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This paper presents a qualitative study of high-technology entrepreneurial networks conducted in Beijing, China. In pursuing the question of what kind of entrepreneurial networks is especially conducive to performance in the context of emerging economies, we have developed a new construct called network extensibility, grounded in qualitative evidence collected from field research. Extensibility is defined as the potential for expansion and enlargement of an ego-centric network through existing contacts. In other words, extensibility is the capacity of existing network relationships to yield further relationships. We argue that network extensibility represents a key mechanism by which entrepreneurial networks affect performance, in emerging economies characterized by weak market-supporting institutions, high uncertainty, low trust, and high velocity. Extensibility renders network ties both ends in themselves and means toward the ends for creation of new ties. The argument, in short, is that entrepreneurial networks in emerging economies tend to radiate out in many directions due to the extensibility multiplier. Moreover, the greater the multiplier, the better the performance of entrepreneurial firms. We then proceed to explore the antecedents of network extensibility including tie strength, entrepreneur’s prior employment, entrepreneur’s university alumnus affiliation, and entrepreneur’s social absorptive capacity. In addition, from the perspective of institutional theory, overseas experience in developed economies is proposed to moderate the effect of tie strength on extensibility.
Introduction

Since Granovetter's (1985) declaration of economic sociology that "rational economic activity" is embedded in "social structure," scholars of strategy and entrepreneurship have recognized the critical role of networks in accounting for the performance of entrepreneurial firms (Gulati et al., 2000). Despite mixed empirical results, a contingency framework has emerged and greatly advanced our understanding by specifying conditions under which certain types of networks are conducive to performance. For example, Rowley et al. (2000) introduced industry context as a contingency, showing that dense networks lead to better performance in a stable industry whereas sparse networks are beneficial in a highly dynamic industry. Hansen’s (1999) study of product development teams finds that network effects on knowledge transfer are contingent on knowledge complexity: strong ties promote the transfer of complex knowledge, while weak ties promote the transfer of simple knowledge. Gulati and Higgins (2003) show that network effects may be contingent on the state of IPO markets: partnerships with prestigious VCs positively affect IPO success during “cold” markets while partnerships with prestigious underwriters are positively associated with IPO success during “hot” markets for IPOs. In short, network influences on performance outcomes such as financial results, knowledge transfer, and IPO success may be contingent on industrial or economic context.

Network effects may also be contingent upon the stage of economic development. In contrast to developed economies, emerging economies are characterized by “weak market structures, poorly specified property rights, and institutional uncertainty” (Nee, 1992). One consequence of weak institutions is that informal networks play a far more significant role in organizing economic activities in emerging than in developed economies (Xin and Pearce, 1996; Peng and Heath, 1996). Moreover, most emerging economies are undergoing rapid, systemic transitions characteristic of “high velocity” environments. The combination of reliance on informal networks, relatively underdeveloped factor and product markets, and rapid political, economic, and institutional change puts firms under pressure to constantly re-configure and upgrade existing resources and capabilities (Hoskisson et al., 2000; Wright et al., 2005). To the extent that networks constitute an important firm resource, the adaptability of entrepreneurial networks may be more closely related to performance outcomes in
emerging economies than in the more stable developed economies. Thus, the static views of networks may not capture their full significance in emerging economies; rather, the mechanism through which networks confer competitive advantage is more likely to lie in their dynamics. As a consequence, network studies undertaken in the context of emerging economies may provide a promising opportunity to depart from the overly static view of networks that has dominated research to date and contribute to the development of dynamic network theories (Aldrich and Zimmer, 1986; Hoang and Antoncic, 2003).

Few empirical studies have examined the network effects contingent on institutional and social context (Galaskiewicz and Zaheer, 1999). Even fewer have captured network dynamics in the context of emerging economies. Most network-based research on entrepreneurship, rather, has been set in relatively stable, developed economies. This study seeks to fill this gap by extending network research on entrepreneurship to the context of emerging economies and by focusing on network dynamics in this context. At the same time, this study seeks to explore the antecedents of networks as well as their consequences on entrepreneurial performance and attempts to develop a theoretical framework linking network processes and outcomes (Hoang et al., 2000).

In seeking the answer to the question of what kind of entrepreneurial networks are especially conducive to performance in the context of emerging economies, we develop a new construct called network extensibility. Extensibility is defined generally as the potential for expansion and enlargement of an ego-centric network through existing contacts; in other words, extensibility is the capacity of existing network relationships to yield further relationships. We argue that network extensibility is especially significant under the circumstances of weak market-supporting institutions, high uncertainty, low trust, and high velocity. Thus, extensibility applies mainly to the setting of emerging economies, where it represents a key mechanism by which entrepreneurial networks affect performance. As a consequence, in emerging economies, contacts are chosen not only on the basis of immediate access to tangible and intangible resources but also on the basis of the potential new relationships that they can bring to the focal actor. In other words, network ties are both “ends” in themselves and “means” towards the ends for creation of new relationships. The argument, in short, is that entrepreneurial networks in emerging economies tend to radiate
out in many directions due to the extensibility multiplier; moreover, the greater the multiplier, the better the performance of entrepreneurial firms.

The setting for this research is the Zhongguancun Science Park (ZSP) in Beijing, China’s largest hi-tech center that is referred to as “China’s Silicon Valley.” ZSP offers “most favorable policies” to tenant companies. These policies include scissors cutting the red tape normally impeding business registration, and tax forgiveness: 100% forgiveness of income tax for the first three years, 75% forgiveness in years 4-6, and 50% forgiveness in years 7 and beyond\(^1\). As a result, many hi-tech entrepreneurs have based their new ventures in ZSP. Despite the advantages offered by ZSP, the failure rate among ZSP tenant firms is fairly high, about 50 per cent in the first five years (ZSP Development Report, 2003). Competition is intense, and entrepreneurs experience a high level of stress. Moreover, entrepreneurs and managers are unwilling to talk about connections openly with strangers (Xin and Pearce, 1996; Peng and Luo, 2000). As a consequence, in ZSP as elsewhere in China, it is extremely difficult to gain access to firms for research purposes. To overcome this problem, we relied on personal contacts for introduction to entrepreneurs—i.e., network extensibility. These personal contacts include business professors at Peking University and Tsinghua University, managers of incubators, and representatives of the Chinese Overseas Students Association, some who themselves are entrepreneurs. We obtained names of 158 entrepreneurs from these contacts. We then phoned everyone on the list to arrange interviews. Some entrepreneurs were disinclined to take part in the study. Others were unavailable because of the difficulty of coordinating schedules. Ultimately, 100 interviews were conducted. While convenience sampling has limitations, in this situation it was the only feasible way to study a population that is extremely difficult to access (Weiss 1994).

This paper is structured as follows. First, we discuss how network impacts on entrepreneurial outcomes in emerging economies may differ from network impacts in developed economies. Drawing on field research conducted in China, we then develop grounded theory centered on network extensibility and develop testable hypotheses about the effect of network extensibility on entrepreneurial performance as well as the antecedents of extensibility. Finally, we discuss the theoretical and practical implications of the study and in

\(^{1}\) Interview with Zhao Mulan, Deputy Director of Zhongguancun Science Park Managing Committee, 2004.
particular, the difference between the extensibility argument proposed here and the widely accepted theory of structural holes.

Emerging versus Developed Economies

Institutional structures represent humanly devised constraint systems designed to facilitate economic and social exchange. As the rules of the game and guide for human interaction, institutions affect the performance of economies and economic actors (North, 1990). Institutions are of pivotal importance in shaping entrepreneurial networks and hence their impacts on firm performance. To date few if any analytical frameworks have incorporated broad institutional environments into the analysis of entrepreneurial networks. In this section, we examine the institutional environments of emerging economies and the consequences of these environments for entrepreneurial outcomes.

