DO NETWORK CONNECTIONS WITH FOREIGN INVESTMENT ENTERPRISES HELP HOST COUNTRY FIRM INNOVATIONS?

DISSERTATION

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With its fast growing pace, foreign direct investment is having tremendous impact on host country economies. Knowledge spillover from inward foreign direct investment (FDI) is one of the important ways that host country firms are likely to benefit from the presence of foreign direct investment. Knowledge spillover here refers to the knowledge that is not fully internalized by the subsidiaries of multinational enterprises while they conduct business in the host country.

This study aims to explore how knowledge spillover from inflow foreign direct investment affects host country firms, and more specifically, how network ties with foreign firms affect host country firms’ exploratory innovation activities. I particularly focus on firms’ exploratory innovations since they have important implications for their long term performance and growth. Exploratory innovations are also more difficult to achieve. Hypotheses are developed by bringing different theoretical perspectives together, including FDI theory, innovation management, and network theory. Using survey data from China I investigate whether domestic Chinese private enterprises’ exploratory innovations are affected by their network ties with foreign investment enterprises. Empirical findings suggest that the number of foreign firm ties help host country firms engage in exploratory innovations. Other findings show that the strength and nature of ties are relevant for knowledge spillover. They indicate that strong ties and technology
cooperation ties have a stronger positive effect on host country firms’ exploratory innovation in contrast to weak ties and non-technology related ties. It is also found that government related ties have a positive moderating effect on foreign firm ties’ effect on domestic firms’ exploratory innovation.
Dedicated to my parents, my parents-in-law, and to my wife, Sheng.
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CHAPTER 1
INTRODUCTION

In this globalization era, foreign direct investment (FDI) has become increasingly important to the global economy. In 2006, global FDI flows reached 1.2 trillion US$, a 34% increase from 2005 (UNCTAD, 2007). In the past decade, FDI has also been growing twice as fast as international trade. Inward FDI has been of great importance to host countries, particularly those that are still developing. The governments of developing countries have been offering significant incentives to attract FDI, motivated by the belief that domestic firms can benefit from the cutting edge technology and advanced managerial knowledge that inward FDI brings. However, research findings on the impact of inward FDI on host country firms have been inconclusive (Görg and Strobel, 2001; Görg and Greenaway, 2004).

Since Caves’ (1974) seminal study, the impact of FDI on host country firms has been one of the central questions in FDI research. Previous studies on the knowledge spillover from FDI, however, have followed the economics approach, and examined the issue on an aggregate industry or country level. As pointed out by Spencer (2008), this aggregated approach taken by previous studies may not allow us to examine the complex underlying relationships in this regard, which are likely to depend on the characteristics of both a multinational enterprise (MNE) and local firms. In international business, this topic has recently been receiving more attention from scholars (Buckley and Lessard, 2005;
Driffield and Love, 2007). Therefore, it is timely to draw from perspectives in international business and organizational studies to further our understanding of how host country firms may benefit from the knowledge brought into host country by foreign firms.

The purpose of the current study is to investigate how network connections between domestic and foreign firms influence the innovation activities of the domestic firms. How and why firms innovate has long been the interest of scholars in various fields. Recent developments in the literature emphasize the importance of external sources of knowledge to firm innovation (Freeman, 1991). Theories of the MNE have stressed the role of proprietary assets, such as knowledge, capabilities and technology, which motivates FDI (Caves, 1996). Since MNEs have new and unique knowledge from the point of view of domestic firms, FDI serves as a critical source of novel knowledge for these firms. In particular, spillover from this knowledge is likely to contribute to host country firms’ innovation activities. Few studies, however, have examined whether host country firms’ innovation capability is affected by inward FDI. Therefore, this study is likely to advance our understanding of how host country firms can benefit from inward FDI by improving their innovation capabilities.

Following previous FDI spillover studies, my dissertation builds on the widely accepted assumption that inward FDI brings advanced and novel knowledge to host country (Caves, 1996). I distinguish between exploratory and exploitative innovations since it has been argued in the literature that these two types of innovations require different types of knowledge (March and Levitt, 1991). I expect that the spillover of novel knowledge from inward FDI is likely to contribute specifically to a host country
firm’s exploratory innovation. Here exploratory innovations are “radical innovations and are designed to meet the needs of emerging customers or markets” (Benner and Tushman, 2003: 242). Exploitation innovations, on the other hand, “are incremental innovations that mainly build on what the firm already knows and meet the needs of current customers or markets” (Benner and Tushman, 2003: 243). Drawing from network theory, I examine the conditions under which host country firms’ exploratory innovations are positively impacted by inward FDI. To this end, I identify the types of networks that are more efficient in transferring novel knowledge from inward FDI to host country firms. More specifically, I examine the influence of several attributes of network connections with foreign firms, including the number and strength of such connection, horizontal versus vertical foreign firm connections, and technology versus non-technology foreign firm connection. Furthermore, the relationship between overall network diversity and host country firms’ general innovation is also examined.

Those hypotheses are tested using data collected in the emerging economy of China. A survey was conducted in the province of Zhejiang, China. Data were collected from 500 domestic private enterprises. Those enterprises range from high tech industries to more traditional manufacturing industries. The questionnaire gathered data of domestic private enterprises network connections as well as their innovation activities. Using these data, hierarchical regressions are conducted to empirically test the hypotheses developed.

There are several areas in which this study makes potential contributions. First, knowledge spillover from inward FDI has been a critical research topic that hasn’t been addressed enough in international business literature. Studies found in economics literature have inconclusive results regarding spillover from FDI. Several studies on
different countries including Hungary, Czech Republic, Estonia, Ukraine, and China all found positive spillover from inward FDI (Kaminski and Riboud, 2000; Djankov and Hoekman, 2000; Sinani and Meyer, 2002; Lutz and Talavera, 2004; Hale and Long, 2006). However, other researchers found no effect or even negative spillover effect to host country economy (Aitken and Harrison 1999; Hu and Jefferson 2002; Tong and Hu 2003). Recognizing that knowledge spillover is not guaranteed by the presence of inward FDI, it is crucial for us to better understand the conditions under which local enterprises are able to benefit from inward FDI. By studying Chinese firms’ network connections with inward FDI, this study gives conditional explanations of how host country firms are likely to benefit from the knowledge brought in by inward FDI.

This study also has implications for general organization and strategic research. The current study focuses on how firms’ innovations, particularly those of an exploratory nature, are affected by their network connections. According to the ambidexterity argument, firms need to achieve a balance between exploration and exploitation so as to remain competitive in the long run (Levinthal and March, 1993). Despite the importance of this task to firms, studies on how firms may achieve this goal have been scarce (Gupta, Smith and Shalley, 2006). Therefore, it is important to investigate how inward FDI may facilitate firms’ endeavor of exploration and exploitation.

Organization of the Dissertation

This dissertation is organized as follows. Chapter 2 presents a review of the literature on foreign direct investment flows, networks and innovation processes, which
provides a theoretical and empirical rationale for this dissertation. In Chapter 3, drawing upon the network and innovation theories and research, hypotheses are proposed to examine how domestic private enterprises’ network connections with foreign investment enterprises influence their exploratory and exploitative innovation activities. Chapter 4 describes the data collection process and the methods used for testing the hypotheses in the dissertation. The results of the study are presented in Chapter 5. Finally, in Chapter 6, the study results are discussed and in Chapter 7, I present some theory and practical implications, and study limitations. In addition, future research directions are also suggested.
CHAPTER 2
LITERATURE REVIEW

This study investigates the impact of inward FDI on host country firms’ innovations, particularly those of an exploratory nature. The role of inward FDI is important in this regard, as it serves as a critical source of novel knowledge for host country firms. To examine this issue, it is important to first understand from a theoretical perspective the contributions of inward FDI to the host country in the form of resources, capabilities or other benefits that may affect host country firms’ innovation activities. After considering these theoretical perspectives, the existing empirical studies on the relationship between inward FDI and host country firms’ innovations are reviewed and summarized. In an effort to add to these studies and further address the question of how knowledge spillover from inward FDI occurs, this dissertation focuses on interactions between host country firms and inward FDI. This dissertation draws from network perspectives to investigate the role of host country firms’ connections with inward FDI. For this reason, I will also review the related literature that examines how a firm’s network ties affect its innovation and how knowledge can be transferred between firms through network ties associated with strategic alliances.

In the following section, discussion is focused on knowledge and innovation as critical motivations behind FDI activities of MNEs. These theoretical perspectives provide support for the assumption that inward FDI brings knowledge to host countries.
As I will show, there has been little work done knowledge spillover from MNEs to domestic firms, particularly relating to exploratory innovation. I will also show that there are very limited insights currently from network analysis in the international business literature.

**FDI and Innovation**

In Schumpeter’s (1942) classic work, innovation was identified as the main driving force of economic growth, and this perspective has continued to be an important one to this day. It is believed that the main reason for rapid economic growth in the United States has been the innovative capability of this country (Gilder 1988). Innovation is central to organizational research not only because of its profound effects on economic changes, but also social changes in society (Sorenson and Stuart, 2000), affecting education, standards of living and quality of life.

For firms, innovation generates economic rents that serve as a critical source of sustainable competitive advantage (Barney, 1991; Wernerfelt, 1984). As a result, innovation becomes one of the central concerns for organizations in competitive environments (Rosenberg, 1974; Teece, 1986). Firms need to continuously invest in innovation activities to succeed in both short term survival and long term competition (Leonard-Barton 1994). Due to increasing levels of competition characterizing most industries, rapidly changing technology has become the norm. In particular, creative destruction, which refers to technology changes introduced by radical innovations that make current technology and competence obsolete, is thought to be critical for industry
growth (Schumpeter, 1950). To survive in such conditions, the ability to innovate is a crucial capability for a firm. Mastery over the innovation process is closely related to a firms’ competency renewal. Continuous efforts in innovation, especially those relating to exploratory innovations can help a firm survive creative destruction in its industry. More importantly it can help the firm to initiate creative destruction, further solidifying its position in the industry (Danneels, 2002).

As can be seen from the earlier international business works, FDI research has always been closely related to innovation (Frost, 2001). Vernon’s (1966, 1979) product life cycle view of FDI emphasizes the importance of innovation in firm’s FDI process. Firms identify a lucrative new product niche in their home country, and begin to draw upon the existing and new knowledge pools in order to fulfill this need. In the original product life cycle hypothesis, Vernon observed that innovations often originate from countries with higher labor costs, since innovations are usually labor saving, but also from countries that have technological capabilities. For both reasons, higher income countries tend to serve as stimuli to innovation. They become the preferred initial production site, because of communication and transporting costs and early production stage uncertainty. Thus, proprietary assets resting on innovations are generated by firms in higher income countries. At later stage of product life cycle, innovations are diffused to foreign markets through trade first, and later through foreign investment. The occurrence of FDI is usually triggered by the emergence of foreign competitors. Higher demand from foreign markets and competitive pressure for lower production cost makes MNEs move production to foreign markets. In the process, innovation is diffused to host countries through FDI.
Other influential theories are based on an industrial organization approach to explain the motivation for FDI. For example, Hymer (1976) theorized that MNEs engage in FDI to exploit their monopoly power in foreign markets. Buckley and Casson (1976) developed the internalization theory, giving a similar argument that MNEs engage in FDI as a way to exploit their competitive advantages, based on proprietary capabilities, in foreign countries. Buckley and Casson noted that the advantages of MNEs lie mostly in their proprietary knowledge. They argued that protecting this knowledge through internalized mechanisms such as FDI rather than market mechanisms, such as international trade or licensing, was a key rationale behind MNEs’ motivation to engage in FDI. FDI involves extending the firm’s boundaries to other countries, which keeps the knowledge within the firm and not exposed to external sources. According to this perspective, it is important to keep the firm’s proprietary knowledge within the firm, since knowledge behaves as a public good in the sense that once it is developed, it can be used by other parties without significant additional marginal cost. Even though its use by other parties will not affect the original owner’s use of the same knowledge and will not decrease the value of knowledge (Caves, 1996), rivals are now able to use this knowledge without compensation. In this sense, knowledge as a public good is non-exclusive, reducing the firm’s ability to differentiate its capabilities.

At the same time, the transaction costs perspective argues that markets for such knowledge will likely fail (Rugman, 1985; Teece, 1986; Hennart, 2001). This is due to information asymmetry between the two parties, where the receiving party may be unable to understand, assimilate or use new knowledge coming from the firm. Information asymmetry arises from inherent differences in the already existing knowledge structures,
modes of organization and absorptive capacity of the firms. Thus, the transactional impediments of transferring knowledge between firms will be higher, making it costly to do so. Consequently, market transactions are not the optimal form for MNEs to exploit their advanced knowledge in foreign markets. In order to benefit from these proprietary assets, FDI becomes the organizational choice for MNEs when expanding internationally.

To summarize, these arguments lead to two important aspects of the knowledge transfer process for MNEs. First, it is difficult to protect knowledge when it is being transferred through market transactions. Second, information asymmetry between parties makes it difficult to transfer knowledge through market transaction.

Another theoretical approach that relates to the MNE is the knowledge-based view of the firm. The knowledge based view suggests that knowledge and innovation are of critical importance to an MNE’s choice of FDI as the organizational form to enter a foreign market (Grant, 1996; Kogut and Zander, 1996). From this perspective, the main purpose of an MNE is to create an internal social environment in which knowledge is embedded. In this social community, the firm has the advantage in knowledge transfer, integration and recombination (Kogut and Zander, 1993; 1996). In this regard, the function of the MNE is not only to effectively transfer knowledge across borders, but also to seek new knowledge to combine with its current knowledge and to generate innovations (Almeida et al., 2002). During this knowledge transfer and knowledge building process, MNEs transfer their current knowledge to their subsidiaries in the host countries. This knowledge and technology are likely to spill over to host country firms with or without the intention on the part of MNEs. However, given the MNE’s determination to protect its competitive advantage and the complexity of the processes
associated with knowledge transfer between firms, it is unclear whether or not and how host country firms can benefit from the presence of inward FDI. For these reasons, this remains an important question in IB research (Caves, 1998).

It is well established that FDI serves as an efficient way for MNEs to transfer knowledge and innovation to host countries. However, for inward FDI to serve as a preferred source of novel knowledge to host country firms, it needs to meet two conditions. First, the knowledge brought in by inward FDI should be different from other sources to which host country firms have access. Second, it should be easier to transfer the same novel knowledge from inward FDI than through other means, for example, international trade. In the next section, I review related literature addressing these issues.

**FDI as a Knowledge Source**

FDI spillover studies have been built on the idea that FDI inflows contribute to the technology and knowledge stock of a host country. As noted earlier, innovations are usually first developed in the MNE’s home country, and through FDI get transferred to other countries. These innovations constitute proprietary assets of the MNE, and include advanced technologies, managerial and technical know-how, efficient organizational structure and systems, as well as other related knowledge. The efficiency with which these proprietary assets are transferred to their host countries will directly impact the success of the MNE (Kogut and Zander, 1993).
Knowledge transfer has always been a difficult task for firms, whether in intra-organizational or inter-organizational settings. Winter (1987) noted an interesting paradox of knowledge transfer. That is, firms need to replicate their success from one subsidiary to another by transferring the knowledge that accounts for their success. During this process, firms seek ways to make knowledge transfer easier, often through knowledge simplification and codification, which, unfortunately, also has the effect of undesired imitation and spillover of knowledge more likely. Difficulty of knowledge transfer also arises from the tacit and “sticky” nature of knowledge (Polanyi, 1958; Rosenberg, 1982; von Hippel, 1993). Tacit knowledge refers to the notion that people know more than they can tell (Polanyi, 1958), an attribute that applies to organizations as well as individuals (Nelson and Winter, 1982). When it is difficult to specify or articulate a piece of knowledge, the costs associated with its transfer will increase as well. The term “stickiness” was first presented by von Hippel (1993) to refer to the type of knowledge, often used in technical problem solving, that “is costly to acquire, transfer, and use in a new location” (von Hippel, 1993: 429). The stickiness of knowledge is related to the tacit nature of the knowledge to be transferred. It can also be caused by other factors, such as the amount of information required for problem solving and innovation, or related knowledge and information needed for assimilating new knowledge in the knowledge transfer process (von Hippel, 1993; Szulanski, 2000).

