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# **The Performance and Risk Management Implications of Multinationality: An Industry Perspective**

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# The Performance and Risk Management Implications of Multinationality: An Industry Perspective

## **Abstract**

Multinational enterprise in control of dispersed overseas resources and capabilities has been linked to strategic flexibility that allows the firm to take advantage of opportunities and manage exposures imposed by changing environmental conditions. This paper analyzes the implied performance and risk management effects in a comprehensive sample of public firms and finds supportive evidence for the proposition that multinationality can enhance performance across industries. However, the ability to exploit upside potential and avoid downside risk is industry specific. The positive effects of multinationality are found particularly pronounced among firms operating in knowledge intensive service industries while firms in capital-intensive primary industries display the inverse relationships.

**Keywords:** Strategic flexibility, Real options, Risk management

# The Performance and Risk Management Implications of Multinationality: An Industry Perspective

## **Introduction**

There is general agreement that multinational enterprise gives access to a range of resources and capabilities that provide the firm with incremental strategic opportunity (Prahalad and Doz, 1987; Yip, 1995; Bartlett and Ghoshal, 1998; Govindarajan and Gupta, 2001). Operating in a global environment also increases the uncertainty and complexity of strategic decisions (e.g., Rosenzweig and Singh, 1991; Zaheer, 1995). The multinational challenge can, therefore, be expressed as an ability to manage global flexibility to exploit the upside potential of business opportunities and avoid major losses from downside risks inflicted by turbulent international market conditions. However, the relationships between multinationality and the associated performance benefits remain inconclusive (e.g., Brewer, 1981; Grant, 1987; Hitt et al., 1994; Quin, 1997; Contractor et al., 2003).

Multinational flexibility has been conceptualized through an options theoretical lens, which suggests that firms in control of real options embedded in global operational assets can help manage exposures to environmental uncertainty in a more proactive manner (e.g., Kogut, 1985; Bowman and Hurry, 1993; Sanchez, 1995; McGrath, 1997). This conceptualization can be extended by a knowledge-based perspective where multinationality provides access to diverse competencies and market insights and thereby increases the firm's ability to recombine these knowledge elements into effective responsive actions (Kogut and Zander, 1992, 1993; Grant, 1996). However, recent studies have questioned the legitimacy of real options related benefits

for a lack of supportive evidence (e.g., Lander and Pinches, 1998; Reuer and Leiblein, 2000; Coff and Laverty, 2001). To enlighten the apparent ‘stalemate’ in the assessment of potential benefits from the implied multinational flexibilities this paper examines the relationship between multinationality and downside risk, upside potential, and economic performance based on a recent dataset covering the five-year period from 1996 to 2000. Where previous empirical studies have been limited to specific manufacturing industries, the current paper analyses the effects of multinationality across the full industrial spectrum ranging from capital intensive primary industries to knowledge intensive service industries and thereby honors the call for a more extended industry focus (Contractor et al., 2003). The study demonstrates that positive performance and risk management effects from multinationality do seem to exist although they vary significantly between industrial environments.

In subsequent sections, the paper outlines the theoretical arguments for the asset related and knowledge-based flexibilities in the multinational enterprise and hypotheses on associated performance outcomes are developed. An empirical study to test the hypotheses is outlined, the results are presented and discussed and tentative conclusions drawn from the findings.

### **Multinational asset structure and flexibility**

The alternative choices associated with real options inherent in the multinational enterprise should provide flexibility in strategic decision-making and thereby increase the firms’ ability to respond to changing conditions. Real option structures can be construed as combinations of tangible and intangible assets that provide the firm with choices between alternative actions, e.g.,

implementation of different business ventures, timing of business projects, expansion and contraction of business activities, moving business activities between corporate entities, etc. Hence, these option structures can take several forms including growth, expansion, contraction, deferral, and switching options (e.g., Trigeorgis, 1988, 1993, 1996; Kulatilaka and Trigeorgis, 1994). It has specifically been argued that switching options make it possible for the firm to restructure in response to changes in global price relations by shifting operations between national entities controlled by the multinational enterprise (Kogut and Kulatilaka, 1994; Rangan, 1998). Other flexibilities have been ascribed to international joint ventures and sequential market entry (Kogut, 1991; Hurry, Miller and Bowman, 1992; Chang, 1995). The conceptualization of real options embedded in operational flexibilities has typically focused on modularized manufacturing processes and investment modes that allow the corporation to modify the production platform along a global value chain (Sanchez, 1993, 1995).

Flexible multinational operations could, for example, allow the firm to mitigate effects of major currency swings and economic exposures associated with changes in relative demand conditions and factor costs across national environments (Allen and Pantzalis, 1996; Kogut and Chang, 1996; Miller, 1998). Similar advantages have been expressed as exploitation of economic arbitrage opportunities across national markets (Teece, 1981). However, the empirical evidence on the risk management effects of multinationality is mixed. Qian (1996) concluded that multinational structure typically is associated with more stable income streams. Reeb, Kwok and Baek (1998) found that internationalization often leads to higher systematic risk, and Reuer and Leiblein (2000) found no reduction in downside risk effects from multinationality.

## **Multinational knowledge management and responsiveness**

The diversity of the global business environment has inspired the use of learning perspectives in the analysis of internationalization (Johanson and Vahlne, 1990; Barkema, Bell and Pennings, 1996). Organizational learning can also be linked to the recognition of real option structures that provide the corporation with an ability to adapt its strategic path (Huber, 1991; Bowman and Hurry, 1993; Chi and McGuire, 1996). It has also furnished an increased focus on knowledge-based perspectives where the multinational enterprise is seen as a knowledge network that enables the development of new strategic opportunity (Grant, 1996; Inkpen and Dinur, 1998; Desouza and Evaristo, 2003). The asset related flexibilities in multinational enterprise derive from the firms' operational setups (e.g., Kogut and Kulatilaka, 1993; Sanchez, 1993). The knowledge-based perspective, in turn, emphasizes the innovative capacity deriving from diverse multinational competencies and insights as support for the development of business opportunities that increase the strategic maneuverability of the firm in an uncertain global environment (e.g., Mang, 1998; Mudambi, 2002). Multinationality arguably enables the exchange of knowledge between different national environments where diversity of experiences can enhance the ability to learn and innovate (Kogut and Zander, 1992, 1993; Grant, 1996). Hence, the absorptive capacity of the associated knowledge network should improve when the firm has a presence across global market locations (Cohen and Levinthal, 1990; Foss and Pedersen, 2002).

