SOCIAL NETWORK TIES, PRIOR KNOWLEDGE, AND ENTREPRENEURIAL
RESOURCE ACQUISITION

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Jing ZHANG
Cass Business School
City University
106 Bunhill Row
London EC1Y 8TZ
U.K.
Email: j.zhang@city.ac.uk
Phone: (44) 07940071158

Poh-kam WONG
NUS Entrepreneurship Centre
14 Prince George’s Park
National University of Singapore
Singapore 118412
Email: bizwpk@nus.edu.sg
Phone: (65) 68746323

Pek-hooi SOH
NUS Business School
National University of Singapore,
1 Business Link
Singapore 117591
Email: bizsohph@nus.edu.sg
Phone: (65) 68743180
ABSTRACT

New ventures face great difficulties in acquiring resources due to the problem of uncertainty and information asymmetry caused by limited prior knowledge of resource owners about the technology and products of these ventures. Although prior studies have argued that social networks can be used to facilitate entrepreneurial resource acquisition, they have not identified the factors that influence the effectiveness of the use of social networks. This paper presents a contingent model that explains the effectiveness of entrepreneurial resource acquisition using direct or indirect social network ties, and tests it with field survey data involving 378 high-tech entrepreneurs in Singapore and Beijing, China. Consistent with our model, we find that the strength of direct ties between entrepreneurs and resource owners has a positive effect on the probability of resource acquisition, but this effect is negatively moderated by the level of prior knowledge of the resource owners. We also find that, in the case of indirect ties mediated through referrers, prior knowledge only has a moderating effect on the ties between referrers and resource owners, but not the ties between entrepreneurs and referrers.

**Key Words:** Social Networks, Entrepreneurship, Resource Acquisition
INTRODUCTION

Prior studies have shown that at the early stage of new venture creation, entrepreneurs often employ social networks, comprised of interpersonal ties, to acquire such resources as financial capital, key technical/managerial expertise and customer purchase orders (Aldrich & Zimmer, 1986; Birley, 1985; Shane & Stuart, 2002; Starr & MacMillan, 1990). New venture creation is characterized by severe uncertainty and information asymmetry problems, which hamper the potential resource owners’ ability to evaluate the viability of the new ventures properly (Venkataraman, 1997). Social network ties have been theorized as a means to overcome these problems by transferring private information about the entrepreneurs and their new ventures to the potential resource owners, thereby promoting trust to facilitate cooperative exchange (Shane & Cable, 2002).

While there has been some prior work that examines the use of social networks by entrepreneurs in acquiring resources, relatively few empirical studies have examined the factors that influence the effectiveness of network ties in this process (Hoang & Antoncic, 2003). Some researchers have argued that the effectiveness of networks in resource acquisition is contingent upon the stage of venture development. For example, Aldrich, Rosen and Woodward (1987) found that only young firms less than 3 years old benefited from strong ties in terms of profitability. Similarly, Starr and MacMillan (1990) provided two case examples that illustrated the prominent role of strong ties in resource acquisition at the founding stage. Although this group of research stresses the importance of strong ties at the early stage of venture growth, it does not identify the specific conditions under which networks ties will be more facilitative. Moreover, other empirical studies have produced contradictory results. For instance, Zhao and Aram (1995) found that the effects of network activities on firm growth were not related to the stages of venture development. Given the limited time and effort that entrepreneurs could invest in building and maintaining network ties, it is imperative to know the conditions under which network ties can be more useful in resource acquisition (Aldrich & Zimmer, 1986).

In this paper, we examine the contingent effect of prior knowledge of resource owners on the effectiveness of social network ties in entrepreneurial resource acquisition. We first argue that the extent of prior knowledge on the part of resource owners has direct implication on their proclivity to
commit resources in particular ventures. Then we hypothesize that strong network ties, whether in the form of direct or indirect ties, are more useful in transferring private information about the ventures to prospective resource owners when the latter have limited prior knowledge about the particular technology or product of these ventures. In contrast, social network ties are expected to be less effective in inducing resource acquisition when the potential resource owners already have good prior knowledge of the technology or products of the new ventures.

We tested our hypothesis using data collected from interviews with entrepreneurs in 128 new high-tech ventures in Singapore and 250 in Beijing on their initial resource acquisition activities and outcome. Consistent with our predictions, we found that both the main effects of tie strength and prior knowledge as well as the moderating role of prior knowledge of resource owners are statistically significant. In the case of indirect ties via referrers, however, we found that the moderating effect of prior knowledge only applies to the tie between referrer and resource owner, but not the tie between entrepreneur and referrer.

Our findings contribute to the entrepreneurship literature in four ways. Firstly, we show the contingent value of social network ties in entrepreneurial resource acquisition: social networks are not uniformly important in all resource acquisition contexts. Secondly, we extend the existing empirical literature by broadening the scope of coverage of resource acquisition to include not only financial resources, but also key human resources and customer order. Thirdly, we also extend the existing empirical literature by providing new insights on how strength of indirect ties affects resource acquisition propensity. Lastly, while the existing literature on entrepreneurship emphasizes the role of prior knowledge of the entrepreneur in new venture creation propensity (Kirzner, 1997; Shane, 2000; Venkataraman, 1997), our findings highlight the role of prior knowledge of the resource owners to whom the entrepreneur turns for help. From this perspective, the high rate of new venture formation in a region like Silicon Valley may be due not only to the high entrepreneurial propensities of technical professionals there, but also to the high level of prior knowledge of other resource owners in the venture ecosystem: the experienced angel investors and venture capitalists who provide the risk capital, the specialist technical professionals and managers who staff the start-up team, and the knowledgeable purchasing managers in large firms who are innovations by new start-ups. We believe
that this shift of focus from the network egos (entrepreneurs) to the network alters (resource owners) hold important implications for entrepreneurs in terms of resource acquisition strategy as well as for policy makers in terms of new venture creation promotion policy.

THEORY DEVELOPMENT

Resource Acquisition by New Ventures

Start-ups need to acquire a wide range of external resources in order to get their new ventures off the ground. While prior empirical work on entrepreneurial resource acquisition tends to focus only on financial resource acquisition (see e.g. Batjargal & Liu, 2004; Shane & Cable 2002), the broader theoretical literature in entrepreneurship has identified two other generic types of resources that are critical for the survival of start-ups: specialized human resources in the form of embodied skills or experience-based technical and managerial knowledge that typically can only be acquired by convincing the resource owners to join the venture as key team members (e.g. chief technology offices, vice-president of marketing); and purchase order by an early customer or lead user, which is often regarded as a critical market validation signal by other resource owners (Venkataraman, 1997).

Scholars in the fields of economics, sociology and entrepreneurship have observed that the perceived high risks arising from uncertainties and information asymmetries are likely to severely impair the ability of resource owners to appraise the viability of new ventures, and consequently the probability of economic exchange between entrepreneurs and resource owners (Bolton & Scharfstein, 1990; Shane & Stuart, 2002; Williamson, 1979). Uncertainty is the lack of information relative to requirements (Daft & Lengel, 1986). In high-tech industries, while both established firms and new ventures face technology uncertainty and market uncertainty (Fiet, 1995), the new firms also face the additional uncertainty arising from the fact that they lack legitimacy and the institutional support of external actors, such as buyers, suppliers and government agencies (Aldrich & Auster, 1986). From the resource owners’ perspective, new ventures lack performance track records, and hence suffer a liability of newness and a greater risk of failure than established firms (Stinchcombe, 1965). Therefore, resource owners prefer to defer resource commitment until the firms can provide more observable information. As noted by Bhide and Stevenson (1992):
“Customers are reluctant to spend time to evaluate, much less place an order […] until the entrepreneur can actually deliver a product; employees are hesitant to commit to a job until the financing is in place; and investors are unwilling to step forward unless customers have shown a willingness to buy.” (p. 156)

In addition to uncertainty, the process of entrepreneurial resource acquisition is also complicated by information asymmetry, since entrepreneurs often possess more information about the prospects of their business, the technical performance of their products, and the competence of their founding teams than outside evaluators (Shane, 2000). Shane and Cable (2002) argued that this information asymmetry generates two problems that make resource owners unwilling to invest in new ventures. First, to prevent others from pursuing the same opportunity, entrepreneurs are reluctant to fully disclose their information to resource owners. Hence insufficient information may be delivered for evaluation. Second, entrepreneurs can engage in opportunistic behavior since they have information that resource owners lack (Williamson, 1979).

