A REAL OPTIONS PERSPECTIVE ON CROSS-BORDER AND CROSS-INDUSTRY ACQUISITIONS: THE ROLE OF SEQUENTIAL BEHAVIOR

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ABSTRACT

Although the concept of real options has created considerable excitement in the strategy and management fields, empirical evidence still can’t provide a whole picture of the determinants and consequences of sequential behavior. Therefore, the specific interest of this study is the application of real options theory on the choice of sequential mode, especially focus on the situations of cross-border and cross-industry acquisition. This study further presents acquirer’s portfolio of options and slack resources as important moderators in affecting sequential acquisition and its value. A sample of 511 cases of completed acquisitions is collected from the Taiwan high-tech companies. The finding indicate that cross-industry entry has positive impact on the use of sequential acquisition, the more diversify the acquirer is, the more likely sequential acquisition been choose. The finding also point out that sequential acquisition has negative impact on acquirer’s value of growth options, and organizational slack have no impact on the relationship between sequential acquisition and value of growth options.

Keywords: real options, sequential acquisition, growth option value.

1. Introduction

Corporate acquisitions are a common form of corporate development. Firms invest in exploration-oriented activities to seek competitive advantage and in response to changing environments use acquisitions as an important vehicle to achieve growth. In recent years, real options formulations represent an emerging strand of thinking on such investments. The underlying logic of the real options framework is based on the realization that future investment opportunities are contingent on prior investment commitments. In theory, real options investments are characterized by sequential, irreversible investments made under conditions of uncertainty (Dixit and Pindyck, 1994). Uncertainty surrounding both the upside potential of an investment (the opportunity cost of investment) and the downside risks (the exposure of firm resources to loss) affect the decision. However, there exist gaps between theoretical and empirical real option literatures (Cuypers and Martin, 2010). Although prior researches have proposed that options are desirable because of uncertainty (Chi and McGuire, 1996; Dixit and Pindyck, 1994; Folta, 1998; Reuer and Leiblein, 2000; Brouthers et al., 2008), there is still little empirical evidence that uncertainties result in sequential investment behavior. Except the research of Xu et al. (2010), in which the authors describes how institutional context influences the choice of sequential acquisition strategy for China firms, the real options literature still fail to answer the questions that how different sources of uncertainty...
influence firm’s choice on sequential investment and how sequential behavior affect the value of growth options. Accordingly, the specific interest of this study is to provide an integrated framework that link determinants and consequence of sequential acquisition behavior.

2. Theory and hypotheses

2.1 The real options theory

Real options theory has emerged as a promising avenue to study firm’s strategic decision-making (e.g., Adner & Levinthal, 2004; McGrath, Ferrier, & Mendelow, 2004; Ton & Reuer, 2007), and has been applied to a number of corporate investment contexts such as joint ventures (JVs) and acquisitions (Folta and Miller, 2002; Ton, Reuer, & Peng, 2008; Xu, Zhou, & Phan, 2010). This theory traces its intellectual roots to Myers’s (1977) initial insight of viewing a firm’s discretionary future investment opportunities as growth options, or “call options on real assets,” in that the firm has the discretion to decide in the future whether or not it wants to exercise the option to undertake these investments (Tong et al, 2008a). Myers’s (1977) idea provides a guide for managers making decisions under uncertainty (Bowman & Hurry, 1993; Kogut & Kulatilaka, 2001; McGrath, 1997), such as those regarding investments in R&D (Mitchell & Hamilton, 1988), JVs (Kogut, 1991), emerging markets (Kogut & Kulatilaka, 1994a, 1994b), entrepreneurial initiatives (McGrath, 1999), and corporate acquisitions and mergers (Collan and Kinnunen, 2009).

Therefore, a real option confers the right, but not the obligation, to make a commitment under uncertainty that can subsequently be reversed, such options generally involves staging strategic investments. In a business context, it can be illustrated in terms of the sequential flexibility with which a productive resource or asset can be designed, acquired, utilized, improved or scrapped. This flexibility can limit downside risk and enhance upside potential under uncertainty (Bowman and Hurry, 1993; Folta, 1998; Li, 2007; Brouthers et al., 2008).