By choosing to locate in overseas markets with different product adaptations, technology



applications, logistical structures, etc., the firm can establish a multinational enterprise that comprises a unique global knowledge network. The insights available from different national markets may help the corporation reach more effective responses to changing environmental conditions through internal knowledge management processes (Huber, 1991; Grant, 1991). The uniqueness of the multinational knowledge base and associated learning processes may enhance specific capabilities that allow the firm to extract economic rents (Wernerfelt, 1984; Barney, 1991). Hence, multinational enterprise can furnish the creation of strategic opportunity from access to diverse market insights, operational capabilities, and firm specific knowledge management processes. The ability to take initiatives and develop global business opportunities extends the strategic alternatives available to the firm and provides flexibility to pursue alternative actions.

### **Hypotheses**

The real options embedded in a multinational operational setup provide the firm with a wider range of alternative actions to choose from (e.g., Kogut, 1989; Luehrman, 1998b). Hence, the firm increases its ability to respond effectively when it, for example, is faced with changing demand conditions and price relationships between national markets (Kogut and Kulatilaka, 1994; Kogut and Chang, 1996; Miller, 1998). Furthermore, a diverse global knowledge network combined with effective knowledge management processes should increase the responsiveness to adverse environmental conditions (Grant, 1996; Foss and Pedersen, 2002; Desouza and Evaristo, 2003). These rationales lead to the following hypothesis.

**Hypothesis 1:** *A firm's level of multinationality is negatively related to its downside risk.*

Multinationality is likely to represent diverse competencies and market insights across different national establishments and thereby provides a versatile knowledge reservoir for innovative behaviors that may enhance the creation of strategic opportunity (Foss and Pedersen, 2002; Desouza and Evaristo, 2003). New business opportunities in effect represent a set of growth options (Kester, 1984; Myers, 1984; Luehrman, 1998a) or “positive NPV undertakings” (Denrell, Fang and Winter, 2003) that can be exploited under favorable circumstances and deferred if conditions are unfavorable. This is consistent with an options perspective where the theoretical option value reflects the potential gains under volatile market conditions (e.g., Andersen, 1993; Hull, 1993). Hence, the capacity to create new business opportunities in the multinational enterprise should increase the corporation’s ability to achieve excess returns. This argues for the following hypothesis.

**Hypothesis 2:** *A firm’s level of multinationality is positively related to its upside potential.*

The positive effects of multinationality can build on asset related flexibilities as well as diversity in knowledge-based resources that allow the multinational enterprise to circumvent the adverse effects of unfavorable conditions and take advantage of business opportunities under favorable conditions. The knowledge-based perspective argues for incremental value creating effects associated with the ability to develop strategic opportunity and achieve better responsive actions (Grant, 1996; Foss and Pedersen, 2002). Internationalization is associated with lower performance due to increased complexity and liabilities of foreignness (Rosenzweig and Singh, 1991; Zaheer, 1995). However, we argue that the combined effects of operational flexibilities

and the responsiveness associated with a multinational knowledge network can outweigh the costs. Therefore,

**Hypothesis 3:** *A firm's level of multinationality is positively related to its economic performance.*

Real option structures in the multinational enterprise have been ascribed to operational flexibilities along the global value chains that provide flexibilities to switch transaction volume between international business entities (Sanchez, 1993, 1995; Kogut and Kulatilaka, 1994). These asset related option structures may allow multinational enterprise to deflect downside performance outcomes and exploit favorable market conditions. The associated performance effects are particularly relevant to manufacturing firms with plants located in different overseas markets but do not take a diverse knowledge network into account as a potential source for strategic opportunity and effective responsive actions (Mang, 1998; Desouza and Evaristo, 2003). As argued by Contractor et al. (2003) there is a need to go beyond the focus on manufacturing and assess potential effects in service businesses. A diverse knowledge network embedded in multinational enterprise can enhance innovative behavior and furnish effective responses to adverse as well as favorable environmental developments (Foss and Pedersen, 2002; Denrell, Fang and Winter, 2003). These incremental performance effects are likely to be differentiated between firms operating in capital intensive production industries and knowledge intensive service industries (Contractor et al., 2003). These arguments lead to the following hypothesis.

**Hypothesis 4:** *The positive effects of multinationality are more pronounced in knowledge intensive service industries and less so in capital intensive primary industries.*

The following section presents an empirical study performed to test the hypothesized relationships.

## **Methodology**

The empirical study was devised to investigate the relationships between multinationality and associated risk management and performance outcomes across a variety of industrial settings reflecting different environmental conditions and levels of knowledge intensity. The relationships were tested in multiple regression analyses using downside risk, upside potential, and firm performance as the dependent variables and multinationality and various control variables as independent variables in different industry sub-samples.

$$(1) \text{Downside risk}_p = \beta_0 + \beta_1 \text{Multinationality}_p + \beta_2 \text{Organizational slack}_p + \beta_3 \text{Firm size}_p + \beta_4 \text{Industry risk}_p + \varepsilon_p$$

Downside risk reflects the firm's ability to deflect economic performance outcomes below a certain industry related target. Multinationality captures the organization's control over and access to tangible and intangible assets in overseas entities. The regressions included a number of control variables to take potential confounding effects into account. Firm size implies successful business expansion in the past and may, therefore, reflect availability of specialized resources and organizational slack that could affect the ability to withstand downside risk (Aldrich and Auster, 1986). Hence, firm size and different measures of organizational slack were included as control variables. Finally, a measure of industry risk was included to control

for industry specific performance effects (Rumelt, 1991). The subscript ‘p’ reflects average annual values over a period of observation, which in this study corresponds to the five-year time span from 1996 to 2000.

