

VALUE AND COST OF MULTINATIONALITY: INTERNATIONAL DIVERSIFICATION AND REAL OPTIONS EFFECTS

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ABSTRACT

In this research, we examine the moderating impacts of external uncertainty and portfolio ownership on the values and costs of multinationality by comparing international diversification and real options effects. We find from Korean FDI data that uncertainty strengthens the negative value of breadth in low level of multinationality, while ownership weakens. Meanwhile, in high level of multinationality, uncertainty strengthens the positive value of multinationality while ownership weakens. While the first results support international diversification perspective, the second results support real options view.

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KEY WORDS: Multinationality, International Area Diversification, Real Options, Uncertainty, Ownership

INTRODUCTION

International geographic diversification literature has addressed the question of why and how multinational companies (MNCs) expand their business scope internationally. The dispersion of operations across different countries (multinationality) is considered a primary driver of additional value for multinational companies. Real options perspectives on multinationality argues for the benefits of international geographic diversification. Specifically it argues that multinational flexibility value comes from dispersed operations across countries when firms are vulnerable to unanticipated changes in exchange rates, demands, and institutions in foreign countries.

Even though the international diversification and real options approaches share some common perspectives on the benefits of internationally-diversified operations, they take on divergent focuses and make contradictory assessments of FDI attributes. For example, while a high level of uncertainty is traditionally considered a factor increasing the cost of multinationality from the international diversification perspective, it enhances firm value jointly with multinationality from the real options perspective (Allen and Pantzalis, 1996; Chung et al., 2010; Huchzermeier and Cohen, 1996; Lee and Makhija, 2009; Tang and Tikoo, 1999). In spite of differences between the international diversification and real options approaches, there is a paucity of research on distinguishing real options effects from other diversification effects.

Mixing up values and costs based on different theoretical perspectives may lead to over- or undervaluing the impact of multinationality, and thus arriving at inconclusive or mixed results. In this paper, we attempt to compare real options effects with overall diversification effects by examining which effect is stronger in differing levels of multinationality in consideration of the moderated role of uncertainty and ownership. We test our predictions regarding this issue in a context involving varying levels of exchange rate uncertainty and network ownership in the FDI portfolios of Korean MNCs.

This paper is organized as follow: First, hypotheses are suggested with the literature review; Second, the methodology and results for empirical testing are summarized. Third, theoretical and practical implications are discussed.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Multinationality and Firm Value

MNCs in early stage of internationalization usually have to pay high costs of learning. They must thus be able to cover the large minimum administrative overhead burden associated with the establishment of their foreign operations in different countries. This financial burden is likely to be so heavy that it prevents them from spreading costs even over a relatively small number of countries (Hitt *et al.*, 1997). The real options perspective also argues that the initial costs of set up are equivalent to the purchasing price of call options, which firms must pay at an early stage. Usually it takes some time for such investments to derive real options value. As such, at lower levels of multinationality, relevant costs exceed values.

On the other hand, firms gain value as breadth increases, meaning that the benefits of international expansion are realized after a certain point. Using dispersed operations across countries, MNCs are able to take advantage of national differences in production or sales markets (Contractor *et al.*, 2003; Santis and Gérard, 2009), to access cheaper idiosyncratic resources in foreign countries (Rugman and Verbeke, 2005), to globally scan rivals, markets, and other profit opportunities, and to better cross-subsidize, discriminate with regards to prices, and gain arbitrage potential with a larger geographical scope (Contractor *et al.*, 2003; Lu and Beamish, 2004). Real options theory places a special emphasis on the benefit of multinational flexibility. MNCs can arbitrage markets by shifting production factors or transferring resources within their networks of affiliates located in one or more foreign countries (Chung *et al.*, 2010; Fisch and Zchoche, 2011; Huchzermeier and Cohen, 1996; Lee and Song, 2012).

From these arguments, we predict a non-monotonic relationship between multinationality and MNC value.

Hypothesis 1: The effect of multinationality on MNC value will be non-monotonic, specifically, reducing value before a cut-off point but increasing value after it.

Negative Role of Uncertainty

International geographic diversification literature commonly argues that under high level of external uncertainty, MNCs will be exposed to the double-layered pressures of adapting and managing their overseas operations, which eventually increases relevant costs and undermines the value of multinationality (Hitt, Tihany, Miller, and Connelly, 2006; Lu and Beamish, 2004; Thomas, 2006). This negative effect of uncertainty becomes particularly obvious when firms are not familiar with local environments and operate at low levels of multinationality. Additionally, unexpected or abrupt changes in host countries' macro-economic factors concerning market demands, production, and institutions call for quick and flexible adjustments by MNCs (Chung *et al.*, 2010; Cuyper and Martin, 2010; Fisch and Zchoche, 2011). If MNCs are not able to respond to unexpected changes in macro-economic factors in their host countries, they are exposed to high adaptation costs or, in extreme cases, sunk-cost risk. The negative impact of high uncertainty levels is expected to increase as more countries are involved in investments (i.e., at high levels of multinationality).

