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UNCERTAINTY, ABSORPTIVE CAPACITY, AND REAL OPTION VALUE OF INTERNATIONAL INVESTMENT: AN EXAMINATION OF PRIOR EXPERIENCE

ABSTRACT

Considering that experience develops a firm's absorptive capacity, this paper examines the moderating effects of firms' prior experience with high uncertainty and international investments on the real options value of subsequent and similar investments under uncertainty. In addition to the firm's real option investments, we propose that consideration for a firm's capability to perceive and respond to exogenous uncertainty and future opportunities would lead to a better understanding of the value of real options under uncertainty. Differential absorptive capacity based on prior experience with similar type of uncertainty and investment leads to heterogeneous value of subsequent uncertainty and investment.

Key Words: prior experience, absorptive capacity, uncertainty, real options, international investment

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INTRODUCTION

Real options theory suggests that, under conditions of high uncertainty, firms use various types of options to learn and/or retain flexibility at a relatively low cost (Bowman and Hurry, 1993; McDonald and Siegel, 1986; Pindyck, 1991). In other words, facing the randomness or unpredictability in the environment, companies cannot exactly anticipate what the future holds. As such, they should be able to adjust their established strategies without incurring significant costs (Chi and Seth, 2002; Cuypers and Martin, 2010; Folta, 1998; McDonald and Siegel, 1986; Roberts and Weitzman, 1981). Once invested, the firm enhances its real option value by having an option to act flexibly under conditions of uncertainty relating to unexpected changes in exchange rates, demand, factor costs, laws, or technology (Folta, 1998; Folta and Miller, 2002; Kogut, 1991; Kumar, 2005; McGrath, 1997). Uncertainty in the real options arguments indicates exogenous uncertainty that comes from uncontrollable sources (Chi and Seth, 2002; Cuypers and Martin, 2010; Folta, 1998; McDonald and Siegel, 1986; Roberts and Weitzman, 1981).

Despite recent development of real options arguments, prior studies have not addressed two key issues. First, although uncertainty is important for deriving real option value from prior-built-in investments, not all types of uncertainty influence an investment's real options value. The nature of uncertainty relevant for real options depends on the nature of the investment. Second, all firms cannot generate real options value even under the same conditions. The role of firms' heterogeneous capabilities should be recognized in this regard. Firms will differ in their ability to derive real options value due to differing perceptions and an ability to assess future uncertainty and opportunity. Because firms evolve with their external environment, firm value can be generated from the capability built up from the historical condition of uncertainty. As expected, firms that are previously exposed to turbulent environments understand the importance of flexibility, and are more likely to respond flexibly to another such environmental challenge in the future. Accordingly, the investments of those firms reflect the strategic orientation of their capability development. Likewise, more consideration of prior conditions and any interplay of uncertainty and investments will provide a coherent explanation of how firms actually generate real options value under future uncertainty. Interestingly, however, no consideration of these historical constraints exists in the extant real option literature. It is hypothesized in this paper that different levels of prior uncertainty leads to heterogeneous development of a firm's capability to perceive and

respond to new but similar uncertainty, which eventually leads to the difference in firm value.

Since firms develop capabilities through experience, this paper presents the following specific research question: Does experience with similar uncertainty and similar investments help firms derive more real options value of international investments under subsequent uncertainty? Specifically, the purpose of this paper is to analyze the contingencies under which international investments actually bring additional value to firms and to tease out the effect of firms' heterogeneous experiences on their ability to perceive and respond to exogenous uncertainty and future opportunities. By ascribing firms' value of real options to prior conditions of uncertainty and investments, this study contributes to the extant literature in two ways. First, this study enriches the real option argument by taking a more historic consideration of prior learning impact on real option value. This study adds one more extension to Argyes and Leibeskind's (1998) attempt to incorporate historic constraints into economics-based theory. Second, by looking more deeply into organizational contexts of option-like investment, this study closely examines the properties of option-like investments under specific circumstances. It provides a detailed explanation of how firms derive additional value from real option investment.

We develop our theoretic arguments by focusing on uncertainty, real options, and the capability of multinational corporations (MNCs). Specifically, we see MNCs are more exposed to diverse sources of exogenous uncertainty, including foreign exchange rates (Campa, 1993; Chung, Lee, Beamish, and Isobe, 2010; Cuypers and Martin, 2010; Huchzermeier and Cohen, 1996; Tong and Reuer, 2007), institution (Chung and Beamish, 2005), or market demand (Cuypers and Martin, 2010; Goldberg and Kolstad, 1995). Therefore, managing uncertainty and retaining flexibility based on future decisions to grow, expand, switch, or divest from prior built-in investments are observed and studied more in international contexts. We also expect that our arguments can be applied in domestic uncertainty situations as well.

