Finance Research Letters 9 (2012) 29–35

Contents lists available at SciVerse ScienceDirect

Finance Research Letters

journal homepage: www.elsevier.com/locate/frl

Negotiating M&As under uncertainty: The influence of managerial flexibility on the first-mover advantage

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ARTICLE INFO

Article history:
Received 19 May 2011
Accepted 22 September 2011
Available online 29 September 2011

JEL classification:
G34
G13
C70
D81

Keywords:
Real option
Game theory
Merger & Acquisition
Negotiation
Flexibility
Ultimatum game

ABSTRACT

Using a dynamic real options approach we show that managerial flexibility is strengthening the first-mover advantage in bargaining M&As by undermining the bargaining power of the second mover.

1. Introduction

The decision to acquire another company is without doubt one of the key decisions faced by firms. In general, acquisitions are creating a surplus by transferring the target's assets from the seller to the buyer, to whom it is of greater value. This surplus is shared between the buyer and the seller. Therefore the question arises who gets which fraction of the surplus? This question is usually avoided, (see e.g. Alvarez and Stenbacka, 2006; Harris, 1990; Lippman and Rumelt,

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1544-6123/$ - see front matter
doi:10.1016/j.frl.2011.09.002

2003), by using axiomatic methods, like the symmetric Nash bargaining solution (Nash, 1950) or the asymmetric Nash bargaining solution, where the fractionizing is done following an exogenous coefficient which expresses the degree of bargaining power (Harsanyi and Selten, 1972). Methods of non-cooperative game theory like the sub-game perfect equilibrium (Selten, 1975) usually show the existence of a first-mover advantage. In the ultimatum game (formalized by Güth et al. (1982)) the first-mover advantage reaches its maximum. The offering party gets the whole surplus while the reacting party gets nothing. Rubinstein (1982) sets up a model in which the buyer and the seller are alternately making offers how to share a pie of size 1 until an agreement is reached. It is shown that if time is valuable, i.e. both players i, j consider an individual discount factor δ_i, δ_j, the only sub-game perfect equilibrium is to reach an agreement directly with the first offer. Expressed formally, party i gets $(1-\delta_i)/(1-\delta_i\delta_j) < 1$.

Subsequently, researchers have extended the model of Rubinstein in several ways. Admati and Perry (1987) are presenting a model, where bargainers may wait with their response to an offer to signal their relative strength. However, the parties might also postpone the response to an offer because they want to wait for new information and thus to resolve uncertainty regarding the value of the traded asset. Only recently, researchers have implemented such managerial flexibility rights by means of real option theory in the context of such transactions (see e.g. Lambrecht and Myers, 2007; Morellec and Zhdanov, 2005; Pawlina, 2002). In brief, a real option expresses the flexibility assigned to a decision, i.e. for example the decision to delay an investment or to abandon an investment project without being obliged to.[1]

Betton and Morán (2003) use a real options approach to analyze acquisitions. The bargaining is modeled as a non-cooperative game where the seller offers a price he is claiming for the company and the buyer can accept this price but is able to wait with his decision to resolve some uncertainty. The results show that the parties reach an agreement only after a time delay which is stochastic and that the selling party gets a higher percentage of the created surplus than the buying party. In contrast Hackbarth and Morellec (2008) explain the resulting stock returns of M&As with a real option model by modeling a simultaneous bargaining game under incomplete information. On the basis of Morellec and Zhdanov (2005) they determine a sharing rule for the shares of the new entity which only depends on the capital stocks of the two companies, on the amount of synergies and on the sunk transaction costs. If the capital stock of the bidding company is higher than the capital stock of the target company the bidder will get a greater share in the new entity than the target. In contrast to our result the sharing rule developed by Hackbarth and Morellec (2008) is independent of uncertainty and flexibility. Furthermore, their result does not directly explain how to share the surplus. Lambrecht (2004) compares the transfer of a company in form of a merger with the transfer of a company in form of a hostile takeover. As Betton and Morán (2003) he is combining a dynamic real option model with a sequential non-cooperative game where the seller acts as the Stackelberg leader to model the hostile takeover. In contrast, the bargaining game of a merger consists of a timing decision which is modeled as a cooperative game and a decision how to share the new entity which is modeled as a simultaneous game. It is shown that due to a first-mover-effect the seller will get a higher fraction of the surplus in a hostile takeover than in a merger. Like Hackbarth and Morellec (2008), Lambrecht (2004) develops particular sharing rules for the new entity. While the sharing rules are affected by flexibility and uncertainty the results, however, neglect discussing the impact of these measures on the division of the surplus generated.