By using appropriate transfer mechanisms, such as organizational structure and management systems, MNEs can also become more efficient in transferring knowledge across borders (Almeida, Song, and Grant, 2002). In doing so, however, it is likely that this knowledge and technology will spill over to local companies, whether or not it is
intended by the MNE. When such knowledge and technology are at the cutting edge, they become a critical source of advanced knowledge for host country firms. This argument has support in several streams of work. In geographical cluster studies (Porter, 1991), it has been found that firms in a given region often exhibit similar knowledge and resources, and display similar strategic behaviors (Pouder and St. John, 1996). In this case, knowledge coming from an outside source is more likely to be differentiated from what is already embedded in the geographical region. Thus, inward FDI serves as an important source of novel knowledge from the external environment. Firm innovations are determined by the interactions among the knowledge of these various parties, including other firms, universities, public organizations, and the government. With the competitive advantages of MNEs mainly composed of advanced technology and knowledge, it is reasonable to assume that inward FDI constitutes an important part of the new knowledge within a local setting. In particular, FDI can help local firms to gain advanced technology and knowledge important for innovation.

As early as March and Simon (1958), it has been pointed out that knowledge from the external environment is critical to a firm’s ability to innovate. Recent innovation research has also started to focus on the firm’s capability to acquire outside knowledge instead of simply relying on its own internal sources (Cohen and Levinthal, 1990; Fiol, 1996). Therefore, how organizations seek and acquire technology and knowledge from external sources is a fundamental question when studying firm innovations (Fiol, 1996).

Another reason why advanced knowledge from inward FDI may be critical for host country firms relates to the localization of knowledge transfer. Despite the globalization and integration of economies, knowledge still tends to be localized within regions and
countries (Jaffe, Trajtenberg, and Henderson, 1993; Almeida and Kogut, 1999).

Knowledge transfer, especially the transfer of tacit knowledge that is embedded in the organizational context, requires constant interactions among parties (Kogut and Zander, 1992, 1996). When new knowledge and technology are brought into a local economy, it greatly reduces the difficulties in observing and absorbing this knowledge on the part of host country firms. The localized nature of knowledge transfer is yet another reason why inward FDI is a critical knowledge source for host country firms’ innovations.

Policy makers have generally believed that knowledge transfer from inward FDI is of great benefit for local firms, and many countries take great efforts towards attracting inward FDI, putting into place a variety of favorable measures in order to accomplish this. Despite the cost of those policies, FDI inflow is expected to bring much more than just financial capital to host countries. Benefits in technology and innovation spillover to local firms are usually the main reason for this favorable treatment. Governments believe that by attracting FDI inflows, domestic firms will be able to get access to more advanced technology as well as managerial knowledge. As a result, domestic industries can become more competitive and successful. For example, China has established special economic zones to attract FDI. Foreign companies coming to these zones receive benefits such as tax breaks amounting to no taxes for the first two years and less than half of domestic firms’ tax rate for the next three years (Branstetter and Feenstra, 2002). These favorable measures have been adopted by developed countries as well. Great Britain offered incentives equal to $30,000 per employee to attract Samsung and $50,000 per employee to ensure that Siemens invest there as well (Girma, Greenaway and Wakelin, 2001). In addition to tax-related incentives, other favorable treatments include fewer policy
constraints, the establishment of special investment zones, and improvement of domestic infrastructure (Caves, 1996). Economists have considered for some time now why governments are willing to bear the high cost that comes with those favorable policies (Görg and Greenaway, 2004).

In sum, in this section I made the point that the transfer of knowledge across countries is difficult. FDI therefore serves as a means for transferring this otherwise “difficult to transfer” knowledge. A focus on FDI is therefore a fruitful approach in order to understand the transfer of novel knowledge to domestic firms. In the next section, theoretical development on how host countries are likely to benefit from inward FDI is reviewed.

Benefits of FDI Spillover to Host Country Firms

The earliest efforts towards understanding the effects of inward FDI spillovers have come from economists (Caves, 1971). Lately, however, this question has also been gaining more attention in the international business field (Buckley and Lessard, 2005; Love and Driffield, 2007). Caves’ (1974) seminal study on foreign direct investment was one of the first to systematically explain the impact of inward FDI on host country firms. Potential spillover effects from inward FDI was categorized into three main types. These include allocative efficiency, technical efficiency, and technology transfer. Allocative efficiency occurs because of the competition MNEs bring to the host country, making resource allocation more efficient, which in turn improves host country productivity. Technical efficiency refers to the impact on host country firms’
technological efficiency due to the presence of foreign firms. Since MNE subsidiaries possess more advanced technology and knowledge, host country firms are likely to improve their technology efficiency because of the competition from MNE subsidiaries as well as the opportunity to observe these subsidiaries closely. There are, however, factors that can limit the benefits host country firms can gain from the presence of FDI. For example, host country firms’ absorptive capacity can affect host country firms’ ability to fully integrate the knowledge brought in by foreign firms. Absorptive capacity refers to a firm’s ability to recognize the value of new, external information, assimilate it and apply it to commercial ends (Cohen and Levinthal, 1990).

In their review of FDI spillover studies, Gorg and Greenaway (2004) noted that most of the prior theoretical treatments in this regard have been based on the assumption that inward FDI brings advanced knowledge to host countries. The focus has been to explain the channels and mechanisms through which inward FDI can have such an impact on host country firms. More recently, however, some efforts have been made to link the level of spillovers with the heterogeneity of inward FDI. Drawing on the OLI framework forwarded by Dunning (1993) to explain the rationale for FDI, Driffield and Love (2007) showed how the motivation for FDI affects the potential level of spillover. In addition, Spencer’s (2008) theoretical work provided arguments from the perspective of the MNE, emphasizing how the different strategic choices of MNEs can have both positive and negative impact on host country firms. These strategies include the extent to which an MNE uses local suppliers and distributors, hires local managers, exports its products, and customizes its product to the host country environment.

The theoretical argument discussed above does not consider specifically how host
country firms can also actively seek knowledge spillover from inward FDI. Yet, these other benefits also have implications for such knowledge transfer. In the next section, I consider empirical research that has looked at this issue. As will be seen, the findings are very mixed, making it difficult for us to draw conclusions.

**Empirical Evidence on Innovation Spillover Effects of FDI**

I noted earlier that researchers are mostly concerned with the technology spillover effect from inward FDI. The measurement of technology spillover in these studies, however, has been problematic. The majority of these studies used indirect indicators to measure technology spillover, such as productivity improvement. The problem with using productivity change as a proxy for technology spillover is that it can reflect the influence of many other factors in addition to technological efficiency improvement. Measures of productivity often rely on price, so such measures may reflect a firm’s market power rather than technology efficiency alone. As explained by Branstetter (2006: 327) “When technologically more advanced foreign firms first enter a market, their presence may erode the market power of indigenous incumbents while – at the same time – introducing new production techniques and technologies from which these same incumbents learn. Real knowledge spillovers can take place, yet their effects can be masked in the data by changes in appropriability conditions.” Also, productivity is affected by factors other than technology. Institutions and policy can all affect productivity levels (Keller, 2004), as seen in research on productivity change in the US (Abramovitz, 1956). In this respect, more direct measures of knowledge spillover, such as those reflecting domestic firms’ innovation activities are likely to be a better indicator of their technology improvement (Singh, 2007).
While adopting and imitating innovations brought in by foreign firms is a crucial benefit that inward FDI can have on the host country economy, the issue with the greatest long-term impact is whether host country firms improve their own innovative capabilities. For emerging economies, improving local firms’ innovative capabilities has been a major policy concern (Cheung & Lin, 2004). Empirical studies have only recently started to directly examine the relationship between inward FDI and host country firms’ innovations. The few studies that do look at the relationship between inward FDI and host country firm innovations are reviewed in this section.

Buckley, Clegg and Wang’s (2002) study incorporated host country innovation as one of their dependent variables when they conducted research on productivity spillover effects of FDI in China. Using the same set of independent variables, they investigated whether the presence of inflow FDI increases Chinese firms innovation output. They focused on the development of high-technology products and new products as a measure of innovation. The way in which they assessed the spillover effect of FDI was by correlating FDI with the level of host country productivity and innovations. They found that the host country industries with higher levels of FDI presence have more innovations. Because they used the same set of independent variables to predict productivity spillover and innovation spillover effect, however, the study suffers from some of the same limitations as previous productivity spillover studies. As I noted earlier, productivity may not be the best indicator of technology improvement. Another issue is that a single measure of FDI presence can introduce certain types of biases into the analysis, so using multiple measures is preferable (Gorg and Stroble, 2001). Being aware of the limitations posed by these issues, the authors made an effort to address some of them. For example,
they used a multi-dimensional measure of FDI presence, including the ratio of FDI to capital, employment, and investment, instead of simply using a single measure of FDI. The use of a multi-dimensional measure not only provides a more comprehensive picture of FDI presence, it also increases the reliability of the measure. Buckley and his colleagues also tried to distinguish the different levels of technology that are associated with FDI. They used the national origin of FDI to create two categories of FDI -- overseas Chinese and foreign countries. They argued that, compared to FDI from other foreign countries, overseas Chinese investments are more focused on industries associated with labor intensity and more concerned with taking advantage of favorable policies of the Chinese government. For these reasons, there is less likelihood of knowledge spillover from overseas Chinese investments. These researchers also identified different levels of absorptive capacity of domestic firms by using the nature of their ownership (i.e., state owned or not state owned) as an indicator of their ability to benefit from the technology spillover from FDI spillover. Although the research design of this study focused more on the productivity spillover effect, Buckley and his colleagues (2002) still provided some evidence that the presence of FDI leads to more host country firm innovation.

Another more recent study by Liu and Buck (2007) also directly examined the relationship between inward FDI and innovation, using a different type of measure to assess this construct. This study focused on Chinese high technology industries and used new product sales as the measure of innovation. They looked at whether new product sales in the host country industry are positively affected by the research and development (R&D) intensity associated with FDI in that industry. Unexpectedly, they failed to find
significant results supporting a positive spillover effect from inward FDI on host country innovation. However, they did find a positive relationship when an interaction term between local R&D intensity and inward FDI was included. This finding shows that R&D from higher inward FDI alone is not enough to explain the superior innovation performance of host country firms. The positive effect of inward FDI only shows up when host country firms have a higher R&D level. This supports the absorptive capacity argument that host country firms need to develop the capability to understand, acquire and utilize the knowledge that brought in by inward FDI.

Some empirical studies used patent data to study the impact of FDI on the innovation of local firms. Branstetter (2006) used patent citation data to track the knowledge flow from Japanese FDI to US firms. The use of patent data has a number of advantages when studying innovation activities. First, it makes it possible to have a numerical measure for firms’ innovation stock, which is usually difficult to measure in an objective way. Secondly, by examining the patent citation pattern it is possible to directly track the knowledge flow between firms. Branstetter defined knowledge spillover as the transfer of knowledge that generates further innovation. Using such data, he showed that FDI has a positive affect on knowledge spillover to local firms, suggesting that FDI can be an effective channel for knowledge transfer from investing firms to local firms, which in turn may contribute to innovation. Moreover, by using a database based on publicly announced international technological cooperative activities, Branstetter was also able to examine the impact of technology alliances on knowledge spillover and found a positive relationship between number of alliances at the industry level and host country firm innovations. This research suggests that network connections with foreign firms may
have an important influence on domestic firm innovation as these ties can provide a favorable organizational setting for knowledge transfer.

Similarly, Singh’s (2007) study also relied on patent data, with a dataset covering thirty countries from the years 1986 to 1995. Specifically, he examined patent citation patterns between MNE subsidiaries and host country firms to investigate the technology and knowledge flow between inward FDI and host countries. He found that while host counties’ innovations (patents) have benefitted from innovations relating to inflow FDI, it also works in the other direction. That is, when MNEs engage in FDI into a given host country, their new patents will tend to cite more patents from that host country as well. This suggests that MNEs also learn from the knowledge stock of the host country. In other words, incoming MNE subsidiaries also draw from host countries’ technology and knowledge for their innovations. This is particularly true when these are industrialized host countries.

Both the studies by Buckley and his colleagues (2002) and Liu and Buck (2007) used the introduction of new products to measure innovation. They also made efforts to recognize the importance of absorptive capacity by considering the benefits to host country firms from the knowledge brought in by inward FDI. Both studies also recognized that inward FDI can be associated with different levels of technology intensity. Buckley et al. (2002) used origin of FDI as a proxy for the level of knowledge inward FDI is likely to bring in to the host country, while Liu and Buck (2007) measured R&D levels of FDI in the host country. Despite these commendable strengths, these studies were conducted at the industry-level which limits our ability to understand the impact of FDI on the innovation levels of host country firms with varying characteristics. Also, they
did not consider the possible interaction effects between inward FDI and host country firms, which may also influence host country firms’ innovation activities. For this reason, they are unable to account for differences between host country firms’ innovation levels.

As I noted earlier, the studies by Branstetter (2006) and Singh (2007) used patent citation patterns to track the knowledge flows between FDI and host country firms. Patent citation patterns have the advantage of tracking the actual technology related knowledge flows between FDI and host country firms. However, as acknowledged by Singh (2007), patent citation isn’t the actual mechanism of knowledge transfer. Rather, it only correlates with the actual knowledge transferred. Branstetter (2006) made an effort to examine whether R&D alliances between Japan and U.S. firms contribute to knowledge spillover. This also helps us to understand whether direct interactions between host country firms and inward FDI can facilitate knowledge flow. However, there are more aspects of alliances between inward FDI and host country firms that need to be examined in order to fully address the question of how knowledge spillover occurs. An R&D alliance isn’t the only strategic alliance form that can promote knowledge spillover between host country firms and inward FDI. Also, the efficiency of knowledge spillover through strategic alliances can vary greatly with different partner relationships, including, for example, whether partners are competitors or supplier-client.

This emerging body of research suggests the need for further work on the impact of FDI on host country firms’ innovation. Empirical probes have largely focused on the existence and level of positive spillover from inward FDI. Conducted at the macro level, empirical studies have adopted industry or national level measures of FDI presence to account for the level of possible interactions between inward FDI and host country firms.
The macro-level studies do provide a big picture of the FDI spillover effect. On the other hand, they overlook firm level heterogeneity regarding knowledge transfer between inward FDI and host country firms. For this reason, current studies are insufficient for explaining the firm level conditions that lead to different level of knowledge transfer between inward FDI and host country firms. For example, within an industry, some host country firms have a closer relationship with inward FDI, and are in a better position to observe and learn from inward FDI. The innovation activities of these indigenous firms are more likely to benefit from inward FDI. Therefore, to further explore the factors and conditions that lead to greater spillover, a focus on inter-firm relationships is needed. In addition, drawing on international business literature that has made contributions to the understanding of knowledge transfer across borders will certainly deepen our understanding on what conditions and factors help host firms to benefit more or less from the presence of inward FDI.

