers. *Economica*, 63(249):37–55.

Schwert, W. (1996). Markup pricing in mergers and acquisitions. *Journal of Financial Economics*, 41:153–192.

Sudarsanam, S. and Mahate, A. (2006). Are friendly acquisitions too bad for shareholders and managers? Log-Term value creation and top management turnover in Hostile and friendly acquirers. *British Journal of Management*, 17:7–30.

Thijssen, J. (2008). Optimal and strategic timing of mergers and acquisitions motivated by synergies and risk diversification. *Journal of Economic Dynamics and Control*, 32(5):1701–1720.