The flexibilities embedded in the multinational enterprise should enable the firm to avoid downside risk effects from unfavorable exposures but also represent opportunities that can be exploited under favorable conditions (Reuer and Leiblein, 2000). Therefore, to consider the full influence of multinationality we should test not only potential effects on downside risk, but also the ability to realize the upside potential associated with better execution of growth options (Kester, 1984; Myers, 1984; Kogut, 1989) and “positive NPV undertakings” that constitute strategic opportunity (Denrell, Fang and Winter, 2003). These relationships were tested in regression analyses using upside potential as the dependent variable and multinationality and control variables as independent variables in different industry sub-samples.

$$(2) \text{Upside potential}_p = \beta_0 + \beta_1 \text{Multinationality}_p + \beta_2 \text{Organizational slack}_{ip} + \beta_3 \text{Firm size}_p + \beta_4 \text{Industry potential}_p + \varepsilon_p$$

The upside potential reflects the firm’s ability to take advantage of opportunities and achieve economic performance outcomes above a certain industry related target. This multivariate model incorporates the same control variables as the test on downside risk but the industry related control variable here considers the industry potential as opposed to the industry risk.

The direct economic performance effects were analyzed in a regression using firm performance

as the dependent variable and multinationality and control variables as independent variables including a control for industry related performance effects.

$$(3) \text{ Firm performance}_p = \beta_0 + \beta_1 \text{Multinationality}_p + \beta_2 \text{Organizational slack}_{ip} + \beta_3 \text{Firm size}_p + \beta_4 \text{Industry performance}_p + \varepsilon_p$$

The use of three different outcome variables in the regression analyses allow us to investigate different aspects of performance while remaining consistent with other studies analyzing the performance relationships of multinationality. The downside risk measure was used in previous studies to assess the potential effects of real options structures embedded in multinational enterprise (Reuer and Miller, 1996; Reuer and Leiblein, 2000). To remain true to the theoretical option valuation models, we also consider the potential effects on the firm's upside earnings potential. Whereas this has not been done in other studies, it does represent another potentially important dimension of firm performance. Finally, a string of studies have used financial ratios, such as return on asset (ROA), as an economic performance measure (e.g., Grant, 1987; Hitt et al., 1994; Contractor et al, 2003).

### **Data collection and measures**

Organizations were extracted from all four-digit SIC industries included in the Compustat database. Only firms with complete datasets for the entire period of study were included and observations with extreme performance measures, approximately one percent of the initial sample, were excluded resulting in a final sample of 1,542 firms across industries. All the performance measures and control variables included in the study were derived from archival

data available in Compustat. Downside risk was measured as the second order root lower partial moment using the annual mean ROA in the two-digit SIC code industry as the implied target level (IROA). Hence, the downside risk measure captures the relative underperformance of the organization during the five-year period, i.e., a high measure implies that the organization has a poor ability to avoid downside risk. Employing a second order coefficient enforces the effect of below target performance reflecting a risk averse behavior (Fishburn, 1977; Miller and Reuer, 1996).

$$(4) \text{ Downside risk}_p = [ 0.2 \sum (\text{IROA}_t - \text{ROA}_t)^2 ]^{0.5} ; t = 1996, 1997, \dots, 2000$$

Similarly, upside potential was measured as the second order root upper partial moment using the annual mean ROA in the two-digit SIC code industry as the target level (IROA). Hence, this measure captures the relative over-performance of the organization during the five-year period and implies that the organization has had a good ability to exploit upside earnings potentials. The second order coefficient enforces the effect of above target performance and thereby reflects an opportunity seeking behavior.

$$(5) \text{ Upside potential}_p = [ 0.2 \sum (\text{ROA}_t - \text{IROA}_t)^2 ]^{0.5} ; t = 1996, 1997, \dots, 2000$$

Firm performance was calculated as the firm's average return-on-assets over the five-year period 1996-2000.

$$(5) \text{ Firm performance}_p = 0.2 \sum \text{ROA}_t \quad ; t = 1996, 1997, \dots, 2000$$

To remain consistent with previous studies, multinationality was measured on the basis of the number of countries in which the company has foreign subsidiaries (Kogut and Singh, 1988; Reuer and Leiblein, 2000). To capture all knowledge-based flexibilities, the measure was determined as the sum of the natural logarithm of one plus the number of foreign subsidiaries and the natural logarithm of one plus the number of countries in which the firm has a presence. The natural logarithm was applied to adjust for data skewness and ensure normality. The information on foreign subsidiaries was gathered from America's Corporate Families and International Affiliates, Vol. III, Dun & Bradstreet (2001).

Time lags were not incorporate in the model for two reasons. First, by analyzing average measures of the variables over contemporary five-year time-periods we assessed the outcome effects of firm processes operating in conjunction over an extended period of time and thereby eliminate the risk of analyzing incompatible data series. Second, it appears reasonable to analyze performance relationships on contemporary data series because options related flexibilities embedded in multinational enterprise are expected to enhance the firm's risk management capabilities on an on-going basis without any time lags. Hence, there is little basis for arguing, for example, that on average there is a five-year time lag between the existence of real options in multinational enterprise and the potential outcome effects from these options. All variables were measured as average values over the consecutive five-year time-period from 1996 to 2000 as reported in Compustat to avoid the possibility for spurious effects and "noise" caused



by inter-period accounting adjustments, etc.