While some economists have argued that formal contracts could minimize opportunistic behavior by allocating control rights between trading partners (Kaplan & Stromberg, 2000), such formal contracts are seldom used in the cases of new ventures, due to the high costs of establishing the contracts, and the fact that contractual controls rarely succeed in fully eliminating entrepreneurs’ ability or incentive to take opportunistic actions (Venkataraman, 1997).

Contrary to the contract economic perspective, organizational theorists have identified the social networks of entrepreneurs as a mechanism for mitigating the problems of uncertainty and information asymmetry. Social networks facilitate the resource acquisition process in several ways. First, networks enable resource owners to gather superior information on entrepreneurs’ capabilities (Shane & Cable, 2002) as well as on the new ventures’ technology and market potential. Second, networks mitigate transaction costs by making opportunism more costly. Resource owners in networks have the power to sanction entrepreneurs by disseminating negative information about them in case the entrepreneurs conduct malfeasant behavior (Granovetter, 1985). Because reputation takes time to build, but can be destroyed quickly, networks can create “self-enforcing” safeguards for opportunistic behavior (Powell, 1990).
Tie Strength and Resource Acquisition

Granovetter (1973) defines tie strength as a “combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie.” In social network literature, a debate has arisen over the benefits of strong vs. weak ties. The resolution of the debate requires a contingency approach. Prior literature has found that while weak ties are useful in providing non-redundant and novel information that is in great need in situations such as job searches in the U.S. (Granovetter, 1973), strong ties are more effective in some other aspects. First, strong ties transfer tacit, fine-grained information and facilitate collaboration (Ahuja, 2000). Second, they promote knowledge-based trust and reduce unethical behavior (Gulati, 1995; Uzzi, 1996). Third, they facilitate shared vision and support resource exchange and combination (Tsai & Ghoshal, 1998). Since resource owners need both explicit and tacit information about the businesses and the entrepreneurs to evaluate the new ventures (Shane & Cable, 2002), and mutual trust and shared vision are crucial for facilitating economic exchange under high uncertain environment such as an emerging firm, strong ties are expected to be more useful in reducing perceived uncertainty and information asymmetry than weak ties (Uzzi, 1997).

Network ties can take the form of either direct ties or indirect ties. Following Larson (1992), we define direct tie as a prior relationship between entrepreneurs and resource owners, and indirect tie as a relationship between entrepreneurs and resource owners who are not directly linked but connected by a common third party (called referrer) with whom both parties have direct ties (Burt, 1987). In the cases of direct ties, our argument about the benefits of strong ties presented above leads to the following prediction:

Hypothesis 1a: An entrepreneur’s likelihood of acquiring resources increases with the strength of the direct tie between the entrepreneur and the resource owner.

In the cases of indirect ties, referrers act as intermediaries in trust, and expand entrepreneurs’ reach by initiating contacts with persons who are not directly connected (Shane & Cable, 2002). Two links are investigated in each case of indirect ties – the link between the referrer and the resource owner, and the link between the referrer and the entrepreneur. Resource owners would be more likely to make favorable decisions if they have stronger ties with the referrers, since the ties transfer the
behavioral expectations from their existing good relationship to the new one (Uzzi, 1996). Moreover, the referrers are usually very careful when referring an entrepreneur to resource owners in order to safeguard their own reputation in business circles, especially when they have strong ties with resource owners (Powell, 1990). Thus, their recommendation is considered very trustworthy. We expect the same influence of strong ties between referrers and entrepreneurs on the resource owners’ decision. From the resource owners’ point of view, stronger ties mean that the referrers know more about the capabilities and honesty of the entrepreneurs, and thus the information transferred is more reliable (Gulati, 1995; Podolny, 1994). We therefore predict:

**Hypothesis 1b:** An entrepreneur’s likelihood of acquiring resources increases with the strength of the tie between the entrepreneur and the referrer.

**Hypothesis 1c:** An entrepreneur’s likelihood of acquiring resources increases with the strength of the tie between the referrer and the resource owner.

**Prior Knowledge and Resource Acquisition**

In this study, we define prior knowledge as the expertise or background knowledge about the technologies or products/services relevant to a particular start-up. Note that since it is typically obtained through education, training or work experience, prior knowledge would be independent of social network constructs, such as tie strength. The concept of prior knowledge is originally employed in the literature to explain the discovery of entrepreneurial opportunities (Shane, 2000). People’s knowledge is typically idiosyncratic because it is acquired through each individual’s own unique circumstances including occupational and daily life (Venkataraman, 1997). As a result, only those people who have acquired specific knowledge through particular experience have certain profit making “insight” (Kirzner, 1997). Hence, entrepreneurs discover opportunities related to the knowledge they have already possessed (Shane, 2000). The uniqueness of prior knowledge necessary to understand and recognize business opportunities is likely to be particularly high among high-tech

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1 Shane (2000) identified three major dimensions of entrepreneurs’ prior knowledge important to opportunity discovery: prior knowledge of markets, prior knowledge of ways to serve markets, and prior knowledge of customer problems. Hereby prior knowledge is the way entrepreneurs understand the markets from producers' perspective. Our definition in this study is broader than Shane’s (2000). But the two definitions share basic traits: (1) prior knowledge is idiosyncratically built up through personal experience; and (2) prior knowledge is necessary information for people (entrepreneurs or resource owners) to understand and recognize the value of new business opportunities.
entrepreneurs, because the emerging technology or business model involves more specialized knowledge and thus could only be obtained from special educational or work experience (Roberts, 1991). However, paradoxically, the unique prior knowledge of entrepreneurs, which facilitates their entrepreneurial opportunity discovery in the first place, also results in information asymmetry and generates difficulties in resource acquisition – resource owners are concerned about opportunist behavior taken by entrepreneurs (Shane & Cable, 2002).

Given that information asymmetry arises from the lack of relevant knowledge possessed by resource owners, a high level of prior knowledge of resource owners can attenuate this problem. In particular, more relevant prior knowledge about the new technologies or products of the new ventures would enable the resource owners to make independent assessment of the prospects of the new ventures, rather than relying on the words of the entrepreneurs. In principle, a higher level of prior knowledge of the resource owners could lead to higher or lower propensity to invest their resources in the new ventures. On the one hand, the greater prior knowledge helps to reduce the perceived uncertainty in evaluating the new ventures. Cognitive science has confirmed the superiority of “experts”, who possess rich prior knowledge, in a myriad of decision processes (Alba & Hutchinson, 1987). Since experts have learning and information processing advantage, they have proportionately high level of interest or involvement in trying and adopting innovations (Wood & Lynch, 2002). Otherwise, “when an adequate level of how-to knowledge is not obtained prior to the trial and adoption of an innovation, rejection and discontinuance are likely to result” (Rogers, 1995: 166).

On the other hand, with a higher level of prior knowledge, the resource owners may be more aware of the potential weaknesses or flaws in the new ventures’ technologies and products in meeting market needs or in overcoming competitive threats, and hence would reduce their likelihood to commit their resources in the new ventures. However, if we assume that resource owners are rational, they should be able to recognize the level of their relevant knowledge in understanding and evaluating the new ventures, and hence will not invest if they perceive a high risk in an unknown area. Under this assumption, the non-experts would generally shun investing in any new venture that they do not understand. In contrast, among the experts some are willing to invest if they evaluate the venture
positively, although the others will not invest if they hold negative evaluation. In aggregate, the experts would show a higher investment propensity than the non-experts.