2.2 Uncertainty and sequential acquisitions

One of the most prominent concepts in real options theory is uncertainty. Real option theory suggests that under high uncertainty conditions firms may prefer to minimize current investments but secure an option to invest at a later time, after they have obtained more information and can re-evaluate the uncertainties involved (Folta, 1998; McGrath, 1997; Rivoli and Salorio, 1996; Brouthers et al., 2008). When firms make cross-border and cross-industry expansion, the new market confront by the new comer exist many uncertainty, therefore it is hard to make full commitment decision. In these cases, sequential acquisitions are real-option-based strategy whereby the sequential acquirer resolves valuation uncertainty through information gathering and learning after making a toehold purchase (Xu et al, 2010). Although the general premise in literature is that uncertainty in general is positively related to option-based activities (e.g., Bowman & Hurry, 1993; Kulatilaka & Perotti, 1998), there is little evidence empirically link uncertainties and sequential strategy. As scholars have pointed out the need to specify conditional relationships between sources of uncertainty and a firm’s expansion strategy (e.g., Miller, 1992; Cuypers and Martin, 2010), this study develop Hypothesis 1 and 2 to describe the linkage between uncertainty related to cross-border and cross-industry entry and the choice of sequential acquisition.
Real option of cross-border acquisitions

Scholars have noted that cross-border investments have the potential to provide firms with real options value under uncertainty (Tong and Reuer, 2007; Driouchi and Bennett, 2011). International acquisitions experience some unique sources of uncertainty owing to heterogeneous external environments across national borders. Acquisition premiums are more likely in new markets because of differing laws, regulations, norms, and values that influence information disclosure and hence a firm’s ability to correctly value an acquisition target. In addition, foreign investors may also be exposed to significant political uncertainty, especially in emerging economies (Lyles & Salk, 1996; Peng, 2000, 2003; Steensma & Lyles, 2000). By acquiring local firms, multinational corporations (MNCs) can rely upon local targets’ resources to manage risk, including their local knowledge, relationships with local government, and so forth. However, firms with little or no experience in a foreign market may have difficulty identifying and negotiating with potential acquisition targets, and as a consequence need to make substantial resource commitments (Reuer and Koza, 2000). Under such conditions, an acquirer may overcome its information disadvantage by first becoming a blockholder of the target firm, and then capitalizing on this position to gather information on the target (Barclay & Holderness, 1991; Xu et al, 2010). Thus, we propose:

Hypotheses 1: Acquisitions that aim at cross-border entry are positively associated with the use of sequential acquisition.

Real options of cross-industry acquisitions

Just like cross-border entry, sequential cross-industry entry also has the potential to provide firms with real options value under uncertainty. Tong et al. (2008a) have argued that cross-industry joint ventures that enter business outside of the firm’s primary business have greater uncertainty than within-industry joint ventures, thus have a greater positive impact on the firm’s growth option value. In the case of diversifying into new business, an important source of uncertainty pertains to corporate capabilities. Through acquisitions, diversification firms can overcome “local search” and reach out for new and more distant capabilities (Rosenkopf and Almeida, 2003; Tong et al., 2008a). Recent real option conceptual advances suggest that a firm is more likely to manage diversifying businesses according to a real options approach, given that such businesses are more distinct from the firm’s primary business, making option exercise decisions organizationally easier to structure (Adner & Levinthal, 2004; Tong et al., 2008a). Using sequential acquisitions in particular for diversification has an added advantage in that they provide organizational flexibility with which to address the uncertainty due to operating in new business environments. Therefore, hypothesis 2 is developed as below:

Hypotheses 2: Acquisitions that aim at cross-industry entry are positively associated with the use of sequential acquisition.

2.3 Sequential behavior and the value of growth options (VGO)

The concept of growth option value traces its intellectual roots to the Myers’s (1977) initial insight of viewing a firm’s discretionary future investment opportunities as growth options. Miller and Modigliani (1961) formalize the theory of corporate valuation, which holds that a firm’s value
consists of two components: the value of assets in place, and the value of future growth opportunities. Following this tradition, a firm’s value has been expressed as the sum of the value of assets in place (\( V_{AIP} \)) and the value of growth options (\( V_{GO} \)):

\[
V = V_{AIP} + V_{GO}
\]  
(1)

Based on the valuation theory formalized by Miller and Modigliani (1961), Kester (1984) provided the first set of empirical estimates of growth option value, defined as the proportion of a firm’s market value that is attributable to growth options. He measured the firm’s value of growth options (\( V_{GO} \)) as the difference between its market value (\( V \)) and the capitalized value of its current earnings stream, which represents the value of the firm without growth options; that is, the value of assets in place (\( V_{AIP} \)). He then calculated a firm’s growth option value (GOV) as the value of growth options (VGO), stated as a percentage of the market value (V):

\[
\text{Growth option value} = \frac{V_{GO}}{V} = \frac{(V - V_{AIP})}{V} = \frac{(V - \text{current earnings/discount rate})}{V}.
\]  
(2)

Growth option value is a leading indicator emphasizing the value of future growth potential rather than profitability that reflect the firm’s historical operations (Tong et al., 2008), it measures the value of growth opportunities the firm possesses, while accounting for its size.