The variables for organizational slack were measured by three different ratios calculated as accounts receivables/sales, inventory/sales, and selling, general, and administrative expenses/sales, which is consistent with previous studies (Miller and Leiblein, 1996; Reuer and Leiblein, 2000). The ratios were normalized across two-digit SIC code industries and averaged for the 1996-2000 time-period. Firm size was measured as the natural logarithm of total assets to correct for positive skew in the size data (Aldrich and Auster, 1986). Industry risk and industry potential were measured as the average downside risk and average upside potential of all firms classified within the two-digit SIC code industries. For comparison, we incorporated a third regression model to test the direct performance relationships of multinationality across different industry sub-samples. Potential outlier effects were assessed by excluding observations with large deviations between actual and predicted values from the analyses but the large sample sizes make the analyses robust to these influences. The data was also checked for normality, heteroschedasticity, and multicollinearity.

## **Results**

Table 1 provides descriptive statistics on the total sample of firms operating across all the four-digit SIC code industries.

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Insert Table 1 about here

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Hypothesis 1 was tested through regression analyses performed with the downside risk measure as dependent variable in the total cross sectional sample as well as industry specific sub-samples. Hypothesis 2 was tested through regression analyses performed with the measure of upside potential as dependent variable in cross sectional as well as industry specific sub-samples. Hypothesis 3 was tested in comparable regression analyses using firm performance as the dependent variable. The regression based on the total sample including firms in all industries indicates that multinationality has a significant positive relationship to firm performance while no significant effects are traced on downside risk and upside potential (Table 2). However, the regression coefficient of multinationality on downside risk was negative and the coefficient on upside potential positive as expected. In a modified sample excluding firms operating in primary and network industries, multinationality has a significant negative relationship to downside risk and significant positive coefficients on upside potential and firm performance (Table 2). Hence, the effect on firm performance can be ascribed to the ability to avoid downside risk as well as exploit upside potential. These results provide general support for hypothesis 3 and support hypothesis 1, 2, and 3 across a majority of industrial environments.

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Insert Table 2 about here

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Further regression analyses on an industry sample of manufacturing firms (SIC: 3000-3999), comparable to the industry segment analyzed by Reuer and Leiblein (2000), show a negative coefficient on downside risk and a positive coefficient on upside potential as expected but did not show statistical significance (Table 3). However, regressions on a sub-sample of firms

operating in knowledge intensive service oriented industries (SIC: 7000-9999), as proposed by Contractor et al. (2003), show statistically significant regression coefficients and, thereby, provides support for hypothesis 4.

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Insert Table 3 about here

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Further regressions based on firms operating in primary industries (SIC: 0000-1999) and network industries (SIC: 4000-4999) points to statistically significant inverse relationships between the outcome variables and multinationality and thus supports hypothesis 4 (Table 4). When these two industry segments are excluded from the total sample, the regression coefficients on the modified sample correspond to the hypothesized relationships between multinationality, downside risk, upside potential, and firm performance (Table 2).

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Insert Table 4 about here

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## **Discussion**

The results from this study seem to confirm that multinationality can have positive effects by reducing the firm's risk of achieving below average performance and increasing the potential to score above average performance leading to excess economic performance. Organization theory has proposed a number of obstacles that may interfere with the ability to take advantage of flexibilities in the multinational enterprise. For example, organizational inertia is a recognized

hindrance to changes in organizational processes (e.g., Hannan and Freeman, 1984; Aldrich and Auster, 1986). Furthermore, multinationality exposes the firm to additional costs deriving from increased complexities and coordination needs when the organization must adapt to foreign ways (e.g., Johanson and Vahlne, 1990; Zaheer and Mosakowski, 1997). On the other hand, the multinational network of subsidiaries operating in different countries provides the firm with a wider operational platform and a much more diverse knowledge base. The associated operational flexibility and knowledge management potential should make it possible for the firm to develop and exploit valuable strategic opportunity and the results seem to verify that these benefits from multinationality outweigh the incremental costs of managing a multinational enterprise. In other words, the real option structures embedded in multinational enterprise may improve the firms' ability to manage risk exposures and business opportunities in most environments and particularly so in knowledge intensive service businesses.

In a previous study, Reuer and Leiblein (2000) did not find significant effects of multinationality on downside risk in manufacturing industries during the five-year period 1990-94. Performing a comparable test within the same manufacturing industry (SIC: 3000-3999) during the subsequent five-year period 1996-2000, we also fail to find statistically significant relationships, although the regression coefficients on downside risk and upside potential display the proposed negative and positive signs. This pattern was repeated in other industry segments including manufacturing of household goods (SIC: 2000-2999), trade and retailing (SIC: 5000-5999), and financial institutions (SIC: 6000-6999), while the knowledge intensive service industries (SIC: 7000-9999) showed statistically significant risk management and performance effects.

The regression coefficients had the expected “signs” in all industry sub-samples with two exceptions. The regressions based on firms in primary industries (SIC: 0000-1999) and network industries (SIC: 4000-4999) indicated that multinationality had significant adverse relationships to downside risk and upside potential resulting in a negative effect on economic performance. The reasons for the adverse risk management effects could relate to a higher degree of business concentration and capital intensity in primary industries, e.g., energy exploration and extraction, where a global emphasis on specific outputs may intensify the exposure to fluctuating energy prices rather than diversifying the risk. Similarly, the network industries include energy conglomerates and communication companies that over-expanded through overseas acquisitions, international energy projects, investment in fiber-optic networks, etc., that increased risk exposures and caused substantial losses in the late 1990s. Nonetheless, the study found that significant positive risk management effects from multinationality seem to exist across a majority of industries and particularly so in knowledge intensive service industries, at least during the recent five-year period 1996-2000. Hence, our analyses reveal significant positive performance effects associated with multinationality deriving from the firms’ ability to deflect downside risk and take advantage of upside potential.