In practice, we believe that the resource owners who are being approached by high-tech entrepreneurs are typically experienced angel investors and venture capitalists, specialist technical professionals and managers, and senior personnel in purchasing, and thus can be assumed to be rational and not naïve in their resource commitment decisions. As highlighted by Bygrave (1987) and others, angel investors and venture capitalists tend to invest in areas where they are knowledgeable. Similarly, specialist technical professionals and managers are sought after precisely because of their technical specialization and relevant experience; and many lead users of new technology already share much of the same tacit knowledge about new technologies or products (Cohen & Levinthal, 1990).

We can therefore make the following prediction in the case of direct ties:

**Hypothesis 2a:** An entrepreneur’s likelihood of acquiring resources increases with the level of prior knowledge of the resource owner about the technology or product of the new venture.

In the scenario of indirect ties, the above argument should continue to hold for the resource owners. For the referrers, we can similarly expect that a higher level of prior knowledge of the referrers is likely to lead to higher propensity of resource commitment by the resource owners. Resource owners are likely to be positively influenced if the referral comes from expert referrers, as the latter’s perceived knowledge or expertise is regarded as a valuable endorsement of the quality of the new ventures they refer (Stuart, Hoang & Hybels, 1999). For instance, in a study of the diffusion of a new drug, Burt (1987) showed that doctors’ perceptions of the therapeutic effect of the drug improved after expert physicians recommended it. Combining arguments about the prior knowledge of resource owners and referrers, we predict that in the case of indirect ties:

**Hypothesis 2b:** An entrepreneur’s likelihood of acquiring resources increases with the level of prior knowledge of the resource owner or the referrer about the technology or product of the new venture.
Moderating Role of Prior Knowledge

While the preceding hypotheses make predictions about the main effects of social network tie strength and prior knowledge of resource owners and referrers respectively, we need to examine further the possible interaction effects of these two constructs: network tie strength and prior knowledge. In particular, we postulate that the effects of network ties on resource acquisition are contingent on the levels of prior knowledge of the resource owners and referrers. The nature of this moderating effect of prior knowledge can be analyzed in terms of how social network ties are used to mitigate against the problem of information asymmetry. As pointed out earlier, strong network ties are used to transfer private information about the competency and integrity of the entrepreneurs to the resource owners, and hence reduce the perceived likelihood of opportunistic behavior by the entrepreneurs (Gulati, 1995). Strong network ties also mean that the entrepreneurs are more willing to disclose information about their technologies or products to the resource owners, thereby increase the latter’s knowledge about the ventures. When the resource owners already have high prior knowledge of the technology and product of the new venture, the level of information asymmetry is reduced, thus making it less necessary for the resource owners to rely on social network ties to mitigate against the problem of information asymmetry. In effect, the level of prior knowledge of the resource owners serves as a converse measure of the level of information asymmetry in the entrepreneurial resource acquisition process. This leads to the following predictions:

**Hypothesis 3a:** In the case of direct ties, the relationship between tie strength and resource acquisition is negatively moderated by the level of prior knowledge possessed by the resource owner.

**Hypothesis 3b:** In the case of indirect ties, the relationship between tie strength and resource acquisition is negatively moderated by the level of prior knowledge possessed by the resource owner or the referrer.
METHODOLOGY

Singapore vs. Beijing

We tested the above hypotheses based on data collected from a sample of 128 high-tech start-ups located in Singapore and another 250 in Beijing, China. We adopted a two-location field research design for two main reasons: First, both countries share common Chinese cultural roots (Bian & Ang, 1997), which have long been known for emphasizing social relationships as a dominant form in economic and social organization (Yang, 1994). Hence we expect significant use of network ties by entrepreneurs in both locations.

Second, notwithstanding the common cultural roots, the two countries have developed very different business environments for high-tech entrepreneurship. Singapore has a more mature and market-oriented environment than China due to her early openness to Western influences. Her market institutions for high-tech venture formation are well established, including a relatively mature venture capital industry and a highly mobile and internationally-open labor market for professional skills (Bian & Ang, 1997; Wong, 2005). In contrast, China’s market context for high-tech start-ups is less matured and more uncertain, since her transitional economy is characterized by weak capital market structures, poorly specified property rights, and institutional instability (Xin & Pearce, 1996; Zhao & Adam, 1995). As personal connections seem particularly important in the absence of stable legal and regulatory environment (Zucker, 1986), the extant literature seems to imply that social networks operate more intensively in China than in Singapore.

In effect, the two countries can be taken to represent two ends of the continuum of Asian national contexts in terms of market maturity for resource transactions involving high-tech start-ups. By drawing our empirical observations from these two locations, we are able to capture a wider variation in the intensity and practice of social networks, thus allowing us to test the robustness of our model with respect to a wider range of variation in our explanatory variables (network tie strength and prior knowledge of resource owners and referrers) and other control variables. Specifically, we introduced a dummy locational control variable to test for possible residual influences not already captured by the explanatory and control variables in our model.
Sample and Data Collection

We collected data in two stages: a pilot study in Singapore, followed by a large-scale sample survey in Singapore and Beijing. In the pilot study stage, we identified a sample of 14 firms according to the criterion discussed below and interviewed the principal entrepreneurs of these firms, defined as the founders who hold the title of CEO, managing director or the equivalence in Singapore. A structured questionnaire was designed and developed based on these interviews. We also interviewed three resource owners for each of the three types, who had been approached by some of the entrepreneurs covered in the pilot study stage, to cross-check the information provided by the entrepreneurs. We found high reliability in the key information provided by the entrepreneurs, including the strength of the ties between the entrepreneurs, resource owners and referrers, and the prior knowledge possessed by the resource owners and referrers. Therefore, in the second stage of large scale questionnaire survey, we focused only on the principal entrepreneurs as the respondents. In this stage, onsite interview with structured questionnaire was carried out with the principal entrepreneur of 128 high-tech start-ups in Singapore and 250 in Beijing, China. We tape-recorded and transcribed all interviews. Although only the data from the questionnaire survey are used in the hypothesis testing, we have found some of the additional qualitative responses from the interview transcripts to be useful in confirming our interpretation of the quantitative analysis findings.

The following criteria were used in defining the sample universe: (1) the firms must be independent start-ups in which the founding entrepreneurs maintain significant control; (2) the firms must be operating in high-tech industries, including hardware, software, telecom, biotech, and other high-tech manufacturing; and (3) the firms must be less than 8 years old at the time of study so that the entrepreneurs could recall the initial resource acquisition processes accurately (Wong, et al, 1993).

In Singapore, the sampling frame was constructed from several independent sources, including a listing of all spin-offs from two local universities, a listing of all tenant firms in three science parks, a listing of firms that have obtained venture capital funding in 2001 and 2002 published by the Economic Development Board of Singapore (EDB), a listing of start-ups in IT and telecommunications provided by the Infocomm Development Authority of Singapore, and a listing of biotech firms provided by EDB. A total of 460 unique firms that met our selection criteria were
identified. We assured confidentiality to all respondents to encourage candid responses. We were able to achieve 128 completed questionnaires, a response rate of 30% that is satisfactory compared with the average response rate of 10% by mailing questionnaire survey in Singapore (Wong et al., 1993). We found no significant differences between respondents and non-respondents, in terms of firm age, number of employees, and industrial distribution.

In Beijing, in view of the fact that most high-tech ventures operate in science parks and high-tech incubators, the sampling frame was identified from 6 high-tech incubators and science parks. The management authorities of these locations helped us identify 523 firms that met our criteria. 250 entrepreneurs completed the surveys, yielding a 48% response rate. We tested and found no significant differences for the descriptors between the respondents and the non-respondents.