Hypothesis 2a: At lower levels of multinationality, uncertainty has a negative moderating effect on the effect of multinationality on value.

Positive Role of Uncertainty

Uncertainty does not always have negative effects on a firm's performance. The real options perspective on multinationality argues that investing in more countries provides firms with more courses of actions given unanticipated changes in macroeconomic factors including exchange rates, demand, or politics (Allen and Pantzalis, 1996; Chung *et al.*, 2010; Cuyper and Martin 2010; Pantzalis *et al.*, 2001; Tang and Tikoo, 1999). Flexible multinational operations based on dispersed operations in different countries can allow a firm to mitigate the effects of major currency swings and economic exposure associated with changes in relative

demand conditions and factor costs (Allen and Pantzalis, 1996; Chung et al., 2010; Fisch and Zchoche, 2011; Lee and Song, 2012). For example, when facing high exchange rate uncertainty, firms having more countries have more rooms to shift their sales or production across countries (Chung et al., 2010; Lee and Song, 2012; Pantzalis, Simkins, and Laux, 2001).

In sum, unlike the perspective common to international diversification literature, the real options perspective suggests the value of firms with greater multinationality will be strengthened by conditions of higher uncertainty (Allen and Pantzalis, 1996; Huchzermeier and Cohen, 1996; Tang and Tikoo, 1999).

Hypothesis 2b: At higher levels of multinationality, uncertainty has a positive moderating effect on the effect of multinationality on value

Positive Role of Ownership

International diversification literature has long emphasized the relationship between an MNC's ownership of foreign affiliates and the MNC's ability to make decisions based on global objectives (Li, 2007; Tihany et al, 2005). MNCs' ownership decisions for their foreign subsidiaries reflect tradeoffs between a firm's desire for control and its desire for the resources contributed by local parties (Li, 2007; Tong and Reuer, 2007). If foreign subsidiaries are characterized by significant proportion of minority ownership in relationships with local partner firms, it will be difficult for MNCs' headquarters to exercise the necessary coordination required for their own benefit (Lee and Chung, 2007; Tong and Reuer, 2007).

These arguments are why Rangan (1994) has used a sample of majority-owned or wholly-owned subsidiaries to examine intra-firm trade. Allen and Pantzalis (1996) and Tang and Tikoo (1999), in their studies on the breadth dimension of multinationality and its value, also consider subsidiaries as firms that are controlled by a parent firm with more than fifty percent ownership.

Hypothesis 3a: At lower levels of multinationality, ownership a positive moderating effect on the effect of multinationality on value

Negative Role of Ownership

The real options perspective argues that growth opportunities are facilitated by smaller ownership, which limits potential downside risk while preserving potential upside (Cuypers and Martin, 2010; Kogut, 1991; Tong et al., 2008). From the growth option perspective, it is important that foreign direct investment can limit its downside risk while maximizing upside potential by starting with smaller level of investments. For this condition to take place, MNCs should be able to keep minority ownership shares in their subsidiaries. Partially-owned subsidiaries reduce the overall risk faced by subsidiaries and maintain the option of acquiring the subsidiary when uncertainty has been resolved (Cuypers and Martin, 2010; Kogut, 1991; Tong et al., 2008).

Kogut (1991) and Tong et al. (2008) argue that international joint ventures with minority ownership are better investment vehicles for capturing growth option value than those with majority ownership. As market demand becomes favorable, small initial investments embed the higher value of future opportunities, with limited irreversibility. Cuypers and Martin (2010) also argue for the value of smaller ownership in international joint ventures under the real options perspective.

Hypothesis 3b: In higher level FDI, ownership has a positive moderating effect on the effect of multinationality on value

RESEARCH METHODOLOGY

Data and Samples: We utilize a panel data of 2,310 Korean FDI observations made at each year from 1991

to 2008. We utilize a large sample of 148 manufacturing MNCs, with domestic firms considered only as a means of calculating the excessive market values of MNCs (Allen and Pantzalis, 1996). We access all of the financial information of these MNCs through the DataPro database, which covers all publicly listed firms on both the Korea Stock Exchange (KSE) and KOSDAQ. Our information about Korean FDI comes from the Bank of Korea, the Bank of Export and Import, the Korean Trade-Investment Promotion Agency, the Korea Listed Companies Association, and the Korea Information Service..

