A Contingent Model of Network Utilization in Early Financing of Technology Ventures

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Abstract

Most of the entrepreneurship literature has addressed the benefits and necessity of using social network ties as opposed to market methods in early venture finance, but it has largely understated the potential limitations and costs of doing so. Specifically, very sparse research has examined the factors that influence entrepreneurs' choice between using networks versus market methods. In this study, we propose a contingent model of network utilization when approaching initial investors, based on the dimensions of human capital of the entrepreneurs. We test this model with primary field survey data from 226 new high-tech ventures in Singapore and Beijing. The results show that high occupational status and relevant industrial work experience are positively associated with the entrepreneurs' propensity to utilize existing networks by enhancing the resourcefulness of their network ties (social capital); however, such influences are alleviated by entrepreneurs' marketing or managerial experience, which increases the entrepreneurs' ability to interact with strangers (an aspect of social competence).

Introduction

Scholars of entrepreneurship increasingly recognize that entrepreneurs embed their business formation and growth in social structures (Aldrich & Zimmer, 1986; Birley, 1985; Greve & Salaff, 2003). In particular, entrepreneurs' network ties are crucial in acquiring funds from initial investors (e.g. Batjargal & Liu, 2004; Shane & Cable, 2002; Starr & MacMillan, 1990). Entrepreneurs often approach prospective investors with whom they have prior relationships (i.e. direct ties) or to whom they are referred (i.e. indirect ties). These ties are particularly useful if the firms operate in high-tech industries and/or at early stage of venture creation (Venkataraman, 1997).

However, entrepreneurs often face constraints in relying on preexisting network ties. For instance, strong and resourceful ties are often limited, and also using networks may incur costs outweighing the benefits, because this is often backed by an expectation of reciprocity (Gabbary & Leenders, 1999; Leana & Van Buren, 1999; Lin, 1999; Portes, 1998). Therefore, entrepreneurs may sometimes turn to alternative "market methods". We define market methods as the methods used in a scenario when entrepreneurs and investors do not know each other either directly or indirectly before initiating the potential business exchange. In practice in this scenario, entrepreneurs approach investors via advertisements or cold calls (e.g., telephone, email or face to face meetings).

An intriguing question then arises: *what factors influence entrepreneurs' choice to utilize their existing network ties versus the market method to approach initial investors?* The network-based research in entrepreneurship has largely ignored this question (Hoang & Antoncic, 2003). Although a few studies have investigated the development and evolution of networks over the venture formation process (Hite & Hesterly, 2001; Larson & Starr, 1993), they did not focus

specifically on how heterogeneity in the human capital of entrepreneurs affects their network utilization decision. We therefore still need "more research on the differences across individuals in the extent to which network resources are leveraged" (Hoang & Antoncic, 2003: 179).

Focusing on entrepreneurs' human capital, we present a contingent model of network utilization. Essentially, we argue that "what you know" (human capital) influences "who you know" (social capital) and "how good you are at interacting with strangers" (an aspect of social competence) and ultimately determines "whom you choose" (network utilization). Understanding the factors that influence entrepreneurs' "network utilization decision" is important because it provides an understanding of the balance between embedded ties and market mechanisms, which is an underdeveloped research area in social network research (Hoang & Antoncic, 2003; Uzzi, 1999). At a more general level, we aim to contribute to the resource-based view of firms (Brush, Greene & Hart, 2001; Starr & MacMillian, 1990), by investigating the fine-grained links between the human, social and financial capital of new firms. We also aim to develop an understanding of one important aspect of entrepreneurs' behavior – social competence (Baron & Markman, 2003) – in the new venture creation process.

Our paper is structured as follows. After a literature review of the benefits and constraints of using networks, we develop conceptually our contingent model of network utilization. The model predicts relationships between measurable human capital dimensions and network utilization (the dependent variable), logically explained via two mechanisms: network resourcefulness (social capital) and the ability to interact with strangers (an aspect of social competence). We then test the model using both survey and interview data. Finally we discuss the study's contribution and implications.

Theoretical Development and Hypotheses

Pros and Cons of Using Networks in Venture Financing

Entrepreneurs usually face tremendous challenges in the early venture financing process. Prospective investors often find it very hard to assess the viability of the new ventures, because they have no track record, the uncertainty of the technology or products is high, and the information asymmetry between the prospective investors and the entrepreneurs exists, especially if the firms operate in high-tech industries (Baum & Silverman, 2004; Venkataraman, 1997). Hence prospective investors are usually very hesitant to make an investment (Bhide & Stevenson, 1992). The term *investors* in this study includes professionals working for institutions (venture capitalists, corporate investors, government agents) and individuals investing their own funds (angel investors).