## **Conclusions**

In a comprehensive cross-sectional sample of firms, the study finds supportive evidence for positive risk management and economic performance effects of multinationality. The real options perspective often associated with multinational enterprise, therefore, seems to have

validity in most industrial environments. However, there are distinct differences between certain industries suggesting that future research should assume an industry perspective when assessing the outcome effects associated with multinationality. Firms operating in primary and network industries including mining, exploration, transportation, communication, and energy distribution that constitute relatively capital intensive business activities show the inverse performance effects. This is consistent with observations that multinational concentration of activities around specific products including crops, wood, metals, oil, and gas increases exposures to price volatilities in global commodities markets. Deregulation of transportation industries have intensified competitive pressures and increased the vulnerability of firms in these sectors and international acquisitions by energy companies caused major losses all of which may help explain the negative outcome effects. Nonetheless, in a sample of firms operating across all other industries including manufacturing, trade, finance, and services, multinationality is associated with lower downside risk, higher upside potential, and better economic performance. The positive effects are most pronounced among firms operating in knowledge intensive service industries including hotels, advertising, software, engineering, accounting, and consulting. This is consistent with a knowledge-based perspective of multinational enterprise where diverse global resources can support development of adaptive solutions and new business opportunities. This implies that real options associated with multinationality not only relate to operational flexibilities but also may be bound in the knowledge network of the multinational enterprise that help increase responsiveness under changing environmental conditions.

## References

- Aldrich, H. E. and Auster, E., 1986. Even dwarfs started small: Liabilities of age and size and their strategic implications, in Staw, B. and Cummings, L. L. (eds.), *Research in Organizational Behavior*, VIII. JAI Press, Greenwich, CT.
- Allan, L., and Pantzalis, C., 1996. Valuation of the operating flexibility of multinational corporations. *Journal of International Business Studies*, 27, 633-653.
- Andersen, T. J., 1993. *Interest rate and currency hedging: A user's guide to options, futures, swaps, and forward contracts* (2<sup>nd</sup> ed.). Prentice-Hall, Upper Saddle River, NJ.
- Barkema, H. G., Bell, J. H. J., and Pennings, J. M., 1996. Foreign entry, cultural barriers, and learning. *Strategic Management Journal*, 17, 151-166.
- Barney, J. B., 1991. Firm resources and sustained competitive advantage. *Journal of Management*, 17, 99-120.
- Bartlett, C. A. and Ghoshal, S., 1989. *Managing across borders*. Harvard Business School Press. Cambridge.
- Bowman, E.H. and Hurry, D., 1993. Strategy through the options lens: an integrated view of resource investments and the incremental-choice process. *Academy of Management Review*, 18, 760-782.
- Brewer, H. L., 1981. Investor benefits from corporate international diversification. *Journal of Financial and Quantitative Analysis*, 16: 113-126.
- Chang, S.L., 1995. International expansion strategy of Japanese firms: capabilities building through sequential entry. *Academy of Management Journal*, 38, 383-407.
- Chi, T. and McGuire, D. J., 1996. Collaborative ventures and value of learning: integrating the transaction cost and strategic option perspectives on the choice of market entry modes. *Journal of International Business Studies*, 27, 285-307.
- Coff, R. W., and Laverty, K. J. 2001. Dilemmas in exercise decisions for real options on core competencies. Paper presented at the Academy of Management Conference, Washington D.C.
- Cohen, W. M. and Levinthal, D. A., 1990. Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly*, 35, 128-152.
- Denrell, J., Fang, C., and Winter, S. G., 2003. The economic of strategic opportunity. *Strategic Management Journal*, Special Issue, 24, 977-990.
- Desouza, K., and Evaristo, R., 2003. Global knowledge management strategies. *European Management Journal*, 21, 62-67.
- Fishburn, P. C., 1977. Mean-risk analysis with risk associated with below-target returns. *The American Economic Review*, 67, 116-126.

- Foss, N. J. and Pedersen, T., 2002. Transferring knowledge in MNCs: the role of subsidiary knowledge and organizational context. *Journal of International Management*, 8, 49-67.
- Govingarajan, V. and Gupta, A. K., 2001. *The quest for global dominance: transforming global presence into global competitive advantage*. Jossey-Bass. San Francisco.
- Grant, R. M., 1987. Multinationality and performance among British manufacturing companies. *Journal of International Business Studies*, 18: 79-89.
- Grant, R. M., 1991. The resource-based theory of competitive advantage: implications for strategy formulation. *California Management Review*, 33, 114-135.
- Grant, R. M., 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17, 109-122.
- Hannan, M. T. and Freeman, J., 1984. Structural inertia and organizational change. *American Sociological Review*, 49, 149-164.
- Hitt, M., Hoskisson, R., and Ireland, R., 1994. A mid-range theory of the interactive effects of international and product diversification on innovation and performance. *Journal of Management*, 20: 297-327.
- Huber, G. P., 1991. Organizational learning: The contributing processes and the literatures. *Organization Science*, 2, 88-115.
- Hull, J. C., 1993. *Options, futures & other derivatives* (2<sup>nd</sup> ed.). Prentice-Hall, Upper Saddle River, NJ.
- Hurry D., Miller, A.T. and Bowman, E. H., 1992. Calls on high-technology: Japanese exploration of venture capital investment in the United States. *Strategic Management Journal*, 13, 85-101.
- Hurry, D., 1994. Shadow options and global exploration strategies', in: Shrivastava, P., Huff, A. and Dutton, J. (eds.). *Advances in Strategic Management*, 10A, 229-248.
- Inkpen, A. C. and Dinur, A., 1998. Knowledge management processes and international joint ventures. *Organization Science*, 9: 454-468.
- Johanson, J., and Vahlne, J. E., 1990. The mechanism of internationalization. *International Marketing Review*, 7(4), 1-24.
- Kester, W. C., 1984. Today's options for tomorrow's growth. *Harvard Business Review*, 62(2), 153-160.
- Kim, W. C., Hwang, P. and Burgers, W. P., 1993. Multinationals' diversification and the risk-return tradeoff. *Strategic Management Journal*, 14, 275-286.
- Kogut, B., 1985. Designing global strategies: Profiting from operational flexibility. *Sloan Management Review*, 27(4), 27-38.