Dependent Variable: We calculate firm value associated with multinationality based on Allen and Pantzalis's (1996) methods. First, we compute excessive market value (EMV) as the ratio of its numerator (market value + book value of debt – total assets) to its denominator (total net sales). We also created a new measure for the value of multinationality (VM) by extracting the EMV of each individual MNC from the averaged EMV of all domestic firms in the same industry. For a robustness check using this measure, we also try to arrive at VM (Tobin's q) by extracting the Tobin's q of each MNC from the averaged Tobin's q of all domestic firms in the same industry. The overall results of applying the two different measures are the same.

Independent Variables

Multinationality: Multinationality is measured as the number of foreign countries in which an MNC has at least one foreign subsidiary, following relevant existing studies (Allen and Pantzalis, 1996; Tang and Tikoo, 1999; Tong and Reuer, 2007). Two more measures are used for comparison purposes. One is the logarithm of 1 plus the number of countries in which a firm has foreign subsidiaries as used by Reuer and Leiblein (2000). The other is the square root of the number of foreign countries in which the company has subsidiaries, as used by Aabo and Simkins (2005). We compare these three measures and find no significant difference in their results.

External Uncertainty: In terms of specific measures of volatility, we employ two different measures. First, we obtain uncertainty levels by normalizing the standardized deviation of the monthly residuals obtained from second order autoregressive equation, in which we follow other relevant studies (e.g. Darby, Hallet, Ireland, and Piscitelli, 1999). We first predict the monthly residuals from the regression and then normalize the standard deviation of the monthly residuals by the mean exchange rate. We also averaged the exchange rate volatility of all host countries by summing the yearly value of exchange rate volatility, weighted by the amount of investment in each host country in each year.

Second, for comparison purposes, we measure uncertainty by realized volatility of annual exchange rates of the Korean won to the US dollar. Each year's volatility is obtained by calculating the square root of the sum of 12 squared differences between the log of previous month's exchange rate and the log of the focal month's exchange rate. We find no significant difference in results using these two measures.

Network Ownership: To examine the role of an MNC's capacity for coordination over its foreign subsidiary operations, we compute its proportion of majority ownership within its whole subsidiary network. The subsidiary network ownership stake is computed as the ratio of the sum of the subsidiaries that have greater than 50% ownership as a controlling ownership stake for effective coordination by the parent firm (Allen and Pantzalis, 1996; Tang and Tikoo, 1999; Tong and Reuer, 2007) to the total number of foreign subsidiaries.

Control Variables

We control for several variables that potentially influence the value of multinationality. First, at the firm level, we control for firm size (logged total assets), R&D (R&D expenses / total sales), advertising intensity (advertising expenditures / total sales), firm age, and financial hedging (gain in current transaction-loss in current transaction / total export sales). At the industry level, we control for Korean conglomerates (Chaebols=1, others=0), foreign sales to total sales ratio, industry competition (total number of firms in the industry using the two-digit Korea Standard Industry Code), industry capital intensity (the ratio of average industry fixed capital to average total industry assets), and sales growth. At the host country level, we control

for country risk (country risk scores in EUROMONEY), cultural distance between Korea and the host countries that each MNC enters (cultural distances of host countries from Korea by averaging the weighted values by the number of subsidiaries in each country for each year), averaged GDP growth rates and averaged real GDP by each year,

Table 1 includes the descriptive statistics of and correlation ratios among all the variables. We check variance inflation factors (VIF) for all variables to diagnose multicollinearity. The average VIFs were less than 2, which is substantially lower than the recommended cut-off of 10, or even a more conservative cut-off of 4, suggesting that multicollinearity is not a concern.