Another area that hasn’t been fully addressed in the current literature is the distinction between different types of innovations. Innovation has been generally treated a monolithic concept; however, some innovations have a greater impact on firm performance and strategy than others. Researchers have long been concerned with the different levels of newness with respect to innovations (Kotabe and Swan, 1995). Terms like “breakthrough innovation” and “radical innovation” have been used to express how some innovations have greater impact than others on firm performance (Phene, Fladmoe-Lindquist, and Marsh; 2006). As discussed earlier, exploratory and exploitative innovations differ on their levels of newness to firms. Exploitative innovation is mostly built on firms’ current knowledge stock, while exploratory innovation requires firms to
search out and/or develop new knowledge. Taking into account the distinction between exploratory and exploitative innovation will likely benefit our understanding of this issue. Firms’ capabilities for achieving both exploratory and exploitative innovation are of critical importance for their ability to compete effectively (He and Wong, 2004). There has been little effort, however, to identify the factors and conditions that facilitate different types of innovations (Gupta et al., 2006).

In the following section, I will review literature that helps to address these issues. Since this study focuses on firms’ innovation activities, it is worthwhile to take a look at the general innovation literature that emphasizes the importance of knowledge acquisition through network connections and strategic alliance. As I noted earlier, research on innovation has long recognized the importance of external knowledge sources for innovation (Freeman, 1991). In the international business literature, prior research on international strategic alliances has also made unique contributions to knowledge flows between firms.

**Networks and Innovation**

Knowledge transfer between firms is not an automatic process. Organizational research has long discussed the difficulty of knowledge transfer even within the firm (Ruggles, 1998). An example of this difficulty is the failure of General Motors in transferring a successful division’s knowledge to other divisions (Kerwin and Woodruff, 1992). Difficulty of knowledge transfer largely comes from the attributes of knowledge. For example, effective knowledge transfer calls for different organizational control
mechanisms, which need to be matched to the nature of attributes characterizing the knowledge (Turner and Makhija, 2006). Research on knowledge transfer has also been influenced by the public good nature of knowledge. Without knowing what exactly the knowledge is, it is hard for a buyer to determine the real value. Once the detailed content of knowledge of technology is known, it will unnecessary for the buyer to pay for it any more. This has been also discussed in the transaction cost economics literature, that the public good nature of knowledge induces opportunism from transaction parties and causes market failure for knowledge. In the knowledge based view of the firm, the ability to transfer and develop of tacit knowledge within the firm has been used to explain the advantage of a firm over market transactions.

As I noted earlier in this chapter, innovation is largely determined by new knowledge search, development and/or acquisition. The ability to innovate at the organizational level is further governed by collections of organizational routines and search strategies (Cyert and March, 1963; Nelson and Winter, 1987; Hannan and Freeman 1984). Early research has been focused on the internal determinants of innovation within the organization, such as firm size and slack resources (Cohen and Levinthal, 1989; Damanpour, 1991). However, in more recent years, researchers are taking into account the fact that technology is changing at a faster pace than ever in a growing number of industries. It is becoming rare that one single firm has all the knowledge and resources necessary to effectively pursue innovation by itself (Ahuja, 2000). For this reason, increasingly researchers argue that network should be treated as the locus of innovation instead of single firms in industries with complex knowledge and dispersed expertise (Powell, Koput and Smith-Doerr, 1996). This changes the focus of innovation research from the
firm’s internal characteristics to firms’ interactions with other firms in their external environment, as well as the effectiveness with which firms are able to acquire new knowledge through network connections and strategic alliances (Freeman, 1991). Merging knowledge from different sources has been identified as the essential driver of firm innovations (Galunic and Rodan, 1998). In particular, the network to which the firm belongs has often been perceived as a preferred means through which firms acquire external knowledge. This may in fact be reflected in the trend of fast growing of inter-firm relationship (Freeman, 1991).

The MNE as an organizational form has the advantage of being able to generate knowledge internally and transfer it across national contexts more efficiently in comparison to external market transactions. However, a network, which consists of relationships between the firm and other organizations such as suppliers, buyers, rivals, governmental entities, may improve on these advantages, since the MNE is a single organizational entity. The network lies in the middle of the firm and the market as a hybrid form of organization (Almeida et al., 2002). Importantly, the relationships characterizing the network allow the firm to tap into additional pools of knowledge associated with these other organizations. In addition to providing the firm with many more sources of knowledge than would be available to it otherwise, it also facilitates access to this knowledge. A network offers many advantages for knowledge transfer, including the development of long term relationships, the ability to build trust, and the sharing of common organizational language. In this sense, networks are preferred to markets for knowledge transfer, both from the perspectives of transaction costs and the knowledge based view. Moreover, networks also offer other important advantages that
firms alone do not possess. Network connections enable firms to explore more opportunities, which would be financially infeasible if all were pursued within a single firm. This advantage is critical for firms’ competitive advantages. Accessing more external knowledge and other resources allow firms to generate more innovations, especially radical ones.

Studies have explored the impact of different network attributes on firm innovation. Indeed, various aspects of networks have been found contribute to firm innovations. The importance of external networks on innovation has been shown as early as Freeman’s (1991) review of networks at the industry level. The number of a firm’s network ties has been found to have a positive effect on its innovation rate (Smith-Doerr et al. 1999). In the biochemical industry, startups with more network connections were found to be more likely to innovate (Shan, Walker, and Kogut, 1994). In the same study, Shan and his colleagues also found that ties bridging structural holes in the firm’s knowledge or competence set contribute to startup’s innovations. Ahuja’s (2000) study examined the influence of both direct and indirect network connections on a firm’s innovation output measured by the patents granted to the firm. He found that the number of ties has a positive effect on innovation performance, while the effect of indirect ties is moderated by number of direct ties. Using a sample of startup firms in the Canadian biotechnology industry, Baum, Calabrese, and Silverman (2000) provided substantial evidence that the size of a firm’s alliance network at founding positively influences its initial performance including rates of patenting, R&D spending, and revenue growth. Networks consisting of firms with advanced technological skills and competence provide the focal firms with opportunities to learn more advanced technological know-how, which will positively
influence their innovation activities (as indicated by patents and R&D expenses). Bell (2005) examined the influence of network centrality on innovation based on data collected among mutual fund companies in Canada. He found that managerial networks consisting of informal ties among firm executives were associated with firm innovativeness, but he did not find the same effect for institutional networks consisting of formal ties among firms. The author reasoned that in this industry, formal ties were likely only used for transmitting well-known information, and such communication was not deep enough for innovation.

In sum, prior literature has shown that network ties can influence firms’ innovativeness through knowledge transfer. Using a network lens is more beneficial than other approaches discussed in earlier sections since it allows us to take a more detailed look at the mechanisms through which knowledge transfer occurs. In particular, this approach relies on the notion that relationships between organizations are based on levels of ongoing interaction, and this is how tacit and complex knowledge is transferred. For this reason, a network approach will provide a better lens through which to examine firms’ access to knowledge than other approaches used in the literature.

Strategic Alliances and Knowledge Transfer

Another substantial body of work in international business concerned with knowledge transfer between inward FDI and host country firms can be found in the international strategic alliances literature. This stream of work shares some common arguments with the network literature. While network analysis is usually concerned with the value of
firms’ network positions and their portfolio of network connections, strategic alliance research focuses more on dyadic relationships between firms. Strategic alliances are formed in line with various strategic motivations. Gaining access to partners’ knowledge base and learning from partners are among the most important functions that strategic alliances serve (Inkpen, 1995). It has long been recognized that strategic alliances provide learning opportunities for firms (Hamel and Doz, 1989; Makhija and Ganesh, 1997), in which partner relationships allow access to partners’ knowledge and resources (Stuart, 2000). Hamel (1991) also stressed the role of organizational learning as a goal for firms establishing international joint ventures. Partners’ learning intention, transparency, and receptivity all contribute to the effectiveness of knowledge transfer through strategic alliances (Hamel, 1991).

Mowery, Oxley and Silverman (1996) used patent citation data to test whether knowledge transfer occurred through strategic alliances, as determined by partners’ learning intent and absorptive capacity. Their empirical evidence showed that although strategic alliances do promote knowledge transfer between partners, knowledge transfer through international strategic alliances is more difficult to achieve. They also found that partners’ absorptive capacity affects the effectiveness of knowledge transfer. The efficiency of strategic alliances as an organizational institution for transferring knowledge across borders has also been compared to other institutional forms, including the MNE and market-based transactions. It has been found that an international strategic alliance is a more effective form for knowledge building for firms comparing to market mechanisms (Almeida, Song, and Grant, 2002). Lyles and Salk (1996) focused on organizational characteristics, organizational structure, and contextual factors to examine
what really leads to effective knowledge transfer. Using survey data on international joint ventures (IJVs) located in Hungary, they found that various organizational mechanisms helped in the transferring of knowledge from the foreign partners to the IJVs. These mechanisms include adaptation mechanisms and structural mechanisms. Other more in-depth case studies have also demonstrated that through various organizational processes, firms are able to transfer tacit and complex knowledge through strategic alliances (Inkpen and Crossan, 1995; Doz, 1996; Inkpen, 2008).

From this review of the network and strategic alliances literature dealing with innovation and knowledge transfer, I can see again that studying firm network connections is very important in order to better understand the processes by which firms get access to and acquire knowledge from outside sources. To further examine how FDI affects host country firms, it will be fruitful to look into the specific network connections that link FDI with host country firms.

**Exploration and Exploitation**

Innovations generally are critical for firms’ strategic competence; however, not all innovations have the same type of impact on firm performance. The notion of exploration and exploitation was first introduced in the organizational learning setting in March’s (1991) seminal paper. Since then, exploration and exploitation have become one of the central themes relating to firm innovation (Kogut and Zander, 1996; Kogut, 2000). The notions of exploration and exploitation have been applied to various firm activities related to innovation, particularly the search for knowledge (Katila and Ahuja, 2000).
As discussed by Benner and Tushman (2003: 243), “exploratory innovations are radical innovations and are designed to meet the needs of emerging customers or markets.” Innovations associated with exploitation, on the other hand, are incremental innovations that mainly build on what firm already knows and meet the needs of current customers or markets (Danneels, 2002). Among these two, managers pay particular attention to exploratory innovation. For firms, exploratory innovation brings radical changes to firm’s capabilities (Danneels, 2002). It also helps firms to add new competence, which is crucial under this ever changing environment (McGrath, 2001). Additionally, exploratory innovation has the possibility of destroying firms’ current competency since it may take time and attention away from what the firm does well already, but at the same time, it provides opportunities for firms to gain new or additional competitive advantages.

For industries, exploratory innovations bring new products and generate variety in firm offerings to the market (Miles, Snow and Sharfman, 1993). From an evolutionary perspective, variety in an industry matters, as it helps firms to differentiate themselves from their competition, create new customers and generate higher economic rents for the industry. For this reason, creating variety is of critical importance to both managers and policy makers, and the focus of strategic decision making processes since it influences firm and industry success (Miles et al., 1993). Although various studies emphasize the importance of their different impact on firm and industry performance, few studies have tried to understand what factors and conditions lead to exploratory and exploitative innovations (Jasen, et al., 2006). While the distinction of exploratory and exploitative innovation is critical for understanding firms’ innovation activities, it is also important for
studying knowledge spillover from inward FDI. I argue that exploratory and exploitative innovation is generated from different types of knowledge. Exploratory innovation requires information of new market, customers’ new demand and knowledge different from a firm’s current knowledge base. Those are likely obtained from inward FDI by host country firms.

It is clear that exploratory innovation is more important in firms’ capability sets, but it is also more difficult to accomplish. For this reason, it is important to understand the mechanisms through which firms gain the ability to engage in exploratory innovation. Although the literature has acknowledged the distinction between exploratory and exploitative innovation, very little empirical work has focused on exploratory innovation, tending instead to lump the two together. In light of the crucial differences between the two, it is important to focus particularly on exploratory innovation as it is the more difficult of the two

**Summary**

In this chapter, I reviewed previous studies that focused on the direct relationships between inward FDI and host country innovations. Empirical evidence has shown that inward FDI does contribute to host country firms’ innovations (Buckley et al., 2002). Nevertheless, there is still much that needs to be added to this growing body of work. In particular, there is very limited understanding of how inward FDI affects domestic firms’ ability to innovate. This study aims to draw from a vast literature in international business and organizational studies that are concerned with the knowledge flow between
firms, and the processes leading to exploratory and exploitative innovations. In particular, this study will focus on firms’ exploratory innovations since it is the more difficult and relevant type of innovation capability. In addition, the study will use a network approach to gain the appropriate level of analysis in understanding knowledge transfer. I discuss in greater detail below.

In following previous efforts on this topic, this study intends to make contributions in two major ways: The first way in which it will contribute is by using a more appropriate level of analysis. As noted earlier, previous research on this issue has mostly focused on the industry or regional level. In particular, the measure of FDI presence has typically been at the industry level. Industry level studies provide important insights, but using a firm level of analysis will certainly bring some important understanding to this topic. As I had discussed above, innovation is a process that involves knowledge acquisition and recombination. Access to knowledge and the ability to utilize that knowledge and generate innovation varies greatly from firm to firm. Knowledge flow among firms within the industry is likely to be uneven. All these may greatly affect the innovation activities of any given firm, making it difficult to address using an industry level analysis. Scholars have also been calling for research on the specific spillover mechanisms (Caves, 1999; Meyer, 2004) Using a network approach presents an effective way to analyze the knowledge flows between inward FDI and host country firms. As noted by Podolny (2001), networks form the pipe and prisms of an industry. As such, the number of network ties possessed by a firm, the type of its network partners, and the strength of these network connections, all have direct impact on the type of knowledge to which a firm has access, thereby directly impacting the firm’s
innovation activities. Thus, focusing on the relationship between inward FDI and host country firms can help us to better understand the channel for FDI spillover.

A second way in which this research will contribute to the literature is by considering innovation in greater detail than before. Current empirical literature has not taken into account the distinction between exploratory and exploitative innovations. As discussed earlier, exploration and exploitation has attracted attention from researchers in fields including international business and strategic management. It is a fundamental issue that firms engaging in organizational learning and knowledge seeking have to consider. Studies have linked exploration and exploitation with strategic alliances (Koza and Lewin, 1998), but have not yet considered how these alliances affect firms’ exploration and exploitation innovations. This study can address this issue by linking firms’ network connections with their exploration and exploitation innovations.

As a potential source of novel knowledge to host country firms, knowledge spillover of inward FDI is likely to have different impact on host country firms’ exploratory and exploitative innovations. Novel knowledge and technology facilitates exploratory innovation as they help develop distinctly new products and services. The innovation process is often considered as combining new and old knowledge. Inward FDI may be more relevant to exploratory innovation as it brings in new knowledge to local firms. Without distinguishing between exploratory innovation and exploitative innovation, I may be misled to conclude that inward FDI facilitates innovation in general when the majority of a firm’s innovations are exploitative. The same level of innovation could have different compositions in terms of exploratory versus exploitative innovation. Combining exploratory and exploitative innovation instead of treating them distinctly will likely
reduce the impact of inward FDI.
CHAPTER 3

THEORETICAL MODEL AND HYPOTHESES

In this chapter, I lay out a theoretical framework and develop hypotheses on how different aspects of networks between host country firms and inward FDI are likely to affect host country firms’ innovations. The theoretical framework is comprised of the following arguments.

The first argument stems from the notion widely adopted in FDI knowledge spillover studies that inward FDI brings novel knowledge to host countries. Following this previous FDI research, this study is also built on the argument that inward FDI brings novel knowledge to host countries. The type of knowledge a firm has access to can affect whether the firm engages in exploratory or exploitative innovations. Advanced and novel knowledge is especially critical to firm’s exploratory innovations. Understanding the nature of knowledge that inward FDI brings to host countries makes the distinction between exploratory and exploitative innovation relevant. For host country firms, if I simply consider overall innovation as the benefit from the presence of inward FDI, which includes both exploratory and exploitative innovations, it is likely that I observe same innovation level for different levels of FDI network connections. However, overall innovation cannot reflect the true level of knowledge host country firms acquire from their FDI network connections. I would therefore be unable to assess whether network connections with FIE make a difference on the nature of firm innovation activities.