Our paper originates from Betton and Morán (2003) but differs in the fact that the total gain of the acquisition is known by both parties, that transferring the target creates transaction costs for both parties and that the buyer can be the offering party, too. We show that in the absence of any interest-effect the bidding party gets the whole surplus generated by the acquisition. In line with Rubinstein's (1982) findings, we demonstrate that an interest-effect impacts the first-mover advantage. Under uncertainty, however, managerial flexibility marginalizes the impact of the interest-effect.

[1] For example Dixit and Pindyck (1994).

2. The model

Consider a group S (the seller) who owns a company, the target, that has at time t a value of V_t. For another company B (the buyer) the same target has a higher value of θV_t ($\theta > 1$). By selling the target from S to B sunk transaction costs of A arise for S as well as for B. We assume that the value of the target is not constant over time but is following a geometric Brownian motion:

$$dV(t) = \eta V(t)dt + \sigma V(t)dW(t), \qquad V(0) = V_0, \tag{1}$$

with $\sigma^2 \in \mathbb{R}_+$ as the volatility of the target value, $\eta \in \mathbb{R}$ as the growth rate of the target value and $dW(t)$ as an increment of a Wiener process with zero mean and variance equal to dt. Finally, we assume that all agents are risk neutral and that the riskless interest rate r, ($r \geqslant \eta$) controls for the time-value of money. Upon selling the target the seller gets the sales price ψV_t ($\psi > 0$), has to pay the transaction costs of A and has to transfer the target of value V_t to the buyer. He does not incur a loss, if $\psi \geqslant 1 + A/V_t$. Buying the target the buyer gets the target with value θV_t and in return has to pay ψV_t the sales price, and the transaction cost A. He does not incur a loss if $\psi \leqslant \theta - A/V_t$. Consequently, a sale of the target from S to B will create a surplus if and only if $(\theta - 1)V_t > 2A$. The surplus is $(\theta - 1)V_t - 2A$ and its partitioning has to be negotiated by the choice of ψ. Therefore, at time t_0 one party is offering a $\psi > 1$ to the other party which can accept the offer or reject it. The reacting party has not to decide immediately at time t_0 of the offer whether it accepts or rejects the offer. Rather, it can postpone the decision. We assume that there is no possibility for further rounds of negotiation or for counteroffers.[2] Hence, accepting the offer leads to an acquisition of the target. In addition, we will make the following generalizations. The party who places the bid receives upon closing the deal $a(\psi)V - A$ while the other party, i.e. the reacting party, receives $c(\psi)V - A$. We will assume that time is continuous, i.e. $t \in (t_0, \infty)$. Thus the offering party has the action set $\psi \in (0, \infty)$ and at every point in time the reacting party has the action set {accept, wait}.

We rely on a Markovian Perfect Nash Equilibrium to determine the equilibrium strategy for both parties. In particular, the party that places the bid optimally defines ψ in stage one. Conditional on the offered premium ψ the reacting party will choose a threshold value $V^*(\psi)$ in stage two at which the offer will be accepted, which corresponds to an optimal timing decision with $t^* = min\{t \geqslant t_0 | V(t) > V^*\}$ Hence, this degree of managerial flexibility can be interpreted as a real option. Exercising the option right refers to accepting the offer by acquiring the target.[3] Consequently, the value of the option to acquire the target held by the reacting party is the solution of the following maximization problem in stage two:

$$F(V) = \max_{\tau} \mathbf{E}[(a(\psi)V_\tau - A)e^{-r\tau}], \tag{2}$$

where $\mathbf{E}[\cdot]$ denotes the expectations operator. Solving Eq. (2) yields:

$$F(V) = (a(\psi)V^* - A)\left(\frac{V}{V^*}\right)^{\beta}, \tag{3}$$

with $\beta = \frac{1}{2} - \frac{\eta}{\sigma^2} + \sqrt{\left(\frac{\eta}{\sigma^2} - \frac{1}{2}\right)^2 + \frac{2r}{\sigma^2}} > 1$ and

$$V^* = \frac{\beta}{(\beta - 1)} \frac{1}{a(\psi)} A. \tag{4}$$

In contrast, the bidding firm will choose ψ in stage one such that it maximizes

$$f(\psi) = \max_{\psi} \mathbf{E}[(c(\psi)V^*(\psi) - A)e^{-r\tau^*}], \tag{5}$$