The structured questionnaire consists of two sections. In the first section, entrepreneurs were asked to identify two cases, if any, for each type of resource owners (key team members, investors and lead users) whom they first approached after the venture started. One represents the earliest successful case (i.e. they succeeded in obtaining the resources), and the other the earliest failure case\(^2\). For each case, respondents were asked to recall the means by which they approached resource owners – whether direct or indirect ties, or market methods such as cold call, attending public events, advertisement, etc. If direct or indirect ties were used, respondents were asked to recall and assess the dyadic or triadic relationships between themselves, the resource owners and the referrers, if any. In the second section of the questionnaire, respondents were asked to provide background information on the educational, work and entrepreneurial experience of themselves as well as other co-founders. The respondents were also asked to assess the technological novelty of their ventures and the competitive intensity that their ventures faced.

**Measures**

*Resource acquisition outcome.* The dependent variable was a binary variable with value one if the resource was acquired and zero if the resource was not acquired.

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\(^2\) In fact, we requested the entrepreneurs to report two earliest successful cases and one earliest failure case, if any. However, herein we only used part of the dataset to reduce sample selection bias. We compared statistical analysis results from this partial dataset with the results from the whole dataset and did not find significant difference. This sensitive test confirmed the robustness of our research model.
**Tie strength.** Prior social network studies have employed several different measures of the “strength of ties” (Marsden & Campbell, 1984). We constructed a three-item, evenly weighted scale based on the three most widely used measures: (1) duration of the relationship, measured by the answer to the question “how many years have you/they known each other prior to this resource acquisition”. X=1 for less than 1 year; X=2 for 1~2 years; X=3 for 2~3 years; X=4 for 3~5 years and X=5 for longer than 5 years. (2) Intimacy level, measured by a 5-point Likert-scale answer to the question “To what extent do you agree that you/they keep a close relationship with each other prior to this resource acquisition” (Bian, 1997). X=1 for “Strongly disagree” and X=5 for “Strongly agree”[3]. (3) Meeting frequency, measured by a 5-point Likert-scale answer to the question “To what extent do you agree that you/they met each other every week prior to this resource acquisition” (Bian, 1997). X=1 for “Strongly disagree” and X=5 for “Strongly agree.” The construct reliability was confirmed since Cronbach’s alpha = 0.73 for the strength of direct ties between entrepreneurs and resource owners, 0.69 for that between entrepreneurs and referrers, and 0.76 for that between referrers and resource owners. Besides the above indicators of tie strength (duration, intimacy and frequency), we also collected data on relationship types by kinship, business associates and others (Marsden & Campbell, 1984). Initially we included two predictor dummies (kinship and business associates) in the regression. However, we deleted them later since they showed insignificant influences.

**Prior knowledge.** A single-item five-point Likert scale (X=1 for “Strongly disagree” and X=5 for “Strongly agree”) was used to measure prior knowledge by asking the respondents the following question: “To what extent do you agree that the resource owner (or referrer) had the expertise and background knowledge about your product or technology prior to your approach to him/her?”

**Control variables.** We introduced the following seven control variables:

a. Competitive intensity. Industrial organization scholars have argued that intense competition usually reduces overall industry profitability (Porter 1980). We therefore predict that a more competitive environment would reduce the perceived quality of the new ventures. Following Porter (1980), we measured competitive intensity with a three-item 5-point Likert scale (Cronbach’s alpha = 0.75 in the case of direct ties and 0.74 in the case of indirect ties): (1) “To what extent do you agree

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[3] It is applicable to all of the following Likert-scale measurement.
that there were a lot of real competitors?” (2) “To what extent do you agree that there were a lot of potential competitors?” and (3) “To what extent do you agree that there were a lot of substitute products or services?”

b. Technological novelty. Since our survey samples consist of high-tech firms, the novelty of their technologies represents an important appraisal criterion (Roberts, 1991). While an incremental technological improvement offers less upside potential than a radical technological change (Barney, 1991), it carries much less risk than the latter. Moreover, radical technologies are often beyond the knowledge domain of resource owners and hence difficult for them to evaluate (Shane, 2001). To the extent that resource owners are risk-averse, we expect that an incremental technological improvement may increase the chance of acquiring resources, whereas a radical technological change may be perceived as unproven and more risky, hence decrease the chance of acquiring resources. We measured “technological novelty” with a 5-point Likert scale composed of 2 items (Cronbach’s alpha = 0.74 in the case of direct ties and 0.71 in the case of indirect ties): “To what extent do you agree that your technology makes your competitors’ technologies obsolete?” and “To what extent do you agree that your technology redefines the performance of this technology?”

c. Characteristics of founding teams. First, we controlled for founding team size, because prior studies have found that team size has positive impact on firms’ subsequent performance (Eisenhardt & Schoonhoven, 1990). Second, we controlled for team diversity in job function, since researchers have shown that among many aspects of team diversity it is primarily function-related diversity that influences team performance (Ancona & Caldwell, 1992). We expected that function-rounded teams were more likely to obtain resources. It was measured by the ratio of the number of different job functions (general management, technology, marketing, and others) taken by the founding teams in their immediate previous jobs divided by the team size. Thirdly, we controlled for management skills of founding teams, which is found to be the most important criterion positively correlated with venture capitalists’ assessment of profitability (MacMillan et al., 1987). This is measured by an “average appointment level” scale that is derived from averaging the occupational status scale of all founding team members in their immediately previous jobs. $X=3$ for “Higher level, as CEO, CTO etc of the whole organization”, $X=2$ for “Middle level, as directors of one department”, $X=1$ for “Lower level, as managers of one department”.

and \( X=1 \) for “Lower level”. To keep its scale consistent with that of the 5-point Likert-scale variables, we multiply each value of the viable by \( 5/3 \). Finally, we controlled for entrepreneurial experience with a dummy variable, \( X=1 \) if any of the founders had created their own business before and \( X=0 \) for otherwise. Prior studies found that more experienced entrepreneurs are more likely to obtain resources, because they are more effective promoters (MacMillan et al., 1987).

d. Reputation of referrers. Studies have shown that high-status referrers would bring certification to founding teams, facilitating resource acquisition (Stuart et al., 1999). We measured it with a scale composed of two equally weighted items: (1) Occupational status of the referrer. \( X=3 \) for “Higher level”, \( X=2 \) for “Middle level”, and \( X=1 \) for “Lower level”. To keep its scale consistent with that of the 5 Likert-scale variables, we multiply each value of the viable by \( 5/3 \). (2) “To what extent do you agree that he/she was well-known in his/her business circle?” The construct reliability was justified since Cronbach’s alpha = 0.74.

e. Industry. We employed a series of dummy variables for IT hardware, software, telecom and biotech (Shane & Cable, 2002). “Other industry” was coded as the reference group.

f. Country. We used a dummy variable to control for country location.

g. Types of resource owners. We employed two dummies to control for the three types of resources – investors, key team members, and customers.

**Validation of Measures.**

We are aware of two potential problems with our measures for tie strength and prior knowledge of resource owners and referrers, and have sought to minimize them within the limitation of the field research design. We have also checked the retrospective recall bias and common method variance problem. The four issues are elaborated below.

(1) In the case of indirect ties we asked the entrepreneurs to assess the “tie strength between referrers (R) and resource owners (O)”. This assessment may be unreliable as a third party evaluation. While it would have been ideal to interview the parties concerned directly, this was not possible due to difficulties in obtaining the identity of these people and to get them to respond. Nevertheless, this data collection method is supported by prior work in the social networks literature, which has
generally reported reliable results. For example, Bian (1997) used a similar method in his widely cited American Sociological Review paper. He reported:

"Information about I-H tie strength was solicited from the respondents (R), thus error might exist, especially if the respondents had no knowledge of the relationship between I and H. However, ethnographic research suggests that guanxi users generally have good knowledge of tie strength between their targeted persons and those in between (Fried [1953] [1969]; Yang, 1994). In the job-assignment context, my in-depth interviews with an independent sample of 27 men and 12 women in Tianjin indicated that the ultimate helper (H) was usually targeted first and the search for the "right" intermediary was planned accordingly. ..." (p. 374-375).

