Dynamic M&A Strategies under Uncertainty: Small Steps or a Big Leap?*

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Abstract

In this paper we study the entrance in a market by means of acquisition when two mutual exclusive strategies are available for the acquirer. One is to choose the big leap strategy, moving directly to acquire the large incumbent, and the other one is to follow a small steps strategy, where the firm first acquires a small company keeping the flexibility to acquire the large player later on. The model we develop helps to define which strategy is preferable for a firm in a given market context, supporting this way the management decision. The model also helps to understand what are the market (or firm specific) condition that favor one strategy against the other. Analytical sensitivity analyses and a numerical example is presented.

Keywords: M&A; Real Options; Sequential Investment; cooperative and Non-cooperative Bargaining

JEL codes: C73; D43; D81; D92; G31.

*This research has been financed by the European Regional Development Fund through COMPETE 2020−*Programa Operacional Competitividade e Internacionalização* (POCI) and by Portuguese public funds through FCT (Fundação para a Ciência) in the framework of the projects POCI-01-0145-FEDER-006683 (Artur Rodrigues) and POCI-01-0145-FEDER-006890 (Paulo J. Pereira).

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1 Introduction

When companies decide to enter in a new market via mergers and acquisition (M&A) often need to establish the optimal strategy to follow. In many situation, mainly when undertaking cross-border acquisitions or when expanding activities to different industries, companies opt for small and intermediary steps even when pursuing a later, and more important, objective. These intermediary steps can reveal crucial for the ultimate goal, improving company's position for the next strategic movements. For instance, *"Chinese firms can (...) utilize German acquisitions as gateway to the European market (...). In this respect, M&A has often proven to be a viable market entry option for Chinese companies seeking growth and know-how in Germany."*[1]

The motivation for the small steps seems to be obvious. They essentially allow companies to benefit from their experience, reducing the rate of failure of their investments (Barkema and Drogendijk 2007). Naturally, this becomes more relevant when uncertainty on the outcome is significant.

Many examples exist where firms decide to start by incremental acquisitions instead of an immediate big leap. Kumar (2009, p.4) refers the case of Hidalco that did not *"immediately cast about for targets overseas. Instead, it patiently executed small takeovers, first in India and later abroad, before making a big global play. Each of the initial acquisitions (...) taught the company something new and served as a stepping-stone toward another acquisition"*. Similarly, Rabbiosi et al. (2012) show that emerging markets firms tend to follow the incremental steps strategy when acquiring firms in developed countries.

This process allows the company to obtain fundamental information and knowledge about a foreign market, or about an industry, almost impossible to be obtained otherwise, when simply observing from outside. It would also allow the company to increase its

[1] Report on Chinese Investors in Germany by PWC.

experience and knowledge about the takeover process itself (mainly when undertaken in foreign markets), which in turn increases the related benefits of an acquisition (Aktas et al. 2013), or of later acquisitions. In many situations, it may also modify the negotiation position of the acquiring firm.

Recently, when referring to the internationalization of emerging market firms (EMF), the sequential acquisitions strategy has been referred to as springboard perspective. According to this approach, EMF use foreign investments as a *springboard* to acquire assets that allow them to compete more effectively in the global arena (Barkema and Drogendijk 2007). The serial acquisitions of targets of increasing value may benefit the acquirer by building its capabilities (Elango and Pattnaik 2011).

In this paper, we study the entrance in a market with an ultimate goal of acquiring a large incumbent. For this purpose, two alternative strategies are available to the acquirer. One alternative is to follow a big leap strategy, moving directly towards the final goal, trying to takeover the large incumbent. The other one, in line with the springboard perspective, is to follow a sequential investment strategy, where the firm acquires a small company first, with the purpose of acquiring the large one later on.

The modeling of the two alternatives requires different acquisition processes, namely the cooperative and non-cooperative bargaining solutions, and may change the relative bargaining power of the firms. The model helps to define which strategy is preferable for a firm in a given market context, supporting this way the management decisions. The model also helps to understand what are the market (or firm specific) condition that favor one strategy against the other.

This paper is related to recent literature on M&A in dynamic context. Under uncertainty and flexibility the optimal timing for the acquisition plays an important role, as it plays the sharing rule of the merger surplus. The optimal timing and the sharing rule appear, for instant, in Lambrecht (2004), Morellec and Zhdanov (2005), Thijssen (2008), or Banerjee et al. (2014). The acquisition process is typically modeled as cooperative (Hackbarth and Morellec 2008, Morellec and Zhdanov 2005) or non-cooperative (Lambrecht 2004, Lukas and Welling 2012) bargaining solution. We depart from the existing literature by considering in the same dynamic model two mutual exclusive strategic decisions, acquisitions in small steps or a big leap acquisition, mixing the cooperative and the non-cooperative bargaining solutions.

The paper unfolds as follows. Next section presents the derivation of the model for the two alternative strategies, the big leap and small steps, as well as the definition of the best strategy to follow. Section 3 presents a detailed numerical example that allows us to show the dynamics of the model. Section 4 concludes.

2 The Model

Consider a setting of three firms. One firm, i.e. E is planning to enter a new technological market that consists of two firms, a large L and a minor firm M. We will assume that the new entrant's main intention is to acquire the prominent incumbent L. To do so, it is faced with two strategies. First, it can make a bid right away to the large firm (the big leap strategy) or second, it prefers to make a bid to the minor firm and in a subsequent step offer a bid to the prominent incumbent L (the small steps strategy). For the sake of simplicity, we will assume that each firm is endowed with a capital stock K_i with $i \in \{E, L, M\}$ and subject to an industry wide shock modeled by means of a geometric Brownian motion, i.e.:

$$dx(t) = \alpha x(t)dt + \sigma x(t)dW \tag{1}$$

We will assume that

$$\Pi_i(t) = K_i x(t) \tag{2}$$

with $i \in \{E, L, M\}$ approximates the firms' individual values. In the following, we will take a closer look at the new entrants individual strategies.