Market-Supporting Institutions vs. Informal Relationships

Market-supporting institutions such as transparent laws and regulations are deeply rooted in western societies are either weak or absent in emerging economies (Peng & Heath, 1996; Boisot and Child, 1999). As a consequence, informal networks such as guanxi in China and blat in Russia may play a more significant role in coordinating economic exchanges and exert a more significant impact on firm performance than in developed economies (Xin and Pearce, 1996; Peng and Luo, 2000; Batjargal, 2000). As Davies et al. (1995) put it, “...the most common contrast between Western and Chinese management practice lies in the emphasis placed on written contracts and procedures in the former, compared with personal relationships in the latter.” In China, repeated transactions between two firms often start from the personal relationships between their top managers; while by comparison, business transactions in developed economies more closely resemble the ideal type of impersonal market where repeated transactions and the institutionalization of inter-firm linkages arise from arms-length transactions that proved successful. In fact, the role of personal relationships in China is so central that it is widely held among scholars as well as practitioners that it is whom you know that gets you what you need to run a successful
business (Tsang 1998; Gold et al. 2002). Some go as far as to suggest that a distinctive form of capitalism—network capitalism—has emerged in China (Boisot and Child, 1996).

Empirical studies of emerging economies other than China have depicted a similar scenario where informal networks prevail in the absence of a formal and reliable system of laws and regulations. For example, in their study of post-Communist Hungary, Whitley et al. (1996) found that managerial ties were more “relational” and more similar to “Asian” practices than to arm’s-length, “Anglo-Saxon” practices (Peng and Luo, 2000). Sik and Wellman (1999) show that guanxi-like relationships remain cushion rapidly changing markets, transmuting institutions, and personal economic insecurities in transition economies. In a similar vein, Batjargal (2000) illustrates the renewed role of “blat” in Russia’s transition economy and found that relational embeddedness and resource embeddedness have direct positive impacts on firm performance.

The institutions of emerging economies may also constrain the flow of information to the point where network effects often observed in Western settings may diminish or vanish altogether. Somewhat differently, while networks promote entrepreneurial performance by providing information benefits in both settings, the mechanisms through which this is achieved may differ fundamentally. In developed market economies, resources (including information) are abundant and control over economic resources is decentralized to private owners (Whitley, 1992). Given abundant information few impediments to initiating network ties where information gaps exist, individuals generally compete with each other on information acquired via networks. As a consequence, people seek to occupy vacant positions—structural holes—between otherwise separate clusters to maximize information benefits (Burt, 1992). In contrast, in emerging economies, information tends to be compartmentalized rather than flowing freely throughout the system. Even though the state gradually withdraws from allocating resources as economic transition proceeds, it retains its central role in the resource sharing regime by formulating new rules and interpreting them. Indeed, some studies argue that firms should increase rather than decrease their investments in political connectedness as economic transformation progresses because the state actor will have more resources to allocate among economic actors (Siegel, 2004). Yang (2002) argues that reconstruction of national economic systems causes valuable resources to become more institutionally segregated and hence filling institutional holes—filling gaps caused by
incomplete laws and regulations—may be more consequential for entrepreneurs than filling structural holes—gaps between people. Under such conditions, therefore, an important mechanism by which networks lead to competitive advantage lies at the provision of privileged access to timely market information through connection with government officials or other high status individuals.

**Uncertainty**

Emerging economies are also fraught with high uncertainty resulting from the high velocity of institutional change during economic transition (Wallace, 1998; Zhou et al., 2003). Uncertainty makes all calculation difficult. For high tech entrepreneurs, the sources of uncertainty include policy, technology and market. Uncertainty related to policy and technology makes it difficult for entrepreneurs to figure out the best way to convert a set of inputs into an output desired by a potential exchange partner. This is what Podolny (2001) called ego-centric uncertainty. In comparison, market-related uncertainty reflects mostly what Podolny (2001) called alter-centric uncertainty, because the alters—potential exchange partners—are the actors who are uncertain about the value and trustworthiness of the entrepreneur. Alter-centric uncertainty makes it especially difficult to initiate a transaction given the reluctance of potential partners to enter exchange relationships with the entrepreneurs. Both ego- and alter-centric uncertainty, nevertheless, drive economic actors to exchange partners with whom they have had prior transactions (Podolny 1994). As Gulati and Gargiulo (1999) show, for example, formation of a new relationship will depend to a great extent on a firm’s prior relationships to reduce uncertainty. In other words, firms tend to partner with partner’s partners. Network development is thus path dependent. Moreover, the greater the environmental uncertainty, the greater the likelihood it is for firms to rely on interpersonal ties when entering exchange relationships (Pfeffer & Salancik, 1978; Powell, 1990). Given that entrepreneurial firms in emerging economies are characterized by high level of ego-centric and alter-centric uncertainty, they are especially likely to rely on their existing network ties for the formation of new ties. In other words, networks in emerging economies may be especially path dependent. Taken together, a high degree of uncertainty in conjunction with the absence of market-supporting institutions—known as “institutional voids” or “institutional holes” in these countries—have caused managers and entrepreneurs
to rely heavily on personal relationships for access to financial capital, favorable policy treatment, and even customers (Wank, 2002; Khanna & Palepu, 1997; Yang, 2002).

Distrust—the Challenge of Creating New Ties

The importance of network relationships in general and relationships with well-connected individuals in particular notwithstanding, it is inherently challenging for individuals to create new relationships or even to identify potential networking opportunities in the context of emerging economies. This paradox stems in part from the low level of trust characterizing these societies and has a profound impact on entrepreneurial networks. To illustrate, the formation of a new relationship requires a player to enter into an exchange with only limited information about the counterparty’s specific attributes. This is especially the case for creating nonredundant contacts which are not connected with any of the extant ties. Generalized or “extended trust” is thus essential in forging nonredundant relationships that according to Burt (1992) will generate maximum network benefit. Generalized or extended trust can be defined as the ex ante willingness to cooperate with anonymous others beyond the closed circles of family or existing business contacts (Raiser, 2001). Such trust among anonymous actors facilitates wide-ranging social and economic exchanges and may be a function of confidence in government institutions to provide impartial enforcement, as well as individuals’ social experiences and cultural predisposition (Milgrom et al., 1990).

In the West, the universalistic law and regulations lay the foundation for the emergence of extended trust. Moreover, the third party enforcement by the state plays an essential role in sustaining this type of trust and the corresponding transactions between largely anonymous individuals (North, 1990; Raiser, 2001; Boisot and Child, 1996). This has lent support to the emergence of networks relationships. Specifically, market-supporting institutions lower the transaction costs associated with creation of a new contact by limiting search costs and opportunistic behaviors. Hence, entrepreneurs seeking to improve their performance will replace old contacts with new contacts that deliver more information and other benefits in order to gain competitive advantage, since forging a new linkage does not typically incur a higher cost than maintaining an old one in an institutional environment conducive to trust.
By contrast, emerging economies generally lack reliable credit-rating agencies or other related set of market intermediaries; they also lack universalistic law or impartial enforcement (Siegel, 2004). The absence of a rational-legal institutional framework not only fails to engender confidence but results in endemic distrust of the market (Boisot and Child, 1988). Most of the emerging economies fall into the category of “low trust society” described by Fukuyama (1995), where social and economic transactions are often based on “ascribed trust” among members of a kinship group or “process-based trust” among individuals that have known each other for a long time (Zucker, 1986). Accordingly, the lack of “extended trust” may impose prohibitively high transaction costs on partners without prior history, thereby foregoing mutually beneficial transactions (Fukuyama, 2000). As a result, the initial transaction between previously unconnected players encounters enormous institutional barriers. The barriers can sometimes be insurmountable for entrepreneurial firms because they lack both a track record of superior performance as well as prestige-conferring observable characteristics that would grant them status (Podolny, 2001). In the absence of trust promoting institutions, the replacement of an old contact by a new nonredundant contact often incurs tremendous additional costs, including lobbying, bribery, and administrative, or legal work, which together referred to as “guanxi campaigns” by some of the Chinese entrepreneurs we interviewed. As a consequence, the value of obtaining a new nonredundant contact is often more than offset by search and set-up costs. Entrepreneurs are thus restrained from replacing existing networks with new ties.