Sequential acquisitions provide valuable growth options because, by purchases one or more blocks of the shares of a target firm, a firm is able to limit its downside losses to an initial, limited commitment, as well as to position itself to expand. However, the firm is not compelled to expand if situations are not favorable. Therefore, sequential acquisitions are often viewed as attractive stepping stones toward more extensive investments in a new and uncertain market (Xu et al., 2010). Accordingly, we expect that sequential acquisitions confer valuable growth options rather than one-time acquisition.

**Hypotheses 3:** Sequential acquisition is positively associated with the growth option value of the acquirer.

3. Data and methods

3.1 Research framework

In this section, we develop a testable framework to explore how uncertainties and acquirer’s portfolio of options affects firm’s choice on sequential acquisition, and whether sequential acquisition behavior actually increase the value of growth option under different level of organizational slack. Research framework and variables are showed as below:

![Research framework](image)

**Figure 2 Research framework**
3.3 Sample and Data Collection

We obtained the data for our empirical analysis from the Taiwan Economic Journal (TEJ) database. The dataset are contain acquisitions that have been taken during the six years period, 2007 to 2012. Finally, we collect 511 cases of acquisitions, either a one-time transaction (363 cases) or two to three time purchases (148 cases). The samples included in our observation must fit below properties:

1. The acquisition events occurred during 2007-2012.
2. The events were taken into account only if complete financial data of acquirers were available (therefore, the acquirers should be listed companies in the United States), so that we could further explore the relationship between acquisition behavior and value of growth options.
3. The share acquired in each transaction should be at least 5%, and after the acquisition complete (no matter one-time or sequential), the acquirer should owned over 50% of shares on the target.

3.4 Measures

Dependent variable

Sequential acquisition. Following Xu et al. (2010), we measure sequential acquisition as a dummy variable. The observed cases of acquisition will be classified into two categories: one-time and sequential acquisition. A one-time acquisition is in which a buyer acquire 100% stock of the target through one-time transactions, coded as 0. A sequential acquisition is in which the buyer acquire over 50% of stock of the target through two or more times transactions, coded as 1.

Growth options value (GOV). Following method used in Tong et al. (2008a, 2008b), our dependent variable, growth option value, is the portion of a firm’s value attributable to growth options. We calculate a firm’s growth option value according to the following equation:

\[ \text{Growth option value} = \frac{V_{GO}}{V} = \frac{(V - CI - \text{PV of current-level EVA})}{V} \]  

Where \( V \) is market value of firm, \( CI \) is capital invested, and \( \text{PV of EVA} \) is the present value of the firm’s expected economics value added (EVA). The \( \text{PV of EVA} \) is calculated by treating the firm’s current EVA as a perpetuity discounted by the firm’s weighted average cost of capital (WACC).

Independent variables

Cross-border entry, is a dummy variable that coded as 1 if the nationality of acquirer and target is different, 0 otherwise.

Cross-industry entry, is a dummy variable that coded as 1 if the first two digits SIC code of the acquirer and target are different, 0 otherwise.

Control variables

To test our hypothesis more precisely, we included several control variables that may influence sequential acquisition and the value of growth option. Firm age is measured as the number of years from the acquirer’s starting year of operations to the year acquisitions happen, which is included as
a control for the possible effects of organization accumulated experience and capabilities on options formation. *Firm size*, measured by the natural logarithm of total assets of the acquirer, is included as a control because firm size may affect acquirer’s resource that can be allocate between options, hence have impact on the propensity to choose sequential mode. Further, two controls are included to account for the potential impact of an acquirer’s financial situation on the acquisition process. The first is *Debt-asset ratio*, which measured by total debts divided by total assets. The second is *Acquirer’s performance* which is measured as ROA of the acquirers.

4. Results

This study attempts to understand the role of cross-border and cross-industry entry in determining sequential acquisition, and how the use of sequential acquisition affect the value of growth options. Firstly, logistic regression models are used to test hypothesis 1 and 2. Secondly, linear regression model are used to test hypothesis 3. Table 2 presents means, standard deviations, and correlations for all measured variables in this study.

Table 3 displays the results of logistic regression for combinations of the independent variables with sequential acquisition as the dependent variable. Model 1 in Table 3 is the base models that include only the control variables. **Firm age** have significant and positive effects, indicating that older firms are more likely to use sequential acquisition. In Model 2, we add the first independent variable, cross-border entry, and find the variable has negative and significant (at p<0.05 level) effect on sequential acquisition. Hypothesis 1 is supported. Next in Model 3, we add the other independent variable, cross-industry entry, and find the variable has positive but not significant effect on sequential acquisition. Thus, Hypothesis 2 is not supported.