- Kogut, B., 1989. A note on global strategies. *Strategic Management Journal*, 10, 383-389.
- Kogut, B., 1991. Joint ventures and the option to expand and acquire. *Management Science*, 37, 19-33.
- Kogut, B., and Chang, S. J., 1996. Platform investments and volatile exchange rates: Direct investment in the U.S. by Japanese electronic companies. *Review of Economics and Statistics*, 78, 221-231.
- Kogut, B., and Kulatilaka, N., 1994. Operating flexibility, global manufacturing and the option value of a multinational network. *Management Science*, 40, 123-138.
- Kogut, B., and Zander, U., 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3, 383-397.
- Kulatilaka, N., and Trigeorgis, L., 1994. The general flexibility to switch: Real options revisited. *International Journal of Finance*, 6, 778-798.
- Lander, D. M. and Pinches, 1998. Challenges to the practical implementation of modeling and valuing real options. *The Quarterly Review of Economics and Finance*, 38, 537-561.
- Luehrman, T. A., 1998a. Investment opportunities as real options: Getting started with the numbers. *Harvard Business Review*, 76(4), 51-67.
- Luehrman, T. A., 1998b. Strategy as a portfolio of options. *Harvard Business Review*, 76(5), 89-99.
- Mang, P. L., 1998. Exploiting innovation options: An empirical analysis of R&D intensive firms. *Journal of Economic Behavior and Organization*, 35, 229-242.
- McGrath, R.G., 1997. A real options logic for initiating technology positioning investments. *Academy of Management Review*, 22, 974-996.
- McGrath, R.G., 1999. Falling forward: Real options reasoning and entrepreneurial failure. *Academy of Management Review*, 24, 13-30.
- Miller, K. D., 1998. Economic exposure and integrated risk management. *Strategic Management Journal*, 19, 497-514.
- Miller, K. D. and Leiblein, M. J., 1996. Corporate risk-returns relations: Returns variability versus downside risk. *Academy of Management Journal*, 39, 91-122.
- Miller, K. D. and Reuer, J. J. 1996. Measuring organizational downside risk. *Strategic Management Journal*, 17, 671-691.
- Mudambi, R., 2002. Knowledge management in multinational firms. *Journal of International Management*, 8, 1-9.
- Myers, S. C., 1984. Finance theory and financial strategy. *Interfaces*, January/February, 126-137.
- Prahalad, C. K. and Doz, Y. L., 1987. *The multinational mission*. Free Press. New York.

- Qian, G., 1996. The effect of multinationality measures upon the risk-return performance of US firms. *International Business Review*, 5: 247-265.
- Qian, G., 1997. Assessing product-market diversification of US firms. *Management International Review*, 37: 127-149.
- Rangan, S., 1998. Do multinationals operate flexibly? Theory and evidence. *Journal of International Business Studies*, 29, 217-237.
- Reeb, D. M., Kwok, C. C. Y., and Baek, H. Y., 1998. Systematic risk of the multinational corporation. *Journal of International Business Studies*, 29, 263-279.
- Reuer, J. J. and Leiblein, M. J., 2000. Downside risk implications of multinationality and international joint ventures. *Academy of Management Journal*, 43, 203-214.
- Rosenzweig, P. M. and Singh, J. V., 1991. Organizational environments and the multinational enterprise. *Academy of Management Review*, 16, 340-361.
- Sanchez, R., 1993. Strategic flexibility, firm organization, and managerial work in dynamic markets: a strategic options perspective, in Shrivastava, P., Huff, A. and Dutton, J. (eds.). *Advances in Strategic Management*, 9. JAI Press. Connecticut.
- Sanchez, R., 1995. Strategic flexibility in products competition. *Strategic Management Journal*, Special Issue, 16, 135-159.
- Teece, D. J., 1981. The multinational enterprise: market failure and market power considerations. *Sloan Management Review*, Spring, 3-17.
- Trigeorgis, L., 1988. A conceptual options framework for capital budgeting. *Advances in Futures and Options Research*, 3, 145-167.
- Trigeorgis, L., 1993. The nature of option interactions and the valuation of investments with multiple real options. *Journal of Financial and Quantitative Analysis*, 28, 1-20.
- Trigeorgis, L., 1996. *Real options: Managerial flexibility and strategic resource allocation*. MIT Press, Cambridge, MA.
- Yip, G. S., 1995. *Total global strategy*. Prentice-Hall. Upper Saddle River.
- Wernerfelt, B., 1984. A resource based view of the firm. *Strategic Management Journal*, 9, 443-454.
- Zaheer, S., 1995. Overcoming the liabilities of foreignness. *Academy of Management Journal*, 38, 341-363.
- Zaheer, S., and Mosakowski, E., 1997. The dynamics of the liability of foreignness: A global study of survival in financial services. *Strategic Management Journal*, 18, 439-464.

**Table 1. Descriptive Statistics and Correlation Coefficients (Full sample)**

(n=1542)	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
<b>1 Downside risk</b>	3.80	7.29	-	-	-	-	-	-	-	-	-	-
<b>2 Upside potential</b>	4.28	6.40	-0.09**	-	-	-	-	-	-	-	-	-
<b>3 Firm performance</b>	3.44	7.92	-0.76**	0.54**	-	-	-	-	-	-	-	-
<b>4 Multinationality</b>	0.57	0.67	-0.09**	0.10**	0.15**	-	-	-	-	-	-	-
<b>5 Slack 1 (receivables)</b>	-0.05	0.84	0.03	-0.07**	-0.05*	0.12**	-	-	-	-	-	-
<b>6 Slack 2 (inventory)</b>	-0.57	2.06	0.01	0.00	-0.06*	-0.10**	-0.06*	-	-	-	-	-
<b>7 Slack 3 (adm. cost)</b>	-0.66	1.63	0.13**	0.09**	-0.06*	0.07**	0.07**	0.11**	-	-	-	-
<b>8 Firm size</b>	1.01	12.03	-0.35**	-0.14**	0.23**	0.33**	-0.04	-0.05	-0.17**	-	-	-
<b>9 Industry risk</b>	4.76	3.75	0.27**	0.44**	-0.08**	0.19**	0.01	-0.05	0.17**	-0.29**	-	-
<b>10 Industry potential</b>	4.17	2.95	0.26**	0.48**	-0.06*	0.16**	-0.05	-0.02	0.16**	-0.29**	0.93**	-
<b>11 Industry performance</b>	3.48	2.69	-0.04	-0.08**	0.35**	0.13**	0.04	-0.09**	-0.03	0.11**	-0.21**	-0.17**