Similar to his findings, our confidence in this data collection method is bolstered by the results of our interviews with the nine resource owners (three of each type) in the pilot study stage. We found that their responses confirmed the assessments provided by the entrepreneurs. To further reduce potential problems, we treated some observations as “missing data” when the entrepreneur respondents showed hesitation in answering relevant questions. We found from the field interviews that in 95% of the cases the entrepreneurs did not show any hesitation in making their assessment, with only 5% indicating any difficulties in doing so. Moreover, we conducted paired T-Test and found that the “tie strength between Referrer (R) and resource Owner (O)” variable was independent of the “tie strength between Entrepreneurs (E) and Referrers (R)” variable (t=0.99; p=0.32), suggesting that there was no systematic bias by the entrepreneurs in evaluating “tie strength R-O” based on the strength of their relationship with referrers.

(2) A similar third party evaluation concern arises in our reliance on entrepreneurs’ evaluation to measure the prior knowledge of referrers/resource owners. Again, while it would be ideal to interview the referrers/resource owners directly, we were unable to do so on a large scale. Nevertheless, similar to what was reported by Bian (1997), our interviews with the nine resource owners in the pilot study stage revealed that their self-evaluation of the prior knowledge level was very close to the assessment by the corresponding entrepreneurs. In the case of indirect ties, their evaluation of prior knowledge level of referrers also supported the evaluation by the entrepreneurs. While recognizing that we can not generalize from this small sample to the entire sample in the second stage, we believe that the third party evaluation approach is sufficiently reliable. Our confidence is also supported by our experience in both stages of data collection – the entrepreneurs
were usually able to provide elaborate information on the professional backgrounds of the referrers and resource owners, even when the ties involved were classified as relatively weak. For instance, one entrepreneur in the pilot study recalled:

“Mr. A and I had worked together for more than 10 years. So he knew me and my product very well and he believed my new product will be very profitable….One day he told me he met Mr. B in a seminar organized by NSTB. Mr. B had a strong interest in data storage business. He was looking for new investment opportunities….I invited Mr. B to my office and had a good talk… I could figure out he knew my track record very well… Of course, before he came, I also did some homework. I got information about him through my people. He graduated from UCLA, and worked as a lecturer in NTU. He also founded a company X and now he is chairman. During the talk, I found he really understood my technology and he knew what we had to go through in the next couple of years …”

This quotation indicates that entrepreneurs in general not only had plenty of information about their direct ties, but that they also tended to collect more information about resource owners in indirect ties prior to and during the negotiation of resource acquisition. This is because such information is critical for them to understand the needs of the resource owners and also helpful in assessing how valuable the resource owners could be to their firms. Moreover, according to cognitive theory (Alba & Hutchinson, 1987), the more knowledgeable a person is, the more s/he understands what the others have known and have not known. Since entrepreneurs are experts in product and technology issues relevant to their ventures, their evaluation should be accurate and reliable.

As an example of how the resource owners we interviewed generally corroborated the assessment of the entrepreneurs, we quote from our interview with the same Mr. B, the investor mentioned in the last quotation:

“I got to know Mr. C [the entrepreneur] through the link of Mr. A 3 years ago. At that time I was seeking for partners to expand my business. Because my research for my PhD study in UCLA is about new materials, and my own business is very close to Mr. C’s, I am very interested in his company… I still remember the first time we met in his office. It was a very stormy day… Anyhow, I believe we had a very nice talk. I was pretty impressed by his understanding of the material technology and his aspiration to create a big business… (Question: how do you evaluate the prior knowledge level of Mr. A?) I think one reason that I decided to meet with Mr. C is because I found Mr. A is really an expert in this particular technology area; plus he seemed to be very close to Mr. C. So I said ‘sure, why not go and have a look?’ ”

One may argue that entrepreneurs’ ability to accurately report the prior knowledge level of referrers is positively related to the strength of their dyadic relationships, and thus a systematic bias may exist in measuring prior knowledge of referrers. Fortunately, we found this to be not a serious
problem. The correlation analysis in Table 1.2 shows only a moderately positive relationship (correlation coefficient = 0.25) between “tie strength E&R and “prior knowledge of R”. In addition, the reported relationships between the entrepreneurs and the referrers, while weaker than those between referrers and resource owners, were usually of moderate strength (mean of “tie strength E&R”=2.80 out of 5.00, and S.D. = 0.92). It suggests that the entrepreneur would be sufficiently familiar with the referrers in most of the reported ties and thus are able to provide an evaluation with satisfactory accuracy.

(3) As we asked entrepreneurs to report about past events, our results might have been affected by retrospective recall bias (Golden, 1992). However, Miller, Cardinal and Glick (1997) found that retrospective reporting is a viable research methodology if the measures used to generate the reports are adequately reliable and valid. Following their suggestions, we sought to maximize the validity of our data by (1) choosing our samples from those firms younger than 8 years to ensure that the entrepreneurs could accurately recall their initial resource acquisition experience; (2) adopting a free reporting format rather than forced choices, that is, the entrepreneurs were encouraged during the interview to say that they did not remember, rather than having to provide a required response; and (3) motivating the entrepreneurs to provide accurate information. For instance, we provided confidentiality letters upon interviews, visited the entrepreneurs in their most preferred time and place to minimize inconvenience, and explained the usefulness of the project in detail when contacting them for the first time.

To examine how well our survey questions mapped into the intended constructs, we used AMOS 4 to conduct a confirmatory factor analysis of the measurement model associated with the Likert Scale items in our study (Arbuckle, 1999). Maximum likelihood parameter estimation was used and a satisfactory fit was achieved for both direct tie and indirect tie models (For direct tie model, \( \chi^2 = 42.13, \text{d.f.} = 18, \chi^2/\text{d.f.} = 2.34, p < 0.01, \text{RMSEA} = 0.06, \text{CFI} = 0.97 \); For indirect tie model, \( \chi^2 = 115.66, \text{d.f.} = 56, \chi^2/\text{d.f.} = 2.07, p < 0.01, \text{RMSEA} = 0.07, \text{CFI} = 0.98 \)). A value of less than 3 for \( \chi^2/\text{d.f.} \), a RMSEA value of below 0.08 and a CFI value of above 0.09 are believed to indicate acceptable
fit (Hair et al., 1998). Although the chi-square statistic is still significant, the measurement model was considered acceptable, given the other supportive indexes (Anderson & Gerbing, 1988).

(4) This study may suffer from the common method variance problem, which could result from collecting the dependent and independent variables from the same respondent in the same survey. We tested against this by using the Harman one-factor test (Li & Atuhene-Gima, 2001). A factor analysis of the dependent and independent variables yielded seven factors accounting for 64% of the variance, and factor 1 accounted for 19% of the variance. Since a single factor did not emerge and one general factor did not account for most of the variance, common method variance is unlikely to be a serious problem. Moreover, our main hypotheses dealing with interactions are insensitive to this problem, because strategy scholars (e.g., Dooley & Fryxell, 1999) and methodologists (e.g., Aiken & West, 1991) have observed that the complex data relationships shown by predicted interaction effects are not explained by common method bias because respondents cannot guess a researcher’s interaction hypotheses to respond in a socially desirable manner.

Data Analysis Method

Based on the valid responses provided by the 378 start-ups in our survey, data on a total of 1,428 cases of resource acquisition approaches were captured. Out of these, 68.2% of the cases reported by Singaporean entrepreneurs involved the use of social network ties (either direct or indirect), while 70.6% of the cases reported by Chinese entrepreneurs used ties. In order to test our hypotheses, we only include those cases involving the use of ties in the regression analysis. Logistic regressions were carried out for the group of cases involving the use of direct ties (n=834) and the groups of cases involving the use of indirect ties (n=206) respectively.