For modeling purposes we will use the first subscript to refer to the strategy under question (B for big leap, and S for small steps), while the second subscript identifies the firm.

2.1 Big Leap: Acquisition of the Large Firm

In order to model the acquisition process, we will rely on a non-cooperative bargaining solution, i.e. the new entrant offers the large incumbent a premium $\psi_{BL} > 0$ while the large firms times the acquisition. Let $\omega_{BL} > 0$ denote the synergies as a percentage of large firm's value, $\epsilon_{BL} T_{BL}$ and $(1 - \epsilon_{BL}) T_{BL}$ denote the transaction costs assigned to each party where $\epsilon_{BL} \in (0, 1)$ indicates the fraction of the transaction costs assigned to E.

Hence for any given premium level ψ_{BL} L's timing decision to sell the company solves the following optimization problem:

$$\begin{aligned} f(x) &= \max_{\tau} \left[\mathbf{E} \left[\left((\psi_{BL} - 1) K_L x(t) - (1 - \epsilon_{BL}) T_{BL} \right) e^{-r\tau} \right] \right], & (3) \\ &= \max_{x^*} \left[\left((\psi_{BL} - 1) K_L x^* - (1 - \epsilon_{BL}) T_{BL} \right) \left(\frac{x}{x^*} \right)^{\beta_1} \right] & (4) \end{aligned}$$

where $\beta_1 = \dfrac{1}{2} - \dfrac{\alpha}{\sigma^2} + \sqrt{\left(-\dfrac{1}{2} + \dfrac{\alpha}{\sigma^2} \right)^2 + \dfrac{2r}{\sigma^2}}$. On the other side, the new entrant anticipates the reaction function of the second mover and grants an optimal premium such that it maximizes her objective function, i.e.:

$$\max_{\psi_{BL}} \left[\left(\left(\omega_{BL} \left(K_E + K_L \right) - K_E - \psi_{BL} K_L \right) x^*(\psi_{BL}) - \epsilon_{BL} T_{BL} \right) \left(\frac{x}{x^*(\psi_{BL})} \right)^{\beta_1} \right] \quad (5)$$

Solving both objective functions recursively leads to the following result:

Proposition 1. *The acquisition of the large firm takes place, if the large firm receives an optimal premium ψ^*_{BL} and waits until $x(t)$ hits the optimal trigger value $x(t) = x^*_{BL}$ where ψ^*_{BL} and x^*_{BL} are given by:*

$$\psi^*_{BL} = 1 + \frac{(\beta_1 - 1)(1 - \epsilon_{BL})}{(\beta_1 - \epsilon_{BL})} \frac{(\omega_{BL} - 1)(K_E + K_L)}{K_L} \quad (6)$$

$$x^*_{BL} = \frac{\beta_1}{(\beta_1 - 1)^2} \frac{(\beta_1 - \epsilon_{BL}) T_{BL}}{(\omega_{BL} - 1)(K_E + K_L)} \quad (7)$$

Proof. See Appendix. □

Corollary 1. *The sensitivities of the optimal solution are as follows:* $\dfrac{\partial \psi_{BL}}{\partial \sigma} < 0$, $\dfrac{\partial x^*_{BL}}{\partial \sigma} >$

$0,\ \frac{\partial \psi_{BL}}{\partial \omega_{BL}} > 0,\ \frac{\partial x^*_{BL}}{\partial \omega_{BL}} < 0\ \frac{\partial \psi_{BL}}{\partial \epsilon_{BL}} < 0,\ \frac{\partial x^*_{BL}}{\partial \epsilon_{BL}} < 0\ \frac{\partial \psi_{BL}}{\partial T_{BL}} = 0,\ \frac{\partial x^*_{BL}}{\partial T_{BL}} > 0\ \frac{\partial \psi_{BL}}{\partial K_E} > 0,$ $\frac{\partial x^*_{BL}}{\partial K_E} < 0\ \frac{\partial \psi_{BL}}{\partial K_L} < 0,\ \frac{\partial x^*_{BL}}{\partial K_L} < 0$

2.2 Small Steps: Sequential Acquisition

2.2.1 Acquisition of the Minor Firm

Like in the previous case, we will assume that firm E can alternatively make an offer to the small firm. In particular, the new entrant offers the small incumbent a premium $\psi_{SM} > 0$ while the small firm times the acquisition. Let $\omega_{SM} > 0$ denote the synergies as a percentage of small firm's value, $\epsilon_{SM} T_{SM}$ and $(1 - \epsilon_{SM}) T_{SM}$ denote the transaction costs assigned to each party where $\epsilon_{SM} \in (0, 1)$ indicates the fraction of the transaction costs assigned to E. Hence for any given premium level ψ_{SM} M's timing decision to sell the company solves the following optimization problem which is analogous to the one of the large firm alluded to earlier:

$$\begin{aligned} g(x) &= \max_{\tau} \left[\mathbf{E} \left[\left((\psi_{SM} - 1) K_M x(t) - (1 - \epsilon_{SM}) T_{SM} \right) e^{-r\tau} \right] \right], \quad (8) \\ &= \max_{x^*} \left[\left((\psi_{SM} - 1) K_M x^* - (1 - \epsilon_{SM}) T_{SM} \right) \left(\frac{x}{x^*} \right)^{\beta_1} \right] \quad (9) \end{aligned}$$

where $\beta_1 = \frac{1}{2} - \frac{\alpha}{\sigma^2} + \sqrt{\left(-\frac{1}{2} + \frac{\alpha}{\sigma^2} \right)^2 + \frac{2r}{\sigma^2}}$.