[2] The absence of counteroffers can be a result of the assumption that the bidding party holds the dominant bargaining power and thus is able to inhibit further rounds of negotiation. Moreover, substantial heterogeneity within the stakeholder groups of the second-mover might exist. Hence, making a counteroffer that is in line with the interests of all is difficult or too costly to formulate. Finally, it is perceivable that a substantial probability exists that negotiations will break down if no agreement is reached in the first round. Consequently, this threat hinders the parties to enter into subsequent rounds of negotiation.

[3] We will assume that this managerial flexibility is not limited by a fixed maturity date. Therefore the possibility to accept the offer is a perpetual real option.

subject to the other party's reaction function, i.e. $V^*(\psi)$. The solution of Eq. (5) leads to the following propositions.

Proposition 1. *The optimal demanded premium depends on whether the seller or the buyer of the target places the bid. If the bid is placed by the seller then the optimal demanded premium equals:*

$$\psi_s = \frac{\beta\theta + \beta - 1}{2\beta - 1}. \tag{6}$$

If the buyer is the offering party then the optimal demanded premium equals:

$$\psi_B = \frac{\beta\theta + \beta - \theta}{2\beta - 1}. \tag{7}$$

Proposition 2. *The optimal timing threshold V^* is independent of whether the buyer or seller is the reacting party and given by:*

$$V^* = \frac{\beta}{(\beta - 1)^2}\frac{(2\beta - 1)}{(\theta - 1)}A. \tag{8}$$

In the following, we will give an answer to the questions what surplus is generated by the acquisition and how much of wealth is distributed to the parties? Because the deal is closed at the same time the generated surplus yields:

$$G(V_0) = \frac{3\beta - 2}{(\beta - 1)^2}A\left(\frac{V_0}{\frac{\beta(2\beta-1)}{(\beta-1)^2(\theta-1)}A}\right)^{\beta}. \tag{9}$$

However, depending on which party holds the bargaining power, this surplus is unevenly shared between the seller and the buyer. The expected profit of the party that holds the bargaining power (first mover, offering party) is $\alpha_1 G$ with a share of the surplus of $\alpha_1 = (2\beta - 1)/(3\beta - 2)$. Contrary, the fraction $\alpha_2 G$ with $\alpha_2 = (\beta - 1)/(3\beta - 2)$ is assigned to the second party.

Proposition 3. *The expected profit for being the offering party is greater than for being the accepting party, i.e. $\alpha_2 < \alpha_1$. This first-mover advantage is reduced by an uncertainty-independent interest effect and reinforced by a flexibility effect which is increasing with uncertainty ($\partial\alpha_1/\partial\sigma > 0$).*

As Fig. 1 depicts for $r > \eta$ we have that $\alpha_1 > \alpha_2$. The difference is due to a first-mover advantage. The extent of this advantage is affected by two factors, the size of interest and managerial flexibility respectively. While the impact of the latter on the first-mover advantage becomes the more pronounced the higher the uncertainty associated with the value of the target the impact of the first factor is uncertainty-independent. The intuition behind this result is twofold. The net gain associated with the acquisition of the target becomes the smaller the longer the postponement regarding closing the deal. In particular, the greater the ratio r/η becomes the stronger the decrease of the net gain. Consequently, the reacting party holds some kind of bargaining power because he controls the exercise of the real option. Uncertainty, however, has a contrary impact on the net gain. Here, an increase in uncertainty increases the net gain because it pays to wait, i.e. the offering party profits from the postponement. Hence, an increase in uncertainty diminishes the bargaining power the reacting party holds. As a result, the gain associated with the first-mover advantage increases.