RESULTS

The profiles of sample firms in the two cities are broadly similar on many control variables. In terms of distribution by industry, 80% firms in Singapore are in IT (hardware and software) or telecom industry, while the proportion is 65% in Beijing. The average employee number is 37 in

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4 We compared the cases of using ties with those of using market methods. Although weak ties did not lead to significantly higher successful rate than market methods, strong ties, especially strong direct ties did. Among the market methods, attending public events produced much better results than advertising or making cold calls.
Singapore and 40 in Beijing. In both locations the average number of founders is about 3, and the average age of the founders when they started the new firms is near 35 years old. However, the firms in Beijing are distinctly younger, with an average age of 2.2 years at the time of the study vs. an average age of 5.4 years in Singapore.

Table 1.1 and Table 1.2 show the descriptive statistics and correlation matrices in the case of direct ties and indirect ties respectively. In both tables, the absence of high correlations between independent variables suggests that multicollinearity is not likely to be problematic in this analysis. Moreover, prior to the creation of interaction items, both independent and moderator variables were mean-centered to reduce any potential multicollinearity problem (Aiken & West, 1991).

Table 2.1 summarizes the results of the logistic regression predicting resource acquisition results in the case of direct ties. Model 1 is the base model that includes all control variables. The results provide some insights about entrepreneurial activity. As prior research has predicted, founding teams with better management skills are more likely to obtain resources (Exp(B)=1.30, \( p<0.05 \) for “founding team average appointment level”). The results also show that biotech is less likely to attract resources (Exp(B)=0.52, \( p<0.05 \) for “biotech (dummy)”). It may imply that in both locations, biotech is still perceived to be a young and risky industry. It is consistent with the experience in the U.S. and other advanced countries.

Interestingly, neither the country dummy nor the resource type dummies are found to have a significant influence in the base model. We had also conducted additional regressions for the two locations separately, as well as for the three resource types separately, and found the results to be qualitatively similar to the base model results from the pooled data analysis.

Model 2 and Model 3 show the individual main effects of tie strength and prior knowledge possessed by resource owners, while Model 4 show their combined effects. Model 2 shows that strong ties between entrepreneurs and resource owners are positively related to the probability of resource
acquisition (Exp(B)=2.18, \(p<0.001\)). The addition of the tie strength variable also significantly
improves the model’s fit (Chi-square of change=50.95, \(p<0.001\)). Model 3 indicates that prior
knowledge of resource owners is also positively related to the probability of resource acquisition
(Exp(B)=2.01, \(p<0.001\)). The addition of the prior knowledge variable to the base model also
significantly improves the fit of the prediction (Chi-square of change=64.11, \(p<0.001\)).

Model 5 shows the main and interaction effects of the two explanatory variables. Hierarchical
Chi-square test for model 5 versus Model 4 is statistically significant (Chi-square of change=6.85,
\(p<0.01\)), indicating the existence of an interaction effect (Jaccard, Turrisi & Wan, 1990). The product
term (Exp(B)=0.85, \(p<0.01\)) also represents statistical interaction. Furthermore, it shows that the
nature of the effect is negative (B=-0.16). These results suggest that if resource owners possess more
knowledge about the technologies/products of the new ventures before being approached to make
resource commitment, the effect of tie strength is reduced. Thus, Hypothesis 1a, 2a and 3a are all
supported. Taken together, the results support our arguments about the significant role of direct ties
and prior knowledge, as well as the moderating effect of the latter on the former.

Table 2.2 shows the results of logistic regression in the case of indirect ties. Model 1 is the
base model. Compared with model 1 in Table 2.1, an additional control variable, “reputation of
referrer” is added, and it shows significantly positive impact (Exp(B)=1.51, \(p<0.05\)). The result
supports the prior argument that the status of prestigious referrers can be a valuable signal of the
expected quality of new ventures. The other controls do not show significant influences.

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Insert Table 2.2 Here
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Model 2 and Model 3 show the individual main effects of tie strength and prior knowledge,
while Model 4 shows their combined effect. Model 2 shows that strong ties between referrers and
resource owners are strongly and positively related to the probability of resource acquisition
(Exp(B)=1.70, \(p<0.01\)), while strong ties between entrepreneurs and referrers do not show significant
influence \((p>0.10\)). The addition of the tie strength variables also significantly improves the model’s
fit (Chi-square of change = 11.15, \(p<0.01\)). Model 3 indicates that the prior knowledge of resource
owners is positively related to the probability of resource acquisition (Exp(B)=3.96, \(p<0.001\)). The
same applies to the prior knowledge of referrers as well (Exp(B)=1.39, \( p<0.05 \)), although the influence appears weaker. The addition of the prior knowledge variables also significantly improves the fit of the prediction (Chi-square of change=48.44, \( p<0.001 \)).

Model 5 shows the main and interaction effects of the two sets of explanatory variables. Since there are two tie strength variables and two prior knowledge variables, four product terms are added in Model 5. Hierarchical Chi-square test for model 5 versus Model 4 is slightly significant (Chi-square of change=9.76, \( p<0.05 \)), indicating the existence of some interaction effects (Jaccard et al., 1990). However, the interaction effect appears to be confined to only one of the four interaction terms, that between tie strength of referrers and resource owners and prior knowledge of resource owners (Exp(B)=0.72, \( p<0.05 \)). Furthermore, it shows that the nature of the effect is negative (B=-0.33), i.e., if resource owners possess more prior knowledge about new ventures, the effect of their tie strength with referrers is reduced. On the whole, Hypothesis 1c and 2b are supported, Hypothesis 1b is rejected and Hypothesis 3b is partially supported. Taken together, the results partially support our arguments about the role of network ties and prior knowledge in the case of indirect ties.

**DISCUSSION AND CONCLUSION**

In this study, we presented new empirical evidence on the influence of social network ties on resource acquisition. We used a more comprehensive set of constructs for tie strength that cover both direct and indirect ties, and extended the scope of coverage of resource owners to three types of resource owners (key team members, investors and early customers). The study also covers new ventures from two countries at varying levels of market maturity to control for socio-cultural differences. Our findings confirmed the importance of strong network ties and prior knowledge of resource owners in increasing the propensity of entrepreneurial resource acquisition. In addition, we showed that the prior knowledge of resource owners not only directly influences the probability of resource acquisition, but also negatively moderates the effects of social network ties. In other words, ties are more useful when the problem of uncertainty and information asymmetry is more serious.

Our study also found that the nature of the network ties matters – while the above results hold true for direct ties, they are only partially supported in the case of indirect ties. In particular, we found
that only ties between referrers and resource owners have a direct effect on resource acquisition, while the ties between entrepreneurs and referrers have no effect. However, the main effects of indirect tie strength become insignificant after the prior knowledge constructs are introduced. Moreover, while the prior knowledge of both referrers and resource owners increase the probability of resource acquisition, only the prior knowledge of resource owners appear to have a moderating effect on the relationship between the owner-referrer tie strength and resource acquisition probability. Overall, indirect ties appear to be weaker than direct ties in raising the probability of resource acquisition.

**Implications**

Our study results provide new empirical evidence on the role of social networks of entrepreneurs in resource acquisition at the early stage of new venture creation. In this context, the problem of information asymmetry arises from the resource owners’ lack of prior knowledge in the technologies and products of the new ventures. Knight (1921) first emphasized the information asymmetry problem in venture financing, arguing that the pursuit of opportunity involved the joint possession of capital and entrepreneurial insight. On the contrary, Schumpeter (1934) believed that if individuals perceived viable opportunities, others would provide resources. Shane and Cable (2002) provided empirical evidence to support Schumpeter: “since social relationships are used to overcome market failure in venture finance, entrepreneurs do not require the perception of an opportunity and the possession of financial capital” (p. 377). Our results support Schumpeter’s perspective by extending the findings of Shane and Cable (2002) to cover two other key resources besides financial capital: critical human resources and customer purchase. Theoretically, our study corroborates the resource-based views that social networks are idiosyncratic and valuable resources of new ventures, which can be leveraged in obtaining other types of resources (Barney, 1991).