Nonetheless, it should be emphasized that the difficulty of creating nonredundant new contacts does not mean that entrepreneurial networks would remain fixed and stagnant in emerging economies. Quite to the contrary, given the significance of network relationships in this context, entrepreneurs seeking to advance in the evolving market system must continually adjust and reconfigure their networks to adapt to the changing circumstances and needs of their enterprises. As economic transformation proceeds in these countries, the ways in which networks matter for entrepreneurial performance may change accordingly. In the emerging sector of high technology entrepreneurship, even more so, the playing field is growing both rapidly and unevenly, and the rules of game are constantly redefined and reinterpreted by government agencies, and established domestic and multinational corporations. It is thus important to investigate how entrepreneurial networks cope with the
institutional constraints and evolving economic circumstances of emerging economies to answer the general question of what kind of networks can be a sustainable source of information, resources and hence competitive advantage for the entrepreneurial firms.

Empirical studies have shed light on our understanding of the process of network evolution in the context of transition economies by looking into how entrepreneurs and managers redeployed former networks to gain advantages under new circumstances. For instance, pre-existing relationships between enterprise directors and bureaucrats under Communism have been shown to have adapted to take advantage of new economic opportunities in Hungary (Stark, 1997; Hayri and McDermott, 1998). And the patron-client ties of the pre-reform era are transformed and “commodified” to achieve business goals amidst economic reform in China (Wank 1996). But as in most studies of networks effects on performance in developing economies, the relevant dimensions of networks and more important, the mechanisms by which they impact firm performance are not specified in detail. Moreover, while the language of social networks is used extensively, formal network analysis is seldom employed to construct measures of the ego-centric networks of entrepreneurs. In particular, individual contacts comprising the ego network and the structure of relations between contacts are often left unspecified, partly due to the difficulty of access to such highly sensitive information. For example, in Peng and Luo’s (2000) study, respondents were simply asked to assess their ties with managers at other firms and with government officials on a scale ranging from “very little” to “very extensive” to derive network measures. The sparseness of data makes it difficult to compare these finding from emerging economies with results from Western settings.

To explore these issues surrounding emerging economies, we conducted field research in China’s high technology entrepreneurial firms. As discussed earlier, China embodies the institutional endowments characterizing emerging economies, namely, weak market-supporting institutions, high level of uncertainty and low level of trust. China is thus an appropriate setting to test received ideas and to develop new ideas about networks and entrepreneurship while the findings are generalizable to other emerging economies.

Given that little systematic has been written on this subject, we employ a two-stage research design. Following the grounded theory approach (Maanen, 1988; Glaser and Strauss 1999), this paper focuses on theory development drawing on extensive field research,
including interviews and archival data gathered from 100 private high tech entrepreneurial firms. The qualitative analysis allows an in-depth understanding of the network mechanisms that lie beneath the link between entrepreneurial networks and performance on the one hand, and of the key factors that gave rise to such networks on the other hand. Grounded on the qualitative data, we craft hypotheses about what kind of entrepreneurial networks contributes to performance and about the antecedents of such networks. In a subsequent paper, we test these hypotheses using survey data from the same 100 entrepreneurs. The combination of qualitative hypotheses construction with quantitative verification of these hypotheses aims to extend network theories to capture entrepreneurial dynamics in the context of emerging economies.

**Hypotheses**

In this section, we develop two sets of hypotheses derived from both field research and existing theory. The first set is about the effect of network extensibility on entrepreneurial performance. The second set concerns the antecedents of network extensibility. Additionally, we include a hypothesis about the relationship between network density and entrepreneurial performance because density has been widely studied in existing network literature and will be a necessary control. The overall theoretical model is presented in figure 1. Throughout the analysis, there is constant interaction between the concepts, data, and the literature, following the grounded theory approach (Glaser and Strauss, 1967; Yin, 1984; Eisenhardt, 1989). Founder-entrepreneurs of 100 firms were interviewed. Interviewing is an extremely effective way to gain fine-grained information about past events illuminating the processes and dynamics of entrepreneurial networks. Following Uzzi (1996 and 1997) and Uzzi and Lancaster (2003), probes like “I am interested in those kinds of details,” “Can you tell me more about that,” “Is there anything else,” “Would you consider this typical or atypical,” were asked during the courses of interviews to understand sensitive issues while avoiding directiveness. In addition, archival information such as company record and media coverage was also incorporated into the analysis.

[Insert Figure 1 about here]
Network Extensibility and Performance

The following vignette illustrates network extensibility and its impact on entrepreneurial performance.

Beijing ZD Technology Development Co. was founded in 2000 by Tian Bing. Tian’s source of initial financing was her personal savings in the amount of RMB 500,000. ZD Tech provides total solutions for e-government. The main businesses are software development and system integration. The company had grown rapidly since its founding and by 2004 the revenue of the company had reached 10 million RMB (about 1.2 million US dollars). Prior to becoming an entrepreneur, Ms. Tian was a reporter for a business newspaper read by government officials and enterprise managers. As a reporter, Ms. Tian had broad access to officials of several central government ministries. Part of Ms. Tian’s success as a journalist was due to her large personal network. Her success as an entrepreneur was due in large part to her ability to leverage this network for business purpose. Ms. Tian had accumulated extensive relationships in the government and research institutes as well as substantial knowledge about doing business. During the interview, Ms Tian provided extensive information about the development of her network and its role in the development of her business. The evolution of ZD Tech’s business network is illustrated in Figure 2.

Since the founding of the company, a major task for Ms. Tian had been management and cultivation of the network of relationships with important parties. Besides her ceaseless efforts in deepening the relationships with existing customers, Ms. Tian has also sought to expand the customer base of the company. When ZD tech was founded in 2000, Ms. Tian’s two most important links were to officials in the Chinese Academy of Science (CAS) and the Ministry of Public Security (MPS). A chief scientist from CAS provided technological guidance for the company’s software development. The company also benefited greatly by turning the research of his students into products of the company. The contact in MPS introduced ZD to its first two customers—the Public Security Bureau in Shanxi and Shandong provinces. The company developed its first product—Temporary Residency Management System—for these two customers in 2000. Upon its initial success, in 2001 MPS introduced Tian to the Public Security Bureau in Chengdu, where the same system was installed. At the meantime, Tian forged relationship with the Ministry of National Resources
(MNR) through the introduction of yet another friend. MNR then introduced her to National Resources Bureau in Xuzhou to whom ZD provided its second product—ecological environment monitoring system. In 2002, the company struck another deal with the Public Security Bureau in Chengdu to provide Internet Security system. Meanwhile, PSB in Chengdu directed the company to Chengdu National Resources Bureau. The launch of the business relationship was also facilitated by introduction from MNR. In 2003, based on the company’s record of several successful cases, MNR then granted the company another contract on ecological environment monitoring system in Beijing. In 2004, MNR introduced the company to the National People’s Congress for a project on E-government.

This case of ZD tech illustrates first, network created for one purpose can be leveraged for other purposes in the business context. In this instance, a journalistic network was converted and subsequently extended into an entrepreneurial network. Secondly, ZD tech illustrates the growth of an entrepreneurial firm as a function of the growth of the entrepreneurial network. Growth of the business was mainly achieved by two means. One was to broaden the scope of transactions with existing customers—selling new product to old customers. The other was to develop new customer relationships via introductions from existing customers. It is worth noting that government agencies constituted the principal market for the company. Yet the success of the company in this market depended greatly on the entrepreneur—Ms. Tian’s pre-existing network relationships and her knowledge of the government market. Notably, she adopted a “top down” strategy of starting with and strengthening her relationships with the central government—the various Ministries—and by their introductions, gradually extending her reach to various customers in the local governments. Introduction from the central government agencies, in turn, proved to be extremely effective for ZD tech to access local markets. In short, Ms. Tian’s success was in extending connections from the central to local government markets. While the importance of connections in obtaining contracts from the government is widely recognized, “only when you understand the way Chinese government is organized—weak horizontal ties among the Ministries and strong hierarchical ties within a Ministry [e.g., from central to local government], will you be able to effectively mobilize your relationship network for the benefit of the company and consequently market your products much more effectively,” said Ms. Tian.
As seen in this case, none of the customers of the company to date had been acquired in the open market. Instead, they were all attained through personal introductions arising from existing relationships. This reflects on the one hand, the difficulty of forging de novo networks in the Chinese context, and on the other hand, the importance of existing relationships in linking the entrepreneur to new business contacts. Given the challenge of initiating arm’s length transaction relations, contacts already in place become the primary means for entrepreneurs to create new business ties and in turn expand their business networks. Thus, a key mechanism by which networks influence entrepreneurial outcomes is extension of networks through existing contacts. This leads to the first hypothesis:

Hypothesis 1: Entrepreneurial networks of higher degree of extensibility will lead to higher performance.