THEORY AND PROPOSITIONS

Uncertainty and international investment

International investments have been considered an option-like investment, in that they can provide preferential access to rent-generating future opportunities (Belderbos and Zou, 2009; Cuypers and Martin, 2010; Kogut and Chang, 1996; Kogut, 1991; Tong, Reuer, and Peng, 2008). Specifically, international investments allow MNCs to take advantage of dynamic production efficiency, downside risk reduction, and to catch future upside opportunities (De Meza and van der Ploeg, 1987; Huchzermeier and Cohen, 1996; Kogut and Kulatilaka, 1994; Tong and Reuer, 2007). Foreign direct investment is structured to offer more options, not being locked into one course of action enables MNCs to respond to abrupt changes in macro-economic factors such as exchange rates or demand (Campa, 1993; Chung et al., 2010; Cuypers and Martin, 2010; Huchzermeier and Cohen, 1996; Kogut and Kulatilaka, 1994; Tong and Reuer, 2007).

FDI can play a role as a foothold investment for incrementally increasing an initial investment within a foreign market (Belderbos and Zou, 2009; Kogut, 1991; Kogut and Chang, 1996; Tong, Reuer, and Peng, 2008), or a switching spot for relocating their value chain activities, or transferring resources within their MNC network (Allen and Pantzalis, 1996; Chung et al., 2010; Kogut and Kulatilaka, 1994; Tang and Tikoo, 1999; Tong and Reuer, 2007). MNCs engaging in FDI with specific features can generate the real options value by preserving upside potential through preferential access to future growth opportunities embedded in their investment countries, or reducing downside risks and abandoning initial investments at relatively low cost (Kogut, 1991; Kogut and Kulatilaka, 1994; Tong et al., 2008). Allen and Pantzalis (1996) and Tang and Tikoo (1999) find that the returns to multinationality are maximized for firms with networks that have breadth (number of foreign countries where MNE has operations) rather than depth (the concentration of foreign subsidiaries in a few countries). As an explanation, they offer two reasons: 1) it gives an MNE the ability to achieve higher earnings growth, concentrate market power by increasing expected cash flow to appropriate markets, gain tax-advantages across countries, transfer to areas with low production cost, and the location to raise low-cost capital; 2) it enables a firm to reduce the uncertainty of future earnings that arises from economic exposure. Likewise, multinational companies can hedge their economic exposure by using the choices that operational flexibility offers.

Based on the above arguments, it can be said that the more volatile the environment, the more valuable it would be to hold international investments.

Proposition 1: Firm's international investments will be positively associated with higher real option value under exogenous uncertainty.

Firm's capability and real option value

The difference in a firm's value or performance depends not only on option-like investments in its current business portfolio, but on its ability to perceive, respond to, and manage uncertainty and relevant investments. From a resource-based view, management of real options requires managerial discretion that is enabled and constrained by firm-specific capabilities (Mahoney, 2004). Firm's heterogeneous capabilities make difference in their creation and exercise of options under the same condition of exogenous uncertainty or same sets of opportunities (Bowman and Hurry, 1993; Cuypers and Martins, 2010; Folta and O'Brien, 2004; Grewal and Tansuhaj, 2001). The firm uses these capabilities to cope with uncertainty. Additionally, these capabilities can offer another option for future use (Kogut and Kulatilaka, 2001). Organizational investments in these capabilities should reflect the firm's environmental needs (Clark, Varadarajan, and Pride, 1994). In environments characterized by high uncertainty, for example, a firm will face more diverse, turbulent, and volatile situations and need more investment in flexibility (Harrigan, 1985).

We argue that capabilities built from prior learning lead to firms' heterogeneity of realizing real options value in future uncertainty. Firms' absorptive capacity as existing knowledge base means the ability to recognize the value of new information, assimilate, and apply it to commercial ends (Cohen and Levinthal, 1990). In real option terms, firms' existing knowledge bases act as "the ability to perceive and respond to exogenous uncertainty and opportunities." This ability is generally exerted in exploitation and exploration in the development of organizational knowledge (March, 1991) according to the peculiarities of knowledge environment (stable vs. turbulent) (Starbuck, 1992).