Another distinctive contribution of this study is that our findings provide new insights on the asymmetric role of indirect ties mediated through referrers. Except for a few studies in sociology (e.g., Bian, 1997; Bian & Ang, 1997), there has been few prior research in organization and strategy that has examined the independent effects of tie strength of the two separate links mediated through a referrer. For example, Ahuja (2000) counted the number of indirect ties maintained by the focal firms as a measure of the richness of their networks, but did not examine the nature of these indirect ties
themselves. The studies in entrepreneurship field generally focused solely on the links between entrepreneurs and referrers (e.g., Aldrich & Zimmer, 1986), implicitly assuming that their intimacy is necessary and sufficient in facilitating new venture survival and growth. In contrast, we found that only strong ties between referrers and resource owners, but not strong ties between entrepreneurs and referrers, appear to affect the chance of resource acquisition. The latter unexpected result suggests that the strength of ties between entrepreneurs and referrers may have ambiguous effects. From resource owners’ standpoint, although strong ties between entrepreneurs and referrers may mean that the referrers have more reliable information about the entrepreneurs (Gulati, 1995; Podolny, 1994), this may be negated by the concern that the referrers may be biased by their strong tie to the entrepreneurs, out of either friendship/affection or gratitude/obligation that may compromise their judgment (Starr & MacMillan, 1990). As such, the net effect of the presence of ties between entrepreneurs and referrers appears to be ambiguous. Nevertheless, prior knowledge of referrers seems to have a significant, positive effect on resource acquisition, possibly due to the ability of referrers to identify resource owners who possess the relevant knowledge for particular ventures. Our study thus highlights the complexity of the roles of indirect ties on economic activities, and suggests the need for more nuanced research on indirect ties.

Our research also contributes to the study of social networks by distinguishing between the impacts of structural dimension of networks (indirect ties) from those of relational dimension (tie strength) on economic activities (Tsai & Ghoshal, 1998). Many prior studies assumed that the roles of indirect ties are akin to weak ties by arguing that indirect ties are mainly useful in conveying non-redundant information (Ahuja, 2000). However, our findings showed that strong ties between referrers and resource owners may in fact be imperative for reducing the problems of information asymmetry on the part of resource owners. Therefore, the entrepreneurs may benefit by exploiting a mix of indirect ties with varying tie strengths – using relatively weaker entrepreneur-referrer ties to get to resource owner who have strong ties with the referrer. In this regard, the earlier quote by Bian(1997) is instructive: indeed, our own interviews with the entrepreneurs also found various similar instances whereby the entrepreneurs first identified the target resource owners, and then searched for suitable referrers that have strong ties to them.
Our two country research design also yields new insights on the role of social network ties in different market maturity contexts. Interestingly, our hypothesized model of how network ties and prior knowledge of resource owners/referrers appear to be applicable not only in the mature market in Singapore, but also in the transitional economy in China, where the importance of guanxi, or social networks, has been much highlighted in the prior literature (e.g. Batjargal & Liu, 2004; Zhao & Adam, 1995). Consistent with the extant literature that indicates social networks to operate more intensively in China than in other contexts, our survey did find a higher propensity by entrepreneurs to use social network ties to seek resources in China than in Singapore. However, we did not find a significant residual difference in the relative effectiveness of network ties. This unexpected result suggests that, while network ties may indeed be more widely used in China, their effectiveness may in fact be over-rated. As succinctly echoed by one entrepreneur in Beijing whom we interviewed as part of this study, “…Guanxi is definitely helpful in opening the door, but whether we can close the deal still depends on our product.” Guthrie (1998) has made a similar observation that, in China, “guanxi only helps if you are competitive” (p. 281), while other scholars such as Li and Atuahene-Gima (2001) have suggested a declining importance of guanxi in China in recent years.

Another contribution of this study is that we investigate the acquisition of three types of resources. Besides financial resources, which are the focus of past studies (e.g., MacMillan, et al., 1987; Shane & Cable, 2002), we include key human resource expertise and early customer purchase orders as critical resources. Although many scholars have recognized the importance of the latter two types of resources in the early start-up phases of new ventures, to-date few have conducted empirical research on how these resources are acquired (Venkataraman, 1997). In our regression models, we incorporated all three types of resources in a pooled sample. Despite the different nature of the three types of resources, our models seemed to be robust⁵, thus suggesting that our theoretical argument is indeed generalizable beyond financial resources to all types of resources.

We believe that the above research insights have significant implications for practitioners too. For entrepreneurs in high-tech industries, our findings suggest that they should focus their

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⁵ We also split the cases into three groups in each type of resources. The regression results did not show significant difference from the models we presented in this paper.
resource acquisition efforts on resource owners who are already familiar with their business domain. In this situation, it does not matter whether social networks are very strong. However, if the prospective resource owner does not possess sufficient prior knowledge in the relevant technology area, a strong tie with the resource owner, or an ability to get referral from a referrer who has strong ties with the resource owner, become important. It would be even better if the referrer has a good reputation as an expert in the particular technology field.

For public policy makers, our findings suggest that they should recognize the important role that resource owners play in the new venture creation process. While much policy focus has been placed on developing the pool of would-be entrepreneurs themselves, our study findings suggest that the high venture creation rate in a place like Silicon Valley may be due not only to the high entrepreneurial propensity of the population there, but also to the high level of prior knowledge of the various resource owners in the entire venture ecosystem – the experienced angel investors and venture capitalists who can provide the risk capital, the specialist technical professionals and managers who are needed to staff the start-up team, and the senior purchasing personnel who are knowledgeable of the latest technological trends to adopt the cutting edge innovation by new start-ups. As such, policy attention needs to be shifted to raising the knowledge level and sophistication of the resource owners whose resource commitments are critical to the emergence and survival of new high-tech ventures. Indeed, policy makers in some countries have started to recognize the importance of angel investors and venture capitalists, while others have highlighted the need for public procurement policy that supports innovation by start-ups. Public policy makers should also recognize that another distinctive factor that contributes to the entrepreneurial dynamism of a place like Silicon Valley is the high intensity of social networking activities taking place there that help build strong network ties between the entrepreneurs and the communities of resource owners (Lee, et al., 2001). Thus, public policy makers may consider playing a facilitating role in promoting such social network development activities among the new venture community.

Limitations and Future Studies

We have highlighted a number of limitations of the present study in our earlier discussion on the validation of the measures for a number of our core constructs (prior knowledge of resource
owners/referrers, and tie strength between referrers and resource owners). As pointed out earlier, while it would be ideal to pursue a research design where both the entrepreneurs and the resource owners and referrers are interviewed, we confined ourselves to interviewing the entrepreneurs only due to cost constraints and practical field work difficulties in tracing respondents and obtaining sufficient response rates. While we had conducted a small sample construct reliability test and had made attempts to minimize potential problems arising from this research design limitations, it may be useful for a future study to pursue a research design that covers pair-responses from both the entrepreneurs and resource owners/referrers to confirm the findings from the present study.

Another limitation of the study is that our construct for prior knowledge of resource owners/referrers consisted only of a single Likert-scale item and hence may raise questions of reliability. Given that the existing literature lacks empirical measurement of this construct, we believed that our single item construct represents only a first attempt, and future research should explore the design of a more comprehensive, multi-scale construct.