Note that network extensibility is a special case of what Borgatti et al. (1998) called “compositional quality” of network ties, referring to the extent a single tie can provide needed resources, such as expertise, financing, or legitimacy. As demonstrated here, network ties also provide access to well needed resources of new ties, which are crucial for long-term growth of entrepreneurial firms where the alternative of relying on the market is not viable. This gives rise to an important question: which entrepreneurs have networks that are high in extensibility? The following hypotheses are proposed to answer this question.

Tie Strength and Network Extensibility

An ego-centric network consists of ties connecting ego to various alters. Extensibility of a network—the capacity of network relationships to yield further relationships—is hence made up of the extensibility of each tie. In other words, extensibility of each tie amounts to extensibility of the network. Therefore, it is necessary to examine the characteristics of ties which may affect tie extensibility and in turn, network extensibility. The strength of the tie appears to be an important predictor of tie extensibility in this context. Strong and weak ties differ in terms of time spent in interaction, emotional intensity, intimacy, or reciprocal services characterizing the tie (Granovetter, 1973; Marsden and Campbell, 1984). In the case of ZD Tech, the ties that have served as bridges for the company to reach new business
contacts—MPS, MNR, PSB in Chengdu—are all strong ties. As the founder Tian Bing indicated, strong ties were more likely to introduce new business relationships for the company and it was thus necessary to increase the robustness of important ties. Many other entrepreneurs interviewed also believed in the higher potential of strong ties in generating further ties. As a conjecture, there may be a positive correlation between the strength of the tie and the degree of extensibility. We then explore the theoretical rationale behind it as follows.

First, the strength of an interpersonal connection can affect the quantity and quality of information/knowledge transfer through the tie (Szulanski, 1996; Uzzi, 1997; Hansen, 1999). With frequent interactions and strong emotional attachment, high volume of information is likely to flow through strong ties. Strong ties can also lead to more effective communication and consequently high quality information transfer due to the relationship-specific heuristics (e.g., codes, convergent expectations, etc.) shared between parties (Uzzi, 1997). Furthermore, under the condition of tacit and complex information/knowledge, it is strong ties rather than weak ties that facilitate the transfer (Hansen, 1999). In the Chinese business world, information about network relationships is considered sensitive and complex (Xin and Pearce, 1996). People usually do not reveal their connections fully and quickly to others. For the purpose of network extension, however, Chinese hi-tech entrepreneurs need to obtain in-depth information from their primary contacts about other contacts in their personal networks so as to identify actors of great potential value and network paths to reach them before they can take further action to create new ties. Strong ties may thus lead to higher network extensibility by allowing more effective transfer of information regarding network relationships.

Nonetheless, information alone is not sufficient for the formation of new ties. To turn the potential network extension opportunity into actual extension, further efforts from the primary contact may be required to mediate and facilitate the creation of a new tie between the entrepreneur and the identified actor. From the perspective of the primary contact, however, such an activity of bringing formerly disconnected alters together could mean the removal of a structural hole and the subsequent loss of brokerage and control benefits (Burt, 1992). Such activities, what Obstfeld (2005) called “tertius iungens,” are likely to occur when the incentive to help outweighs the concern of forfeiting control. The motivation to
provide assistance, i.e., the willingness to be helpful, depends greatly on the strength of the tie. In general, “strong ties have greater motivation to be of assistance and are typically more easily available” (Granovetter, 1982: 113). Besides, it should be noted that Chinese businessmen generally take great care in introducing someone to his or her own network, due to concerns about what potential negative outcomes would do to his/her reputation and about possibility of subsequent collusion of connected alters against his/her own interest (Tsang, 1998). Higher level of interpersonal trust characterizing strong ties can mitigate such concerns. Moreover, strong ties in China are typically characterized by reciprocal obligation. Favors tend to be exchanged between persons who are strongly tied rather than weakly tied (Bian, 1997). Being confident that he/she will be reciprocated in the future for the help that he/she offers today, a person is thus more willing to provide assistance when there is a strong tie. In conclusion, strong ties are more motivated to help introduce the entrepreneur to further contacts, which in turn, will lead to higher network extensibility.

In addition, given the underdeveloped market in emerging economies, the exchange between the entrepreneur and the newly acquired contact may fall into the category of what Bian (1997) called “unauthorized activities”—exchanges or transactions that may be illegal, socially disapproved, or for which mechanisms of coordination are either insufficient or unavailable in formal institutions. High level of trust associated with strong ties will thus be especially important in offsetting the risk involved in such activities (Granovetter, 1985; Bian, 1997).

The above analysis highlights the importance of strong ties in yielding further ties for the entrepreneur and subsequently in expanding the entrepreneurial network. Therefore, we propose the following hypothesis:

*Hypothesis 2: Ties of higher strength will lead to higher network extensibility.*

**Overseas Experience as a Moderator**

Despite greater reliance on strong ties for more fine-grained information and introduction to further ties, an entrepreneur usually possess extensive relationships including both strong ties and weak ties. But the percentage of weak ties and the benefit of weak ties may vary across different entrepreneurial networks. Our field research suggests an interesting
difference between locals and overseas returnees in the use of weak ties. Since 1999, the Chinese government has adopted a set of policies encouraging overseas students to start their own enterprises in China, in its attempt to develop national technological capabilities. Within the Zhongguancun Science Park, the government has established “Returning Students Venture Parks” that provide additional benefits in infrastructure and finance, etc. As a result, overseas returnees who returned to China after studying and/or working in Western countries constitute a unique sub-population of the new entrepreneurial class in China and it will be interesting to examine whether and how their networks may differ from that of the local entrepreneurs. In general, the field research suggests that compared to local entrepreneurs who do not have overseas experience, Chinese hi-tech entrepreneurs returned from overseas tend to include a greater number of weak ties in their networks\(^2\). More important, overseas returnees have explored their weak ties as well as strong ties for extending the reach of their networks. This can be illustrated by the following example.

VisionNex Technologies specializes in software development for large-scale IP voice and video conferencing systems. The company was founded in 2000 by a team of returnees from Silicon Valley. By 2004, revenue had grown to 16 million RMB. Shortly after the interview of the Founder CEO Chen Zheng (August, 2004), the company was acquired by US based Radvision, a critical milestone for a startup. Aside from its technological capabilities, the reach of the company’s sales network has also contributed to the rapid growth of VisionNex. Figure 3 below depicts the development of the central part of VisionNex’s sales network since its founding. VisionNex’s principal domestic customer is China Railcom (Railway Telecom). The relationship originates from an introduction made by a director of the company, Mr. Li, who has a strong background in the telecom industry. Mr. Li brought Chen and a top level manager of Railcom together for a number of dinner meetings. As Chen and Li continued to spend efforts in developing the strength of this personal level tie, the relationship with the top manager of Railcom had brought Chen in direct contact with numerous Railcom project managers (denoted as project 1, 2 and 3 in Figure 3) which were later turned into contracts for VisionNex.

\[\text{[Insert Figure 3 about here]}\]

\(^2\) 36 out of 100 entrepreneurs interviewed were overseas returnees.
As a startup founded by returnees from the Silicon Valley, VisionNex had aimed to market its product globally. In the international market, a preexisting tie with a senior Technology manager of the World Bank (WB in Figure 3) had opened doors to several customers within the World Bank. It is worth noting that while Chen and WB share a strong tie (former classmates), Chen’s ties with WB1 or WB2 who became VisionNex’s customers through the introduction from WB were actually weak—there was no extensive cultivation on the part of Chen aimed to cultivate interpersonal relationships. Despite the weakness of these ties, through them VisionNex was introduced to further customers (A and B in Figure 3).