Again, firm E anticipates the reaction function of the small firm and grants an optimal premium such that it maximizes her objective function. However, since the new entrant's true intention is to buy the large firm a subsequent option F emerges, i.e. to buy the large firm after acquiring the small firm. Hence, firm E's objective function becomes:

$$\max_{\psi_{SM}} \left[\left(\left(\omega_{SM} \left(K_E + K_M \right) - K_E - \psi_{SM} K_M \right) x^*_{SM}(\psi_{SM}) + F(.) - \epsilon_{SM} T_{SM} \right) \left(\frac{x}{x^*_{SM}(\psi_{SM})} \right)^{\beta_1} \right] \quad (10)$$

where $F(.)$ denotes the flexibility to buy the large firm after successful acquisition of the small firm. Obviously, a solution to the decision problem is only obtainable once a flexibility value can be assigned to the subsequent option to merge with the large firm.

At this point two alternative strategies need to be considered: either the acquisition of the large firm is a cooperative game (i.e., the firm opts for a friendly merger), or, on contrary, is a non-cooperative game (where the firm places an hostile takeover). There are arguments that may justify each strategy. On the one had, at the time E acquires M, information is revealed and the large firm might anticipate the new entrant's true intention in such a way that it will reject any non-cooperative bid by EM. Hence, the only way to acquire the large firm is that both need to agree upon a cooperative bargaining solution. On the other hand, the hostile takeover strategy allows the new entrant E to capture a greater fraction of the generated surplus since it will hold the greater barganining power due to the first-mover advantage.

2.2.2 Cooperative Acquisition of the Large Firm

Let us start by considering that the subsequent merger between the new entity EM (which results out of E's acquisition of the small firm M) and the large firm. In particular, let us assume that after the merger, each firm holds an equity stake γ in the new firm. The large firm will give up his stand-alone value $\Pi_L = K_L x(t)$ and receives upon paying the transaction cost $(1 - \epsilon_{SL})T_{SL}$ a stake in the new venture thereby profiting from the synergies ω_{SL} that arise out of the merger. Hence, firm L's net gain becomes:

$$(1-\gamma)(\omega_{SL}(K_L + \omega_{SM}(K_M + K_E)) - K_L)x(t) - (1 - \epsilon_{SL})T_{SL} \tag{11}$$

On the contrary, firm E's net gain amounts to:

$$\gamma(\omega_{SL}(K_L + \omega_{SM}(K_M + K_E)) - \omega_{SM}(K_M + K_E))x(t) - \epsilon_{SL}T_{SL} \tag{12}$$

Assuming that both firms possess a certain amount of bargaining power, η for firm C and $1 - \eta$ for firm L, then the optimal share each firm has in the new venture solves the following optimization problem:

$$\begin{aligned} \max_{\gamma} \Big[&((1-\gamma)(\omega_{SL}(K_L + \omega_{SM}(K_M + K_E)) - K_L)x(t) - (1 - \epsilon_{SL})T_{SL})^{\eta} \\ &(\gamma(\omega_{SL}(K_L + \omega_{SM}(K_M + K_E)) - \omega_{SM}(K_M + K_E))x(t) - \epsilon_{SL}T_{SL})^{1-\eta} \Big] \end{aligned} \tag{13}$$

Since we are focusing on a cooperative game the optimal investment trigger equals the central planner's optimal investment threshold. Hence, the central planners objective function equals:

$$\begin{aligned} G(x) &= \max_{\tau} \left[\mathbf{E}\left[\left((\omega_{SL}(K_L + \omega_{SM}(K_M + K_E) - K_L) - K_L)x(t) - T_{SL}\right) e^{-r\tau}\right]\right] \\ &= \max_{x^{*c}_{SL}} \left[((\omega_{SL}(K_L + \omega_{SM}(K_M + K_E) - K_L) - K_L)x^{*c}_{SL} - T_{SL}) \left(\frac{x}{x^{*c}_{SL}}\right)^{\beta_1}\right] \end{aligned} \quad (14)$$

Regarding the derivation of the optimal decision of the overall sequential M&A entry sequence, we have to solve the presented objective functions recursively. In particular, we first solve firm E's and firm L's cooperative bargaining setting as stated by Equation (13) and (15), i.e. γ^* and x^{*c}_{SL} and then subsequently solve for the optimal premium and acquisition threshold of the non-cooperative game between M and E.

Consequently, solving the cooperative bargaining game by means of the Nash-Bargaining solution leads to the following proposition:

Proposition 2. *Both firms will agree to merge, if $x(t)$ hits the optimal timing threshold x^{*c}_{SL} from below:*

$$x^{*c}_{SL} = \frac{\beta_1}{\beta_1 - 1} \frac{T_{SL}}{(\omega_{SL} - 1)\theta_{SL}} \quad (15)$$

Firm E's optimal stake γ^* in the merger amounts to:

$$\gamma^* = \frac{\eta((\omega_{SL} - 1)\theta_{SL}x - T_{SL}) + \omega_{SM}\theta_{SM}x + \epsilon_{SL}T_{SL}}{\omega_{SL}\theta_{SL}x} \quad (16)$$

with $\theta_{SM} = K_E + K_M$ and $\theta_{SL} = \omega_{SM}\theta_{SM} + K_L$.