Second, as suggested by the organizational learning literature, firm innovation, and
exploratory innovation in particular, is affected by the firm’s access to new knowledge. The innovation process is composed of firms seeking new knowledge, and combining new and current knowledge to solve problems. As I will argue, a firm’s network directly influences its knowledge seeking, transferring, and combining capabilities. Furthermore, a firm’s tendency to engage in exploratory and exploitative innovation is largely determined by the kind of knowledge to which it has access and is able to integrate through its networks (Laursen and Salter, 2006; McEvily and Zaheer, 1999). In particular, it is expected that a firm with access to more novel knowledge is more able to focus on exploratory innovation. In light of this, it is important to determine the type of network connections between host country firms and inward FDI that will more likely facilitate exploratory innovations.

Below, I first define exploratory and exploitative innovation. I then discuss the relationship between knowledge from inward FDI and host country exploratory innovation. Following this discussion, hypotheses are developed using a network approach to explain the conditions under which inward FDI is likely to have more of an impact on host country firm innovations.

**Exploratory and Exploitative Innovations**

Since Schumpeter (1968), innovation has been widely perceived as a process by which an organization combines knowledge of different kinds to solve problems. The difficulty of innovation lies in the fact that the problem is often not well structured, which means that the available information does not provide a solution to the problem. Firms
thus need to search for new information and knowledge, and through recombination of this new knowledge with its existing knowledge, identify a solution (Dosi, 1988). This description of innovation process has been widely accepted by later researchers. Kogut and Zander described the innovation process as “new combinations of existing knowledge and incremental learning” (Kogut and Zander, 1992: 392). Innovation is a problem solving process and requires integration and combination of diverse complementary knowledge (Obstfeld, 2005).

Hargadon and Sutton (1997) developed an innovation process model in which the innovation process is characterized as consisting of activities relating to knowledge accessing, acquisition, storage and retrieval. In this process, firms need to first seek knowledge that they do not possess. They will then access and acquire this new knowledge in order to combine it with their current knowledge, ultimately helping them to achieve innovation. This process requires the transfer of novel knowledge for it to be used for exploratory innovation. As defined by Argote and Ingram (1999), knowledge transfer is the process through which one unit is affected by the experience of another. As noted earlier in the chapter reviewing the literature, the effect of knowledge transfer on innovation has been studied extensively in the stream of work relating to the relationship between networks and innovation. The efficiency with which firms are able to get access to and transfer diverse knowledge directly impacts their ability to innovate.

The processes associated with innovation are closely related to those relating to organizational learning. There appears to be, however, very little consensus on the definition of organizational learning. Researchers have noted that there are two dimensions of organizational learning, cognitive and behavioral (Fiol and Lyles, 1985).
Firms achieve organizational learning through gaining new insights and knowledge, and these new insights and knowledge are reflected at the organizational level, including new organizational structures and systems.

March’s (1991) introduction of exploration and exploitation to the organization learning process provides insight to searching and seeking of knowledge both within and outside the firm. Exploration and exploitation have been recognized as one of the central themes regarding organizational learning and the innovation process. Both are essential to firms’ short-term survival and long-term competitiveness and have been the underlying focus of organizational research in various areas. March (1991) originally described exploration and exploitation as:

“Exploration includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation. Exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, execution” (March, 1991: 71).

A review by Gupta, Smith, and Shalley (2006) of studies focusing on exploration and exploitation discusses different views of exploration and exploitation. Some researchers considered whether activities involve any learning and innovation at all to distinguish between exploration and exploitation. They view exploitation as a simple replication process which involves virtually no learning or innovation (Vermeulen and Barkema, 2001). Exploitation has also been conceptualized as only a knowledge application process (Almeida et al., 2002). In other cases, incremental learning or
acquiring knowledge close to what firms currently possess has been labeled as local exploration instead of exploitation (Rosenkopf and Nerkar, 2001).

Another stream of work argues that the difference between exploration and exploitation lies in the extent to which new knowledge is similar to firms’ current knowledge stock (Gupta, Smith and Shalley, 2006), but that both involve learning and innovation to some degree or another. In He and Wong’s (2004) study, exploitative innovations are activities based more on current products and markets, involving the improving and refining of these existing products, whereas exploratory innovations are those targeting new products and markets. A similar view that exploitation involves learning and innovation can also be found in research on process management (Benner and Tushman, 2002) and decisions surrounding the location of a chain’s new acquisitions (Baum, Li, and Usher, 2000). This interpretation of exploitative innovation is likely to be closer to what March (1991) intended in his description of exploitation, which is that exploitation can still involve some incremental creation of new knowledge, even though it is mostly based on what the firm already knows. Gupta, et al., (2006) also argued that exploitation and exploration both involve innovation. The distinction between the two is more of a difference on the type or degree of innovation rather than whether it is innovative or not. Following their argument, as well as that of He and Wong (2004), this study adopts the view that exploration and exploitation can both involve innovation and learning. Consistent with this prior work, in this research I define exploitative innovation of firms as activities that help firms to improve on current products or markets, and exploratory innovation as those activities that help firms introduce a new product or entering a new market. The improvement of current products or markets is considered to
be exploitative innovation since such activities mostly build on firms’ current knowledge, extrapolating it in new but limited directions. The introduction of a new product or entering a completely new market requires much more novel knowledge than that embedded in existing products or markets. It is therefore considered to be exploratory innovation.

Exploration and exploitation innovations serve different functions for firms and can greatly impact both the short term and long term firm performance. From an evolutionary perspective (Winter and Nelson, 1986), exploration generates greater variations in firm outcomes. With an ever changing environment and its unpredictability, the variation generated by exploration provides firms with long-term survival and new opportunities for growth. At the same time, however, exploration has much greater risks associated with it than exploitation. Exploration is a search into unknown areas for firms. Firms usually are not able to make their decisions based only on their current experiences and knowledge, so returns from exploratory innovations are associated with greater uncertainty, and therefore, with greater variation than exploitative activities. That is, a “wrong” direction of explorative activities can result in a huge failure for firms.

Since exploitative innovation is largely based on what firms already know and utilizes firms’ current experiences and existing knowledge, it provides much more certain returns to the firm. Exploitation replicates and capitalizes on what firms already do well. It generates a stable return that is critical to firms’ short-term survival. However, it is likely that exploitation will not provide firms with long-term growth, especially when facing a changing environment. In addition, it will not help produce the novel ideas firms need to dramatically improve their capabilities. Nevertheless, exploitation plays an
important role in the repertoire of firm capabilities because it allows them short term successes that provide financial viability. Exploitation may also reinforce firm’s current capabilities, which better prepares the firm for exploration.

There has been extensive research on the importance of engaging in both exploration and exploitation strategies. Theoretical discussions can be found in March (1991, 1995) and March and Levinthal (1993). Empirical evidence has shown that a balance between exploration and exploitation innovation helps firms achieve their strategic goals (O’Reilly and Tushman 2004; Benner and Tushman, 2003) and has positive effects on firms’ sales growth for manufacturing firms (He and Wong, 2004). Using a sample of robotics manufacturers, Katila and Ahuja (2002) found that engaging in both exploratory and exploitative search enables firms to form a dynamic path to improve their absorptive capacity.

Empirical studies have generally found that a mix of balanced exploitation and exploration innovations has a positive impact on firms’ performance and capability building. Therefore, striking the balance between exploration and exploitation innovation is both beneficial and critical for firms. With exploration and exploitation being such central strategic choices for firms, not many studies have tried to explain what factors may influence firms’ exploration and exploitation innovations (Gupta et al., 2006). However, one study that has provided theoretical arguments regarding the factors that, during the course of organizational learning, contribute to firms’ exploration and exploitation is Levinthal and March (1993). As these authors note, achieving balance between exploration and exploitation is a difficult task since exploitative and exploratory innovations involve very different organizational processes that nonetheless create
significant demand for organizational resources. They compete for firms’ financial and human resources, as well as managerial attention. Exploration in particular poses a challenge for firms. Exploration is impeded by the myopia of learning, and the strong self-reinforcement associated with exploitation. While firms are enjoying good returns from focusing on exploitative innovation; it is likely their core competence becomes a core rigidity (Leonard-Barton, 1994). By requiring organizations to reach out of their current experiences and knowledge base to search for new possibilities, exploration involves very different capabilities than those associated with exploitation. As a result, they may get into a competency trap, and may be unable to adapt when the external environment changes significantly.

A few empirical studies have also tried to identify factors that contribute to firms’ exploration and exploitation. Beckman (2006) found that founding team members’ previous experiences and affiliations influence firms’ exploration and exploitation levels. It has also been shown that firms manage their strategic alliances in ways that help them to balance exploration and exploitation. A study by Jansen, Van Den Bosch and Volberda (2006) focused on factors like organizational coordination mechanisms and the external environment. They found that organizational centralization prevents firms from exploratory innovation while organizational formalization increases firm exploitative innovation. Koza and Lewin (1998) pioneered the attempt to directly link strategic alliances with firm exploration and exploitation. They argued that different types of strategic alliances can be viewed as exploration or exploitation for firms. The nature of the strategic alliance formed is a response to the external environment. This notion was later further ested in Lavie and Rosenkopf (2006). They found that software companies
do balance exploration and exploitation when they form strategic alliances. By choosing strategic alliances partners with different attributes and network positions, firms are able to balance exploration and exploitation in the long run. In Rothaermel and Deeds’ (2004) work, they found that firms’ strategic alliances portfolio is linked with their exploration and exploitation innovation processes. At the exploration stage of an innovation (i.e., the development stage of a new product), firms seek more exploration-oriented strategic alliances, and for the exploitation stage of an innovation, firms have more exploitation alliances.

From these studies, it can be seen that understanding a firm’s exploration and exploitation closely links to understanding its strategic alliances and network connections. Network ties and strategic alliances have long been recognized as main organizational forms for organizational learning. Whether firms are able to engage in exploratory and exploitative innovations is greatly determined by their access to new knowledge and their current knowledge stock. Previous studies have associated strategic alliances with exploration and exploitation based on the value chain function they serve. For example, if firms participate in a joint R&D project, it is more likely that firms are able to create or acquire new knowledge and engage in exploration. When firms find a partner to market its current product, then it is more likely an exploitation relationship (Koza and Lewin, 1998). Studies also emphasize the attributes of partners (Stuart, 2000). Different partners have their own unique knowledge sets. Some partner firms possess more advanced and novel knowledge than the focal firm, so strategic alliance with these partners are likely benefit firms’ exploration innovation activities (Lavie and Rosenkope; 2006).
Network connections with inward FDI

As noted above, different network partners can provide different types of knowledge. As discussed earlier, MNEs set up subsidiaries in host countries to take advantage of their own proprietary assets, which reflect knowledge otherwise not available in the host country. Relative to host country firms, then, inward FDI brings novel knowledge to host countries. Such knowledge presents new possibilities for host country firms. Even when some FDI may only be for the purpose of leveraging MNEs’ current knowledge (i.e., reflecting exploitation from the perspective of the MNE), that knowledge can still be new to host country firms. Therefore, by internalizing such knowledge, host country firms gain access to novel knowledge and are more likely to engage in exploratory innovation. Thus, the access to novel knowledge gained by host country firms’ network connections with inward FDI should lead to more exploratory innovations.

In addition to the argument that inward FDI is associated with knowledge that facilitates host country firms’ exploratory innovations, I also draw upon relevant social network theory literature and strategic management literature on innovations and networks to understand the aspects of network connections likely to affect whether host country firms are able to benefit from novel knowledge of inward FDI. In particular, two theoretical frameworks—Burt’s (1992, 2000) structural holes argument and Coleman’s social capital perspective—are often used to explain the value of networks for transferring knowledge between firms. Despite their different approaches, both theories suggest that network ties are important to firms as they provide firms with access to valuable information,
knowledge, and resources.

Accordingly to Burt’s (1992, 2000) structural holes argument, firms benefit from having network connections bridging otherwise unlinked parties. Through such “bridging” ties, firms are more likely to get access to new knowledge and diverse ideas. Coleman’s concept of social capital emphasizes the closeness of networks. Specifically, the strength of ties is associated with the level of trust between partners. It is argued that the existence of greater trust will facilitate positive outcomes from the relationship. According to this view, strong ties between firms help to more effectively transfer knowledge because of the intensive nature of interactions, shared values and trust between partners (Walker, Kogut, and Shan, 1997). Coleman (1988) further suggests that social capital is appropriable as the ties may be used for purposes such as information gathering. Accordingly, connections with another firm, such as an alliance partner, may serve as a source of knowledge and resources for variety of goals, including innovation activities.

Because the present study is more concerned with the attributes of ties rather than the position of a firm in the network (Burt, 2001), Coleman’s (1988) perspective of networks is particularly relevant here. Since this study is trying to understand the kinds of network connections that allow host country firms to innovate drawing on the new knowledge brought into the country through inward FDI. In the following sections, I develop arguments that link attributes of ties to the innovation of host country firms, followed by testable hypotheses.
Number of Ties

The number of network connections is an important aspect of a firm’s network that is likely to affect its ability to obtain knowledge needed for innovation from external sources. From the viewpoint of social network structure, the number of network connections reflects a firm’s centrality in its network. Centrality in a network represents how well connected a firm is with other firms (Powell et al., 1996). For host country firms, more network connections with inward FDI means more opportunities to get access to novel knowledge. More information also passes through focal host country firms with more foreign firm network connections.

Using companies in the biotechnological industry, Shan, Walker and Kogut (1994) found that the number of cooperative connections is positively related to innovative outputs such as number of patents. Almeida and Phene (2004) also found that more knowledge linkages with other firms lead to higher innovation level. These findings suggest that with more network ties firms are able to get access to more knowledge sources and are also more likely to be exposed to promising new ventures in a timely manner (Nelson, 1990; Powell et al., 1996). Both of these effects stemming from more network ties will be conducive to the enhancement of innovation endeavors.

From a social structural perspective, firms with more network ties are also more likely to form new connections through their partners. On the other hand, firms with high centrality also tend to attract other prominent partners as they send a signal of their access to other central firms (e.g., Gulati, 1995; Mizruchi, Mariolis, Schwarz, and Mintz,
Therefore, the large number of connections, which represents invaluable social capital for the firm (Ahuja, 2000), has the potential to generate new opportunities and gives these firms further access to novel knowledge and additional resources to reinforce their exploratory innovation activities. Moreover, research has shown that firms with greater number of network ties are more likely to form R&D collaborations through these connections and develop new technical collaboration linkages (Ahuja, 2000; Powell et al., 1996). For these reasons, I expect that host country firms with more network connections with foreign firms are more likely to focus on exploratory innovations. In line with this, I propose the following hypothesis:

**Hypothesis 1:** Host country firms’ network connections with foreign firms are positively associated with their exploratory innovation activities.

**The Effect of Strong versus Weak Ties on Exploration**

In addition to the number of direct network connections that firms have with foreign firms, network theory identifies other network attributes that may help the effective transfer of knowledge. Tie strength is one critical aspect of network connections that has been studied extensively (Hansen, 1999). Both strong and weak ties offer benefits for firms’ innovations.

Strong ties have the advantage of transferring knowledge necessary for innovation activities (Hansen, 1999). Knowledge has been often categorized in two types, information and know-how. Information can be coded and is often easier to transfer
between organizations. Know-how is often tacit knowledge, difficult to articulate and
code and often embedded in an organizational settings, thus transferring know-how
requires much more effort. To innovate, firms need to combine new and current
knowledge. Some tacit organizational knowledge is also critical to firms’ innovation
output. Strong tie refers to those network connections that firms communicate more often,
and work closer together. Firms with strong ties between them develop a common set of
organizational language to help exchange information more efficiently. Strong ties allow
richer, more detailed, complex, and reliable knowledge to be transferred (Granovetter,
1985). Strong network connections provide a better social environment to transfer tacit
and complex know-how knowledge which contributes to exploratory innovation. In the
setting of a large multinational electronics and computer company, it has been found that
strong network connections transfer complex knowledge related to innovation project
more efficiently (Hansen, 1999). Uzzi (1997) also found that with strong close network
connections, non-codified knowledge within apparel industry is able to be shared faster
across firms. Therefore, it is expected that when host country firms possess strong ties
with foreign firms, they are more likely to focus on exploratory innovation.