Most of VisionNex’s international customers, nevertheless, came from Radvision (NASDAQ: RVSN), a provider of products and technologies for videoconferencing, video telephony, etc. Radvision had significantly extended VisionNex’s global sales network by directing potential customers to VisionNex as well as bundling VisionNex’s software with its products for sale. According to Chen, the tie with Radvision was acquired from market, when they were selling products to the same customer and recognized the potential synergy between their products. “We have very good working relationships with the managers of Radvision but not at the personal level,” Chen said. He further added that he’s more comfortable with this model of doing business due to his overseas education and experience.

In contrast, in order to open the domestic market, entrepreneurs have to spend a lot of time and energy “going to dinners and developing personal relationships at the table,” which according to Chen is not his strength. Therefore, as Chen stated, the company would focus on the international market and wait for the domestic market to improve. Clearly, VisionNex has developed a highly extensible network over the years. More notably, in VisionNex’s network, weak ties such as WB1 and Radvision have brought various new relationships for the company and still retain potential to yield further relationships. As a matter of fact, the weak ties in this case are at least as extensible as strong ties. This observation is in conflict with hypothesis 2, which states that strong ties lead to higher extensibility than weak ties. A possible explanation lies in the different propensity and ability of local versus returning entrepreneurs in extending their networks through weak ties, i.e., entrepreneurs with overseas experience are able to expand and enlarge their networks by means of not only strong ties, but also weak ties. This is consistent with the literature and other cases that we studied.
First of all, most overseas returnees find it difficult to adapt to the Chinese way of doing business based on *guanxi* (network relationships). Tao Ran, the founder of Beijing Annex Informedia Technology, derived a success formula for high tech startups in China from his own experience: \( \text{success} = \text{third class technology} + \text{second class products} + \text{first class guanxi} \). Coming from an environment where innovative capabilities in technology and business model are key to competitive advantage in the high-tech industry, the returnees tend to overlook the *guanxi* factor at the outset (Saxenian, 2003). Having spent years in the West, returnees face the challenge of breaking into the local clusters of *guanxi*. Besides, according to the returnees, many of their prior *guanxi* networks in China have run outdated in today’s fast changing environment, making it less likely to simply activate a sizeable network consisting of various strong ties. Since cultivation of new ties especially strong ties will take substantial time and energy, the number of strong ties that they can rely on to expand and enlarge their networks may be limited. Under tremendous pressure to grow their networks so as to sustain the business, nevertheless, many returnees have to explore the possibility of extending their networks through weak ties.

On the other hand, returnee entrepreneurs might have developed personal networks or points of contacts in the West. Besides, other things being equal, foreign firms will prefer to enter exchange relationships with entrepreneurs who have a western background, for better mutual understanding and communication. Beijing Tianwei Times Technology is a biotech startup developing products for Molecular and Cellular Biology such as PCR kit, DNA purification kit, etc. It was founded in 2001 by Wang Chunxiang, who returned to China after getting her PhD in Biology and working as a post-doc for several years in the U.S. In 4 years, Tianwei had developed a sizeable entrepreneurial network and penetrated into the U.S., Japan and European markets through its international partners besides its presence in the Chinese market. According to Wang Chunxiang, her US background made her the ideal local partner for western companies since they “share a common understanding of the field,” “speak the same language,” and “employ similar standards for the products.” Consequently, returnees, compared to the locals, are likely to have more foreign contacts in their entrepreneurial networks. This is confirmed by Zweig et al. (2004), which found that returnees have more foreign firms in their supply and sales network. Given Western firms’ emphasis on complementarity between businesses rather than personal relationship, the
entrepreneurs do not need to invest a lot of time and energy in maintaining these transnational ties as in maintaining domestic ties. Having these foreign contacts in the entrepreneurial networks can thus greatly extend the reach of the networks into the foreign markets without incurring substantial costs in developing relatively weak ties into strong personal ties.

Returnees’ greater reliance on weak ties for network extension also stems from their influence by the western institutions. Extensive use of weak ties for access to various financial and technological networks has been widely recognized as an important determinant of Silicon Valley’s success (Saxenian, 1996). While the institutions that have given rise to such practice are not present in China, the norms and beliefs that have been internalized in the actors will continue to shape their behavior (Scott 1995, DiMaggio and Powell 1983). To the extent that the returnees have developed and maintained contacts in the West, this set of norms and beliefs will be reinforced by their interactions with the foreign actors. As a consequence, since returnees have been subject to different forces of institutionalization than their local counterparts, they are likely to rely more on weak ties for network development than the locals who incline to rely on strong ties (guanxi). Thus, both empirical analysis and theoretical analysis have given rise to the following hypothesis:

**Hypothesis 3:** The relationship between tie strength and extensibility is moderated by entrepreneur’s overseas experience. Specifically, the correlation between tie strength and extensibility will be lower for entrepreneurs with overseas experience.

**Prior Employment and Network Extensibility**

The entrepreneurs also pointed to the reputation of prior employer as an important driver of network building and development. As one entrepreneur stated, “Having worked for a prestigious organization would give you a higher starting point in the competition, including the competition for network (guanxi) resources.” The experience of Huang Wei, founder of WinJet Technologies, illustrates the benefits of having worked for a prominent firm. Huang Wei had worked for Siemens and ABB before he established his own firm in 2001. Huang acknowledged that he had accumulated important customer resources from his experience. In fact, the business contacts he developed when working for both Siemens and
ABB had laid the foundation for his initial entrepreneurial network. His network had grown rapidly due to the effectiveness of his primary contacts in bringing numerous investors and customers as well as government contacts. Therefore, prior experience with prestigious employer is likely to have a significant effect on entrepreneurs’ ability to explore their existing ties for the sake of network extension. But in what ways can a prestigious prior employer be translated into higher network extensibility for the entrepreneur? Derived from both literature and the field study, we identify reputation as the main mechanism giving rise to such a relationship.

The literature has demonstrated that reputation transference from their high-status partner is an important mechanism by which network relationships affect entrepreneurial firms’ ability to acquire resources for survival and growth (Benjamin and Podolny, 1999; Podolny and Phillips, 1996). For example, Stuart et al. (1999) show that private biotech firms with prominent strategic alliance partners and investors go to IPO faster and earn greater valuations at IPO than firms that lack such connections. Moreover, they demonstrate that the benefit of having prominent affiliates stems to a large extent from the transfer of status within the interorganizational associations. Given the high uncertainty surrounding the new ventures, reputation plays an especially important role in resource holders’ assessment of the quality and potential of the entrepreneurial firms, and their subsequent decisions of whether to enter an exchange relationship. However, for entrepreneurial firms that lack both a track record of superior performance and a predictable future, it is difficult to establish a formal relationship with prominent organizations. Under the circumstance, prior employer represents an observable attribute of the entrepreneur and an indicator of the quality of the firm. Other players make inferences about the talents and abilities of the entrepreneurs based on their career histories of affiliation with employers. Prominence of previous employers may function as an indicator of the quality of the entrepreneur (Spence, 1974). Substantial reputational benefits thus accrue to employees of prominent firms (Burton et al., 2002; Higgins and Gulati, 2003). This is especially true in China since the opportunity to work for a world renowned employer is extremely limited. Thus, former employees carry the reputations of prestigious firms into entrepreneurial venture they founded.