Now that we have derived the optimal policy for the two firms to merge, we can deduce firm E's ex-ante option value for this strategy, i.e.:

$$F(x) = \begin{cases} ((\gamma^*\omega_{SL}\theta_{SL} - \theta_{SL})x^{*c}_{SL} - \epsilon_{SL}T_{SL}) \left(\frac{x}{x^{*c}_{SL}}\right)^{\beta_1} & x < x^{*c}_{SL} \\ ((\gamma^*\omega_{SL}\theta_{SL} - \theta_{SL})x^{*c}_{SL} - \epsilon_{SL}T_{SL}) & x_0 \geqslant x^{*c}_{SL} \end{cases} \quad (17)$$

By inserting Equation (18) into Equation (10) we can now solve for the optimal premium

ψ^{*c}_{SM} and acquisition threshold x^{*c}_{SM} marking the first phase of the sequential entry.

A closer look, however, reveals that two cases are possible. First, the entry by E follows a real sequence, i.e. after buying the small it will later on buy the large incumbent. In such a case the ordering of the M&A threshold follows $x^{*c}_{SM} < x^{*c}_{SL}$. On the other hand, the entry might be characterized by a big-bang solution where the firm will buy both firms simultaneously at the investment trigger which implies that $x^{*c}_{SM} > x^{*c}_{SL}$. In the following we will present the solutions for both case.

Case 1: Sequential Entry $x^{*c}_{SM} < x^{*c}_{SL}$

In such a case, firm E can capture the full value of the option to merge subsequently with the large incumbent $F(.)$ when offering the bid to M. The following proposition summarize the optimal contract.

Proposition 3. *The acquisition of the small firm takes place, if the small firm receives an optimal premium ψ^{*c}_{SM} and waits until $x(t)$ hits the optimal trigger value $x(t) = x^{*c}_{SM}$ from below where ψ^{*c}_{SM} and x^{*c}_{SM} are given by:*

$$\psi^{*c}_{SM} = 1 + \frac{(\beta_1 - 1)(1 - \epsilon_{SM})}{(\beta_1 - \epsilon_{SM})} \frac{(\omega_{SM} - 1)(K_E + K_M)}{K_M} \tag{18}$$

$$x^{*c}_{SM} = \frac{\beta_1}{(\beta_1 - 1)^2} \frac{(\beta_1 - \epsilon_{SM}) T_{SM}}{(\omega_{SM} - 1)(K_E + K_M)} \tag{19}$$

From the optimal results it becomes apparent that the merger between M and L is irrelevant for both, the firm E's optimal offered premium as well as for the small incumbents timing decision. Neither ψ^{*c}_{SM} nor x^{*c}_{SM} depend on the characteristics of the subsequent merger, e.g. its synergies, transaction costs or equity shares.

The following corollary summarizes the different sensitivities of the optimal solution.

Corollary 2. $\frac{\partial \psi^{*c}_{SM}}{\partial \sigma} < 0$, $\frac{\partial x^{*c}_{SM}}{\partial \sigma} > 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial \omega_{SM}} > 0$, $\frac{\partial x^{*c}_{SM}}{\partial \omega_{SM}} < 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial \epsilon_{SM}} < 0$, $\frac{\partial x^{*c}_{SM}}{\partial \epsilon_{SM}} < 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial T_{SM}} = 0$, $\frac{\partial x^{*c}_{SM}}{\partial T_{SM}} > 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial K_E} > 0$, $\frac{\partial x^{*c}_{SM}}{\partial K_E} < 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial K_M} > 0$, $\frac{\partial x^{*c}_{SM}}{\partial K_M} < 0$

Case 2: Simultaneous Entry $x^{*c}_{SM} > x^{*c}_{SL}$

In the second case, however, firm E assigns no additional flexibility value to merge subsequently with the large incumbent $F(.)$. Rather, it is already very profitable to merge with the large incumbent. Consequently, there is no added value due to further postponement and $F(.)$ just reflects the intrinsic value assigned to the immediate merger. Consequently, as soon as E finds it optimal to give up the option to wait with acquiring the small firm it will exercise the option to merge with the large firm, too. Hence, the following proposition summarize the optimal contract for such a big-bang entry.

Proposition 4. *The acquisition of the small firm takes place, if the small firm receives an optimal premium ψ^{*c}_{SM} and waits until $x(t)$ hits the optimal trigger value $x(t) = x^{*c}_{SM}$ from below where ψ^{*c}_{SM} and x^{*c}_{SM} are given by:*

$$\psi^{*c}_{SM} = 1 + \frac{(\beta_1 - 1)(1 - \epsilon_{SM})T_{SM}}{(\beta_1 - \epsilon_{SM})T_{SM} + \eta(\beta_1 - 1)T_{SL}} \frac{z_{SM}}{K_M} \tag{20}$$

$$x^{*c}_{SM} = \frac{\beta_1}{(\beta_1 - 1)^2} \frac{(\beta_1 - \epsilon_{SM})T_{SM} + \eta(\beta_1 - 1)T_{SL}}{z_{SM}} \tag{21}$$

with

$$z_{SM} = (\omega_{SM} - 1)(K_E + K_M) + \eta(\omega_{SL} - 1)(\omega_{SM}(K_E + K_M) + K_L)$$

By comparing both optimal solutions it becomes apparent that the characteristics of the subsequent merger are relevant when offering a premium to the small incumbent and thus impact his timing decision.

Like previously, the following corollary summarizes the different sensitivities of the optimal solution.