The literature has argued that prospective investors with whom entrepreneurs have direct or indirect ties may be more likely to make a financial commitment (Light, 1984; Zimmer & Aldrich, 1987). Based on private information collected through prior interactions, these investors are better able to assess the ability and integrity of the entrepreneurs (Venkataraman, 1997). A recommendation from prestigious referrers also endorses the worth of the ventures, thus influencing the investors' decision favorably (Stuart, Hoang & Hybels, 1999). Empirical studies have also shown that venture capitalists tend to invest in new ventures where they know the entrepreneurs directly or indirectly (e.g. Batjargal & Liu, 2004; Shane & Cable, 2002; Shane & Stuart, 2002).

There is, therefore, theoretical and empirical evidence to suggest that the probability of getting funding through network methods (direct or indirect ties) is higher than through market methods. Moreover, most businesses are not set up in a way that can attract the interest of

institutional investors from the very beginning (Brush et al., 2001). Due to these real constraints faced by the majority of entrepreneurs, it is reasonable that entrepreneurs will go for the low-hanging fruit first (i.e., utilise their network) (Lin, 1999; 2001). We argue that in general there is a sequential pattern in the network *versus* market selection. Thus the majority of entrepreneurs will first utilize network ties because of the higher probability of obtaining funding. Eventually, if and when their contact base is exhausted, they venture into the market.

However, there will be exceptions to this rule, the reason for this being that there are also constraints and costs in using existing ties. First, although entrepreneurs may possess an extensive network, only a limited number of ties are useful in starting new ventures (Aldrich & Zimmer, 1986). For instance, only a few ties might be aware of potential investors in the particular technical or market domain of the new ventures, and thus be able to help (Fiet, 1995). Moreover, network usage is backed by an expectation of reciprocity, although the payback may not be immediate (Lin, 1999). In addition, the funds that can be accessed using ties may be of an inferior quality to alternative resources accessible in the marketplace. In particular, when compared with a less-experienced investor in the entrepreneur's network, a prestigious investor in the market may be more skilled at injecting expertise and sound business judgment into startup ventures (Hellmann & Puri, 2002). Successful venture capital firms in the market also facilitate the funded startup's efforts to obtain other necessary resources through endorsing the new firm with their reputations (Baum & Silverman, 2004; Megginson & Weiss, 1991; Stuart et al., 1999). In practice, it has also been found that in some circumstances entrepreneurs attempt to avoid using funds from existing network ties (e.g., Schulze, Lubatkin & Dino, 2003)

We therefore argue that *network utilization is ultimately a choice*. It is possible that under certain conditions entrepreneurs will forgo the convenience of relying on existing ties, and seek "better" investors in the marketplace, even before their network base is exhausted.

So what factors influence the entrepreneur's network utilization decision (network ties *versus* market methods) in the early venture financing process? The entrepreneurship literature is silent in answering this question (Hoang & Antoncic, 2003). Indeed, only two studies have touched upon the concept of network utilization at all. First, Larson and Starr (1993) have coined the term "network culling" to describe an iterative process which involves the exploration, screening and selective use of network dyads to match the resource demands of the new business. They explain that "certain relationships are selected, others are dropped, others continue to evolve, and new ones are added" (p. 8). In the same vein, Hite and Hesterly (2001) have proposed that, as new firms respond to the resource challenges from emergence to early growth, their networks evolve from primarily social network ties drawn from a dense, cohesive set of connections to a balance of network ties and market relations based on a calculation of economic costs and benefits. However, with their more general focus on network evolution, neither study has explicitly answered what influences entrepreneurs' network utilization decisions in the venture financing process, and this is the purpose of our paper.

Contingent View of Network Utilization in Venture Financing

In this section, we present a contingent model of network utilization decisions (Figure 1), based on the dimensions of the entrepreneurs' human capital. Specifically, human capital can influence the decision via two parallel mechanisms: (1) some dimensions of human capital can raise the resourcefulness of the entrepreneurs' network (social capital), thus increasing the

opportunities for network utilization when approaching investors; and (2) other human capital dimensions can enhance the entrepreneurs' ability to interact with strangers (social competence) and identify superior resources in the broader market, thus reducing their incentive to rely on the existing networks. In the next paragraphs we are going to use a step-by-step approach to explain the development of the model. First we will focus on explaining the two underlying mechanisms (not explicitly shown in Figure 1), and then we will present the hypothesized relationships.