Table 4 displays the results of linear regression for sequential acquisitions with value of growth options as the dependent variable. Model 1 in Table 4 is the base models that include only the control variables. **Firm age** have significant and negative effects, indicating that younger firms have higher value of growth options. Next, we can see that in Model 2, sequential acquisition have negative and significant (at p<0.05 level) effect on value of growth options. Hypothesis 3 is supported.

5. Discussion and conclusion

Real options is a growing field of research and there also seems to be a growing interest in modeling and analyzing real options connected to corporate mergers and acquisitions. The specific interest of this study is the application of real options theory to the choice of sequential mode, especially under the context of cross-border and cross-industry acquisition. The finding indicate that cross-border entry has positive impact on the use of sequential acquisition. The finding also point out that sequential acquisition has positive impact on acquirer’s value of growth options. This study has significant contributions and useful managerial implications for understanding firm’s option-based behavior. Our study attempt to provide insight of firm’s strategic decision-making by fill exist gaps between theoretical and empirical real option literatures. This study provides an integrated framework in which discover the linkages between the determinants, consequences and facilitators of firm’s sequential acquisition.
TABLE 2 Descriptive Statistics and Correlations

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Firm age</td>
<td>19.00</td>
<td>10.37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Firm size</td>
<td>2259.84</td>
<td>5801.18</td>
<td>-0.029</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Debt-asset ratio</td>
<td>38.92</td>
<td>16.77</td>
<td>0.026</td>
<td>0.165 *</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Acquirer’s performance</td>
<td>2.47</td>
<td>9.97</td>
<td>-0.055</td>
<td>0.037</td>
<td>-0.189 *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Cross-border entry</td>
<td>0.27</td>
<td>0.45</td>
<td>0.025</td>
<td>-0.049</td>
<td>0.054</td>
<td>0.137 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Cross-industry entry</td>
<td>0.27</td>
<td>0.65</td>
<td>0.016</td>
<td>-0.015</td>
<td>-0.000</td>
<td>-0.010</td>
<td>-0.066</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Sequential Acquisition</td>
<td>0.28</td>
<td>0.45</td>
<td>0.110*</td>
<td>0.026</td>
<td>0.048</td>
<td>-0.071</td>
<td>-0.102 *</td>
<td>0.045</td>
</tr>
<tr>
<td>8.</td>
<td>Growth Option Value</td>
<td>0.94</td>
<td>1.29</td>
<td>-0.097*</td>
<td>0.029</td>
<td>-0.049</td>
<td>-0.049</td>
<td>0.076 *</td>
<td>0.045</td>
</tr>
</tbody>
</table>

Number of observations: 511; * p < .05

TABLE 3 Results of logistic regression on sequential acquisition

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm Age</td>
<td>0.023 *</td>
<td>0.023 *</td>
<td>0.023 *</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Debt-asset ratio</td>
<td>0.004</td>
<td>0.005</td>
<td>0.003</td>
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<tr>
<td>Acquirer’s performance</td>
<td>-0.014</td>
<td>-0.010</td>
<td>-0.158</td>
</tr>
<tr>
<td>Cross-border entry</td>
<td></td>
<td>0.536 *</td>
<td></td>
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<tr>
<td>Cross-industry entry</td>
<td></td>
<td></td>
<td>0.016</td>
</tr>
<tr>
<td>Constant</td>
<td>-1.554 ***</td>
<td>-1.489 ***</td>
<td>-1.564 ***</td>
</tr>
<tr>
<td>LR chi square</td>
<td>9.33 *</td>
<td>14.49 *</td>
<td>9.81 *</td>
</tr>
<tr>
<td>Pseudo R2</td>
<td>0.011</td>
<td>0.024</td>
<td>0.167</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-297.31</td>
<td>-294.73</td>
<td>-288.37</td>
</tr>
</tbody>
</table>

Number of observations: 511; +p<0.10; * p < .05; ** p < .01; *** p < .001

TABLE 4 Results of regression on growth option value

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm Age</td>
<td>-0.012 *</td>
<td>-0.011 *</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Debt-asset ratio</td>
<td>-0.005</td>
<td>-0.005</td>
</tr>
<tr>
<td>Acquirer’s performance</td>
<td>-0.009</td>
<td>-0.009</td>
</tr>
<tr>
<td>Sequential acquisition</td>
<td></td>
<td>0.242 *</td>
</tr>
<tr>
<td>Constant</td>
<td>1.372 *</td>
<td>1.412 *</td>
</tr>
<tr>
<td>F value</td>
<td>2.170</td>
<td>2.45</td>
</tr>
<tr>
<td>R square</td>
<td>0.017</td>
<td>0.242</td>
</tr>
</tbody>
</table>

Number of observations: 511; +p<0.10; * p < .05; ** p < .01; *** p < .001
References