Lastly, the present study highlights two other promising future research directions. First, in view of our study finding that there is no residual country effects on resource acquisition propensity in our regression models, it would be interesting to test if the model can be generalized to additional countries, including in particular non-Asian countries that exhibit quite different social cultural contexts, e.g. Anglo-Saxon countries that are characterized as having “high trust” (Fukuyama, 1995). Second, although our model appears to be broadly applicable to all three types of resources (key human resources, financial capital and purchase orders), future research may explore possible nuanced differences among the three types of resource owners, perhaps through a larger sample that provides more discriminating power.
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Table 1.1: Descriptive Statistics and Correlations Matrix in the Cases of Direct Ties (N=834)

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<td>2. Tie strength</td>
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<td>3. Prior knowledge of resource owner</td>
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<td>4. Competitive intensity</td>
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<td>5. Technological novelty</td>
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<td>6. Founding team size</td>
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<td>7. Founding team job function diversity</td>
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<td>8. Founding team average appointment level</td>
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<td>9. Entrepreneurial experience (dummy)</td>
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<td>-0.01</td>
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<td>0.24**</td>
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Mean: 0.75 3.09 3.96 3.27 3.53 2.80 0.54 3.90 0.58 0.11 0.59 0.06 0.12 0.64 0.43 0.25
St. Deviation: 0.43 0.92 1.06 0.78 0.90 1.50 0.37 0.99 0.50 0.30 0.52 0.21 0.32 0.49 0.51 0.44
Minimum: 0.00 1.00 1.00 1.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
Maximum: 1.00 5.00 5.00 5.00 5.00 14.00 1.00 5.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
Table 1.2: Descriptive Statistics and Correlations Matrix in the Cases of Indirect Ties (N=206)

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* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).
Table 2.1: Logistic Regressions Predicting Resource Acquisition in the Cases of Direct Ties (N=834)

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<td>B(S.E.)</td>
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<td>2.18***</td>
<td>#</td>
<td>0.68(0.13)</td>
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<td>Prior knowledge of resource owner</td>
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<td>#</td>
<td>#</td>
<td>0.70(0.09)</td>
<td>2.01***</td>
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<td>850.78</td>
<td>759.78</td>
<td>726.97</td>
<td>717.53</td>
</tr>
<tr>
<td>Chi-Square</td>
<td>24.52*</td>
<td>75.47***</td>
<td>84.63***</td>
<td>121.64***</td>
<td>128.49***</td>
</tr>
<tr>
<td>Chi-Square change</td>
<td>50.95***</td>
<td>64.11***</td>
<td>97.12***</td>
<td>6.85***</td>
<td></td>
</tr>
<tr>
<td>Nagelkerke R²</td>
<td>0.06</td>
<td>0.15</td>
<td>0.17</td>
<td>0.24</td>
<td>0.29</td>
</tr>
</tbody>
</table>

'a: This value = (Chi-square in model 5) - (Chi-square in model 4)
* p < 0.10
* p < 0.05
** p < 0.01
*** p < 0.001
Table 2.2: Logistic Regressions Predicting Resource Acquisition in the Cases of Indirect Ties (N=206)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B(S.E.)</td>
<td>Exp(B)</td>
<td>B(S.E.)</td>
<td>Exp(B)</td>
<td>B(S.E.)</td>
</tr>
<tr>
<td><strong>Predictors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tie strength E &amp; R</td>
<td>#</td>
<td>-0.01(0.18)</td>
<td>0.99</td>
<td>#</td>
<td>-0.17(0.25)</td>
</tr>
<tr>
<td>Tie strength R &amp; Owner (O)</td>
<td>#</td>
<td>0.53(0.18)</td>
<td><strong>1.70</strong></td>
<td>#</td>
<td>0.00(0.24)</td>
</tr>
<tr>
<td>Prior knowledge of R</td>
<td>#</td>
<td>#</td>
<td>0.33(0.16)</td>
<td><strong>1.39</strong></td>
<td>0.36(0.17)</td>
</tr>
<tr>
<td>Prior knowledge of O</td>
<td>#</td>
<td>#</td>
<td>1.38(0.22)</td>
<td><strong>3.96</strong></td>
<td>1.38(0.24)</td>
</tr>
<tr>
<td>Tie strength E&amp;R * Prior knowledge of R</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>-0.28(0.20)</td>
</tr>
<tr>
<td>Tie strength E&amp;R * Prior knowledge of O</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>0.00(0.18)</td>
</tr>
<tr>
<td>Tie strength R&amp;O * Prior knowledge of R</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>0.00(0.15)</td>
</tr>
<tr>
<td>Tie strength R&amp;O * Prior knowledge of O</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>0.00(0.15)</td>
</tr>
<tr>
<td><strong>Controls</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competitive intensity</td>
<td>-0.31(0.21)</td>
<td>0.73</td>
<td>-0.36(0.22)</td>
<td>0.70</td>
<td>-0.28(0.27)</td>
</tr>
<tr>
<td>Technological novelty</td>
<td>-0.17(0.18)</td>
<td>0.85</td>
<td>-0.15(0.18)</td>
<td>0.86</td>
<td>0.04(0.23)</td>
</tr>
<tr>
<td>Founding team size</td>
<td>0.00(0.12)</td>
<td>1.00</td>
<td>0.10(0.13)</td>
<td>1.11</td>
<td>-0.13(0.16)</td>
</tr>
<tr>
<td>Founding team job function diversity</td>
<td>-0.51(0.49)</td>
<td>0.60</td>
<td>-0.54(0.50)</td>
<td>0.58</td>
<td>-0.24(0.61)</td>
</tr>
<tr>
<td>Founding team average appointment level</td>
<td>0.19(0.28)</td>
<td>1.20</td>
<td>0.15(0.29)</td>
<td>1.17</td>
<td>-0.26(0.38)</td>
</tr>
<tr>
<td>Entrepreneurial experience (dummy)</td>
<td>-0.13(0.35)</td>
<td>0.87</td>
<td>-0.15(0.36)</td>
<td>0.86</td>
<td>0.03(0.43)</td>
</tr>
<tr>
<td>Hardware (dummy)</td>
<td>0.39(0.13)</td>
<td>1.48</td>
<td>0.34(0.16)</td>
<td>1.40</td>
<td>0.09(1.39)</td>
</tr>
<tr>
<td>Software (dummy)</td>
<td>-0.78(0.66)</td>
<td>0.46</td>
<td>-0.87(0.67)</td>
<td>0.42</td>
<td>-1.36(0.77)</td>
</tr>
<tr>
<td>Telecom (dummy)</td>
<td>-1.11(0.79)</td>
<td>0.33</td>
<td>-1.29(0.83)</td>
<td>0.28</td>
<td>-1.60(0.94)</td>
</tr>
<tr>
<td>Biotech (dummy)</td>
<td>-0.70(0.76)</td>
<td>0.50</td>
<td>-0.78(0.78)</td>
<td>0.46</td>
<td>-1.58(0.90)</td>
</tr>
<tr>
<td>Country (Singapore = 0; China = 1)</td>
<td>-0.20(0.35)</td>
<td>0.82</td>
<td>-0.52(0.38)</td>
<td>0.60</td>
<td>0.05(0.44)</td>
</tr>
<tr>
<td>Key management team member (dummy)</td>
<td>0.67(0.39)</td>
<td>1.96</td>
<td>0.56(0.40)</td>
<td>1.75</td>
<td>1.05(0.49)</td>
</tr>
<tr>
<td>Investor (dummy)</td>
<td>-0.58(0.41)</td>
<td>0.56</td>
<td>-0.79(0.45)</td>
<td>0.45</td>
<td>-0.36(0.53)</td>
</tr>
<tr>
<td>Reputation of referrer</td>
<td>0.41(0.18)</td>
<td>1.51</td>
<td>0.33(0.16)</td>
<td>1.39</td>
<td>0.21(0.26)</td>
</tr>
<tr>
<td>-2 Log Likelihood</td>
<td>213.45</td>
<td>201.22</td>
<td>165.82</td>
<td>157.59</td>
<td>131.43</td>
</tr>
<tr>
<td>Chi-Square</td>
<td>25.98*</td>
<td>37.13**</td>
<td>74.42***</td>
<td>80.56***</td>
<td>90.32***</td>
</tr>
<tr>
<td>Chi-Square change</td>
<td>11.15**</td>
<td>48.44***</td>
<td>54.58***</td>
<td>9.76*</td>
<td></td>
</tr>
<tr>
<td>Nagelkerke R²</td>
<td>0.17</td>
<td>0.27</td>
<td>0.49</td>
<td>0.52</td>
<td>0.54</td>
</tr>
</tbody>
</table>

*a*: This value = (Chi-square in model 5) - (Chi-square in model 4)

**p < 0.10
*p < 0.05
***p < 0.01
****p < 0.001