Insert Figure 1 about here
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1) Effect of network resourcefulness (social capital) on network utilisation

Social capital is defined as the sum of the actual and potential resources that individuals obtain from their direct or indirect ties in social networks (Nahapiet & Ghoshal, 1998). Rich social capital indicates a "resourceful network" for the focal actor (Lin, 1999; 2001), in our case a network of contacts who have the ability to help venture fundraising directly or indirectly. Whether or not the existing ties of the entrepreneurs are resourceful for *the specific venture in question* varies according to the needs of the individuals. Suppose, for example, a Ph.D. student has a number of academic ties. When she starts a new venture in e-learning, those ties will probably still be resourceful, but if her new venture is a beauty spa, they become less resourceful. This case highlights the importance of the *relevance* of the resources accessible in existing ties and the resource needs when considering the resourcefulness of ties (Lin, 2001).

The literature has indicated that fundraising is generally more successful and convenient when using contacts rather than searching in the market (Batjargal & Liu, 2004; Shane & Cable, 2002; Shane & Stuart, 2002; Stuart et al., 1999). We therefore argue that entrepreneurs with rich social capital enjoy a resourceful network and thus have the opportunity to increase their

convenience and success-rate in fundraising by utilizing it. Therefore, they have fewer reasons to look to the market. On the other hand, entrepreneurs who have a less resourceful network will lack opportunities to raise funds effectively by utilizing their contacts and will therefore be more likely to approach market investors.

2) Effect of ability to interact with strangers (social competence) on network utilization

Social competence refers to the overall effectiveness of a person's performance in interacting with others on a face-to-face basis (McFall, 1982). The literature has identified a few important aspects of social competence in business contexts, such as social perception, impression management, persuasiveness and social adaptability (Baron & Markman, 2003). Studies in social psychology have found that socially competent people are able to read other persons accurately (Ferris, Witt & Hockwarter., 2001), to make a good first impression (Leary, 1995) and to be persuasive (Argyle, 1969).

In the context of venture financing, we focus on a particular aspect of social competence, "social boldness". As one aspect of social adaptability, social boldness refers to the ability to approach and interact with total strangers (e.g., "I am comfortable with all people – young or old, people from the same or different backgrounds as myself," "I can talk to anybody about anything," "I have no problem introducing myself to strangers.", Baron & Markman, 2003: 55). Socially bold entrepreneurs have lower psychological barriers to exchanging private information with strangers whom they personally identify as target investors (Ferris et al., 2000; Ferris et al., 2001). This capability to search, identify and persuade investors in the marketplace may lower the relative benefits of using existing ties (i.e., convenience) and therefore reduce the incentive to network utilization (Baron & Markman, 2000; 2003; Lin, 2001). Hence we argue that the effect

of the resourcefulness of the contacts on the possibility that entrepreneurs will use them is conditioned by their ability to interact with strangers. For more socially bold entrepreneurs, the positive effect of their network resourcefulness on the propensity of network utilization becomes weaker (a moderation effect).

Human Capital and Network Utilization Decision

In this section we develop testable hypotheses between specific dimensions of human capital and the network utilization decision, with "network resourcefulness" and "ability to interact with others" as the underlying mechanisms explaining the relationships.

Human capital is comprised of knowledge, skills, and abilities that people have acquired through work and educational experiences (Becker, 1993; Burt, 1992). It was found to be imperative in attracting complementary resources, especially financial capital, during the startup stage (Baum & Silverman, 2004; Tyebjee & Bruno, 1984). In particular, many studies have found that the entrepreneurs' experience and skills are the most frequent selection criteria self-reported by VCs (Byrne, 2000; MacMillan, Zemann & Subbanarasimha, 1987; Zacharakis & Meyer, 2000). Investors believe that entrepreneurs' human capital is the most reliable public signal of the credibility and competence of the ventures, since the information about the technology and product/service is usually lacking at the firm startup stage (Pennings, Lee & van Witteloostuijn, 1998). Therefore, the focus on human capital in this study will help extend our knowledge about the roles of this type of critical resource in the venture creation process.

The theories of social capital suggest a close association between entrepreneurs' human capital and the resourcefulness of their network ties (Lin, 2001). The entrepreneurship studies that take a resource-based view of firms (RBV) have argued that the human and social capital of

entrepreneurs, as equally important resource endowments, play the most critical role in attracting other resources (Brush, et al., 2001; Davidsson & Honig, 2003; Florin, Lubatkin & Schulze, 2003). Sociologists have broadly informed us that human capital and social capital are in fact positively related (Bourdieu, 1986; Coleman, 1988). For instance, well-connected parents and social ties can indeed enhance the opportunities for individuals to obtain better education, training, skills and knowledge credentials; meanwhile, better-educated and better-trained individuals tend to move in social circles and clubs rich in resources (Lin et al., 1981; Marsden & Hurlbert, 1988). The literature suggests that the two types of capital are complementary to each other in that increased human capital leads to enhanced social capital and *vice versa* (Lin, 1999; 2001). In other words, rich human capital is in general associated with resourceful networks. Hereafter, we specify two dimensions of human capital that indicate the level of network resourcefulness in terms of venture financing.