Reputation transferred from prior employer is an important source of competence-based trust. There are two kinds of trust: intention-based trust based on the belief of other’s
intentions and values as closely aligned with one’s own; and competence-based trust based on the belief in other’s capabilities (Atkinson and Butcher, 2003; Harrison et al., 1997; Doney et al., 1998). In China’s transition economy, competence-based trust can be of greater significance than intention-based trust, as the process of networking is increasingly driven by actors’ calculation of the instrumental value of ties (Walder, 1986; Lin, 2001). With respect to entrepreneurial networks, a high level of competence-based trust can increase the degree of network extensibility by enhancing both the willingness and the ability of a given contact in introducing the entrepreneur to other contacts in his/her network. As discussed earlier, individuals are generally cautious in referring one to another because his reputation is at stake. According to some entrepreneurs, a person will “lose face” if he introduced somebody who is perceived as “incapable” or “disqualified.” And loss of face is taken very serious in the Chinese culture. With high level of competence-based trust, such concern will be mitigated and an existing contact will thus be more willing to refer and introduce the entrepreneur to others. Moreover, under the norm of reciprocity, a person can expect to be reciprocated by his/her efforts. Higher level of trust in the capabilities of the entrepreneur would lead to a belief of higher expected value of future reciprocation from the entrepreneur, which in turn provides the contact with higher incentive to help. The contact might even be able to claim credit from the other party for the introduction to the extent that the entrepreneur is capable of bringing value to the new exchange relationship. Furthermore, reputation also allows competence-based trust to develop in parties prior to direct interaction, which makes it easier for the existing contacts in the entrepreneurial networks to convince others about the potential benefits and hence the necessity of entering a direct relationship with the entrepreneur. For example, Liu Shiping, a former IT manager of IBM, attributed the fast growth of his entrepreneurial network to his reputation. “Reputation in the business circle is very important. It will open a lot of doors for you,” Liu stated. Although some of Liu’s customers such as Shanghai Stock Exchange and the Bank of Communications were introduced by his friends, they had known him by name from their business with IBM. Competence-based trust in the entrepreneur, then, can greatly facilitate the process of network development through existing ties and thus has a positive effect on network extensibility. Following these lines of reasoning, we pose the following hypothesis:
Hypothesis 4: Networks of entrepreneurs previously employed by prestigious firms will have higher extensibility.

University Affiliation and Network Extensibility

As a form of informal institutions, alumni networks play an important role in facilitating economic activities (Saxenian, 2002). Like Japan and Korea, university alumni networks in China play an important part in linking entrepreneurs to resourceful actors and circles. Alumni networks of prestigious universities such as Peking University (known as China’s Harvard) and Tsinghua University (known as China’s MIT) provide an especially useful networking base for their members because they have linked elites both across various institutions—government bodies, firms, universities, etc—and vertically within them. For example, current President Hu Jintao and former Prime Minister Zhu Rongji are both graduates of Tsinghua University. Research has shown how the technocratic graduates of Tsinghua University help each other move upward in their business and political careers (Cheng 1994; Gold et al., 2002). Therefore, the network of an entrepreneur who is an alumnus of a prestigious university is likely to exhibit a higher potential for network extension once he taps into his alumni networks. The following example illustrates the benefit of affiliation with a prestigious university on the extensibility of entrepreneur’s network. Burvis Technology is a startup in the area of IP communication. Telecommunication is a heavily regulated industry in China and to operate in this industry, extensive and intensive relationships with the government, the telecoms and other players are indispensable. The founder of Burvis, Wang Lijun, clearly did not have the relationships in hand when the company was founded. But he managed to “pull” the necessary relationships for the startup by resorting to his former classmates. Wang stated, “I’m fortunate because I graduated from Beijing University of Posts and Communications, where many graduates are currently occupying important positions in the telecom industry. Chances are high that my classmates will either know the key people or know somebody who knows them. So I can rely on them to introduce me to the key players.” He further added that there is still enormous potential to explore further network extension from the alumni network as the business grows. Other entrepreneurs who were graduates of Peking University and Tsinghua
University have also indicated the usefulness of classmates and schoolmates in extending their reach into different networks. Therefore, we pose the following hypothesis:

*Hypothesis 5: Networks of entrepreneurs who are alumni of prominent universities will have higher extensibility.*

Given that the research is conducted in Beijing, we single out “first class” universities based in Beijing certified by the Ministry of Education to construct the list of “prestigious universities.” The list includes Peking University, Tsinghua University, People’s University, Beijing University of Posts and Communications, Beijing University of Aeronautics and Astronautics, and University of Science and Technology in China.

**Social Absorptive Capacity and Network Extensibility**

The extent to which an entrepreneurial network can be expanded and enlarged also depends on the decisions made by the entrepreneur and his/her subsequent actions to carry out the decisions. First of all, the entrepreneur needs to discover potential network opportunities and identify viable network paths to explore these opportunities. Secondly, even when introduction is made by an existing contact, whether and to what extent a concrete relationship will take place remain uncertain. How the entrepreneur draws from his repertoire of knowledge and resources to develop the potential new relationship matters. In a similar vein, the entrepreneur also makes choices regarding how to exploit the newly acquired relationship for business ends and to explore it for further extension of the network. To do all these things effectively, it is necessary for the entrepreneur to have a high level of social knowledge—both social know-what and social know-how. The former includes knowledge about who knows what and who knows whom; whereas the latter refers to knowledge of the methods and skills in managing and developing networks. The accumulation of social knowledge takes time and practices on the part of the entrepreneur. In the Chinese business setting, such social knowledge can be rather complicate and involves a lot of behind-the-scene knowledge. For emerging entrepreneurs and especially for hi-tech entrepreneurs who come from a technology background, it presents an enormous challenge for them to learn and apply the social knowledge in effectively exploiting and exploring the networks.
The field study suggests the importance of social knowledge for success of entrepreneurs. Yan Changmin, who was Tsinghua educated in engineering and went to Canada to pursue his graduate study before he returned to China to become an entrepreneur, was quite optimistic about the prospect of his new company. The company—Beijing Landsnice Science and Technology focuses on the development of new construction material such as Sialite and new ceramics. Mr. Yan says, “At Landsnice, we have gathered first rate minds in technology, management, finance and law. Moreover, we have developed extensive external relationships with established firms in the steel and energy sectors, as well as local governments whose support would be critical in our business success. To use the traditional Chinese saying, we are now ‘prepared in a million items and are just waiting for the wind’ to set things in motion.” However, Yan’s career as an entrepreneur has been everything but smooth. He had founded two other start-ups in Zhongguancun before and both cases failed unfortunately. Yan shares his perspective:

It is painful to experience failure as an entrepreneur. In both cases, we had developed good technology and new products. But we lacked marketing and management experience. More important, we didn’t have guanxi resources and didn’t know how to develop personal relationships with potential customers and governments to support the business. In retrospect, however, these failures are of enormous value to me. I learned two important lessons. The first was that technology is not the only factor in the success of a hi-tech entrepreneurial firm. Firms also compete on other grounds such as networks, management, and speed. Secondly, the human dimension is much more important and demands special attention from the manager, especially in China. How to address the needs of individuals and align their incentives with ours are highly important.

But addressing personal needs in doing business in China can be a delicate matter. In most cases, the resources that the entrepreneur seeks to access lie at the level of an organization level, be it a firm or a government agency. However, it is the people who are in the positions that make decisions which affect the entrepreneur’s access to these resources. Firstly, the entrepreneur’s needs to identify the key people involved in decision-making, which is not an easy task because Chinese government and SOEs are often organized around a complicated inner network of personal relationships that do not correspond to a standard organizational chart. Secondly, as the decision-makers are more concerned about their personal gains than the gain of the organization in an exchange, the entrepreneur needs to
figure out an effective way to do it. Under weak legal institutions in the society and improper incentive mechanisms government many government and state owned enterprises, such practices of rent seeking from roles/positions have become common in China. Entrepreneurs that have more knowledge about the needs of the persons and the methods appropriate to address these needs that fall on the grey zone between “legal” and “illegal” will be better at extending their networks. To illustrate with an anecdote, during one of the field interviews, the telephone rang. The entrepreneur picked up the phone and started to discuss how to arrange for the child of a local government official to go to study abroad. After he hang up, he turned to me and said, “This is how we built guanxi. And in a way, this is how business is done in China. Personal favors that address the priority needs tend to be much appreciated and reinforce the business relationships.” He continued, “But like any other knowledge, the best way to learn it is from practice. You learn by doing it. My background as a manager in an SOE has given me a lot of experience with building relationships. That becomes one of my strength as an entrepreneur.” In fact, children’s education has become the focal concern of parents given the traditional Chinese value and the “one child” policy. Other entrepreneurs have also used it as means to develop the robustness of a relationship. Yao Xin from Beijing MapUniverse Technology indicated that by helping the kids to get into schools, his links to Chinese Academy of Science and other universities had facilitated the expansion of his network in an indirect but important way. To summarize, entrepreneur’s stock of social knowledge about other actors, the interrelationships among these actors, as well as how to develop relationships with particular actors is likely to exert a significant effect on the degree of extensibility of the entrepreneurial network. In other words, different level of social knowledge may lead to different level of ability in exploring existing ties for the creation of new ties.