Corollary 3. $\frac{\partial \psi^{*c}_{SM}}{\partial \sigma} < 0$, $\frac{\partial x^{*c}_{SM}}{\partial \sigma} > 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial \omega_{SL}} > 0$, $\frac{\partial x^{*c}_{SM}}{\partial \omega_{SL}} < 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial \omega_{SM}} > 0$, $\frac{\partial x^{*c}_{SM}}{\partial \omega_{SM}} < 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial \epsilon_{SM}} < 0$, $\frac{\partial x^{*c}_{SM}}{\partial \epsilon_{SM}} < 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial T_{SL}} < 0$, $\frac{\partial x^{*c}_{SM}}{\partial T_{SL}} > 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial T_{SM}} < 0$, $\frac{\partial x^{*c}_{SM}}{\partial T_{SM}} > 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial K_L} > 0$, $\frac{\partial x^{*c}_{SM}}{\partial K_L} < 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial K_E} > 0$, $\frac{\partial x^{*c}_{SM}}{\partial K_E} < 0$ $\frac{\partial \psi^{*c}_{SM}}{\partial K_M} > 0$, $\frac{\partial x^{*c}_{SM}}{\partial K_M} < 0$

Finally, we can provide an answer to the question what are the key determinants when choosing between the sequential entry and the big-bang solution, i.e. buying both firms simultaneously. A closer look reveals, that the ordering of the investment thresholds depends on the level of achievable synergies, the transaction costs and the sizes of the capital stock. An analytical solution can be provided that marks the choice between simultaneous and sequential acquisition which is summarized by the following proposition.

Proposition 5. *The new entrant will switch from sequentially acquiring the incumbent firms M and L to a simultaneous acquisition of M and L should the substantially achievable synergies ω_{SL} due to acquiring the large firm are higher than:*

$$\omega_{SL} > 1 + \Omega \tag{22}$$

with

$$\Omega = \frac{(\beta_1 - 1)}{(\beta_1 - \epsilon_{SM})} \frac{(\omega_{SM} - 1)\theta_{SM}}{\omega_{SM}\theta_{SM} + K_L} \frac{T_{SL}}{T_{SM}} \tag{23}$$

2.2.3 Non-Cooperative Acquisition of the Large Firm

Let us now move to the second possible strategy, where EM opts to acquire L under an hostile takeover. The dynamics of this game have already been presented and consist in EM offering a given share of the synergies to L, while L times the merger. Following the same procedures as before we state that,

Proposition 6. *For the non-cooperative takeover, the large firm receives an optimal premium ψ^*_{SL} and waits optimally until $x(t)$ hits the trigger value x^*_{SL}, given by:*

$$\begin{aligned} \psi^*_{SL} &= \frac{K_E + K_M}{K_L} \frac{(\beta_1 - 1)(1 - \epsilon_{SL})(\omega_{SL} - 1)\omega_{SM}}{\beta_1 - \epsilon_{SL}} \\ &- \frac{\epsilon_{SL}\left(\beta_1(\omega_{SL} - 1) - \omega_{SL} + 2\right) - (\beta_1 - 1)\omega_{SL} - 1}{\beta_1 - \epsilon_{SL}} \end{aligned} \tag{24}$$

and,

$$x^*_{SL} = \frac{\beta_1}{(\beta_1 - 1)^2} \frac{(\beta_1 - \epsilon_{SL})T_{SL}}{(\omega_{SL} - 1)(K_L + (K_E + K_M)\omega_{SM})} \tag{25}$$

Moving now backwards to the first acquisition (hostile takeover of E over M), two possible cases need again to be considered. In the first case, E acquires M and waits before move towards L, as the trigger to acquire the latter has not yet been achieved

($x^*_{SM} < x^*_{SL}$), while in the second, that occurs when $x^*_{SL} < x^*_{SM}$, firm E takes M and after which immediately acquires L (the big-bang solution).

Case 1: Sequential Entry

Consider first the situation where $x^*_{SM} < x^*_{SL}$. In this case the acquisitions happen sequentially.

Proposition 7. *For the first takeover, the firm E offers the premium ψ^*_{SM} and waits optimally until $x(t)$ hits the trigger value x^*_{SM}, given by:*

$$\begin{aligned}\psi^*_{SM} &= \frac{(\beta_1-2)\epsilon_{SM}(\beta_1-1)(1-\epsilon_{SM})\omega_{SM}+1}{\beta_1-\epsilon_{SM}} \\ &- \frac{K_E(\beta_1-1)(1-\epsilon_{SM})(1-\omega_{SM})}{K_M(\beta_1-\epsilon_{SM})}\end{aligned} \tag{26}$$

and,

$$x^*_{SM} = \frac{\beta_1}{(\beta_1-1)^2}\frac{(\beta_1-\epsilon_{SM})T_{SM}}{(K_E+K_M)(\omega_{SM}-1)} \tag{27}$$

Case 2: Simultaneous takeover

Consider now that $x^*_{SL} < x^*_{SM}$. In this case the two acquisitions happen simultaneously.

Proposition 8. *For the first takeover, the firm E offers the premium ψ^*_{SM} and waits optimally until $x(t)$ hits the trigger value x^*_{SM}, given by:*

$$\begin{aligned}\psi^*_{SM} &= \frac{K_L T_{SM}(\beta_1-1)(1-\epsilon_{SM})(\omega_{SL}-1)+K_E T_{SM}(\beta_1-1)(1-\epsilon_{SM})(\bar{\omega}-1)}{K_M(T_{SM}(\beta_1-\epsilon_{SM})+T_{SL}(\beta_1-\epsilon_{SL}))} \\ &- \frac{T_{SM}+T_{SL}\beta_1+T_{SM}\epsilon_{SM}(\beta_1-2)-T_{SL}\epsilon_{SL}+T_{SM}(\beta_1-1)(1-\epsilon_{SM})\bar{\omega}}{T_{SM}(\beta_1-\epsilon_{SM})+T_{SL}(\beta_1-\epsilon_{SL})}\end{aligned} \tag{28}$$

where $\bar{\omega} = \omega_{SM}\omega_{SL}$, and

$$x^*_{SM} = \frac{\beta_1}{(\beta_1-1)^2}\frac{T_{SM}(\beta_1-\epsilon_{SM})+T_{SL}(\beta_1-\epsilon_{SL})}{(K_L+(K_E+K_M)\omega_{SM})\omega_{SL}-(K_E+K_M+K_L)} \tag{29}$$