The first dimension is occupational status in a prior job. The sociological literature suggests that people with different job attainment levels possess remarkably different networks. Senior positions are generally linked with resourceful network ties because they represent an individual's social position (Lin, 1999; 2001). Social resource theory suggests that individuals who occupy top positions in a hierarchical social structure have greater access to and control of diverse resources (Weber, 1968). Not only do they have direct control of more resources, they also gain diverse access to other people in similar positions in the hierarchy (Lin, 1999; 2001; Lin et al., 1981). Hence, these people can serve as either direct ties that provide financial capital or indirect ties that provide links to potential investors (Seibert, Kraimer & Liden, 2001). Therefore, high occupational status in a prior job enhances the resourcefulness of their network.

Since a more resourceful network increases the probability of its utilization we propose the following hypothesis:

> ***Hypothesis 1:*** *The previous occupational status of entrepreneurs is positively correlated with their propensity to use existing networks when approaching initial investors.*

The second dimension of human capital that may increase the resourcefulness of networks is the similarity of the industrial sectors between the prior employment and the new venture. The reasons are twofold: (1) according to community of practice theory (Wenger, 1998), people with a similar professional background tend to possess similar knowledge and have linkages with those sharing a similar background. Therefore, the existing ties in the same industry can offer high quality "smart money" (i.e., funds accompanied by knowledge and advice based on experience in the sector) (Baum & Silverman, 2004; Megginson & Weiss, 1991); and (2) with their prior knowledge in the relevant business domains, the existing ties are better able to evaluate the new ventures' propositions, and hence are more likely to commit their money (Zhang, Wong & Soh, 2003). We therefore predict that relevant industrial experience enhances the resourcefulness of the entrepreneurs' networks. Since a more resourceful network increases the probability of its utilization (see the argumentation in the previous section), we pose the following hypothesis:

> ***Hypothesis 2:*** *The similarity of the industrial sectors between entrepreneurs' prior employment and their new ventures is positively correlated with their propensity to use existing networks when approaching initial investors.*

The literature suggests linkages between entrepreneurs' human capital and their ability to interact with others (social competence). Social competence is different from personality, in that personality is relatively stable and enduring, but social competence can be improved through

social skills training (Kavale & Forness, 1999; McFall, 1982). Social skills training can be acquired through education (Gresham, Sugai & Horner, 2001), but more importantly during working life (Baron & Markman, 2000). We therefore specify "previous job function" as a human capital dimension with an impact on the ability to interact with others (social competence), and in particular with strangers (social boldness).

It is well known that people trained as technicians, such as engineers and scientists, are usually weak in communicating with others, especially with strangers. Badawy (1995), using empirical evidence, argued that the major cause of managerial failure among engineers and scientists is poor interpersonal skills. More recently, Aucoin (2002, p. 8-9) stated: "the most critical requirement for the engineer in transition (to manager) is the development of strong interpersonal skills. However, engineers typically excel at engineering by being individualistic. The transition does not compel the engineer to abandon what made her previously successful. Rather, it necessitates the development of new skills to become more social and more *human.*" Interpersonal skills not only include the abilities to get along with colleagues in the firm, but also to communicate or negotiate with outsiders, such as customers, suppliers and investors (Badawy, 1995).

In contrast, research has shown that people who take non-technical positions such as marketing and business management have better interaction abilities (Thompson, Warhurst & Callaghan, 2001). This is largely because people working in non-technical positions are given more opportunities to expose themselves to persuading and influencing others in order to accomplish certain tasks or to buy their products and services (Argyle, 1969). In addition, people with inherently better interaction abilities are more likely to be recruited into management and marketing-related jobs (Barrick & Mount, 1991).

Prior marketing or managerial experience should therefore enhance the ability of entrepreneurs to interact with strangers (Baron & Markman, 2000; 2003). In the previous section we argued that the ability to interact with strangers alleviates the positive impact of network resourcefulness on the probability of network utilization. Consequently, we predict that the positive impact of the two dimensions of human capital that enhance network resourcefulness – occupational status and industrial experience – on the propensity of network utilization will be weakened when entrepreneurs have marketing or managerial experience in previous employment.