As uncertainty becomes infinitely large, the uneven distribution of profits reaches its maximum. Here, the offering party receives hundred percent of the value generated while the reacting party does not participate from the gains generated, i.e. $\alpha_1 = 1$ and $\alpha_2 = 0$. Without an interest effect, i.e. $r = \eta$ the model is equal to the solution of the ultimatum game with sub-game perfect equilibrium. The sharing rule is calculated by $\lim_{r/\eta \to 1}\alpha_1 = 1$. Hence the ultimatum game can be seen as a special case of the presented model.

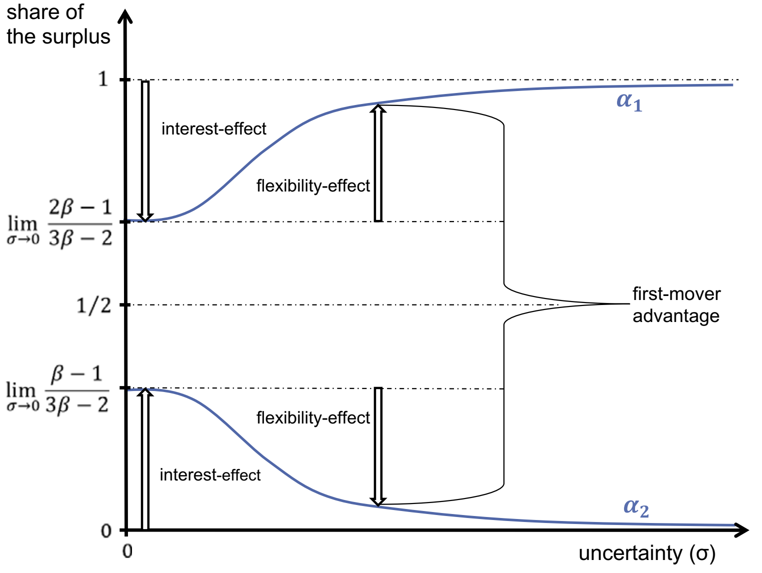

Fig. 1. The shares of the surplus of the offering party (α_1) and of the reacting party (α_2) depending on the amount of uncertainty. For $\eta > 0$ the limit of $\lim_{\sigma\to 0}\beta = r/\eta$. For $\eta \in \mathbb{R}_0^-$ the limit of $\lim_{\sigma\to 0}(2\beta-1)/(3\beta-2)$ and $\lim_{\sigma\to 0}(\beta-1)/(3\beta-2)$ equals 2/3 and 1/3 respectively.

Moreover, the results raise the question if and under which conditions the distribution of the surplus between the parties will be shared equally. Under the assumption that $r > \eta$ it is easy to show that $\alpha_1 \geqslant 2/3$. Hence, the offering party will always get more than twice of the gain generated by the reacting party. Notably for $\eta \leqslant 0$ we have that $\lim_{\sigma\to 0}\alpha_1 = 2/3$.

Proposition 4. *In a cooperative framework, i.e. the parties act as a central planner, the optimal timing threshold is* $V^*_{opt} = \frac{\beta}{\beta-1}\frac{2A}{(\theta-1)}$. *Therefore, the sale of the asset happens inefficiently late if it is determined sequentially by the two parties.*

Nevertheless, a social efficient structured deal is conceivable in two limiting cases. First, if the discount rate r is near infinity the individuals place a high weight on the immediate present. Consequently, there will be no value of waiting and therefore no dynamic game at all. Second, if $\eta \leqslant 0$ and given no uncertainty $V(t)$ will remain constant or fall over time and it is clearly optimal to invest immediately if $c(\psi)V > A$ and never invest otherwise.

In general, however, a too late exercise occurs in the sequential model because of the asymmetric sharing rule. Assuming irreversible transaction costs the timing of consummating the deal depends critically on the individual's ratio of payoff to cost accrued. High sunk costs in relation to a moderate payoff indicate high opportunity costs of investing now rather than waiting when uncertainty is present. In the sequential game setting the first-mover is claiming more than half of the surplus while the second-mover gets less than half of the surplus generated by the acquisition. Because the second-mover still has to pay exactly half of the transaction costs his ratio of payoff to cost is now lower than in the case of a central planner. Consequently, it pays for the second-mover to wait for new information and to postpone the timing of the deal. Although this strategic delay is socially inefficient it is nevertheless a good choice of the first-player to claim more than half of the surplus because his larger share of a smaller pie is still bigger than half of the optimal pie.