This phenomenon we call social absorptive capacity—ability to recognize the value of potential new ties, incorporate them into the actor’s network by leveraging existing resources and knowledge, and to apply them for business ends. The concept of absorptive capacity was first developed by Cohen and Levinthal (1990). They define it as “the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends.” They argued that absorptive capacity is a function of a firm’s level of prior related knowledge. Similarly, social absorptive capacity is a function of an actor’s
(entrepreneur in this case) prior social knowledge—social know-what and social know-how. As the field research suggests, the stock of social knowledge can be accumulated from related experience, such as prior start-up experience, management and marketing experience. We therefore propose the following hypothesis:

\[\text{Hypothesis 6: High social absorptive capacity of the entrepreneur acquired from previous start-up experience, management experience or marketing experience is associated with higher degree of network extensibility.}\]

**Network Density and Performance**

Network density has been employed as a key measure in social network analysis and has been found to affect a range of performance consequences from knowledge transfer, innovation to financial performance. Thus, the current study will also examine whether dense or sparse networks promote the performance of Chinese hi-tech entrepreneurial firms.

A dense network may entail positive consequences on performance by promoting trust and cooperation among its members (Coleman 1988). Ties between actors facilitate the diffusion of norms across the network and, as a result, firms embedded in highly interconnected networks develop shared behavioral expectations (Meyer and Rowan 1977; Oliver 1990). Based on this line of argument, dense networks may play an especially important role in emerging economies where legal and market institutions are weak, level of uncertainty is high, and contract enforceability is low. High density would facilitate the information flow on deviant behavior, thus constrain opportunistic behavior, lower transaction costs, and boost economic efficiency (Coleman 1988; Walker, Kogut, and Shan, 1997; Williamson 1993).

In addition, dense networks are demonstrated to be beneficial in facilitating the exchange of fine-grained information and tacit knowledge (Krackhardt, 1992; Uzzi, 1996; Rowley et al., 2000). For entrepreneurs in the high technology sector, information that embodies opportunities can be rather vague and complex and will require both time and capacity to communicate effectively. More than likely, the entrepreneur may need additional efforts from his/her contacts besides the provision of information to exploit the opportunities. Actors embedded in densely connected networks are likely to be more motivated to help each
other than those embedded in less dense networks. Therefore, a dense network is likely to lead to better performance for the new firm.

On the other hand, however, there is growing empirical evidence on the negative consequences of dense networks: tightly controlled relationships reinforce obligations and expectations that may limit freedom of economic actors to recognize and exploit new opportunities (Light and Isralowitz, 1997; Podolny and Page, 1998). Other things being equal, the maintenance of strong ties in a tightly knitted network is more costly than maintaining the same number of weak ties, thus more quickly reaching one’s “bounded sociability” and constraining one’s ability to seek out new ties (Boisot and Child, 1999). In contrast, firms embedded in sparsely connected networks will enjoy efficiency and brokerage advantages based on the ability to arbitrage nonredundant information exchanges (Burt 1992; 2000).

Moreover, as Nahapiet and Ghoshal (1998) argued, embeddedness in dense networks can limit a firm’s openness to information and to alternative ways of doing things, producing forms of collective blindness that sometimes may lead to devastating outcome. Dense networks may suppress innovation by curtailing any kind of deviant behavior, good or bad, with the prevalence of strong isomorphic forces. For entrepreneurial firms in the high-tech sector, innovative capability in both product and business model development is crucial to their long term performance. To them, the suppressive effect of dense network can be especially detrimental. Furthermore, a highly dense network also poses the danger for firms to be blind to new developments or be “locked-in” (Johannisson, 2000). Uzzi (1996) finds that overembeddedness stifle economic performance of firms. Overembeddedness in a highly dense network may thus constrain a firm’s flexibility and ability to adapt to exogenous shocks, which is indeed crucial for entrepreneurs navigating in the turbulent water of a transition economy. By contrast, sparse networks provide access to diverse and novel information, as ties bridge disparate segments of the network that are otherwise unconnected, and hence may give rise to new opportunities (Granovetter, 1973, 1982; Burt, 1992). There are thus ways in which sparse networks can be conducive to the performance of Chinese hi-tech entrepreneurial firms.

To reconcile the contrasting theoretical views, several studies argue that dense networks are more beneficial for early stage firms while sparse networks lead to more
benefits for later stage of development (Larson and Starr 1993; Hite and Hesterley 2001). In the early phase firms must access, mobilize and deploy resources in order to exploit the opportunities they have spotted (Garnsey, 1998). Securing resources is one of the crucial tasks of the entrepreneurs in new ventures and their key relationships have to be used to get privileged access (Starr and MacMillan, 1990). Birley et al. (1991) also argue that entrepreneurs, at an early stage of enterprise development, rely heavily on an informal network of friends, family members and social contacts from the local neighborhood to gather relevant data. At a later stage entrepreneurs rely increasingly on arms-length ties such as professional bankers, accountants, lawyers, suppliers, and government agencies to gain access to requisite business information. In short, networks of emerging firms evolve in order to adapt to the firm’s changing resource needs and resource challenges. Initially, entrepreneurial networks consist primarily of socially embedded ties drawn from dense, cohesive sets of connections. As firms grow, their networks evolve from networks that emphasize cohesion to those that exploit structural holes (Hite and Hesterley 2001). High technological entrepreneurial networks in China are also likely to follow such a development trajectory. In fact, as an early stage economy, in China system wide information and resource distribution mechanisms are insufficient and worse, distorted against emerging private firms (Huang 2003), and may hence enhance the necessity and prolong the period for entrepreneurial firms to rely primarily on dense and resourceful networks for a competitive edge. We then propose the following hypotheses:

\[ H7: \text{Network density is positively correlated with the performance of entrepreneurial firms.} \]

**Discussion**

This qualitative study has shown that an important way in which Chinese hi-tech entrepreneurs obtain new contacts is through introductions made by their existing contacts. Figure 4 is a graphic representation of the process of network extension via existing ties. At time 1, A initiates a tie with B, which also creates a path for A to reach both C and D. At time 2, A develops C and D into primary contacts. At time 3, A’s network is further extended
to include C’s contact E and D’s contact F. Thus, the formation of a tie with B has led to a whole new set of relationships for A. In other words, entrepreneurial networks evolve and expand over time as existing contacts link the entrepreneurs to further contacts. The development of entrepreneurial networks is thus path dependent, as existing relationships lead to new relationships.

[Insert Figure 4 about here]

Furthermore, the qualitative evidence presented here suggests that network extension through existing ties represents an important mechanism by which networks influence entrepreneurial performance in the context of China’s emerging economy. Entrepreneurial networks differ in their potential for expansion and enlargement through existing contacts—network extensibility. Networks with higher extensibility appear to lead to better performance. A number of factors in turn drive network extensibility, including tie strength, the prestige of entrepreneurs’ prior employers, universities attended by entrepreneurs, and entrepreneurs’ social absorptive capacity. In addition, whether the entrepreneur has overseas experience is shown to moderate the effect of tie strength on network extensibility.

This study stands in sharp contrast to the theory of structural holes, which treats new contacts connected with existing contacts as redundant contacts. According the Burt (1992), redundant contacts are unnecessary or worse, deleterious to performance because they consume resources that can otherwise be used more efficiently. “There is little to gain from a new contact redundant with existing contacts. Time and energy would be better spent cultivating a new contact to unreached people” Burt (1992: 67). As illustrated in figure 5, structural hole theory posits that information or resources held by C and D will flow to A through B. Therefore, there is no need for A to maintain a direct tie with C or D. In the context of entrepreneurship, however, redundant business contacts may provide complementary resources. When the marginal return of developing an additional primary contact from a cluster is sufficiently high, it is worth treating each person in them as a primary contact, regardless of redundancy. The new contacts can be potential suppliers, customers, or business partners who may contribute directly to the sales or profit of entrepreneurial firms. By developing indirect contacts into direct contacts (moving from time 1 to time 2 in figure 4), the entrepreneurs are also likely to reap more information benefit through more effective communication. In fact, studies of interorganizational networks have
also suggested that direct ties provide different content and higher magnitude of benefits compared to indirect ties (Ahuja, 2000). In other words, developing new contacts that are redundant can still provide the entrepreneurs with nonredundant benefits.