> ***Hypothesis 3:*** *The prior work experience of entrepreneurs in marketing or business management alleviates the positive impact of occupational status on the probability of network utilization.*

> ***Hypothesis 4:*** *The prior work experience of entrepreneurs in marketing or business management alleviates the positive impact of industrial experience on network utilization.*

Methodology

Sample and Data Collection

We collected data through on-site interviews with a questionnaire survey from high-tech start-ups in Singapore and Beijing, China. The high-tech sectors included IT hardware, software, telecommunications, biotechnology and high-tech manufacturing. The start-ups were less than eight years old in 2002 when the data were collected.

Given the lack of accurate lists of firms in our sampling frame we identified our own target population, collating information from various sources. In Singapore, the sources included local universities, science parks and government agents such as the Infocomm Development Authority of Singapore and the Economic Development Board of Singapore. In Beijing, given that the vast majority of new high-tech startups are concentrated in incubators or science parks

where the government offers special policy schemes (BBIA, 2001; 2002), our target population was the sum of qualifying firms residing in these locations. The lead founders of the firms were our target respondents. Overall, we collected usable data from 102 Singaporean respondents (response rate = 22%), and 124 Beijing respondents (response rate = 24%). We found no significant differences between respondents and non-respondents in firm age, number of employees and industrial distribution.

On-site interviews with a questionnaire survey were conducted, to ensure the reliability and validity of the data and enhance the response rate (Li & Atuahene-Gima, 2001). Before administering the survey, we conducted pilot interviews with 16 entrepreneurs. The questionnaire was designed and improved during the interview process. The finalized questionnaire had two sections. The first section asked respondents to identify the earliest three cases of investors that the founders approached, whether the investors committed funds or not. For each case, respondents recalled the methods used – whether through network ties or by market methods. In the second section, respondents provided information on their educational, work, industrial and entrepreneurial experience for themselves and their co-founders, and assessed the competitive environment of their ventures. They also explained (during the interview) why they used a network or market method in each particular case. All interviews were tape-recorded and transcribed as narrative data.

Reliability and Validity of the Data

All the respondents were the lead founders, offering information about the whole founding team. We verified through the interviews that the founding team members had worked very closely together at the early stage of the startup and in most cases the respondents were

knowledgeable about the ties between all the founders and investors, as well as about the human capital dimensions of each member of the founding team. Where the respondents had doubts and could not reach their partners for data verification at the time of the interview or later, we treated this as missing data for the particular observations.

We also tried to minimize the retrospective recall bias by following the suggestions of Miller, Cardinal and Glick (1997): (1) we chose samples from firms younger than eight years old to ensure that the entrepreneurs could accurately recall their initial venture financing experience (Zahra, 1996); (2) we used free reports to avoid forcing them to say something they could not remember; and (3) we motivated the entrepreneurs to provide accurate information by explaining the significance of the project when contacting them for the first time, by providing confidentiality letters upon interviews, and by visiting them at their most preferred time and place to minimize inconvenience.

While it would have been ideal to interview all prospective investors in order to triangulate the data, this was not possible due to the difficulties in obtaining the identity of these people and in getting them to respond. However, we successfully interviewed six such investors in the pilot study and found that their responses confirmed the information provided by the entrepreneurs. To further reduce potential problems, we treated a few observations as missing data when the entrepreneur respondents showed hesitation in answering the relevant questions.

Measures

1) Propensity to use ties when approaching investors.

We used an egocentered method to collect data of the dependent variable (Knoke & Kuklinski, 1982; Wasserman & Faust, 1994). Egocentered network analysis normally asks

individuals to identify the five most important connections in order to insure accurate recall (Burt & Ronchi, 1994; Greve & Salaff, 2003). In this study, the pilot interview suggested that every founding team (the average team size of our sample firms was 2.7) had (at least) three contacts with potential investors, on whom the respondents would have a natural tendency to call first (i.e., the low-hanging fruit effect). We therefore constructed the dependent variable as the proportion of using ties (either direct or indirect) in approaching the first three investors. For instance, assume a respondent reports that their first potential investor approached was an ex-colleague, the second one was referred by a former classmate, while the third was contacted through a cold call; then, in this case, one direct and one indirect tie were exploited. The dependent variable takes the value y=2/3.

The small number (three) of the approaches considered as "initial" ensured that the respondents who went for the market method did that by forgoing their top contacts, rather than because (say at the 20^{th} attempt) being forced to go for the market when their contact base was exhausted.

2) Human capital of entrepreneurs:

(1) *"Occupational status"* was the average value of the founders' prior appointment levels with equal weight. The value was "3" for senior managers (CEO, CFO, etc.), "2" for middle managers (manager of a division/department), and "1" for a position lower than the above.

(2) *"Similarity of industry"* was the average value of the similarity of the industrial sectors between the prior employment of the founders and the new firm with equal weight. The value varied from "5" for "very similar", to "1" for "very dissimilar".