Table 1: Correlations Matrix and Descriptive Statistics

Panel A : Correlations Matrix and Descriptive Statistics											
	Mean	SD	VIF	1	2	3	4	5	6	7	8
1	-0.18	3.38	-	1.00							
2	2.17	0.61	1.19	-0.09*	1.00						
3	0.00	0.01	1.20	0.03	-0.01	1.00					
4	0.01	0.02	1.44	-0.05	0.04	0.03	1.00				
5	0.12	0.33	1.56	-0.00	-0.10*	-0.01	-0.01	1.00			
6	0.14	0.35	1.54	-0.05	0.53*	-0.04	-0.03	-0.05	1.00		
7	0.34	0.28	2.02	-0.02	0.13*	0.05	-0.34*	-0.02	0.14*	1.00	
8	0.08	2.42	1.98	-0.00	-0.00	0.01	0.01	-0.00	0.01	-0.04	1.00
9	3.25	0.80	1.02	0.02	-0.01	0.09*	0.22*	0.01	0.03	-0.06*	0.02
10	0.62	0.10	1.78	0.06	0.17*	0.12*	-0.05	-0.01	0.04	0.07*	0.02
11	32.0	30.74	1.86	0.06	0.01	0.01	0.06	0.07	-0.06	0.10*	0.00
12	1.20	1.02	1.66	-0.03	-0.07	-0.03	0.06	-0.00	-0.00	-0.23*	-0.02
13	0.00	0.01	1.38	-0.02	0.01	-0.08*	-0.02	0.04	0.00	0.07*	-0.02
14	0.59	0.41	1.42	-0.11*	-0.00	0.07	0.04	0.03	0.27*	0.13*	0.03
15	2.59	3.18	1.20	-0.04	0.49*	0.10*	0.03	-0.03	0.03	0.17*	-0.02
Panel B : Correlations Matrix and Descriptive Statistics											
	Mean	SD	VIF	9	10	11	12	13	14	15	
1	-0.18	3.38	-								
2	2.17	0.61	1.19								
3	0.00	0.01	1.20								
4	0.01	0.02	1.44								
5	0.12	0.33	1.56								
6	0.14	0.35	1.54								
7	0.34	0.28	2.02								
8	0.08	2.42	1.98								
9	3.25	0.80	1.02	1.00							
10	0.62	0.10	1.78	0.45*	1.00						
11	32.0	30.74	1.86	0.10*	0.11*	1.00					
12	1.20	1.02	1.66	-0.04	-0.05	-0.51*	1.00				
13	0.00	0.01	1.38	0.00	0.07	-0.17*	-0.08	1.00			
14	0.59	0.41	1.42	-0.11*	-0.06	-0.12*	0.11*	-0.07	1.00		
15	2.59	3.18	1.20	0.06	0.12*	0.24*	-0.36*	0.07	0.04	1.00	

This table shows correlation ratios among variables and descriptive statistics. *, indicates significance at the 5 percent levels.

Analytical Procedures

In this paper, as an efficient estimation method, we refer to feasible generalized least squares (FGLS) to estimate the summary effect and its standard error, and to transform the original variables so that they satisfy OLS assumptions. In this study, we also adopted the Heckman (1979)’s two-stage approach which is a most commonly-used method in reducing any potential selection bias and misspecification errors. In the first stage, a choice or selection model (probit model) is estimated with a subject variable as dependent variable. We used a dummy variable depending on whether a firm enters new country in each year or not, since we think firm’s yearly choice of new country is made endogenously by the factors which also influence the annual value of the firm. From the first choice model, the inverse mills ratio is obtained by a hazard function ratio of pdf over cumulative discrete function (Tong & Reuer, 2007). And then the mills ratio is included in the second FGLS model. The following equation was estimated to identify the determinants of multinationality value. The results were presented in Table 2.

Multinational Value

$$\begin{aligned}
 &= d_0 + d_1 \text{multinationality} + d_2 \text{uncertainty} + d_3 \text{Ownership} \\
 &+ d_4 \text{multinationality} * \text{uncertainty} + d_5 \text{multinationality}^2 \text{uncertainty} \\
 &+ d_6 \text{multinationality} * \text{ownership} + d_7 \text{multinationality}^2 \text{ownership} + \text{error term}
 \end{aligned}
 \tag{1}$$

RESULTS

To test for possible endogeneity in FDI selection and performance, we conducted a probit analysis as a selection model. The model shows that there is a selection bias in that firms that enter new country are different from those that do not. For this reason, we input the inverse Mill’s Ratio obtained from the selection model into the second stage model. Table 2 presents probit regression results for endogeneity Table 3 contains the results for all hypotheses, which examine the non-monotonic relationship between multinationality and firm value and the moderating effects of uncertainty and ownership.