Prior experience with exogenous uncertainty

Considering that firms evolve with their external environment (Grewal and Tansuhaj, 2001) and respond flexibly by building up relevant capabilities, it is necessary to consider the nature of prior uncertainty for better understanding the impact of subsequent

uncertainty over time on real option value. Firms that have experienced turbulent environments are likely to dedicate efforts to be more focused on explorative activities. Here, exploration means the development of a new competence base by the acquisition of new resources from an external source (March, 1991) in order to pursue new knowledge (Levinthal and March, 1993). Alternatively, in a dynamic environment, a firm should change its resource structure to adapt to new environmental opportunities (Karim and Mitchell, 2000) because existing organizational practices and routines may reduce a firm's flexibility to adapt to new changes (Levitt and March, 1988). This strategic orientation is associated with searching for and discovering future opportunities, long-term time scale, visions, experimentation, radical innovations and changes, risk taking, entrepreneurial mindset and culture, and tolerance for failure (Levitt and March, 1988).

From the organizational learning view, exploration is closely related to the scope and flexibility dimension of knowledge absorption (Van den Bosch, Wijk, and Volberda, 2001). Here, scope is also associated with breadth of knowledge a firm draws upon. Flexibility refers to the extent to which a firm can access additional resources and reconfigure existing knowledge. The breadth dimension of absorptive capacity facilitates the absorption of new knowledge. The dynamic capability perspective stresses that exploration activities are needed in uncertainty and unpredictable environments (Teece, Pisano, and Shuen, 1997). From the real option views, Kogut and Kulatilaka (2001) argue that investment in exploration creates capabilities to address future opportunities. Firms that perceive that their environment is entering a phase of high-velocity turbulence (Brown and Eisenhardt, 1997) can be expected to intensify and diversify their activities in prospecting for new opportunities.

In a stable environment, on the other hand, existing firms have a strong focus on the exploitative activities. The knowledge domain the incumbent firm wishes to exploit is closely related to its current knowledge base (Cohen and Levinthal, 1990). Exploitation indicates the use and the development of things already known (Levinthal and March, 1993). From the organizational learning view, exploitation is closely related to the efficiency dimension of knowledge absorption (Van den Bosch et al., 2001). Efficiency dimension of knowledge absorption is likely to result in a low diversity of knowledge structures, few cross-functional relationships, and a low absorptive capacity. Therefore, firms operating in stable knowledge environments are likely to become more reactive.

In the event of unpredictable and fundamental shifts in the level of demand and in the relative costs of inputs, firms have to adjust or reconfigure their value chains radically (Kogut, 1991). For this reason, more unstable and unexpected markets require different resources, capabilities, and strategies compared to more stable markets (Bowman and Hurry, 1993). The problem is that managers are restricted by limited attention and information processing capacities in gathering all possible information from their environment (Cuypers and Martin, 2010). Therefore, decision-makers' subjective perception of uncertainty and thereby their valuation of options is dependent of their prior experience.

Based on the above arguments, high level of uncertainty entices the firms to focus on flexibility and strategic orientation toward exploration. Firms seek for a more diverse knowledge base to adapt unanticipated future conditions. Predictability, firms that experience turbulent environments are likely to adapt to another similar uncertainty. This prediction is based on the assumption that firms can build more explorative capabilities from prior turbulent environments. Experience with similar uncertainty characterized as more turbulence can enable firms to build the capability to perceive and respond to another future similar uncertainty.

Proposition 2: Firm's prior experience with exogenous uncertainty will be positively associated with higher real option value of its international investments under subsequent similar uncertainty.

Interactions of prior experience with similar uncertainty and investments

As argued earlier, international investments can play a role as real options in adding value to the firms. However, consideration must be given to the organizational context in which firms can derive the real options value from their established investments in international markets. In specific, MNCs cannot take full advantage of international investments under heightened uncertainty in their macroeconomic environment unless they cannot control or manage their foreign operation for their own benefit.