+  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$

**Table 2. Results of Regression Analyses [sample including all industries and modified sample]**

	All Industries (n=1542)			1) Modified Sample (n=1242)		
	Downside risk	Upside potential	Firm performance	Downside risk	Upside potential	Firm performance
<b>Intercept</b>	12.633** (11.909)	0.262 (0.293)	-7.384** (-7.478)	12.460** (10.379)	1.293 (1.241)	-6.776** (-5.905)
<b>Slack 1 (receivables)</b>	0.245 (1.195)	-0.575** (-3.348)	-0.664** (-2.990)	0.174 (0.722)	-0.791** (-3.845)	-0.709** (-2.686)
<b>Slack 2 (inventory)</b>	-0.003 (0.037)	0.036 (0.515)	-0.048 (-0.528)	-0.012 (-0.129)	0.020 (0.258)	-0.047 (-0.465)
<b>Slack 3 (adm. cost)</b>	0.236* (2.169)	0.039 (0.428)	-0.119 (-1.016)	0.346* (2.467)	0.052 (0.437)	-0.203 (-1.323)
<b>Firm size</b>	-1.351** (-10.127)	-0.052 (-0.466)	0.928** (6.884)	-1.275** (-8.548)	-0.192 (-1.508)	0.787 (5.203)
<b>Industry risk</b>	0.373** (7.393)	-	-	0.382** (6.944)	-	-
<b>Industry potential</b>	-	1.013** (19.109)	-	-	0.981** (15.821)	-
<b>Industry performance</b>	-	-	0.945** (13.545)	-	-	0.984** (10.561)
<b>Multinationality</b>	-0.462 (-1.606)	0.348 (1.456)	<b>0.695*</b> (2.320)	<b>-0.931**</b> (-2.898)	<b>0.586*</b> (2.142)	<b>1.066**</b> (3.171)
<b>Multiple R<sup>2</sup></b>	0.138	0.236	0.166	0.161	0.224	0.132
<b>Adjusted R<sup>2</sup></b>	0.134	0.233	0.163	0.157	0.220	0.128
<b>F-significance</b>	0.000	0.000	0.003	0.000	0.000	0.000

+  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$

1) Total sample excluding corporations operating in primary and network industries.

**Table 3. Results of Regression Analyses [manufacturing industries (SIC: 3000-3999) and service industries (SIC: >7000)]**

	<b>Manufacturing Industries (n=312)</b>			<b>Service Industries (n=227)</b>		
	<u>Downside risk</u>	<u>Upside potential</u>	<u>Firm performance</u>	<u>Downside risk</u>	<u>Upside potential</u>	<u>Firm performance</u>
<b>Intercept</b>	11.060** (5.586)	3.284* (2.505)	-2.559 (-0.831)	25.282** (5.376)	0.796 (0.166)	-14.539** (-4.013)
<b>Slack 1 (receivables)</b>	0.100 (0.219)	-0.312 (-1.042)	-0.144 (-0.293)	1.687+ (1.796)	-2.100* (-2.303)	-2.590** (-2.749)
<b>Slack 2 (inventory)</b>	-0.034 (-0.365)	0.076 (1.247)	0.001 (0.005)	-0.923 (-0.836)	-1.027 (-0.961)	0.367 (0.328)
<b>Slack 3 (adm. cost)</b>	0.821** (2.971)	-0.178 (-0.982)	-0.908** (-3.056)	0.632 (1.590)	-0.046 (-0.121)	-0.451 (-1.134)
<b>Firm size</b>	-1.001** (-3.794)	-0.427* (-2.462)	0.216 (0.766)	-2.680** (-4.577)	-0.356 (-0.620)	1.754** (3.128)
<b>Industry risk</b>	0.221* (2.355)	-	-	0.191 (0.964)	-	-
<b>Industry potential</b>	-	1.013** (12.789)	-	-	0.996** (3.623)	-
<b>Industry performance</b>	-	-	1.019* (2.331)	-	-	1.067** (3.145)
<b>Multinationality</b>	-0.477 (-0.855)	0.078 (0.212)	0.491 (0.828)	<b>-2.876*</b> (-2.360)	<b>2.239+</b> (1.903)	<b>3.176**</b> (2.635)
<b>Multiple R<sup>2</sup></b>	0.147	0.383	0.066	0.204	0.104	0.174
<b>Adjusted R<sup>2</sup></b>	0.130	0.371	0.047	0.182	0.079	0.151
<b>F-significance</b>	0.000	0.000	0.002	0.000	0.000	0.000