On the other hand, Granovetter (1973) has also noted that weak ties play an
important role in the transfer of knowledge as well. Weak ties help organizations to get
access to a broader range of information by creating access to a more diverse set of
partners. At the same time, weak ties do not restrain firms from considering alternative
points of view; they allow the firm to be exposed to new knowledge outside their strong
ties (Granovetter, 1973). It is important to note, however, that Granovetter’s study
examined the role of social networks on job search, which did not require access of
complex knowledge, unlike innovation. In addition, the strength of weak ties lies in the fact that maintaining them requires little cost. This issue may also not be paramount in a firm’s quest for developing exploratory innovation related capabilities. For these reasons, I offer the following hypothesis:

_Hypothesis 2: Strong foreign firm network connections will have a more positive effect on firms’ exploratory innovation activities than weak foreign firm network connections._

The Effect of Vertical versus Horizontal Network Ties on Exploration

As defined in previous research, vertical network connections “occur when firms cooperate across different levels of (the) value-added chain” and horizontal network connections occur when they are “across the same level” (Kotabe and Swan, 1995: 624). Both types of network connections with foreign investment enterprises provide opportunities for knowledge transfer between partners. Previous research has noted that supply-client relationships help suppliers develop technology more efficiently (Chung, Mitchell & Yeung, 2003; Dyer & Hatch, 2006). Laursen and Salter (2006) have also emphasized the role of vertical relationships (i.e., serving as suppliers) in helping firms gain access to advanced knowledge. For host country firms, being a supplier of more efficient and technologically advanced foreign companies suggests that they have to meet the higher standards demanded by them. Based on the U.S. auto industry, Dyer and Hatch
(2006) showed that foreign firms often engage in substantial effort to share their knowledge with host country suppliers. Similarly, Ethiraj et al. (2005) also found that working with the same client repeatedly and establishing closer relationships helped firms to develop their capabilities. Foreign firms have incentives to help improve their host country suppliers’ technological capabilities, since their performance is partly determined by the quality and performance of these suppliers. Host country firms can also benefit from being suppliers of foreign investment enterprises through learning the latest information about other foreign markets. Another type of vertical network connections is when host country firms develop relationships with foreign firms through purchasing technology intensive capital goods from them. This helps host country firms to acquire new process technology. Improvement of process technology makes new product innovation possible.

These benefits are greatly enhanced by the presence of foreign firms in host countries. Due to the geographical proximity afforded by their investments in the host country, host country firms have the opportunity to work closely with their foreign clients or suppliers. Technology and knowledge transfer is therefore likely to be more efficient. Information and knowledge acquired through those relationships is likely to contribute to host country firms’ exploratory innovations.

On the other hand, horizontal network connections are also often formed between host country firms and foreign investment enterprises that are in the same industry. Partners involved in horizontal network relationships are more likely to view each other as potential rivals. The relationship between these firms is likely to become a learning race (Khanna, Gulati and Nohria, 1998; Baum, Calabrese and Silverman, 2000). To
prevent host country firms from becoming stronger competitors, foreign investment enterprises have incentives to guard their technology and knowledge from their host country partners. While knowledge transfer to host country firms still occurs, this can greatly reduce its efficiency. Thus, for host country firms, vertical network ties with foreign investment enterprises are more likely to contribute to their exploratory innovations comparing horizontal network ties. Therefore, I hypothesize:

*Hypothesis 3: Vertical foreign firm network connections will be more positively associated with domestic firms’ exploratory innovation activities than will be horizontal foreign firm network connections.*

**Technology Cooperation Network Ties versus Other Network Ties**

Technology cooperation network ties here refer to those network connections involve technology cooperation between host country firms and foreign firms. Technology cooperation relationships can involve the joint development of new products, R&D cooperation or the direct transferring of technology. These network ties have been the primary focus of previous strategic alliances studies (Hamel, 1991; Mowrey et al., 1996). It has been found that firms with more technology linkages have better innovation performance (Almeida and Phene, 2004). Hagedoorn and Schakenraad (1994) showed that entering into technology alliances has a positive effect on firms’ innovation rates. Knowledge-generating technology alliances have also been identified as exploration alliances by researchers (Koza and Lewin, 1998; Rothaermel, 2001; Levie and Rosenkopf,
For host country firms, whether they form network relationships to develop new technology or to gain access to foreign firms’ already existing technologies, there is an extensive process taking place to share and exchange their knowledge. This type of network ties has the advantage over many other network connections in transferring knowledge between firms. In this case, host country firms are in a much better position for gaining access to foreign firms’ advanced knowledge stock. Moreover, host country firms also have the opportunity to observe foreign firms’ routines for conducting research and developing new innovations. Both types of knowledge are critical for a firm’s innovation activities.

While host country firms should be able to gather information and knowledge through all kinds of activities with foreign investment enterprises, technology cooperation aims to share partners’ technology knowledge or develop new technology together. Therefore, network connections that focus on technology cooperation will likely bring much more information and knowledge necessary for exploratory innovation to host country firms.

*Hypothesis 4: The positive impact of technology foreign firm network connections on domestic firm’s level of exploratory innovation activities will be stronger than those of other foreign firm network connections.*
Moderating Effect of Government Related Network Connections

Another type of network connections that can contribute to host country firms’ innovation activities is their government related network ties. Here I define government related ties as those network ties between host country firms and the local government, as well as firms owned by state. Exploratory innovation is a process full of uncertainty and its impact on firm’s performance is shown in the long run. Government related network ties can offer resources that help firms to fully utilize the novel knowledge they acquired from their ties with foreign investment enterprises.

Host country firms are likely to benefit from government related ties in a variety of ways. First, government related ties can offer stability to host country firms in a turbulent market. Firms often enjoy long term contracts with the government, which bring them stable income (Anand and Singh, 1997) and the necessary resources to invest in their exploratory innovations. Government related ties can also provide various support services for host country firms. After attracting FDI through favorable policies, the host country government often makes an effort to encourage host country firms to learn from foreign firms. In this regard, a closer relationship with the government helps host country firms to take advantage of the support services offered by local government, including training programs and market research (Baum and Oliver, 1992). Government ties also help host country firms to learn about the related policies and take advantage of those policy benefits. As discussed earlier, connections with foreign firms are expected to be positively related to exploratory innovation. Exploratory innovation requires a lot of resources including both financial and human capital. Government related ties help the
focal host country firm to access to these critical resources. This will allow host country firms to improve their absorptive capacity to acquire knowledge from their foreign investment enterprise ties, and better capitalize on that knowledge.

From an economist's point of view, strong ties to government may be initiated because firms want protection from competition. If their ties to government are successful in creating protected markets for themselves, this could also mean that strong ties would be correlated with less innovation, not more. However, direct protection from competition may not be the only benefit from the government. Ties with the government also can provide access to government resources and preferential treatment in terms of policies and enforcement. Such benefits can be considered to be part of firm resources and capabilities, which help the firm to create more slack resources, necessary for innovation (Makhija, 2003, 2004). Thus, they can have more flexibility under uncertainty, which helps them to be more innovative.

In sum, I offer the following hypothesis:

*Hypothesis 5: Domestic firms’ government related network connections enhance the positive relationship between their foreign firm network connections and their focus on exploratory innovation.*

**Network Portfolio**

The composition of a firm’s network connections influences the firm’s access to a diverse set of necessary knowledge for innovation. Previous studies have suggested that
firm’s network portfolio matters for firm’s knowledge transfer (Baker, 1990; Uzzi, 1997). By having network connections with different types of firms, the focal firm is able to get access to diverse information and knowledge. In the current study, this diversity is represented by different types of ownership of firms. Foreign firms, as discussed earlier, may serve as sources of new and advanced technology and knowledge, they can also provide up to date information on foreign markets. These are all likely to contribute to host country firms’ exploratory innovations.

Other domestic firms can also provide the focal host country firm with valuable information. In contrast to foreign investment enterprises, domestic partners mainly operate in the host country. They possess information and knowledge that is similar to that already possessed by the focal host country firm. They have a deeper understanding of the tastes of the local market; and know the most promising technology trajectory for the economic environment in the host country. This kind of knowledge and information overlaps with what the focal firm knows already. Nevertheless, it still can make critical contributions to firm innovations, especially exploitative innovation. That information and knowledge reinforces what the focal firm already knows. It can reduce the error during learning experience, and make improving and refining firm’s technology possible (Levinthal and March, 1993). Knowledge acquired through network connections with other domestic firms is likely to contribute to the focal firm’s exploitative innovations. Combine these arguments together, a diversified network portfolio helps host country firms to improve on their overall innovation performance including both exploratory and exploitative innovations. Hence, I argue:
Hypothesis 6: *Domestic firms with a more diversified network connections portfolio are more likely to have higher overall innovation performance.*

In this chapter, different theories have been brought together to draw a picture of how inward FDI is likely to impact host country firms’ exploratory innovations. Hypotheses are developed concerning both the general positive effect that network connections with foreign firms have on firms’ exploratory innovations, as well as the more specific effects of different types of network connections with FIEs in this regard. In the next chapter, I will show how an empirical test of the hypotheses developed in this chapter is carried out using data from China.
CHAPTER 4

METHODS

In this chapter, the empirical context in which the hypotheses are tested will be introduced. I provide details on the data used in this study, which were collected through a survey of domestic private firms conducted in Zhejiang province in China. I also outline in detail the data collection process. I then explain how variables in the model are measured.

The empirical setting for the study is China. Emerging economies such as that of China provide unique empirical settings for studies in international business. An emerging economy is considered to be one that is undergoing ongoing economic development, particularly in terms of its formal institutions, including laws, regulations and policies relating to private enterprise. Khanna and Palepu (2000) have noted that emerging economies are characterized by “institutional voids,” suggesting that they lack critical institutions that cause incomplete or inadequate markets for labor, raw materials or intermediate products. The presence of institutional voids in their environment causes firms to seek other means for gaining access to these resources. In this regard, firms’ networks play a critical role in filling in the institution voids. Although networks play a key role for firms’ access to resources and information in any context, scholars have argued that networks play an even more important role for domestic firms in emerging economies (Peng and Heath, 1996). Firms that are affiliations of business
groups in emerging economy have better performance since they have the advantage of gaining access to financial and technology resources through their network connections and mitigating transaction costs (Khanna and Palepu, 2000). Nonetheless, empirical studies on the effect of networks on innovations have been mostly set in developed country settings, and they have found positive result for the network effect on firm innovations. Since networks are thought to serve an even more important role in emerging economies, it is important to initiate an empirical examination of their effect in such a context.

Rationale for China as the Setting for this Research

There are several reasons why China provides a perfect setting for a study on the network effects of inward FDI on local economy. First, after its open door policy since the late 1970s, China has steadily become one of the largest recipients of FDI in the world. This is relevant since the impact of inward FDI on domestic firms is the central concern of this study. Second, with the fast growing MNE presence in the local economy, China’s domestic private sector has enjoyed rapid growth and silently become the most dominant economic force in China. Firms in the private sector in China have also been perceived as being more vibrant and innovative than public sector enterprises (Buckley et al, 2002). Third, the economic reforms in China are well covered in the academic world. With its institutional change and the emergence of the domestic private sector, a study in this setting has the potential to address issues of relevance to institutional and organizational theories. With China’s continuing transformation towards a market-based
economy and the importance of networks in this process, it is interesting from both a theoretical and empirical perspective to investigate how newly established private firms strategically respond to this unique combination of challenges. Because FDI and foreign firms also play an important role in this complicated process, an empirical test in such a setting, which is abundantly characterized by foreign firms, domestic private firms and state-owned enterprises, can contribute to the fields of both international business and strategic management.

Since late 1990s, China’s continuous economic growth has been catching researchers’ attention. On its way to a true economic force globally, the factors contributing to China’s great success in economic growth has drawn wide interest from scholars (Buckley, 2006). Despite its importance in the global economy and a growing body of research on China, there are still important and interesting areas that have not yet been covered, including issues relating to China’s domestic private sector. Domestic private firms have been growing rapidly in recent years and have taken over as the most important sector in terms of employment in contrast to state owned enterprises (SOE) in China. Compared to their important role in the economy, research on the subject of domestic private firms has been lacking, particularly with regard to how they make strategic decisions under the unique economic and political environment of China. Li’s (2006) recent review of studies on China’s domestic private enterprise (DPE) also calls for more research on the influence of multinational enterprises (MNEs) on China’s domestic firms. The current study aims to address this gap by examining the relationship between China’s domestic firm and foreign firms, and also contribute to the literature on impact of FDI on host economy.
The relationship between China’s domestic firms and foreign firms is further complicated by policy and regulatory issues. Being the fastest growing sector in China’s economy, the domestic firms have not enjoyed the same political and financial treatments that SOEs have had in the transition process (Ralston et al., 2006). Even foreign firms have the benefits of tax breaks and special developing zones. This perspective can be seen in the argument that China’s inflow FDI is attracted by inefficiency in China’s economy rather than a more market-oriented and efficient economy (Huang, 2003). However, the question still remains whether or not, even in the face of such inefficiency, FDI benefits the Chinese local economy. Although acknowledging the role of FDI in providing capital, Huang noted that, if not for the inefficiency of the institutional environment, the same business opportunities exploited by FDI could also have been perfectly exploited by China’s domestic entrepreneurs. The problem relating to inefficiency is that it is not capital that is lacking, but rather, the inefficient way in which the capital is distributed over the whole economy. SOEs receive capital without being competitive, while entrepreneurs with capabilities lack support from the state-owned banking system. Therefore, the natural argument stemming from Huang’s observation is that the motivation for engaging in FDI does ultimately have an affect on host country firms. Simply bringing in capital without new technology or advanced managerial skills is unlikely to generate positive spillovers to other domestic private firms. On the other hand, it has been argued that the government improves the regulatory environment to attract FDI and keep it in place. Since domestic private firms also seek more favorable regulations, they are able to enjoy some of the improvements in the general regulatory environment towards the private sector. The recent World Bank survey offers some
empirical evidence to this argument (Hale and Long, 2006).

Instead of just looking at the spillover effect from a productivity perspective, the current study differs from a traditional economics approach by examining how local firms’ innovation is affected by the presence of MNEs, and how FDI affects the ability of domestic firms to develop capabilities, especially with respect to their adoption of different innovation strategies. This may be a more important question than one simply pertaining to productivity spillover due to the presence of FDI, since productivity improvement is not necessarily equal to sustainable long-term competitiveness. The role of FDI in causing domestic firms to put more emphasis on technology development and pursue a more competitive innovation strategy is a much more important long-term impact that FDI can have on the host country economy. The technology performance of a nation is thought to be critical to a nation’s international competitiveness (Porter, 1990). In this era of global competition, it has been argued that technology entrepreneurship has provided the vital assets for global competition for the United States (Gilder 1988). While emerging economies are currently enjoying rapid development in manufacturing capacity, most of them are still lagging behind in terms of technology. Governments of emerging economies have already realized that in order to maintain a high economic growth rate, science and technology are key. As Chinese President Hu Jintao stated, “Science and technology are an important basic source of economic and social development, as well as a leading force for future development” (Yoshida and Wolff, 2005). In the year of 2001, China’s R&D expenses already reached $84 billion, behind only United States and Japan.
Development of human resources also provides a positive environment for technology development in China. According to OECD (Organization for Economic Co-operation and Development), China currently has the second largest number of researchers in the world, in this case only behind the United States and ahead of Japan (Yoshida and Wolff, 2005). Even with such positive macro-environment factors, conducting R&D and innovation is still difficult for private firms in China. Compared to Western countries, government plays a much more important role in technology development in China. The Chinese government accounts for most of the investment in R&D, while domestic firms face very limited financial and human resources. The lack of resources can be attributed to the disadvantages of newly established firms in any economy, often referred to as the liability of newness (Stinchcombe 1965). In the case of China, this can be attributed to the uniquely emerging economic and political order. China has been a successful example of operating a market based economy while maintaining its communist political order. Nonetheless, private firms tend to be more flexible in adapting to newly emerging conditions than state-owned enterprises, despite their limited resources.