(3) *"Job function"* was a dummy variable that equaled "1" if any founder had prior work experience in management or marketing, and "0" otherwise.

3) Control variables:

(1) "*Technological risk*". In high-tech ventures, the risks of their new technologies represent an important appraisal criterion in financial markets (Roberts, 1991). The entrepreneurship literature suggests that the higher the risks of the technology a firm possesses, the more severe the uncertainty and information asymmetry problem perceived by prospective investors will be (Venkataraman, 1997). To minimize potential risks, the investors will limit their choice of the projects to the people they know directly or indirectly (Shane & Cable, 2002). So from the view of the entrepreneurs, they see more difficulties in fundraising in the market place and more relative benefits in relying on pre-existing ties, and hence they are very likely to use ties. In this study we used a series of industry dummy variables - *IT hardware, software, telecom* and *manufacturing* - and *biotech* was coded as the reference group. We expected that the entrepreneurs in the biotech industry, which was believed to be young and most risky, would have a higher likelihood of using ties than those in other industries (Zahra, 1996).

(2) "*Munificence of the financial market*". When the financial market is under-developed, the cost of seeking prospective investors is higher (Fiet, 1995). More importantly, the chance of obtaining funds from stranger investors is lower, because without institutional protection from the market investors perceive a very high uncertainty and information asymmetry problem if investing in somebody they do not know (Zucker, 1986). Hence, entrepreneurs will find more difficulties in acquiring funds in the market. This variable was approximated by *country*, and Singapore was the reference group. Compared with China, Singapore's financial market and VC industry were well developed due to its early openness to western influences (Wong, 2005). By

the end of 2001, VC funds in Singapore had researched S$13.7b (about US$8.5b) with 115 VC firms and 635 VC-supported companies (EDB, 2002). In comparison, by July 2001 about 180 VC were active in China with funds about RMB¥20b (US$2.5b) (*Business Weekly*, 2003). We therefore expected that Singaporean entrepreneurs would be less likely to rely on networks.

In addition, we have also experimented with a number of control variables (potentially having an effect on the propensity for utilizing networks) such as "job function diversity", "educational level", "founding team size", "entrepreneurial experience", "age at founding", "gender" and "market competitive intensity". However, none of these controls showed significant influences on the dependent variable and therefore we do not present them in this paper.

Regression models

Ordered Probit regression was used, since the dependent variable *y* was not continuous (Long, 1997). The Ordered Regression Model (ORM) can be derived from a measurement model in which a latent variable y^* ranging from $-\infty$ to ∞ is mapped to an observed variable *y*. In this study, *y* is related to y^* according to the measurement model:

$$y_i = \begin{cases} 0 & \text{if } \tau_0 = -\infty \le y_i^* < \tau_1 \\ 1/3 & \text{if } \tau_1 \le y_i^* < \tau_2 \\ 2/3 & \text{if } \tau_2 \le y_i^* < \tau_3 \\ 1 & \text{if } \tau_3 \le y_i^* < \tau_4 = \infty \end{cases}$$

where the τ's are thresholds or cutpoints which are also unobservable. The regressions are based on the structure model:

$$\boldsymbol{y_i^* = \alpha_i + \beta_i x_i + \varepsilon_i}$$

It merits noting that although y^* is unobservable and its change is difficult to interpret with observed variables, it has the same direction with y. In other words, the higher value of y^* means that the entrepreneurs have higher propensity to use network ties.

Results

Survey Data

The profiles of the entrepreneurs, founding teams and firms are as follows. On average, the entrepreneurs were 36-years old when founding their firms, had obtained an undergraduate degree and had worked as a middle level manager. Regarding the characteristics of founding teams, on average the team size was 2.7; 28% of teams had a female member; and 59% had prior entrepreneurial experience. The average age of the firm in 2002 was 3.8 years, which to some extent ensured the reliability of recalled data (Zahra, 1996).

Table 1 shows the descriptive statistics and the correlation matrix. The mean value for "propensity to use ties" was 0.71. In other words, in about 70% of the cases the entrepreneurs used network ties to approach investors. Between the two countries, the entrepreneurs in Singapore used ties in 68% of the cases, whereas their Chinese counterparts used ties in 75% of the cases. The data suggest that most entrepreneurs approached networks in their first three attempts at venture fundraising, confirming our earlier argumentation. Finally, congruent with prior studies (e.g., Shane, 2000), the data showed that the majority chose an industrial sector with which they were familiar.