Table 2: A Probit Regression Results for Endogeneity

Independent Variables	Dependent Variable: Entry into New Country
R&D intensity	-14.06(1.61)
Advertising intensity	-2.319 (0.59)
Firm age	0.164 (0.99)
Chaebol membership	0.095 (1.24)
Foreign sales	0.764(3.45)**
Financial hedging	-0.031 (0.14)
Industry competition	0.191 (2.04)*
Capital intensity	-1.248 (1.87)†
Country risk	-.003(1.07)
Cultural distance	0.945 (1.37)
Constant	-2.381 (4.21)***
Chi-square	46.64***
# of observations	1,059

*This table shows the results for the probit model for checking endogeneity issue. The numbers in parentheses are z-statistics. **, *, and † indicate significance at the 0.1, 1., 5, 10 percent levels respectively.*

Hypothesis 1: Multinationality and Firm Value

Our results support this hypothesis regarding the non-monotonic relationship between the level of multinationality and its value. The value is negative at low levels of multinationality ($\beta = -0.12$, $p < 0.05$ (Model 3), $\beta = -0.08$, $p < 0.05$ (Model 4), $\beta = -0.17$, $p < 0.05$ (Model 5)), and positive at high levels ($\beta = 0.03$,

$p < 0.10$ (Model 3), $\beta = 0.06$, $p < 0.05$ (Model 4), $\beta = 0.05$, $p < 0.05$ (Model 5)).

Figure 1 depicts a graph plotting the non-monotonic relationship between multinationality and MNC value with no interactions.

Table 3: FGLS Results for All Hypotheses

	Model 1	Model 2	Model 3	Model 4	Model 5
R&D Intensity	97.47(5.13)***	24.19(2.16)*	24.90 (2.23)*	21.69(1.93)†	24.15(2.15)*
Adversizing Intensity	0.33(0.05)	-0.19(0.04)	-1.16(0.23)	-1.25(0.25)	-1.94(0.48)
Firm age	-0.80(3.56)**	-0.66(3.87)**	-0.59(3.41)**	-0.50(2.81)**	-0.48(2.68)**
Chaebol Membership	-0.49(2.67)**	-0.24(1.75)†	-0.18(1.27)	-0.22(1.52)	-0.13(0.87)
Foreign Sales	0.01(0.04)	0.08(0.35)	0.14(0.60)	0.19(0.80)	0.13(0.55)
Financial Hedging	0.02(0.48)	0.02(0.40)	0.02(0.35)	0.02(0.45)	0.02(0.39)
Industry Competition	-0.33(2.05)*	-0.19(1.66)†	-0.21(1.81)†	-0.21(1.81)†	-0.20(1.72)†
Capital Intensity	2.13(2.04)*	1.29(1.79)†	1.38(1.92)†	1.03(1.44)	1.12(1.49)
Country Risk	0.01(2.80)**	0.01(2.82)*	0.01(2.56)*	0.01(2.40)*	0.01(2.09)*
Cultural Distance	0.10(1.03)	-0.07(0.77)	-0.16(1.75)†	-0.14(1.51)	-0.17(1.82)†
Uncertainty (Unc)	-17.30 (1.85)†	-10.43(1.16)*	-7.45(0.82)	25.11(1.46)	-3.12(0.34)†
Ownership (Own)	-0.44(2.18)*	0.19(1.21)	0.24(1.57)	0.17(1.46)	-0.41(1.15)
Multinationality (Multi)		-0.06(1.99)*	-0.119(2.75)*	-0.08(1.99)*	-0.17(3.47)**
Multinationality(squared)			0.025(1.74)†	0.06(1.78)†	0.05(2.46)*
Unc * Multinationality				-7.12(3.03)**	
Unc* Multinationality(squared)				1.40 (2.47)*	
Ownership*Multinationality					0.40 (2.10)*
Own * Multinationality (squared)					-0.07(1.97)*
Inverse Mills Ratio	-0.22(0.47)	-0.60(1.67)†	-0.68(1.88)†	-0.73(2.04)*	-0.70(1.94)†
Constant	-1.57(1.41)†	-1.44(1.74)†	-0.25(1.66)†	-0.49(1.67)†	-0.56(1.82)†
Number of observations	2,310	2,310	2,310	2,310	2,310
Wald χ^2	1,227.46***	3,476.83***	3,520.18***	3,567.13***	3,515.07***