Another direct result of China’s unique institutional environment is that private firms are operating without well defined property rights. The fast growing private sector has shown that this has not posed a serious problem for private firms so far, however, and when it comes to the innovation process, it is not certain whether lack of secure property rights will slow down the process (Kogut and Zander 2000). With the domestic private sector achieving significant economic status, it is just a matter of time that it will grow to be a much more important part of China’s technology development and national
competitiveness. Even so, exploratory innovation will likely be harder to achieve and possibly more important for domestic firms. China is the largest transitional economy in the world. Its institutional environment is still going through rapid changes, and its market growing at record speed. This changing and uncertain environment makes exploration innovation especially critical for China’s domestic firms, making China a highly relevant context for examining this research question.

**Data Collection**

This study is based on data collected through a survey conducted in Zhejiang, China. Zhejiang province is located on the east coast of China, bordering Shanghai on the southwest and Jiangsu province on the south. The area including Zhejiang, Jiangsu and Shanghai is called the Yangzi River Delta area. It is currently the most developed economic area in China. With about 10% of the total population in China, the Yangzi River Delta area accounts for approximately 25% of national GDP. Zhejiang itself is also one of the top provinces in China with respect to economic growth. Its total GDP and GDP per capita both ranked 4th among China’s 31 provinces in 2006 (China Statistics Bureau, 2007). Zhejiang province is also famous for its government support of the domestic private sector of its economy (Huang, 2003). The private sector accounted for over 70% of Zhejiang’s annual GDP in the year of 2006, in contrast to the much lower levels typical in the rest of China. The province achieved its economic success through both attracting FDI inflow and the development of its own private sector. The success of domestic firms and the significant presence of FDI in the region provide an ideal setting.
for this study.

The data for the study were collected using a survey methodology. This research project was facilitated by the support of the provincial government of Zhejiang, which was interested in understanding issues relating to the growth and innovation capabilities of domestic private enterprises. The current study uses part of data collected through this project. The whole questionnaire included several parts. The first part asked respondents to provide basic information about the firm, including its age, size, ownership and attributes relating to the general manager. The second part of the questionnaire related to organizational culture and the firm’s strategic focus on innovation, including exploration and exploitation. The third part of the questionnaire asked respondents about the human resource policies and strategy of the firm.

Since respondents spoke Chinese, I required a Chinese version of the questionnaire for data collection. For this reason, the conventional ‘translation back-translation’ method was used to translate the survey instruments from English to Chinese (Brislin, 1980). The translators included two bilingual management researchers and a professional business translator. A pilot study was conducted with 15 senior managers of private firms in Zhejiang before undertaking the final study to ensure that surveys items were meaningful to respondents. Interviews with these managers also helped to determine the validity and relevance of survey items in the Chinese context. Corrections were subsequently made to both the questionnaire and data collection procedures to eliminate ambiguity in the survey items and increase the validity of the data collected. The final version of questionnaire was 9 pages long. In addition, information on the firm’s network connections was collected via interviews. Questionnaire items in both Chinese
and English can be found in Appendix 1.

Since the data collection process involved on-site visits, the data was collected over a 3-month period from the end of 2006 to early 2007. A total of 500 domestic private companies were identified in the location of Zhejiang, spread throughout the whole province. In each area of the province, the firms were categorized into three different performance levels. Performance was measured as firm profit to asset ratio. In each level of performance, the same number of firms was randomly selected. This sampling procedure makes the sample a self-weighted random sample, also known as an Equal Probability of Selection Method (EPSEM) sample, since every domestic private firm has the same probability to be selected. This way, the sample represents different performance levels within the population of firms.

The data collection process was administrated by several research assistants. Graduate students who majored in management from Zhejiang University served as the local research assistants. They were briefed on the purpose of the survey and were made to understand the intent and structure of each item of the entire questionnaire. Detailed instruction on how to conduct the survey was provided and all research assistants were trained to follow the same correct procedures.

To increase the response rate, surveys were presented to general managers of the companies by a personal visit and later were also collected in person by research assistants. The respondents of the surveys were individuals who actively contributed to the strategic decision making of the company, including top-level managers and company presidents.
Our pilot test suggested that respondents might have difficulty completing the section
relating to network connections. This was due to the fact that many of the questions were
open-ended and relied on judgment, in contrast to the more specific nature of other
questions in the survey. Therefore, a separate survey on network connections was
collected through face-to-face interviews at a different time scheduled with the
interviewees. This part of the questionnaire was based on a systematic protocol of
questions.

The returned questionnaires showed that the respondents had an average of 10.8
years of experience with the company, and 52% of the respondents were the founders of
the companies. With on-site visits, any questions or confusion respondents had regarding
surveys items could be answered and cleared. Respondents were assured confidentiality.
When presenting the questionnaire to respondents, the research assistant explained to the
respondents that the individual firm information they provided would not be presented to
government or to other companies. Information would be aggregated with that of other
companies that ensured anonymity of each firm. In addition, firms were not required to
provide their own names or those of their network partners anywhere in the
questionnaire.

On the first visit, research assistants presented the questionnaire to respondents, and
explained the purpose of the survey. Interviewers also told the respondents that they
would pay additional visits to the firm in order to answer questions and collect the
questionnaire in person. Research assistants also asked when the questionnaire would be
likely be completed and based on this, scheduled a second visit with respondents.
On the second visit, research assistant collected the finished questionnaire and completed the firm network connections section through interviews. If the questionnaire had not been completed by that time, research assistants were available to address any questions or concerns the respondent had with the questionnaire. They also explained the items if the respondents were not familiar with the terms. If time permitted, the research assistants helped the respondents complete the questionnaire through interview on site. Otherwise a self-addressed return envelop was provided for the respondent. One round of phone calls was made one week after the second visit to remind those who still hadn’t returned the questionnaire.

This whole procedure, together with the support from the provincial government of Zhejiang, greatly enhanced the return rate of the surveys. Overall, 363 questionnaires were collected, resulting in a high response rate of 72.6%. Because of missing values and the fact that some of the companies did not identify themselves as private owned companies, the final sample included 238 domestic private firms. The sample covered firms in various industries, from textile clothing to information technology. The age of companies in the sample ranged from 1 to 52 years with the average of about 10 years. The sample also covered a broad range of domestic private firms in different stages of growth.
Variables and Measures

**Dependent variables.**

For Hypotheses 1 to 5, the firm’s exploration related innovation activities is the dependent variable. This dependent variable is measured using He and Wong’s (2004) four-item scale of exploratory innovation. It assesses the importance of exploratory innovations among firm’s innovation activities in the past three years. Questions assessing exploratory innovations focused on whether those innovations are serving new market and new customers, and how those innovations are different from firms’ current knowledge base. Questions asked respondents to rate the importance of certain innovation activities on a scale of 1 to 5, with 1 being “not important” and 5 “very important”. These innovation activities included the following: (a) introduce new generation of products, (b) extend product range, (c) open up new markets, and (d) enter new technology fields. These items are in accordance with the seven items developed by Jasen et al (2006) specifically for the financial service industry. They also reflect the general agreement in the literature over the definition of exploratory innovation (Abernathy and Clark 1985, Benner and Tushman 2003; Lewin et al. 1999; March 1991, Uzzi and Lancaster 2003).

Another dependent variable relates to Hypothesis 6, and is concerned with is the overall innovation performance of domestic firms. This is measured by the number of total new products, services and processes introduced in last three years added together. Separate questions were used to ask for the number of products, services and processes.
Independent variables.

For the independent variables relating to the characteristics of the network connections domestic firms had with network partners, an adapted ego network survey was used. An ego network survey, which is often used in social network research, is a name generating survey asking the respondents to list their social network ties in several categories (Burt, 2001). As mentioned earlier, interviews were used to complete the part of the questionnaire relating to network connections. The interviewees were asked to list the firms with which they had network relationships. Only those network connections the respondents perceived to have a significant impact on their own firm's performance and future growth were asked to be listed. These firms were put into five different categories including clients, suppliers, partners in the same industry, partners in other industries, and governmental entities. Detailed information about the firm’s network partners and the nature of the network connections was collected, including the ownership of their partners, and the area they worked together with their network connected firms, whether it was marketing, R&D, production, technology cooperation or any other areas. Respondents also indicated the closeness of the relationship between the firm and each identified network connected firm on a scale of 1 to 5, with 1 being not at all close and 5 being very close. In contrast to a traditional ego network survey, this survey did not require firms to list the names of their connection firms. Firms’ network connections are especially sensitive information in China. Managers are extremely reluctant to disclose this type of information even when they are assured confidentiality. Therefore, to achieve a reasonable response rate and valid data, managers were not required to report the names of their network partners. Even so, this approach has
considerable advantages over some of the previous network studies conducted in China (Luo, 2003; Li and Atuahene-Gima, 2002). In those studies, managers were only asked to report the level of closeness they had with each firm category; for example, whether they had generally close relationships with SOEs, with foreign firm enterprises, and so on. Information on individual network connections is generally not available. In contrast to these previous studies, the data from the current survey allow us to examine the effect of each network connection in much greater detail.

**Number of foreign firm network ties.** Hypothesis 1 examines the effect of total foreign firm network ties on exploratory innovation. Total foreign firm connections of domestic firms were measured by the number of foreign firm network partners possessed by the firm. It is calculated by adding all the foreign firm network ties a domestic firm has in all categories.

**Strong and weak network ties.** Hypothesis 2 compares the effect of strong and weak ties on exploratory innovation. Strong foreign firm ties refer to those network connections that the domestic firm perceived as a very close relationship (4 and 5 score on the survey question). Weak foreign firm network ties are those the domestic firm reported as not so close relationships (1 and 2 score on the survey question).

**Vertical and horizontal network ties.** Hypothesis 3 compares the effect of vertical and horizontal network ties on exploratory innovation. Vertical foreign firm ties are defined as network ties with foreign firms that have relationships up and down the value chain. It is calculated by adding the number of foreign firm network partners with which the domestic firm is engaged in a supply and client relationship. Horizontal foreign firm ties refer to when the domestic firm is in the same industry as its foreign firm network
partner.

**Technology and other types of network ties.** Hypothesis 4 compares the effect of technology and other types of network ties on exploratory innovation. Foreign firm network connections of domestic firms involving technology cooperation was measured as a count variable. Specifically, if the connections the domestic firms had with foreign firms involved a joint R&D effort, technical information sharing or any other type of technology cooperation, it will be counted as a technological cooperation network ties for the domestic private enterprise.

**Government ties.** Hypothesis 5 examined the moderating effect of government ties on exploratory innovation. Government related network connections of domestic firms were measured as the number of ties it has with the government or state owned enterprises. I included state-owned enterprises as part of government related ties because government ownership signifies government involvement and control in these firms, consistent with corporate governance theories used in IB, strategy and finance (Makhija, 2003). There is therefore necessarily a tight linkage between the government and state-owned enterprises, even if the latter are separate from the ‘formal’ government.

**Network diversity.** This variable intends to capture whether there are different types of network partners in the network of the firm. Different types of network partners are assessed by network partners’ form of ownership. In the discussion regarding China’s context, I had noted that firms with different forms of ownership also tend to possess different types of resources. To measure network portfolio diversity, a measure of portfolio heterogeneity was constructed by taking into account the proportion of firms in each ownership category in the firm’s network portfolio (Perry-Smith, 2006). This
measure has also been used in previous network studies (Perry-Smith, 2006):

\[
Diversity = (1 - \sum p_i^3)
\]

where \( p \) is the percentage of network ties of different types (foreign investment enterprises, domestic private enterprises, state owned enterprises, and host country government), and \( i \) is the number of different types represented.

**Control Variables**

**Environment uncertainty.** It has also been shown that firm innovativeness depends on environmental characteristics (Zahra, 1996; Zahra and Bogner, 1999), particularly environmental uncertainty. Industry uncertainty is not only a major attribute of industry conditions, it has particular salience for innovation. Researchers have noted that environmental uncertainty causes existing strategies and resources to become obsolete, and greater competitive threats from firms with superior capabilities to handle newly emerging conditions (Makhija, 2003; Zahra, and Bogner, 1999). For this reason, under turbulence firms must engage in innovation to continually renew their capability set. Other ways of controlling for industry, such as through industry dummies, may capture aspects of the industry that are as relevant in this regard and may also use up too many degrees of freedom.

To control for industry uncertainty, seven items were drawn from Miller (1987). These items reflect how firms perceive the level of turbulence in their industry. Managers were asked to rate the speed with which strategy, product and technology changed in their
principal industry, the predictability of their competitors’ strategic moves, and the availability of raw material and financial capital. A similar questionnaire has been used in Li and Atuahene-Gima’s (2002) study on China’s high technology ventures’ adoption of agency strategy.

**Firm size.** Since the ability of the firm to innovate is affected by its inventory of resources, including slack resources, this needed to be controlled for. Previous innovation research has found that firm size as an important indicator of innovation. Since firm size is often used to proxy such resources, I included a control variable for firm size, measured by the total number of employees of the firm.

**R&D intensity.** The *a priori* ability of firms to engage in research reflects their absorptive capacity for internalizing novel knowledge emanating from other firms. I address this issue by controlling for the firm’s R&D intensity, measured by the percentage of R&D employees among total employees of the firm.

**Firm age.** I had noted earlier that younger firms suffer from the liability of newness, with less time to develop the capabilities for internalizing new and novel knowledge from other sources. On the other hand, younger firms are less bureaucratic as well, and have greater flexibility in obtaining knowledge. In light of both effects, it is important to control for firm age. Firm age is measured in the number of years during which the firm has been in existence.
Analytical Method

In sum, in this chapter I discussed the context for testing the hypotheses of the study, which is the emerging economy of China. I also noted the manner in which the data were collected, which included questionnaires and interviews. In the next chapter, I will discuss the findings of the study in relation to the six hypotheses.
CHAPTER 5
RESULTS

Table 1 shows the descriptive statistics and correlations of all variables included in the dissertation. As might be expected, there is significant correlation between the different types of ties within the firm’s network. This is because the more ties that a firm has in its network, it is more likely to have ties of different types. The high correlations, however, may create problems of multicollinearity in the analysis. For this reason, I have chosen to test the effect of these independent variables in separate equations.

Insert Table 1

Table 2 presents results for hypotheses 1-4. Following the recommendation of Cohen, Cohen, West, and Aiken (2003), the independent variables were mean-centered to reduce multicollinearity prior to the creation of the interaction terms in Model 4 in Table 2. To further examine multicollinearity, variance inflation factors (VIF) were computed for each regression equation. The maximum VIF value obtained from the models was 1.4, well below the rule-of-thumb cut-off criterion of 10 (Neter, Wasserman, & Kutner, 1990). In Table 2, the baseline models (Model 1, 3) included only the control variables.
Although this was not an issue for testing hypothesis 1, the testing of hypotheses 2-4 (which involved strong ties versus weak ties, vertical ties versus horizontal ties, and technology ties versus nontechnology ties) required the consideration of only the firms with at least one FDI connection in the analyses. This was because having FDI ties is necessary for each type of comparison, resulting in a smaller sample of 204 firms.