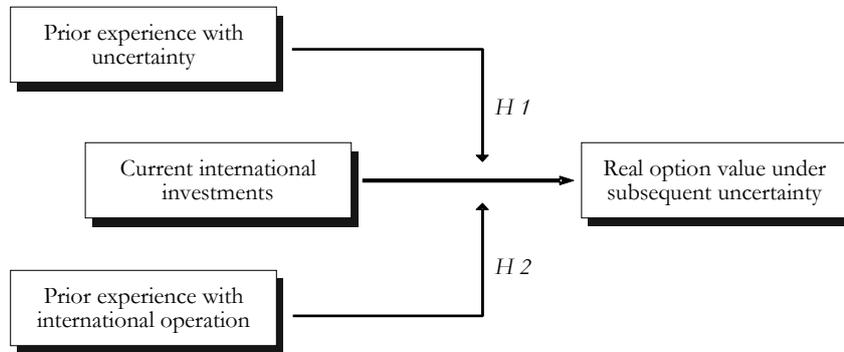
Though international investment offers business opportunities and value to MNCs, it also incurs potential costs associated with high agency and transaction costs (Allen and Pantazalis, 1996; Hitt, Hoskisson, and Kim, 1997; Tang and Tikoo, 1999; Tong and Reuer, 2007). Agency and transaction costs come mainly from the difficulty to coordinate

dispersed operations internationally and to monitor managers of foreign subsidiaries (Allen and Pantzalis, 1996). Additionally, unfamiliarity with complicated host country environments is accompanied by higher management costs. For instance, if parent firms cannot control their foreign subsidiaries to their own benefit, they cannot take advantage of multinational flexibility embedded in their international investments (Kogut and Kulatilaka, 1994; Reuer and Leiblein, 2000; Tong and Reuer, 2007). Coordinating foreign operations would prove costly if parent firms do not possess the capability to do so. As Tong and Reuer (2007) point out, factors that shape firms' capabilities to implement real options and limit the costs associated with coordinating a multinational network should be taken into consideration in the research on the real option value of international investments.

Thus, it is expected that prior experience with international operations enables MNCs to coordinate their configured subsidiaries to their own benefit and retain the real option value inherent in international investments. Firm's capabilities to perceive, respond, and manage subsequent uncertainty and future opportunities are usually built from either their experience with prior similar uncertainty or business experience. Therefore, the combination of prior experience with both similar domestic uncertainty and international operation is expected to strengthen the positive impact of each experience on the real option value of current international investments.

If a firm has experience with international investments in prior uncertainty, the investments have different value in new similar uncertainty. It is possible to compare the firms that have international investments with the firms that do not, in terms of the impact of the dual experience on real options value. In sum, a longer history of international operation will influence real options value with the help of prior experience of exogenous uncertainty.

Proposition 3: Firm's prior experience with exogenous uncertainty and international operation will be positively associated with higher real option value of its international investments under subsequent similar uncertainty.

Figure 1: Presents all causal relationships specified by the three hypotheses

SUGGESTIONS FOR EMPIRICAL TESTING

A natural empirical setting: economic crisis

The economic crises in the world economy may provide a good setting for empirical research on the impact of firm's prior experience with similar uncertainty and international operations on the real options value of their international investments under new uncertainty. For instance, Asian multinational firms in crisis-stricken countries in the late 1990s (i.e., Malaysia, Philippines, Indonesia, Thailand, and South Korea) or multinational firms from non-crisis countries can be studied on their prior experience with similar uncertainty and investments in other countries. For instance, Grewal and Tansuhaj (2001) find that firms' organizational capabilities have differential influences on their performance. While market orientation may negatively affect firm performance, strategic flexibility is found to influence performance positively during a crisis. They also found that the impact of market orientation is positively moderated by demand and technological uncertainty while those of strategic flexibility were moderated positively by competitive intensity. In light of this, it will be worthwhile to compare industrial organization (IO) and real options perspectives under conditions of heightened uncertainty with respect to macroeconomic conditions.

Similarly, worldwide economic crisis during late 2000 provides a good research opportunity where multinational firms faced unexpected fluctuation in production inputs and outputs, and some of them made it through successfully based on their prior experience with similar types of uncertainty. It is expected that firms cannot exactly know

the timing of exogenous uncertainty, but they can be well prepared for the future by lessons from prior and similar uncertainty. As the real options arguments suggest, they can structure their investments in a more flexible manner, for instance, having more country options (Allen and Pantzalis, 1996; Chung et al., 2010; Pantzalis, Simkins, and Laux, 2001; Tang and Tikoo, 1999) or creating internal product markets via intra-firm trade (Lee and Makhija, 2009).

In future studies, we can examine the impact of prior experience with other country MNCs in one country on the value or behavior in their subsequent investments in those host countries. The approach may allow us to see how an MNC's prior experience with foreign firms in its home country can help the MNC cope with similar uncertainty in the countries of those foreign firms. Assume that a Korean MNC has prior business experience with Malaysian MNCs in Korea and subsequently engages in FDI in Malaysia. In this case, the Korean MNC's prior experience in Korea will be helpful for its FDI in Malaysia in terms of its use of its capabilities to deal with Malaysian partners and environmental uncertainty.