Another potential contradiction between the logic of network extensibility and structural holes concerns the introduction behavior on the part of existing contacts. From the perspective of an existing contact, introducing the entrepreneurs to his/her other contacts may close existing structural holes and lead to a loss of information and control benefits for the existing contact. Thus, according to the logic of structural holes, an existing contact would be disinclined to introduce the entrepreneur to other contacts in his network. This study suggests that actors connect disparate network members guided by the reciprocity principal. Almost all of the entrepreneurs interviewed indicated that they would reciprocate the contacts who had introduced them to new people either immediately or in the near future. In addition, while introduction may make it more difficult for the introducer to leverage the formerly disconnected contacts against one another, the introducer may benefit more from the joint support of these contacts. The act of introduction may enable the introducer to reap network benefits that may otherwise remain unrealized. Therefore, contrary to the logic of structural holes, this study shows that actors engage in introduction activities to bring formerly disconnected network members together, thus making network extension through existing ties not only viable, but also effective under certain circumstances.

More important, in context fraught with high uncertainty, low trust and weak market-supporting institutions characteristic of emerging economies, it is difficult for entrepreneurs to create de novo relationships, relationships that are not extensions of existing ties. Thus, even though a nonredundant contact may provide substantial information and control benefits, extension through existing ties represents the only feasible way for entrepreneurs to expand their networks and in turn, improve performance of their firms. Moreover, the newly developed contacts can in turn open doors for the entrepreneurs to reach even further contacts, creating a virtuous cycle of regeneration and reconstitution.

Nevertheless, it should be noted that while extension through existing ties appears to be a maximizing strategy for entrepreneurs to expand their networks and improve performance in the short run, in the long run it may work less and less well. If all ties are
extensions of existing ties, a natural consequence would be increasing network density within a given cluster, which may drive down profit margin for all entrepreneurs and result in hyper competition. Paradoxically, while many may perceive the opportunities of occupying the hole positions located between clusters, they may not be able to do so because existing ties within a cluster can only introduce them to other contacts they know, who are most likely to be inside rather outside the cluster. As a consequence, few people can break out from their existing clusters and seize the perceived opportunity of occupying hole positions between clusters. The isolation of clusters is likely to persist, leading to persistent fragmentation of the national economy by region and sector. Given the path dependency of network extension in the context of emerging economies, therefore, it is advantageous to start with a network that transcends a single cluster. In this sense, the competitive advantage of overseas returnees who tend to start with a transnational network may gradually surface in the long run.

In the short run, returnees’ greater reliance on weak ties and locals’ greater reliance on strong ties may not entail a noticeable difference in terms of overall network extensibility given that both the returnees and locals can extend and expand their networks, albeit through ties of different strength. However, in the long run, network extension through weak ties may yield an edge over extension through strong ties. The reasons are twofold. First, weak ties are more likely than strong ties to be bridges to distant regions of a network (Granovetter, 1973; Burt, 1992). For hi-tech entrepreneurial firms, this could mean the opening of a whole new market (e.g., products to be tailored to a different industry) or access to a different domain of knowledge and expertise that may yet be applied in the development of new technology or product. This could also mean reach to distant actors much higher in status, with a higher potential in yielding further valuable contacts (Ibarra, 1993). Second, weak ties and strong ties incur different maintenance costs. Maintaining a strong tie is significantly more costly than maintaining a weak one (Boorman, 1975). It requires frequent social interaction that cost more time, energy and money. As the entrepreneurial network evolves and grows, it would ultimately hit the limit of so called “bounded sociality”—the time and energy required to sustain face-to-face relations (Boisot 1999). Given the lower maintenance costs of weak ties, an entrepreneurial network comprised of more weak ties can have a larger effective size than a network predominated by strong ties. In the long run, therefore, a greater proportion of weak ties will result in higher degree of overall network extensibility if those weak ties yield
similar degree of extensibility. As an implication, the returnees who are both deliberate and capable in exploring the benefits of weak ties for further network extension are likely to enjoy a competitive edge over locals who focus on the development and exploration of strong ties.

**Conclusion**

The institutional environments of emerging economies give rise to a network paradox: on the one hand, in the absence of formal market-supporting institutions entrepreneurs must rely on informal networks for access to resources to sustain new ventures; on the other hand, a high level of uncertainty and low level of trust have make it extremely difficult for entrepreneurs to forge de novo networks. As a consequence of this paradox, entrepreneurs seek to expand their networks through their existing contacts. Thus, a key mechanism through which networks influence entrepreneurial outcomes in emerging economies is network extension via existing contacts or network extensibility. Network extensibility—the capacity of existing network relationships to yield further relationships—thus is expected to have a positive effect on entrepreneurial performance in emerging economies.

There are several antecedents of network extensibility. Grounded in qualitative evidence collected from field research, we have identified four antecedents of network extensibility: tie strength, entrepreneur’s prior employment, entrepreneur’s university alumni affiliation, and entrepreneur’s social absorptive capacity. In addition, overseas experience appears to moderate the effect of tie strength on extensibility. While tie strength is a tie level characteristic, all the other factors appear to be characteristics of entrepreneurs and their experience.

There are implications for both strategy and network research. For strategy, theory of network extensibility brings to light the role of strategy in managing and developing entrepreneurial networks. Despite the path-dependency in network extension through existing ties, entrepreneurial networks do not automatically extend to new contacts. In which direction and to what extent a network expands depends to a considerable degree on the strategy and decision made by the entrepreneur. When guided by a well-defined strategy,
entrepreneurs may be more effective in extending and reconfiguring their networks to address the needs of their ventures in a high velocity context. In addition, the concept of social absorptive capacity also points to the existence of strategy element in entrepreneurial networks—the capacity of the entrepreneur to consolidate existing resources and explore new resources. A parallel between social absorptive capacity for network extension and absorptive capacity for knowledge extension at the firm level is suggested.

For network theory, this study has built upon previous efforts (Gulati and Gargiulo, 1999) to move beyond a static view of networks and towards an understanding of their dynamics. Understanding the evolution of firm networks during emergence and early growth is an important and necessary step in this agenda, especially in the context of emerging economies where the institutional environments stand in sharp contrast to that in the developed economies. Network extensibility captures a dynamic aspect of networks—how much and how networks grow—and thus can be more predictive of subsequent entrepreneurial performance in emerging economies. In addition, by exploring the antecedents of network extensibility, this study has developed an integrative model of network processes and outcomes.

In conclusion, this study has highlighted the importance of extending existing networks to new business contacts in the context of Chinese hi-tech entrepreneurship. As economic transformation proceeds and the context changes, the impact of network extensibility is likely to change as well. Thus, it will thus be important to conduct longitudinal research on entrepreneurial networks in China and other emerging economies. Guided by the concept of network extensibility and the propositions developed here, a quantitative study based on a survey of the same set of entrepreneurs will be reported in a separate paper. The quantitative research allows us to explore the hypotheses proposed in this paper and to test them against competing theories of entrepreneurial performance.
References


Saxenian, Anna Lee. 2002. Local and Global Networks of Immigrant Professionals in Silicon Valley, Public Policy Institute of California.


Figure 1: The Model

- Overseas Experience
  - Tie Strength
  - Prior Employment
  - University Affiliation
  - Social Absorptive Capacity

- Network Density
- Network Extensibility

→ Performance
Figure 2: Evolution of ZD Tech’s Network
Figure 3: VisionNex’s Sales Network

Customers in 27 countries, accounting for 50% revenue 2003

Radvision

VisionNex

Director A

Railcom

Project A

Project B

Project C

WB1

WB

WB2

Note: → represents strong ties
       - - - - represents weak ties
Figure 4: Network Extension

Dynamic view

Network at Time 0

A

B

C

D

Network at Time 1

A

B

C

D

E

Network at Time 2

A

B

C

D

E

F

--- = direct tie

--- = indirect tie

--- = new tie created
Figure 5: The Static View of Network

Static view

A -- B -- C
A -- D

C

D