Insert Table 2

The baseline models in Table 2 include Models 1 and 3. I only found one control variable to be significant, and that was environmental uncertainty. The coefficient for environmental uncertainty is positive and significant at .05 in both models. The significance levels for this variable increases to .01 in the models in which explanatory variables are included. These findings indicate that higher levels of environmental uncertainty are associated with higher levels of exploratory innovation, as one would expect. Controlling for this environmental condition is therefore important when considering this type of innovation, since the more turbulent the environment, the more need to renew one’s capability set.

Other control variables, including firm age, firm size and R&D intensity, did not show significance in the baseline or other models. In the case of firm age, it may be the case that the sample does not exhibit adequate variance since the firms in the sample are relatively young (due to the emerging nature of the Chinese economy). Firm size may not have shown significance due to the possibility that the effect of this variable may not be linear, as suggested in the literature. Finally, R&D intensity may be highly correlated
with other explanatory variables, reducing its statistical role in the equation.

**Findings for Hypothesis 1: Effect of Overall Ties on Exploratory Innovation**

Hypothesis 1 suggested that the more ties that a firm has to foreign firms, the more likely it would be to engage in exploratory innovation. I argued that this would be the case because the greater number of ties represents more opportunity for novel knowledge transfer. The results for this hypothesis are presented in Table 2. Model 2 shows that the coefficient is positive and highly significant ($\beta = .28, \ p < 0.01$). This indicates that there is a positive effect of the total number of host country firms’ foreign firm network connections on a firm’s exploratory innovation activities, in line with our expectations, thus, Hypothesis 1 is supported.

**Findings for Hypothesis 2: Effect of Strong versus Weak Ties on Exploratory Innovation**

Hypothesis 2 predicted that strong foreign firm network connections will have a more positive effect on firms’ exploratory innovation activities compared to weak foreign firm network connections. This argument was based on the notion that strong ties are more effective for transferring complex and tacit knowledge, which is a necessary element for exploratory innovation. As shown in Model 4, the coefficient for strong ties is positive and significant ($\beta = .20, \ p < 0.01$) while the coefficient for weak ties is positive but not significant ($\beta = .07, \ p > 0.10$). Therefore, Hypothesis 2 is supported. The findings indicate that the number of strong foreign firm ties is more important to host country firms’ exploratory innovation activities than weak foreign firm ties.
Findings for Hypothesis 3: Effect of Vertical versus Horizontal Ties on Exploratory Innovation

Hypothesis 3 noted that vertical ties would be more important than horizontal ties for exploratory innovation. I had argued that this would be the case because foreign firms have more motivation to transfer complex and tacit knowledge to its supplier firms than to firms that had horizontal ties, since most of such firms would be rivals. The results in Model 5 suggest that more vertical ties do result in increased exploratory innovation activities, even though this effect is not particularly strong. The coefficient for vertical foreign firm ties is positive and marginally significant ($\beta = .12, p < 0.10$). Although the coefficient for horizontal ties is not significant ($\beta = .11, p > 0.10$), its magnitude is similar to the effect of vertical connections, therefore, no strong support was found for Hypothesis 3.

Findings for Hypothesis 4: Effect of Technology versus Other Types of Ties on Exploratory Innovation

Hypothesis 4 proposed that the positive relationship between technology foreign firm network ties and host country firm’s exploratory innovation activities will be stronger than that of non-technology ties. Results in Model 6 show that the coefficient for technology ties is positive and significant ($\beta = .17, p < .05$) while the coefficient for nontechnology ties is not significant ($\beta = .11, p > .10$). Thus, Hypothesis 4 is supported.
Findings for Hypothesis 5: Positive Moderating Effect of Government Related Ties on Foreign Firm Ties’ Effect on Exploratory Innovation

Hypothesis 5 noted that government related ties would positively moderate the relationship between total number of foreign firm connections and the firm’s exploratory innovation activities. I predicted a stronger relationship between foreign firm network connections and exploratory innovation activities for firms with more SOE and government network ties since government related ties help the firm to obtain more governmental support and resources (i.e., loans and preferential policies) that can help it to take risks and engage in more difficult forms of innovation. Table 3 shows the moderating effect of host country firms’ SOEs and government network connections on the relationship between the total number of foreign firm connections and exploratory innovation activities. As shown in Model 4, the interaction between the total number of foreign firm ties and SOE and government ties is positive and significant ($\beta = .16, p < 0.05$). Thus, Hypothesis 5 is supported.

Insert Table 3

To see how the interaction between government and foreign firm ties works, I plotted the interaction effect, using one standard deviation below and above the mean values of the total number of foreign firm connections and government-related ties (Aiken and West, 1991). The plot of the interaction effect is shown in Figure 1. As can be seen, the direction of the pattern is consistent with Hypothesis 5. That is, the relationship between foreign firm ties and host country firms’ exploratory innovation
activities is stronger for firms with more SOE and government ties. This is consistent with my argument relating to Hypothesis 5. Post hoc analyses were further conducted to examine possible moderating effects involving strong ties, technology ties, and vertical ties. None of the results were statistically significant.

Findings for Hypothesis 6: Effect of Network Portfolio Diversity on Overall Innovation Performance

Hypothesis 6 predicted that host country firms with a more diversified network connections portfolio are more likely to have higher innovation performance. Table 4 presents results of the negative binomial regression analyses to test Hypothesis 6, which considers overall innovation performance. As indicated before, innovation performance was operationalized as the total number of new products, services and processes introduced in the past three years, which is a count variable. It may be problematic to use OLS regression in relation to count data since doing so can violate assumptions of normal distribution of the underlying data, and instead exhibit heteroskedasticity of residuals. For this reason, a Poisson model usually is used to appropriately estimate a model incorporating count variables (Cohen et al., 2003). Indeed, an examination of the data showed that the variance of innovation performance exceeded the mean (mean = 29.59, s.d.=71.53), which suggests overdispersion of the data. A likelihood-ratio test of the dispersion parameter $\alpha = 0$ also provided evidence for overdispersion ($p < .001$). Therefore, to estimate count variables with overdispersion, the negative binomial model,
which is a generalization of the Poisson model, was preferable to Poisson regression (Gardner, Mulvey, & Shaw, 1995; Cohen et al., 2003).

As shown in Model 11 (Table 4) based on negative binomial regression, the coefficient for network diversity is positive and significant ($b = 1.00, p < .10$). Unlike OLS regression, $R^2$, an index of overall fit, is not provided but instead, log-likelihood is given to calculate deviance in negative binomial regression. Deviance (i.e., $-2 \log$-likelihood) is a measure of lack of fit (Cohen et al., 2003). In other words, as model fit gets better, the value of deviance will decrease because deviance indicates “badness of fit”. If a model with predictors fits better than a model with only control variables, the model deviance should decrease after hypothesized predictors are introduced. As shown in Table 3, the baseline mode with control variables only (Model 10) had a deviance of 1942.84. After adding the predictor, diversity, in the successive model (Model 11), the deviance value was reduced to 1939.52, indicating an improvement in model fit. The likelihood ratio test based on deviance was used to compare the two models and the result was marginally significant at the .10 level. Therefore, Hypothesis 6 is supported.

Insert Table 4

In this chapter, empirical test results of 6 hypotheses are presented. All hypotheses gain strong support except hypothesis 3. I find that the overall number of foreign firm network ties do have a positive effect on a domestic firm’s exploratory innovation. Also among those ties, strong ties and technology cooperation ties contribute more to the domestic firm’s exploratory innovation. Domestic firm’s government related ties also
moderate foreign firm ties’ effect on exploratory innovations positively. Results also show that a more diversified network portfolio contributes to a firm’s overall innovation performance. These findings provide evidence of the important role played by firms’ network ties on its ability to obtain knowledge and resources for the purposes of exploratory innovation, and the particular role of foreign firm ties in providing novel knowledge in this regard. In the next chapter, I will further discuss these results.
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**Note:** N=238. Logarithm. *p < .10, **p < .05, ***p < .01.
<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
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Antecedents

Total FDI ties .28**
Government-related ties
( GOV )
Strong ties .20**
Weak ties .07
Vertical ties .12†
Horizontal ties .11
Technology ties .17*
Non-technology ties .11

F 1.87 5.37** 2.53* 2.88** 2.66* 2.25*
R² .03 .10 .05 .08 .08 .08
ΔR² .07** .03* .03† .03*

N=238 for Models 1-2 and N = 204 for Models 3-6.
Note. Standardized regression coefficients are reported. †p<.10, *p<.05, **p<.01.

Table 2 Results of Hierarchical Regression Analyses for Exploratory Innovation Activities
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<td>R&amp;D</td>
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Antecedents
- Total FDI ties: .27**
- Government-related ties (GOV):
  - Strong ties
  - Weak ties
  - Vertical ties
  - Horizontal ties
  - Technology ties
  - Non-technology ties

Interaction effects
- FDI total ties*GOV: .16*

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<td>F</td>
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<td>ΔR²</td>
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Note. Standardized regression coefficients are reported. †p<.10, *p<.05, **p<.01.

Table 3 Results of Interaction Analysis of Moderating Effect of Government-related Ties
### Table 4 Results of Negative Binomial Regression Analyses for Innovation Performance

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<td>Firm size</td>
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<tr>
<td>R&amp;D</td>
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<td>Total FDI ties</td>
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Antecedent Diversity 1.00 (.53)†

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<th>(\chi^2)</th>
<th>(\chi^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log-likelihood</td>
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<td>-969.76</td>
</tr>
<tr>
<td>Deviance</td>
<td>1942.84</td>
<td>1939.52</td>
</tr>
<tr>
<td>2 x Δlog-likelihood</td>
<td>3.32†</td>
<td>3.32†</td>
</tr>
</tbody>
</table>

N=238. Note. Standard errors are in parentheses.
†p<.10, *p<.05, **p<.01.
Figure 1 The Moderating Effect of Government-related Ties
CHAPTER 6
DISCUSSION OF THE RESULTS

This research examined the relationship between a firm’s network ties with foreign firms and its ability to engage in exploratory innovation. In order to do this, I generated 6 hypotheses that related to different aspects of a firm’s network ties, based on innovation and network theories. The hypotheses were tested using a sample of 238 Chinese firms in the private sector. I used regression and negative binomial regression analyses to test these hypotheses, which were largely supported. In this chapter, I will discuss the findings in greater depth.

Hypothesis 1 argued that the more foreign firm network ties possessed by a firm, the more these ties will help it to engage in exploratory innovation. This argument rests on the notion that novel knowledge from foreign firms is critical to firms’ exploratory innovations. Since this hypothesis was supported, it suggests that it is helpful to firms to have foreign firm network ties when seeking new and advanced knowledge to engage in exploratory innovations. This finding is consistent with other research that has found that the number of network partners is critical for firms’ innovation. For example, Tsai (2001) found this to be the case at the business unit level. Shan et. al. (1994) also found for start ups, more network partners lead to more innovations. However, the present study adds to the literature by highlighting the effect of network ties for innovation in the international setting. No prior study has shown the role of foreign direct investment in
Two studies, Chung and Mitchell (2001) and Almeida and Phene (2004), have shown that foreign firms gain knowledge through network connections with local partners, but not the other way around. Hypothesis 2 focused on how strong foreign firm network ties have more influence on firms’ exploratory innovations compared to weak network ties. I had argued that this is because strong network ties have advantages in transferring tacit and complex knowledge that is critical to firm exploratory innovation. In contrast to this study, Reagan and McEvily (2003) find only weak support for strong network ties in the sharing of knowledge in the hotel industry, and argue that network cohesion (i.e., the closeness of relationships within the overall network) is a more important factor in this regard. McEvily and Zaheer (1999) also do not find strong ties to be important for exploration, and instead argue that it is important for firms to be embedded in networks that have ‘structural holes,’ which is characterized more abundantly by weak ties and, thus, more sources of knowledge. On the other hand, our findings in relation to hypothesis 2 is consistent with Capaldo (2007) and Hansen (1999), who both also emphasize the ability of strong ties to transfer difficult forms of knowledge. Capaldo (2007), however, based his argument on a case study in the furniture design industry in Italy, the uniqueness of which may limit our ability to generalize these findings to other types of industries. Similarly, Hansen (1999) examined the transfer of knowledge among business units within a large firm in his study, rather than among different firms. The findings of the present study take these arguments further, since it examines interfirm ties of different types, including those relating to foreign firms and governmental entities.
Hypothesis 3 argued that vertical network ties possessed by a firm have a stronger effect than its horizontal network ties on the firm’s exploratory innovation, but our analysis did not support this argument. I had argued that this would be the case because foreign firms would be more likely to share their most important knowledge with supplier firms, since their own success was closely tied to this relationship and suppliers did not pose competitive threats. In contrast to this argument, Spencer (2008) and Kotabe and Swan (1995) have both argued that horizontal ties are more important in this regard. This is due to the fact that such ties are characterized by similar knowledge bases, and therefore, it is easier to transfer knowledge among the firms (Kotabe and Swan, 1995), or that such ties have the support of governments in the international context, due to their relevance for competitiveness (Spencer, 2008). Clearly, our findings suggest the need for a more fine-tuned analysis of horizontal versus vertical ties in future research. Perhaps the lack of significance for this hypothesis stems from the fact that the focus is on exploration and not exploitation-related innovation. Knowledge transfer from vertical relationships may be more pertinent to exploitative innovation than to exploratory innovation. That is, foreign firms may transfer limited knowledge to their supplier firms, pertaining only to processes rather than markets. Since the supplier typically manufactures only component parts of the overall product, the knowledge transferred by the foreign firm likewise pertains only to a part of the product. Such limited knowledge transfer may not be conducive to exploratory innovation.

Hypothesis 4 argued that technology-related ties would be more important for firms’ exploratory innovation activities than other types of ties. The support found for this hypothesis is consistent with those of Hagedoorn (1993). Our study goes further,
however, since Hagedoorn (1993) only focused on the number of technology-related strategic alliances possessed by a firm, and did not compare different kinds of ties. Mowery Oxley and Silverman (1996) focused on the knowledge transfer between firms in this regard. They found that more ties caused firms to develop similar knowledge bases. My study goes further than this one in that I show how knowledge transfer of different kinds affect the firms’ innovation capabilities.

Hypothesis 5 takes into account the role of government ties in affecting firms’ exploratory innovation. The support for this hypothesis shows the relevance of government in influencing firms’ ability to engage in innovation. The role of government is particularly important in the international context, and often differs across countries. For this reason, it is important to take it into consideration. Previous studies have also considered the role of government in this regard. Li and Atuahene-Gima (2001), show that government support of firms’ innovation strategy has weak positive influence on their performance in the high-technology sector in Beijing. Makhija (2003) also notes that government ties in transitional and highly uncertain economies help firms to gain needed flexibility and enhance their long-term performance. The present study extends these arguments, however, by considering the role of government ties in the context of networks, and more specifically in relation to their role in promoting exploratory innovation. This study also extends our understanding of Chinese private firms, showing that maintaining network ties with government can be costly (Li and Atuahene-Gima, 2001),
Hypothesis 6 considers the diversity of the firm’s overall network portfolio in
influencing its innovation performance in general. Here again, I found support for the
argument that different types of network ties help a firm to gain different types of
knowledge, and this enhances its ability to be innovative. Baum, Calabrese and
Silverman (2000) also use a similar rationale when examining the innovation
performance of start-up firms in the Canadian biotechnology sector. They find that a
diversity of network ties is positively related to the number of patents these start-up firms
have. By the same token, Beckman, Haunschild and Phillips (2004) find that a diversity
of network ties helps large firms in service and manufacturing settings to engage in both
exploration and exploitation activities. The findings of the present study are consistent
with those of these two other studies.