2.3 Choosing the best strategy

The best strategy for the firm is the most valuable path. The value of each alternative strategy is given by:

$$F_{BL} = A_{BL}\ x^{\beta_1} \tag{30}$$

$$F^{*c}_{SM} = A^{*c}_{SM}\ x^{\beta_1} \tag{31}$$

$$F^{*}_{SM} = A^{*}_{SM}\ x^{\beta_1} \tag{32}$$

where

$$A_{BL} = \frac{\beta_1 - \epsilon_{BL}}{(\beta_1 - 1)^2} T_{BL} \frac{1}{x^*_{BL}} \tag{33}$$

$$A^c_{SM} = \frac{\beta_1 - \epsilon_{SM}}{(\beta_1 - 1)^2} T_{SM} \frac{1}{x^{*c}_{SM}} + \begin{cases} \left(D_1 \dfrac{T_{SM}}{T_{SL}}\right)^{\beta_1} \dfrac{\eta T_{SL}}{\beta_1 - 1} & x^{*c}_{SM} < x^{*c}_{SL} \\ \beta_1 D_1 \dfrac{\eta T_{SM}}{\beta_1 - 1} - \eta T_{SL} & x^{*c}_{SM} \geqslant x^{*c}_{SL} \end{cases} \tag{34}$$

$$D_1 = \frac{(\beta_1 - \epsilon_{SM})(\omega_{SL} - 1)\theta_{SL}}{(\beta_1 - 1)(\omega_{SM} - 1)\theta_{SM}} \tag{35}$$

$$A_{SM} = \begin{cases} \left(D_2 x^*_{SM} + \dfrac{T_{SL}(\beta_1 - \epsilon_{SL})}{(\beta_1 - 1)^2} - T_{SM}\epsilon_{SM}\right)\left(\dfrac{1}{x^*_{SM}}\right)^{\beta_1} & x^*_{SM} < x^*_{SL} \\ (D_3 x^*_{SM} - T_{SL}\epsilon_{SL} - T_{SM}\epsilon_{SM})\left(\dfrac{1}{x^*_{SM}}\right)^{\beta_1} & x^*_{SM} \geqslant x^*_{SL} \end{cases} \tag{36}$$

$$D_2 = \frac{(K_E + K_M)(1 + (\beta_1 - 2)\epsilon_{SM})(\omega_{SM} - 1)}{\beta_1 - \epsilon_{SM}} \tag{37}$$

$$D_3 = \frac{(T_{SL} + T_{SM} + (\beta_1 - 2)(T_{SL}\epsilon_{SL} + T_{SM}\epsilon_{SM}))(K_L(\omega_{SL} - 1) + (K_E + K_M)(\bar{\omega} - 1))}{T_{SM}(\beta_1 - \epsilon_{SM}) + T_{SL}(\beta_1 - \epsilon_{SL})} \tag{38}$$

For defining the strategy to follow, E should compare the value of A_{BL}, A^{*c}_{SM}, and A^*_{SM} choosing the alternative with the highest value. If A_{BL} is the most valuable, E chooses the big leap strategy and places an hostile bid for L, if not, the firm should follow the small steps strategy. In the latter case, E will follow a mixed non-cooperative/cooperative or a full non-cooperative strategy depending on the relative values of A^{*c}_{SM}, and A^{*}_{SM}.

3 Cases

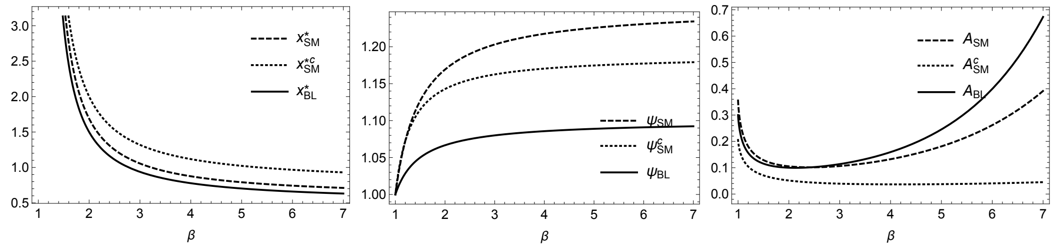
In the following, we will analyze the analytical results by means of a comparative-static analysis which of the generic entry strategie, i.e. hostile takover of L or sequential M&A is more valuable to E. If not noted otherwise, we will assume that the transaction costs that arise are splitted evenly between the parties, i.e. $\epsilon_{BL} = 0.5$, $\epsilon_{SM} = 0.5$, $\epsilon_{SL} = 0.5$ and that the absolut transaction costs are $T_{BL} = 0.15$, $T_{SM} = 0.1$, $T_{SL} = 0.1$. Here, we acknowledge the fact that it is more expensive to acquire the larger incumbent then the smaller firm when entering the market for the first time. Moreover, the bargaining power of the firms in the Nash-bargaining solution is related to the relative size of the firms. Hence, for the new entity EM we have:

$$\eta = \frac{\omega_{SM}(K_E + K_M)}{\omega_{SL}(\omega_{SM}(K_E + K_M) + K_L)} \tag{39}$$

while the barganing power of L results to $1 - \eta$.