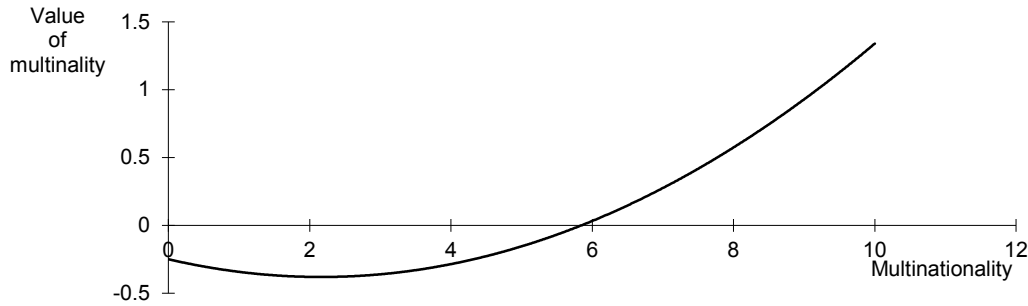
This Table shows the FGSL regression estimates. Model 1 shows the results for control variables only. Model 2 shows the results with main predictors included. Model 3 shows the results with multinationality and its squared term included. Model 4 shows the results with an interaction term between multinationality and uncertainty. Model 5 shows the results with an interaction term between multinationality and ownership. All interaction terms are centered to reduce any potential multicollinearity. The numbers in parentheses are the z-statistics. ***, **, *, and † Indicate significance at the 0.1, 0., 5, 10 percent levels respectively.

Hypothesis 2a and 2b: Moderating Impact of Uncertainty

Our results support hypotheses 2a and 2b. In Model 4, all interaction terms between multinationality and uncertainty are significant. At lower levels of breadth and high levels of uncertainty strengthen the negative impact of multinationality (β for uncertainty * multinationality = -7.12, $p < 0.01$), while at higher levels of breadth, they strengthen the positive impact of breadth (β for uncertainty * multinationality (squared) = 1.40, $p < 0.05$). To make interaction easier to interpret, we plot the main moderated impact of uncertainty in Figure 2, including regression equations for three different uncertainty levels.

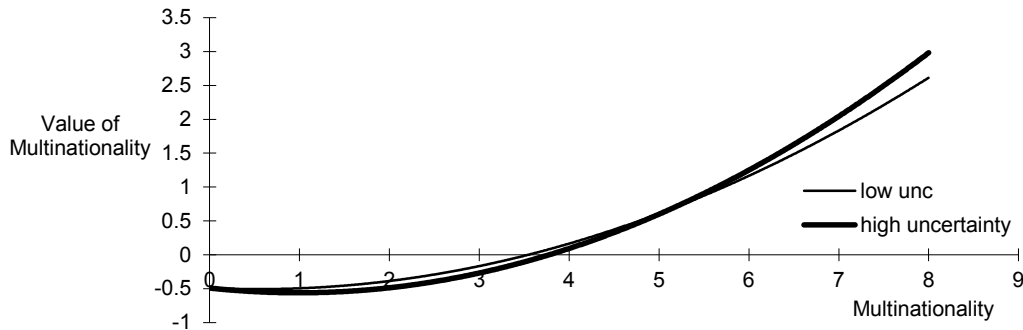
High uncertainty accentuates the curvilinearity of the graph. At low levels of multinationality, firm value decreases as multinationality increases. However, beyond a threshold, increasing uncertainty boots the positive value of multinationality significantly. This implies that our data supports the real option predictions on the positive role of uncertainty in enhancing value at high levels of multinationality.

Figure 1: The Relationship b/w Multinationality and MNC Value with No Interaction



This figure shows non-monotonic relationship between levels of multinationality and value of multinationality. In the initial stage of multinationality, its value is negative. However, after a threshold, its value gets positive.

Figure 2: The Relationship b/w Multinationality and MNC Value Moderated by Uncertainty Level



This figure shows the impact of uncertainty on the value of multinationality in different levels of multinationality. In lower levels of multinationality, uncertainty moderates the impact of multinationality negatively. Meanwhile, in higher levels of multinationality, uncertainty moderates positively. The graphs are drawn from the below equations:

$$\hat{Y} = (-0.08 - 7.12U)X + (0.06 + 1.4U)X^2 - 0.49 \tag{1}$$

For Low Uncertainty: Mean - 1SD = -.0027

$$\hat{Y} = -0.102X + 0.064X^2 - 0.49 \tag{2}$$

For High Uncertainty: Mean + 1 SD = .0087

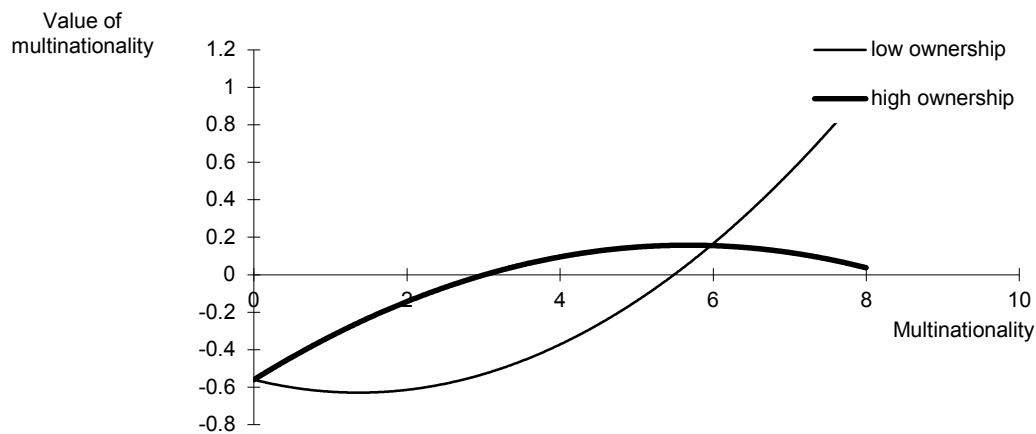
$$\hat{Y} = -0.142x + .072X^2 - 0.49 \tag{3}$$

Hypothesis 3a and 3b: Moderating impact of Ownership

The results in model 5 show that this predicted moderated role of ownership is supported (β for ownership * multinationality = 0.40, $p < 0.05$). Our results in model 5 support that higher levels of multinationality lead to higher value in association with lower ownership level (β for ownership * multinationality (squared) = -0.07, $p < 0.05$).

To make interaction easier to interpret, we plot the main moderated impact of ownership in Figure 3, showing the regression equations with interaction terms for three different ownership levels. Multinationality is truncated at 10 in order to clearly present the relationships. High ownership accentuates the curvilinearity of the graph in a manner opposite to that of high uncertainty. At low levels of multinationality, firm value increases as ownership increases. However, beyond a threshold, increasing ownership significantly decreases the positive value of multinationality.

Figure 3: The relationship between Multinationality and MNC Value Moderated by Ownership Level



This figure shows the impact of ownership on the value of multinationality in different levels of multinationality. In lower levels of multinationality, ownership moderates the impact of multinationality positively. Meanwhile, in higher levels of multinationality, ownership moderates negatively. The graphs are drawn from the below equations:

$$\hat{Y} = -0.168 + 0.3950X + 0.05 - 0.740X^2 - 0.56 \tag{1}$$

For low ownership: Mean - 1SD = 0.17

$$\hat{Y} = 0.0511X - 0.05X^2 - 0.56 \tag{2}$$

For High Ownership: Mean + 1SD = 0.991

$$\hat{Y} = 0.253X - 0.0223X^2 - 0.56 \tag{3}$$

DISCUSSION AND CONCLUSIONS

In this paper, we examine the roles of uncertainty levels and ownership levels in moderating the non-monotonic relationship between multinationality and MNC value. At low levels of multinationality, uncertainty strengthens the negative value of multinationality, while ownership weakens it. Meanwhile, at high levels of multinationality, uncertainty strengthens the positive value of multinationality, while ownership weakens it. The first results indicate the commonality of theoretical predictions made from the international geographic diversification and real options perspectives, while the second results indicate the divergence of predictions made from these two perspectives.

The positive impact of uncertainty on the value of multinationality at high levels connects to the traditional real options argument that the value of real options becomes more evident under conditions of high uncertainty, and supports the positive role of operative hedges under conditions of high exchange rate volatility. Firms need to take types and levels of uncertainty into consideration in determining their optimal levels and configurations of multinationality according to different geographic locations.

The negative impact of high ownership levels on high levels of multinationality indicates that even though smaller ownership basically offers greater growth potential as foreign expansion continues to move toward a certain level, there may be conditions in which greater ownership can be more helpful to firm value. For example, when switching needs become greater, high multinationality and larger ownership of an FDI portfolio enables a parent firm to relocate its foreign subsidiaries quickly and in a timely manner. However, due to the operational flexibility associated with joint business with partners, small network ownership may hurt the operational flexibility value of FDI, especially at times of high volatility in exchange rates and high necessity of switching value chains across countries. Alternatively, minority ownership negatively affects firm value, which raises the question of whether, within a real options framework, smaller ownership is always valuable.

Our results related to multinationality support the findings of recent studies that increasing multinationality does not always enhance value, but instead involves a non-monotonic relationship depending on the different magnitudes of relevant values and costs. This result implies that managers should assess the optimality of their expansion into new countries in terms of the relative magnitudes of the values and costs involved. Under ordinary environmental conditions, managing a very large number of foreign subsidiaries is more of a burden than a benefit, which is why firms choose “focus” or “concentration” strategies instead. These findings imply that firms need to balance breadth and depth, as well as international diversification and focused strategy, considering the characteristics of host country environments, including uncertainty levels and types.