As can be seen, some of the findings of this study are consistent with those of other
studies, while other findings are new to the network and innovation literature. Most
research on networks has been conducted in developed country contexts. In contrast,
this study is set in a developing context, allowing us to gain insight into the unique
characteristics of networks relating to firms in such a setting. For example, the
government plays an important role in emerging contexts, and this study has been able to
highlight this role.

This study is also one of the very few that has taken into account foreign firms.
However, even these studies have only considered the point of view of the foreign firm;
that is, they are concerned with how different types of knowledge is transferred to the
foreign firm. No prior study has considered knowledge transfer to the domestic firm by
using a network perspective. This study fills this gap, by examining the effect of foreign firm network ties on Chinese firms.

Although many previous studies have been concerned with the effect of knowledge transfer on firms’ innovation, very few have differentiated between exploratory and exploitative innovation. This is understandable, as such data are difficult to obtain. This difficulty of obtaining appropriate data makes the findings of this study even more important and further distinguishes the study from others.

In the next chapter, I will review the contributions of the study and consider its limitations. I will also suggest additional directions for future research.
CHAPTER 7
CONCLUSIONS AND IMPLICATIONS

This study makes contributions to several streams of work in both international business and strategic management, particularly relating to innovation. First, this study provides empirical support for the notion that, in an emerging economy, domestic firms’ exploratory innovations benefit from their network connections with foreign investment enterprises. This adds to the current body of research on the impact of FDI on host country innovations. The empirical support of hypothesis 1 shows that knowledge spillover from inward FDI does benefit host country firms’ exploratory innovations. This study also found certain aspects of network ties are more important for host country firms to benefit from the knowledge brought in by inward FDI. Strong network ties and technology cooperation ties with foreign investment enterprises are found to have more impact on host country firms’ exploratory innovations. These findings are consistent with previous network and innovation research that strong network ties are more effective in transferring knowledge necessary for innovation (Hansen, 1999).

While previous studies on knowledge spillover from FDI mostly focused on the question of “Is there knowledge spillover from inward FDI?” empirical findings here help to address an arguably more intriguing question of “how does knowledge spillover from inward FDI occur?” Previous studies have typically taken an MNE perspective when studying FDI knowledge spillover (Meyer, 2004; Spencer, 2008). This approach may
neglect the role that host country firms can play during this process (Shenkar and Li, 1998), as well as gloss over the differentiated effects on such firms. By studying the composition of host country firms’ networks, it is possible to take in to account what host country firms can do to benefit more from their foreign investment enterprises partners through the way in which they manage their network portfolio.

In this regard, this study makes several contributions to general international business (IB) theory. Much of IB theory is concerned with the multinational firm, and considers strategy only from the perspective of the firm going abroad and entering new markets. In contrast, this study shows how the presence of foreign firms in a host country affects the ability of domestic firms to engage in competition. In particular, it shows how foreign firms can change the capability set of domestic firms for competing. By focusing on exploratory innovation, a very difficult type of capability for firms to develop, it highlights the role of foreign direct investment in fostering economic development. This aspect of foreign direct investment theory has remained underdeveloped in the IB literature.

The IB literature to date has considered the role of networks only in terms of the MNE network of subsidiaries across national contexts. There has been very little work on ties with external (non-MNE) entities within the host countries. It has been routinely recognized in the strategy literature, however, that firms have network ties with many external organizations in their environment, including supplier firms, rival firms, clients and governmental bodies. There has been little or no consideration of this issue in the IB literature to date. This study therefore initiates such a consideration, adding to the traditional network perspective of the MNE network by including domestic firms and
other organizations into network analysis. Such an approach will help to enhance IB theory relating to networks.

This study also contributes to general knowledge transfer and innovation management research. Exploratory innovations have critical long term impact on the performance of not only firms but also industries (Benner and Tushman, 2003; He and Wong, 2004), however, research on what conditions lead to firm exploratory innovations is limited (Gupta et al., 2006; Jansen et al., 2007). Findings here suggest that novel knowledge gained through network connections with foreign investment enterprise contributes to firm’s exploratory innovations. The effect of that acquired knowledge on firms’ exploratory innovations is also moderated by resources firms have access to through other network ties. The moderating effect of SOE and government network connections confirms some of the qualitative research findings by Zhao, Anand and Mitchell (2005). In their case study of China’s automotive industry, Zhao and his colleagues found that a domestic firm’s local network can affect the process of its technology transfer from foreign partners. The implication for managers is that to make one firm’s network more effective, the firm should manage the network as a whole instead of focusing on single network connection.

By showing that specific types of relationships with foreign firms can boost domestic firms’ ability to engage in exploratory research, which in turn has implications for economic development, this research has implications for government policy. The government should encourage the development of certain types of ties between domestic and foreign firms. To do so, the government can provide incentives to foreign firms to encourage them to enter into partnerships with domestic firms. They can set up special
economic zones for technology cooperation between the two types of firms, in which there may be tax breaks and better infrastructure available. They can also establish research centers and other facilities that can provide support for such link-ups and reduce their costs. The government can hold conferences that provide foreign firms opportunities to learn about domestic firms, and to meet each other. The government can also establish regulations about local content, which would encourage the use of domestic suppliers.

Limitations and Suggestions for Future Research

There are several limitations that need to be noted, to be possibly improved in future research. First, the sample of host country firms in this study is all from one single province in China. As mentioned earlier, domestic firms have received strong support from the Zhejiang provincial government. Although this has the advantage of controlling for the differences in economic conditions and government policies, the generalizability of the study results to other areas in China or other emerging economies may be limited. Different countries have very different economic conditions and institutional environment. Regulations and government policies toward inward FDI and domestic firms can also vary from region to region. Both factors are likely to have some impact on firms’ innovation activities. Future research is needed to cover more diverse geographic areas and examine how the level of economic development and the level of government support affecting the impact of FDI on local firm’s innovations.
Another limitation of this study relates to the data on network connections. The sensitivity of network connections data made some detailed information unavailable for use in this study. For example, information regarding the names of companies with which the firm has network connections was unavailable. Empirical studies conducted in a developed country setting often rely on public announcements of partnership relationships. Data compiled from public announcements have some advantages, including detailed information on involved partners. However, these data are not readily available in the current empirical setting. With more information regarding the firm’s network position, it is possible to draw from other network perspectives. For example, Burt’s (2001) structural holes framework focuses on how network structures and firm network positions can affect the information available to the focal firm. Insights from this framework are likely to improve our understanding of the knowledge flow between inward FDI and host country firms.

Third, the network connections are constantly evolving and the exploratory innovations is also a long term process. In the model proposed by Hargadon and Sutton (1997), knowledge acquired by organizations can be memorized and utilized in their long term innovation process. The results of knowledge spillover from inward FDI are therefore likely to show in the long run. Survey data used here were only concerned with firms’ innovation activities in the past three years. So the findings here are limited to a relatively static picture between network connections and exploratory innovations. Longitudinal data will allow us to examine the dynamics between knowledge spillover from inward FDI and host country long term innovation performance, and provide more insights on the topic.
Despite the limitations discussed above, this paper makes an effort to provide a more managerial and organizational approach to the research on the impact of FDI on host country firm innovation activities. Since most FDI spillover studies are based on economics frameworks, I believe the addition of this management and organization research approach offers some new insights to this important topic.

Another area for future research stems from recent studies in which FDI serves as a channel for MNEs to tap into the host country’s knowledge stock. While it may be true that this is less relevant for FDI into emerging economies, due to the larger gap in the knowledge and technology stock between foreign investment enterprises and host country firms. However, combining the motivations of MNE for investing with the active network strategy of host country firms is likely to result in a more complete picture of this issue.
REFERENCES


Aldrich, H. E. and M. A. Martinez (2001). "Many are called, but few are chosen: An evolutionary perspective for the study of entrepreneurship." Entrepreneurship Theory & Practice 25(4): 41-56.


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FDI: The Case of Estonia," mimeo, Centre for East European Studies, Copenhagen Business School.


尊敬的企业家、总经理:
您好！非常感谢您在百忙之中抽出时间参与我们的调查！本问卷目的是了解当前我国民营企业与外资合作等国际化活动对于企业创新能力的影响，为进一步增强企业自主创新能力提供策略。本问卷主要由企业家或企业负责人填写。

您的职务:

课题组特别承诺：调研信息将受到严格保密。数据结果报告不涉及个人信息。谢谢您的合作！

第一部分 基本情况
填写说明：请在相应选项方框上打“√”，或在横线上填写数字。如果是某集团子公司，问卷中“公司”则指子公司而非集团。如果您在集团工作，公司则是指集团。

1、您的性别？
2、您的年龄：______岁。
3、您参加工作已有______年。
4、您创办贵公司的年数：______年。
5、您任职多长时间了？______年。
6、贵公司总人数：______人。
7、您的文化程度？
8、贵公司是否家族企业？是□否□
9、贵公司是否一家公司的子公司？是□否□
10、贵公司是否有人事部门？是□否□
11、贵公司一共有多少员工？______人。

12、请从以下行业中选出贵公司所从事的行业，并在前面的横线上打勾（可多选）

教育        金融业        保险        政府机构
房地产        医疗保健        加工制造业        出版业        零售业        服务业
电信业        电力燃气水供应业        高科技/电子行业；其他：______________

其中，贵公司所从事的主要行业是：________________________（请填写一种行业）

13、贵公司是民营还是国有企业？民营□国有□港澳台外资□，其它外资□
14、公司年销售额：______万元，销售收入约占______% 近三年上交利税______万元。
15、在最近一年里，公司推出的新产品数量：______项；最近三年呢？______项。
      在最近一年里，公司推出的新服务项目：______项；最近三年呢？______项。

贵公司平均多长时间会推出一项新产品或新服务项目：______________个月。
16、与同行业平均水平相比，在过去五年里，贵公司利润如何？（请在最符合实际一项画圈）

1）低于平均水平很多       2）有些低于平均水平       3）稍低于平均水平       4）平均水平
5) 稍高于平均水平   6) 有些高于平均水平   7) 高于平均水平很多
贵公司的销售额增长（或收入增长如何？）
1) 低于平均水平很多   2) 有些低于平均水平   3) 稍低于平均水平   4) 平均水平
5) 稍高于平均水平   6) 有些高于平均水平   7) 高于平均水平很多
17、贵公司 2001 年销售额________元；2002 年销售额________元；
      2003 年销售额________元；2004 年销售额________元；2005 年销售额________元。

第三部分：请考虑近三年贵公司所进行的各类创新项目，请用 1-5 表示这些创新活动通过
以下方面改善公司市场竞争优势的重要性。

<table>
<thead>
<tr>
<th>创新项目</th>
<th>非常不重要</th>
<th>不太重要</th>
<th>说不准</th>
<th>比较重要</th>
<th>非常重要</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2</td>
<td>3</td>
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<td>5</td>
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<td>2</td>
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<td>4</td>
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<tr>
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<td>3</td>
<td>4</td>
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<td>5</td>
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<tr>
<td>提高生产的灵活性</td>
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<td>2</td>
<td>3</td>
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<td>5</td>
</tr>
<tr>
<td>降低生产成本</td>
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<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>提高产量或降低原材料量</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

请针对贵公司所从事的销售额比例最大的行业（主营业务），回答以下的问题。请在最能表示贵公司
主营业务实际条件速度或深度的数字上画圈。1 表示最左边陈述的程度；5 表示最右边陈述的程度。

1、我们公司几乎不必改变市场营销策略来跟上市场和竞争对手。 1 2 3 4 5 我们公司必须非常频繁的改变
市场营销策略（如：每半年）。  
2、在我们行业，产品或服务的淘汰率很低（例如：钢铁）。 1 2 3 4 5 产品和服务很容易过时（如：服装）。  
3、我们很容易预测竞争对手举动。 1 2 3 4 5 竞争对手的举动非常难以预测。  
4、需求量和顾客品味很稳定，非常容易预测。 1 2 3 4 5 需求量和顾客的品味很不稳定，非常难预测。  
5、我们的产品和服务所需的技术已经很成熟，不会有很大变化（如：钢铁生产）。 1 2 3 4 5 我们产品和服务的形式变化很快也很大（如：高级电子产品）。  
6、融资的渠道很容易预测。 1 2 3 4 5 融资的渠道很难预测。  
7、获取原材料的渠道很容易预测。 1 2 3 4 5 获取原材料的渠道很难预测。
请列出对贵公司业绩及未来发展有重要影响的主要合作伙伴（客户，供应商，同行业公司，政府机构等），并回答以下关于你合作伙伴的问题：
请问你合作伙伴的企业性质，是国营企业，民营企业，外资企业，还是政府机构，或其它？
请问贵公司和你的合作伙伴是什么样的关系，客户，供应商，同行业企业，其它行业伙伴，或其它？
请问贵公司和你的合作伙伴合作的领域是哪些？合作研发，技术转让，合作生产，

非常感谢您的支持与参与！
Dear managers,

Thank you for participating in this survey. This questionnaire aims to understand how Chinese private firms’ innovation capabilities are affected by globalization and cooperation with foreign firms. Information gathered through this survey will help to develop better strategies to promote innovation capabilities of firms.

**Firm information:**
1. Your gender?
2. Your age?
3. How many years has your firm been established?
4. How long have you been with the current company?
5. What is your company’s sales in last 5 years?
6. What is your company’s profit in last 3 years?
7. How are your company’s sales increase compare to other companies in the same industry?
8. How is your company’s profit compared to other companies in the same industry?
9. How many employees does your company have? Among them, how many of them have higher education?
10. How many R&D employees does your company have?
11. How many new products has your company introduced in the past 3 years?
12. How many new services has your company introduced in the past 3 years?
13. How many new processes has your company introduced in the past 3 years?
14. How often does your company introduce a new product, service or process?
15. Is your company a family controlled company?
16. Which industry does your company mainly operate in?
17. What is the ownership of your company?

**Exploration and Exploitation innovations:**
Considering innovation projects undertaken in your organization over the past three years, please indicate the extent that each of the following are important outcomes of innovation activities (5 point Likert scale with 1 = not important to 5 = very important) (Adapted from He & Wong, 2004, in Organization Science).

1. Introduce new generation of products
2. Extend product range
3. Open up new markets
4. Enter new technology fields
5. Improve existing product quality
6. Improve production flexibility
7. Reduce production cost
8. Improve yield or reduce material consumption

**Network Connections:**
List the parties that you think are critical to your firm’s performance and growth and
provide the following information of your partner:
1. What is the ownership of your partner firm? (State owned enterprise, domestic privately owned enterprise, foreign investment enterprise, or government entity)
2. In which of the following areas have your company and this firm had a partner relationship: marketing, production, R&D, technology licensing, or other (please specify)
3. Which is the nature of the relationship you have with your network partners: buyer-supplier or same industry cooperation, or other (please specify)
4. How close is the relationship between your company and this firm (indicate on a 5 point Likert scale with 5 being very close and 1 being not close at all).
5. How often do your company and this firm interact with each other?

**External environment perception:**

| 1. Our firm must rarely change its marketing practices to keep up with the market and competitors | 1 2 3 4 5 | Our firm must change its marketing practices extremely frequently |
| 2. The rate at which products or services are getting obsolete in the industry is very slow | 1 2 3 4 5 | The rate of obsolescence is very high |
| 3. Actions of competitors are quite easy to predict | 1 2 3 4 5 | Actions of competitors are unpredictable |
| 4. Demand and consumer tastes are stable and easy to predict | 1 2 3 4 5 | Demand and tastes are unstable and hard to predict |
| 5. Our production/service technology is not subject to much change and is well established | 1 2 3 4 5 | The modes of production/service change often and in a major way |
| 6. Access to financial capital is predictable | 1 2 3 4 5 | Access to financial capital is unpredictable |
| 7. Access to raw material supplies are predictable | 1 2 3 4 5 | Access to raw material supplies are unpredictable |

Thank you for your support of this research project!