First, we will assume that the new entrant E is as big as the large incumbent L. We refer to this case as the base case scenario and use the following parameters for the capital stocks $K_E = 1.5$, $K_L = 1.5$, $K_M = 0.35$ and synergies amount to $\omega_{SM} = 1.01$, $\omega_{SL} = 1.1$, $\omega_{BL} = 1.1$, respectively. Obviously, acquiring M does not really increase the capital stock of the new entity, i.e. EM and thus bargaining power in the subsequent negotiation process should EM prefer to bargain cooperatively. Figure (1) shows the impact of uncertainty on the optimal entry thresholds, the premiums, and the overall option value of the two strategies. In general, a higher uncertainty is equivalent to a lower β $\left(\frac{\partial \beta}{\partial \sigma} < 0\right)$ and thus deters the M&A strategies in general as indicated by increasing thresholds. Moreover, as uncertainty increases both premiums offered to either M or L decrease. Looking at the option values we see that the firm E will consider both generic entry strategies, i.e. direct hostile takover of L and sequential M&A to acquire L as valuable.

In particular, for low levels of uncertainty E will prefer to place a direct bid to L. This



(a) (b) (c)

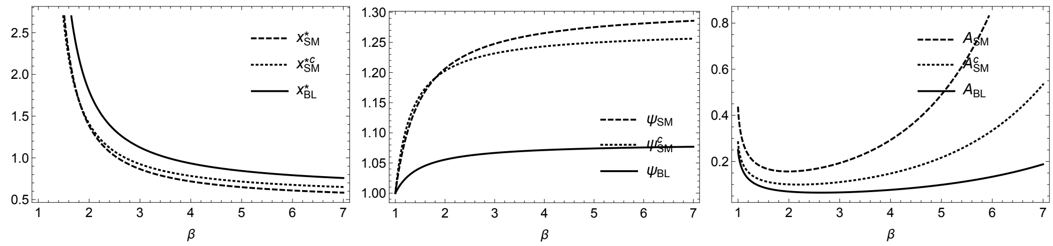
$\omega_{BL} = 1.1$, $\omega_{SM} = 1.01$, $\omega_{SL} = 1.1$, $\epsilon_{BL} = 0.5$, $\epsilon_{SM} = 0.5$, $\epsilon_{SL} = 0.5$, $T_{BL} = 0.15$, $T_{SM} = 0.1$, $T_{SL} = 0.1$, $K_E = 1.5$, $K_L = 1.5$, $K_M = 0.35$

Figure 1: A sensitive analysis on the effect of uncertainty for the base case scenario.

is associated with the lowest investment threshold and the lowest premium. If, however, uncertainty is considerable high the firm will refrain from this strategy and rather follow the small-step strategy. Here, E will prefer to negotaiate with both incumbents, i.e. M and L, non-cooperatively and the results indicate that E will simultaneously (big-bang) acquire M and L. The intuition behind this is as follows. Since acquiring the small incumbent M is not generating much synergies but is a prerequisite for this strategy, E will offer M a premium higher than the stand-alone premium for M in order to induce a faster asset sale. Finally, when comparing the thresholds we see that the most valuable strategy is not always the one with the largest entry threshold. Looking at Figure (1) reveals that when the big leap strategy becomes optimal, the threshold drops from x^*_S to x^*_B indicating an increased propensity of M&A activity.

Second, let's assume that E is only of equal size once it acquires the small incumbent M. From Figure (2) it becomes apparent that the most valuable strategy in this case is the small-steps strategy. A closer look reveals that the firm will prefer to non-cooperatively accquire both M and L and that the premiums offered allow E to acquire both simultaneously, i.e. by means of a big-bang strategy. Again the new entrant will offer M a higher premium to induce an earlier asset sale. However, comparing the optimal thresholds for acquiring M we see that although the most valuable, negotiate subsequently with L cooperatively would have resulted in a lower initial entry threshold.

What happens if the new entity after acquiring M, i.e. EM is far bigger? Obviously, this will increase the capital stock of E and improves his position when negotianting



(a) (b) (c)

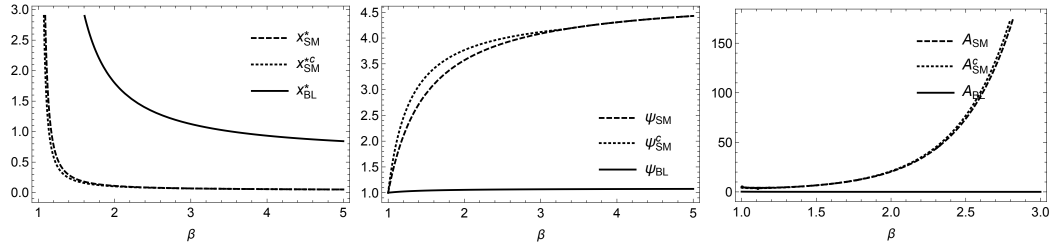
$\omega_{BL} = 1.1$, $\omega_{SM} = 1.1$, $\omega_{SL} = 1.1$, $\epsilon_{BL} = 0.5$, $\epsilon_{SM} = 0.5$, $\epsilon_{SL} = 0.5$, $T_{BL} = 0.15$, $T_{SM} = 0.1$, $T_{SL} = 0.1$, $K_E = 1$, $K_L = 1.5$, $K_M = 0.35$

Figure 2: A sensitive analysis on the effect of uncertainty for where the new entity EM would be as big as the large incumbent.