An additional area of interest for future work is the replication of this study in different countries or industries. It would also be useful to deeply examine the actual mechanisms used by MNCs to take advantage of their dispersed operations in different countries, for example with regard to how firms actually spread out risks associated with macro-economic factors within or across countries.

REFERENCES

- Aabo T, & Simkins, B. J. (2005) “Interaction between and real options and financial hedging, Fact of fiction in managerial decision-making”, *Review of Financial Economics*, vol. 24, 353–369.
- Allen L, & Pantzalis C. (1996) “Valuation of the operating flexibility of multinational corporations. *Journal of International Business Studies*,” vol. 27, 633–653.
- Contractor, F.J., Kundu, S.K. and Hsu, C.-C. (2003) “A three-stage theory of international expansion, the link between multinationality and performance in the service sector,” *Journal of International Business Studies*, vol. 34, 5–19.
- Cuypers, I. R. P., & Martin, X. (2010) “What makes and what does not make a real option? A study of international joint ventures,” *Journal of International Business Studies*, vol. 41, 47–69.
- Darby, J. Hallet, A. H. Ireland, J., & Piscitelli, L. (1999) ”The impact of exchange rates uncertainty on the level of investment,” *Economic Journal*, vol. 109, 55–67.
- de Santis, R. A., & Gérard, B. (2009) “International portfolio reallocation, Diversification benefits and European monetary union.” *European Economic Review*, vol. 53(8), 1010–1027.
- Fisch, J. H, & Zschoche, M. (2011) “Do firms benefit from multinationality through production shifting?”. *Journal of International Management*, vol. 17, 143–149.
- Hitt, M. A., Tihanyi, L., Miller, T., & Connelly B. (2006) “International diversification, Antecedents, outcomes, and moderators,” *Journal of Management*, vol. 32(6), 831–867
- Huchzermeier, A., & Cohen, M. A. (1996). “Valuing Operational Flexibility under Exchange Rate Risk,” *Operations Research*, vol. 44(1), 100–113.
- Kogut, B. (1991). “Joint ventures and the option to expand and acquire,” *Management Science*, vol. 37(1), 19–33.
- Kogut, B., & Kulatilaka, N. (1994). “Operating flexibility, global manufacturing, and the option value of a multinational network.” *Management Science*, vol. 40, 123–139.
- Lee, S. H., & Chung, C. C. (2007). “Geographic diversification, Risk reduction or operational flexibility,” *A New Generation in International Strategic Management*, S. Tallman (ed.).

Lee, S. H., & Makhija, M. (2009). "The effect of Domestic Uncertainty on the Real Options Value of International Investments," *Journal of International Business Studies*, vol. 40(3), 405–420.

Lee, S., & Song, S. (2012). "Host country uncertainty, inter-MNC production shifts, and foreign subsidiary performance," *Strategic Management Journal*, vol. 33(11); 1331–1340.

Li, J. (2007). "Foreign entry and survival, Effects of strategic choices on performance in international markets," *Strategic Management Journal*, vol. 16(5), 333–351.

Lu, J. W., & Beamish, P. W. (2004). "International diversification and firm performance, The S-curve hypothesis," *Academy of Management Journal*, vol. 47(4), 598–609.

Pantzalis, C., Simkins, B. J., & Laux, P. (2001). "Operational hedges and the foreign exchange exposure of U.S. multinational corporations," *Journal of International Business Studies*, vol. 32(4), 793–812.

Rangan, S. (1994). "Are transnational corporations an impediment to trade adjustment?" *Transnational Corporations*, vol. 3, 52–80.

Reuer, J. J., & Leiblein, M. J. (2000). "Downside risk implications of multi-nationality and international joint ventures," *Academy of Management Journal*, vol. 43(2), 203–214.

Rugman, A. M., & Verbeke, A. (2005). "The limits to globalization and the regional strategies of multinational enterprises," *Multinational International Review*, vol. 45(1), 5–17.

Tang, C., & Tikoo, S. (1999). "Operational flexibility and market valuation of earnings," *Strategic Management Journal*, vol. 20, 749–761.

Thomas, D. E. (2006) "International diversification and firm performance in Mexican firms, A curvilinear relationship?" *Journal of Business Research*, vol. 59(4), 501–507

Tong, T., & Reuer, J. J. (2007). "Switching options and coordination costs in multinational firms," *Journal of International Business Studies*, vol. 38, 215–230.

Tong, T. W., & Reuer, J. J., & Peng, M. W. (2008). "International joint ventures and the value of growth options," *Academy of Management Journal*, vol. 51(5), 1014–1029.

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