Insert Table 1 about here

The correlation matrix suggests that collinearity among the main variables was low. In addition, it should be noted that although the variables "occupational status" and "job function" were positively correlated, the correlation coefficients were not high enough to raise multicollinearity concerns (r=0.24). Prior to the creation of interaction items, the variables "occupational status", "similarity of industry" and "job function" were mean-centered to further reduce any potential multicollinearity problem (Aiken & West, 1991).

Table 2 presents the regression results. We also tested the hypotheses using OLS regression but we found no significant differences in the results.

Insert Table 2 about here

Model 1 is the base model with only control variables. We found that compared with their counterparts, entrepreneurs in the biotech industry and in China were more likely to use ties in approaching investors. This suggests that higher technological risk or a less munificent financial capital market make it more likely that entrepreneurs will solicit their network ties.

In model 2, the main effects of human capital variables are added. Model 3 introduces the effects of the interactions of the human capital variables. Here we discuss the results based on the full model 3.

The result in model 3 showed that occupational status was positively correlated with the propensity to use network ties. Hypothesis 1 was supported. "Similarity of industry" also appeared to be a strong predictor of the propensity to network utilization. Hence, hypothesis 2 was supported. Regarding the moderating effects, the coefficient of the product term "Occupational status * Job function" represented a significant, negative interaction effect (B=-0.10, p<0.05), as did the coefficient of the product term "Similarity of industry * Job function"

(B=-0.09, p<0.05). The results suggested that if entrepreneurs had prior marketing or managerial experience, the positive influence of occupational status or industrial experience on network utilization were mitigated. So hypotheses 3 and 4 were supported.

To understand the nature of the moderating role of "job function" in H3 and H4, we presented the graphs of the interactions in Figure 2 by following the method outlined by Aiken and West (1991). The moderator "job function" was 0 or 1, and the other variables were constrained to their mean values. Both panels in Figure 2 showed that overall "occupational status" or "similarity of industry" had positive impact on y*, which indicated the propensity to use networks; and its impact was strengthened (the slope was steeper) when the entrepreneurs had no prior work experience in marketing or business management.

Insert Figure 2 Here

Interview Data

In this section we present some qualitative data from the interviews, with a dual purpose: (1) to illustrate the relationships presented in the model; and (2) to support our arguments that "network resourcefulness" and "ability to interact with strangers" were the mechanisms behind the hypothesized relationships between human capital dimensions and network utilization. We did not measure network resourcefulness and ability to interact with strangers as explicit constructs in the questionnaire, because we felt that one respondent could not answer on behalf of the whole team and we did not have access to all team members.

First, to support hypothesis 1 (occupational status is positively correlated with network utilization), we found that some entrepreneurs who had left prior employment at a high position

preferred to use network ties to search for funds, since they had established diverse and resourceful social networks. For instance, one entrepreneur recalled:

> "I used to work at IBM as a senior technical manager, and then I worked after that for an international investment company as a vice-president taking charge of Southeast Asian business … There seemed to be an opportunity to get into software in the very early days. So I spoke to two people who were ex-IBM working for me for about 10 years. Since they knew me, it was just a five minute phone call to each and they agreed to put in the money. Then we used my contacts in the investment company and found 3i (a renowned international VC), our major investor. One of them (the two ex-IBM investors) also happed to know one partner in Singapore 3i. So it was quite straightforward."

In contrast, other entrepreneurs claimed that since the accessibility of relevant investors through extant network ties was very limited (a less resourceful network) they considered the market method. This was much more serious for those whose prior job positions were relatively low in terms of organization hierarchy. One of these presented a good example of how he approached the first investor:

> "I started my own business after I left my first job in an American company … Actually I had worked for seven months only. When I started, I was only 23. Nobody knew me. The work experience in the American company only taught me that the electronic manufacturing is a promising industry… I went to Penang to visit Intel. Intel began manufacturing 286 CPUs there in 1987. I talked with them without anything in hand… Intel finally invested in my firm…"

In terms of supporting hypothesis 2 (similarity of the industrial sector is positively correlated with network utilization), many entrepreneurs highlighted the fact that staying in the same industry provided them with resourceful contacts, which they utilized to obtain financial capital. For instance, one entrepreneur stressed the importance of the possession of prior knowledge in the business domain of the new venture by himself as well as by the prospective investor:

> "Mr. A and I had worked together for more than 10 years. So he knew me 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 understood my track record very well… Of course, before he came, I also did some homework. I got information about him through my people. During talk, I found he really knew what we had to go through…"

In contrast, other entrepreneurs, due to their change of industrial sector and the lack of resourceful contacts, sought investors in the market. A typical remark was:

> "Because the market is new, there is not much like you have an existing network as if you were in the same industry as before. In our case, it's not. So we can't really make use of a lot of prior relationships".