Measuring main variables

We can measure the real options value of international investments in several ways. First, we can measure it as Tobin's q or market value, market's evaluation of an MNC's international investments (Lee, Makhija, and Paik, 2008). Another measure to capture additional value of MNCs engaged in international investments compared to domestic firms is to compute the value of multinational flexibility using the method specified by Allen and Pantzalis (1996) or Thomas and Eden (2004). They computed an MNC's excess market value (EMV) (the ratio of market value plus the book value of debt minus total assets, divided by total net sales) and then extracted the EMV of each MNC from the averaged EMV of all the domestic firms in the same industry. Real option value related to not only upside potentials but downside risks can be tried in a balanced manner. Refer to Reuer and Leiblein's (2000) or Tong and Reuer's (2007) measures of downside risk which capture organizational outcome below some target values like market average on ROA or ROE.

To assess a firm's established international investment, we can refer to the measure of breadth of international investments (Allen and Pantzalis, 1996; Tang and Tikoo, 1999). The breadth is measured by the number of countries that foreign subsidiaries operate in.

The higher the number of countries that a firm operates in, the higher the real options value embedded in its international investments. In case that the distribution of FDI breadth in a sample is skewed, Reuer and Leiblein's (2000) method can be applied. They took the log of the sum of 1 and the number of all investment countries to resolve the skewness.

To assess economic uncertainty in an economy over a certain period of time, we can first calculate the mean and standard deviation of exchange rates on a weekly and monthly basis and subsequently measure the volatility of exchange rate movements of manufacturing firms. We allot each count to four different cases. '0' is for firm's with no experience with prior uncertainty, '1' is for firm's experience with between one and two standard deviated uncertainty, '2' is for firm's experience with between two and three standard deviated uncertainty, and '3' is for firm's experience with more than three standard deviated uncertainty.

A firm's experience with international operations is measured by the number of years that it has been involved in foreign businesses since its first entry or by its count year, which is the sum of operating years that all subsidiaries have been in existence in global markets.

Methodology

A panel data can be appropriate for taking into account prior experience with uncertainty and investment in terms of their moderating roles. One methodological issue with a panel data would be how to control for cross-sectional heteroskedasticity and within-unit serial correlation (Hitt, Gimeno, and Hoskisson, 1998). OLS is not adequate for addressing these problems since it assumes that variance is consistent and error terms are not correlated. By contrast, generalized least squares (GLS) fits well with a panel data since it transforms the original variables and thus satisfies the OLS assumptions (Lee, Makhija, and Paik, 2008). For addressing the potential endogeneity issue related FDI decision of MNCs, a two-stage model such as Heckman's two-stage model can be applied. Specifically, the FDI decision is expected to affect multinationality, which again influences real options value or downside risks (Reuer and Leiblein, 2000; Tong and Reuer, 2007). In addition, MNCs may choose some specific sets of countries that they are familiar with based on their prior experience there. So it is also worthy of addressing a relevant endogeneity associated with MNCs' choice of their host countries.

CONCLUSION

This study argues that uncertainty is the main element in the real option argument and that there must be variance in uncertainty over time, it remains necessary to evaluate relevant learning impact from historical evolution of external uncertainty and firms' co-evolution with their external environment. Firms that are exposed to a turbulent environment *ex ante* and establish their flexibility are more likely to respond flexibly to another environmental challenge in the uncertain future. This paper predicts that different levels of prior uncertainty leads to heterogeneous development of firm's capability to perceive and respond to new but similar uncertainty, which eventually leads to the difference in firm value or performance.

By ascribing firms' value of real options to prior conditions of uncertainty and investments, this study contributes to the extant literature in two ways. First, this study enriches the real option argument by taking a more historic consideration of prior learning impact on real option value. This study adds one more extension to Argyes and Leibeskind's (1998) attempt to incorporate historic constraints into economics-based theory. Second, by looking more deeply into organizational contexts of option-like investment, this study fine-grains the properties of option-like investments under specific circumstances. It provides a detailed explanation of how firms derive additional value from real option investment.

Our argument also highlights the importance of managers' ability to perceive, collect, and apply their prior experiences with similar investment and uncertainty types. The value of real options embedded in investment like FDI cannot be realized without those managers' roles or awareness (Coff and Laverty, 2008; Driouchi and Bennett, 2010).

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