cooperatively with the large incumbent. For the sake of simplicity, we will assume that this is mainly due to very high synergies that arise when acquiring M.[2]

From the figures below (see Fig. (3)) it becomes apparent that the small-step market entry is the best strategy for all levels of uncertainy. A closer look, however, reveals that E will change the tactic on how to acquire both incumbents, i.e. M and L. For low levels of uncertainty we see that E will prefer to non-cooperatively bargain with M while it will prefer to cooperatively bargain with L. This is mainly due to the fact, that the synergies achieved along the way will put E in a stronger position with almost superior bargaining power when negotiating with L. As a result, E will acquire both incumbents simultaneously. For high levels of uncertainty, however, E will refrain from this strategy and prefer to place a non-cooperative bid to L. In such a situation, E will no longer simultaneously acquire M and L. Rather, it will sequentially conquer the market, i.e. after acquiring the small incumbent, E will wait and once $x(t)$ hits x_L^* from below merge with the large incumbent. The effect of this overall switch between the small-step deal strategies has also consequences for the premium paid to M and the propensity to engange in the hostile takeover of M. First, while for low levels of uncertainties the premium paid to M is equal, we see that upon a switch from acquiring L by means of a friendly merger to a hostile takeover of L the premium paid to M drops from ψ_S^* to ψ_S^{*c} while at the same

[2] We believe that this reflects most of the cases when acquiring small firms. To put different young innovative firms tend to be largely capital contraint and it would make no sense to simply raise their capital stock in order to construct such a scenario. Rather, those start-ups tend to be very innovative and hold tangible and intengible assets with promising synergy potential.



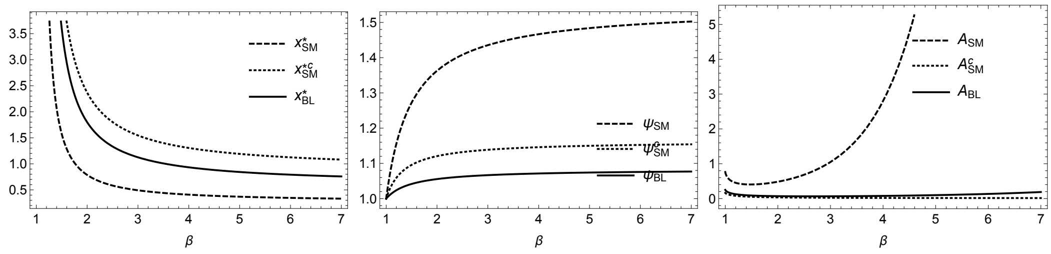
(a) (b) (c)

$\omega_{BL} = 1.1$, $\omega_{SM} = 3$, $\omega_{SL} = 1.4$, $\epsilon_{BL} = 0.5$, $\epsilon_{SM} = 0.5$, $\epsilon_{SL} = 0.5$, $T_{BL} = 0.15$, $T_{SM} = 0.1$, $T_{SL} = 0.1$, $K_E = 1$, $K_L = 1.5$, $K_M = 0.35$

Figure 3: A sensitive analysis on the effect of uncertainty for the case where the new entity EM would be far bigger than the large incumbent.

time the threshold increases from x^*_S to x^{*c}_S indicating an increased propensity of a later acquisition of M.

Finally, we will assume that acquiring M might generate negative synergies. In particular, we want to assume that acquiring M destroys value, i.e. $\omega_{SM} < 1$. From Equation (20) it becomes apparent, that $\omega_{SM} < 1$ would result in a negative threshold indication that it is never optimal to acquire such an asset. While this is certainly true on a stand-alone basis, the new entrant, however, also acquires the right to merge/acquire the large incumbent. Hence, the value destroying element in this serial merger can be offset by the value gain due to the subsequent acquisition. Figure (4) depicts that indeed acquiring M makes sense even in such a setting and that it is the most valuable strategy. In particular, E will prefer to acquire both incumbents simultaneously by means of a hostile takeover. As expected, the premium offered to M is larger than the one offered in the stand-alone case in order to motivate earlier asset sale. At the same time, however, this deal structure shows the highest propensity of E performing an acquisition of the large incumbent L. To see this, please keep in mind that a simultaneous acquisition (big-bang) corresponds to an alignement of the first and second entry threshold, i.e. $x^*_{SM} = x^{*c}_{SL}$. Comparing the thresholds of the big-leap strategy x^*_{BL} and the small step strategies x^*_{SM} reveals that $x^*_{SM} < x^*_{BL}$ thereby indicating that this entry strategy correponds not only to the most valuable but also to the fasted strategy (see Figure (4)).



(a) (b) (c)

$\omega_{BL} = 1.1$, $\omega_{SM} = 0.8$, $\omega_{SL} = 1.4$, $\epsilon_{BL} = 0.5$, $\epsilon_{SM} = 0.5$, $\epsilon_{SL} = 0.5$, $T_{BL} = 0.15$, $T_{SM} = 0.1$, $T_{SL} = 0.1$, $K_E = 1$, $K_L = 1.5$, $K_M = 0.35$

Figure 4: A sensitive analysis on the effect of uncertainty for the case of negative synergies between E and M.

4 Conclusions

This paper studies the entrance in a market by means of acquisition when two mutual exclusive strategies are available for the acquirer. One is to choose the big leap strategy, moving directly to acquire the large incumbent, and the other one is to follow a small steps strategy, where the firm first acquires a small company (starting a learning process) with final the purpose of acquiring the large player later on. The model we develop helps to define which strategy is preferable for a firm in a given market context, supporting this way the management decision. The model also helps to understand what are the market (or firm specific) condition that favor one strategy against the other. An analytical sensitivity analysis and a numerical example was presented.

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