+  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$

**Table 4. Results of Regression Analyses [primary industries (SIC: <2000) and network industries (SIC: 4000-4999)]**

	Primary Industries (n=78)			Network Industries (n=222)		
	Downside risk	Upside potential	Firm performance	Downside risk	Upside potential	Firm performance
<b>Intercept</b>	18.150 <sup>+</sup> (1.924)	-0.227 (-0.042)	-7.426 (-1.261)	15.577** (6.424)	-8.543** (-5.138)	-16.253** (-7.096)
<b>Slack 1 (receivables)</b>	-0.099 (-0.133)	0.929 <sup>+</sup> (1.708)	0.411 (0.777)	0.806 <sup>+</sup> (1.915)	0.076 (0.263)	-0.635 (-1.354)
<b>Slack 2 (inventory)</b>	0.226 (0.245)	0.734 (1.109)	0.215 (0.395)	0.018 (0.076)	0.021 (0.135)	-0.106 (-0.400)
<b>Slack 3 (adm. cost)</b>	-0.371 (-0.620)	-0.197 (-0.147)	-0.424 (-0.996)	-0.016 (-0.090)	0.037 (0.312)	0.075 (0.377)
<b>Firm size</b>	-2.267* (-1.995)	0.116 (0.147)	1.008 (1.305)	-1.933** (-6.439)	1.079** (5.252)	2.300** (7.093)
<b>Industry risk</b>	0.313 (0.381)	-	-	0.293 <sup>+</sup> (1.771)	-	-
<b>Industry potential</b>	-	1.102** (7.247)	-	-	1.286** (10.111)	-
<b>Industry performance</b>	-	-	1.138** (2.682)	-	-	0.705** (5.202)
<b>Multinationality</b>	2.237 (1.372)	<b>-2.219<sup>+</sup></b> (-1.933)	-1.396 (-1.251)	<b>2.494**</b> (3.436)	<b>-0.927<sup>+</sup></b> (-1.865)	<b>-2.238*</b> (-2.801)
<b>Multiple R<sup>2</sup></b>	0.102	0.480	0.129	0.273	0.358	0.384
<b>Adjusted R<sup>2</sup></b>	0.023	0.434	0.052	0.253	0.340	0.367
<b>F-significance</b>	0.275	0.000	0.138	0.000	0.000	0.002

<sup>+</sup>  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$

**Table 5. Size and Scope of Total Sample and Industry Sub-Samples (n = number of observations)**

Industries	SIC	Table 2		Table 3		Table 4	
		All	Modified	Manufac.	Service	Primary	Network
Primary	0000-1999	78	.	.	.	78	.
Manufacturing 1	2000-2999	272	272	.	.	.	.
Manufacturing 2	3000-3999	312	312	312	.	.	.
Network	4000-4999	222	.	.	.	.	222
Trade and retailing	5000-5999	185	185	.	.	.	.
Financial institutions	6000-6999	246	246	.	.	.	.
Service	7000-8999	227	227	.	227	.	.
<b>Total sample</b>		1542	1242	312	227	78	222

## APPENDIX

### Industry sub-samples applied in the study

#### Standard Industrial Classification by four-digit SIC-Codes

- (0000-1999) Primary industries (agriculture, forestry, fishing, mining, and construction)
  - Agriculture Production – Crops
  - Agriculture Production Livestock and Animal Specialties
  - Agricultural Services
  - Forestry
  - Fishing, Hunting and Trapping
  - Metal Mining
  - Coal Mining
  - Oil and Gas Extraction
  - Mining and Quarrying of Nonmetallic Minerals, Except Fuels
  - Building Construction – General Contractors and Operatives
  - Heavy Construction Other than Building Construction-Contractors
  - Construction – Special Contractors
  
- (2000-2999) Manufacturing industries 1 (basic household goods and industrial bulk products)
  - Food and Kindred Products
  - Tobacco Products
  - Textile Mill Products
  - Apparel and Other Finished Products made from Fabrics and Similar Material
  - Lumber and Wood Products, Except Furniture
  - Furniture and Fixtures
  - Paper and Allied Products
  - Printing, Publishing and Allied Industries
  - Chemicals and Allied Products
  - Petroleum Refining and Related Industries
  
- (3000-3999) Manufacturing industries 2 (electronics, computer products, and industrial machinery)
  - Rubber and Miscellaneous Plastic Products
  - Leather and Leather Products
  - Stone, Clay, and Concrete Products
  - Primary Metals Industries
  - Fabricated Metal Products, Except Machinery and Transportation Equipment
  - Industrial and Commercial Machinery and Computer Equipment
  - Electronic and Other Electrical Equipment and Components
  - Transportation Equipment
  - Measuring, Analyzing, and Controlling Instruments, Photographic, Medical and Optical Goods
  - Miscellaneous Manufacturing Industries
  
- (4000-4999) Network industries (transportation, communications, electricity and gas distribution)
  - Railroad Transportation
  - Local and Suburban Transit and Interurban Highway Passenger Transportation
  - Motor Freight Transportation and Warehousing
  - United States Postal Service
  - Water Transportation
  - Transportation by Air
  - Pipelines, Except Natural Gas



Transportation Services  
Communications  
Electric, Gas, and Sanitary Services

(5000-5999) Trade and retailing  
Wholesale Trade – Durable Goods  
Wholesale Trade – Nondurable Goods  
Building Materials, Hardware, Garden Supply, and Mobile Home Dealers  
General Merchandise Stores  
Food Stores  
Automotive Dealers and Gasoline Service Stations  
Apparel and Accessories Stores  
Home Furniture, Furnishings, and Equipment Stores  
Eating and Drinking Places  
Miscellaneous Retail

(6000-6999) Financial institutions  
Depository Institutions  
Nondepository Credit Institutions  
Security and Commodity Brokers, Dealers, Exchanges, and Services  
Insurance Carriers  
Insurance Agents, Brokers, and Services  
Real Estate  
Holding and Other Investment Offices

(7000-8999) Service industries  
Hotels, Rooming Houses, Camps, and Other Lodging Places  
Personal Services  
Advertising Agencies  
Credit Reporting Agencies  
Direct Mail Advertising  
Computer Programming Services  
Prepackaged Software  
Computer Integrated Systems Design  
Computer Processing, Data Preparation Services  
Business Services  
Motion Pictures, Videotape Production  
Motion Picture Theaters  
Amusement and Recreational Services  
General Medical and Surgical Hospitals  
Medical Laboratories  
Educational Services  
Engineering Services  
Accounting, Audit, Bookkeeping Services  
Management Consulting Services