Given this context, several policy recommendations can be deduced from the model. A comparison of both thresholds yields $V^*_{opt} = (\beta - \frac{1}{2})/(\beta-1)V^*$. Hence, less uncertainty will lead to less social-inefficiency ($\partial\beta/\partial\sigma < 0$). Consequently, reducing economic uncertainty by means of e.g. transparent long-term policies is one strategy to circumvent social inefficient structured deals. Moreover, the results show that the risk-free interest rate r can be used as an instrument for policy-makers in order to align the critical investment thresholds. Consequently, raising the risk-free interest rate would reduce the undesirable delay. Finally, another option would be to coordinate ex-ante the transaction costs accrued. For example, policy-maker can implement a subsidy that decreases the reacting party's transactions cost.

3. Conclusion

In general, acquisitions raise the question how the generated surplus is shared among the parties. Usually, a first-mover advantage prevails. In this paper, we demonstrate the impact of managerial flexibility on the first-mover advantage in a sequential game under uncertainty. The findings reveal that the outcome of the sequential game is always socially inefficient and that the first-mover advantage is reduced by an uncertainty-independent interest effect and reinforced by a flexibility effect that is increasing with uncertainty.

Acknowledgments

We are grateful to the co-editor Dirk Hackbarth and an anonymous reviewer for helpful comments and suggestions. Any remaining errors are the sole responsibility of the authors.

Appendix A

The offering party chooses $\psi \in (0,\infty)$ to maximize $(c(\psi)V^*(\psi) - A)\left(\frac{V_0}{V^*(\psi)}\right)^\beta$ while the reacting party is maximizing $\Omega(\psi)(V(t))^\beta$ by choosing the threshold $V^*(\psi)$ contingent on ψ. Here Ω is given by the following system of equations which represents the value-matching and smooth-pasting condition[4]

$$\left| \begin{array}{l} \Omega(\psi)(V^*(\psi))^\beta = a(\psi)V^*(\psi) - A \\ \beta\Omega(\psi)(V^*(\psi))^{\beta-1} = a(\psi) \end{array} \right| \tag{A.1}$$

For the offering party we get:

$$\max_{\psi\in(0,\infty)} \left[\left(c(\psi)\frac{\beta}{1-\beta}\frac{-A}{a(\psi)} - A \right) \left(\frac{V_0}{\frac{\beta}{1-\beta}\frac{-A}{a(\psi)}} \right)^\beta \right]. \tag{A.2}$$

Consequently, we find ψ by solving the following equation:

$$0 = \frac{\beta}{1-\beta}\frac{c(\psi)a'(\psi) - c'(\psi)a(\psi)}{a(\psi)} + \left(\frac{\beta}{1-\beta}\frac{-c(\psi)}{a(\psi)} - 1 \right) a'(\psi)\beta. \tag{A.3}$$

If the seller is the offering party, we have that $a(\psi_s) = \theta - \psi_s$ and $c(\psi_s) = \psi_s - 1$ leads to $\psi_s = \frac{\beta\theta+\beta-1}{2\beta-1}$ and $V_S^* = \frac{\beta}{(\beta-1)^2}\frac{2\beta-1}{\theta-1}A$. If the buyer is the offering party then we have $a(\psi_B) = \psi_B - 1$ and $c(\psi_B) = \theta - \psi_B$. Hence, we get $\psi_B = \frac{\beta\theta+\beta-\theta}{2\beta-1}$ and $V_B^* = \frac{\beta}{(\beta-1)^2}\frac{2\beta-1}{\theta-1}A$.

In contrast, the central planner has at any time t the possibility to change $2A$ into $(\theta-1)V(t)$. Following Dixit and Pindyck (1994, p. 142), the optimal threshold of this perpetual American Call Option is $V_{opt}^* = \frac{\beta}{\beta-1}\frac{2A}{(\theta-1)}$. Upon rearranging we get: $V_{opt}^* = \frac{\beta}{\beta-1}\frac{2A}{(\theta-1)} = \frac{A}{\theta-1}\frac{\beta(2\beta-2)}{(\beta-1)^2} < \frac{\beta}{(\beta-1)^2}\frac{2\beta-1}{\theta-1}A = V^*$.

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[4] Dixit and Pindyck (1994, p.141).

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