In hypotheses 3 and 4, we predicted that previous marketing or management experience moderates the positive relationship between resourceful network ties and the propensity of entrepreneurs to use ties. In the interviews, we observed that entrepreneurs were much more concerned about the disadvantages of relying on established ties when they had managerial experience, which brought confidence in interacting with strangers. For instance, one entrepreneur remarked on his search for VCs:

> "Yes, we do know quite a few individuals having interests in our business and want to invest. But we want to get the best investor who can add value to our business, not only money ... When I worked in the former company as CEO, I used to handle many different kinds of people, and I did like to share my ideas with others. I think it is quite easy to convince people. Also there is no harm to try all of the chances. We attended network events organized by NSTB (National Science & Technology Board) and approached some big VCs. They seemed quite interested in our business idea, especially after learning that we have worked on it for almost two years as a research team."

Entrepreneurs with marketing experience were also generally very confident and they believed that people who start a business should be sociable and open to strangers. One interviewee noted:

> "I have been a salesman for four years. I believe part of entrepreneurship is salesmanship. You must be able to convince people that your product will benefit them; your company will make profit in a couple of years… referrers are helpful in some cases. But there's nothing to be afraid of in making cold calls… You have to have your story. Any entrepreneur must be able to sell his ideas. That's how I got funding and orders."

These comments clearly reveal the intention and reasons that entrepreneurs approach prospective investors in the market place. However, it is worth noting that the respondents did not deny the benefits of using ties in this process; rather, the entrepreneurs with more experience in dealing with strangers foresee lower costs and potentially higher returns in approaching more potential investors in the market place. The remark below may illustrate this point explicitly:

> "I think it (whether use ties or market methods) depends. My previous boss was interested in my new idea. So I used his money. Why not? But I still want to keep business and friendship separate. I don't want my friend say 'I trusted him and gave him money, but he turned out to be a fool!' So I always keep an eye on what is happening outside. To me, our second prospective investor was the best choice. If I could get him, he would bring us a lot of people and experience we needed. So my co-founder and I tried all our best to get him. It was not too hard for me. I have been the sales star in my old company for many years!"

In sum, both questionnaire survey and interview data supported all hypotheses, and they corroborated the contingent view of network utilization decision in early venture financing.

Discussion

Many entrepreneurship studies have emphasized the importance of social networks as a method of approaching initial investors for new venture creation. However, studies have paid little attention to the fact that the utilization of social networks is a choice, and under some circumstances entrepreneurs may well decide to go for market methods. In this study, we present a contingent model, which incorporates both an opportunity (social capital) and incentive (social competence) perspective in network utilization. We tested this model using the human capital

dimensions of entrepreneurs. The results show that high occupational status and relevant industrial work experience are positively associated with the entrepreneurs' propensity to utilize existing networks by enhancing the resourcefulness of the network ties (social capital). However, such influences are alleviated by entrepreneurs' marketing or managerial experience, which increases the entrepreneurs' ability to interact with strangers (an aspect of social competency).

Theoretical Contribution

Our study makes three important theoretical contributions. First of all, this study fills a gap in social network research that puts emphasis on the balance between embedded ties and market mechanisms (Uzzi, 1999). Few studies in entrepreneurship have touched upon the complementarity between network and market relations (Larson & Starr, 1993; Hite & Hesterly, 2001). Most network-based entrepreneurship studies have only addressed the benefits and necessity of using ties, but have understated the potential limitations and costs in doing so (Hoang & Antoncic, 2003). This study takes a more balanced perspective by contributing to a contingent view on network utilization. It demonstrates that, although the opportunity to use ties may increase the possibility of network utilization, that effect could be mitigated by the incentives for people to forgo the convenience of relying on existing ties. Moreover, our results imply that individual heterogeneity in the extent of network utilization is significant even at the very early stage of new venture creation. This implication adds a new perspective to the dominant view that the shift of the underlying mechanisms of resource acquisition from network-based to market-based happens only at the onset of the growth stage of new ventures (Hite & Hesterly, 2001).

This study develops the resource-based view of firms in an entrepreneurial context by examining the fine-grained linkages between the human, social and financial capital of new firms. Previous studies have noted that the unique, valuable and inimitable human and social capital of entrepreneurs help in the acquisition of financial capital and consequently in the survival of new firms (Brush, et al., 2001; Davidsson & Honig, 2003; Florin, Lubatkin & Schulze, 2003). However, we still need more studies examining the complex relationship *between* human and social capital. We argue that human capital not only shapes and is shaped by social capital; it also influences the *utilization* of social capital. Therefore, this study adds to our understanding of the importance of the human capital of entrepreneurs in venture financing (Cooper, Gimeno-Gascon & Woo, 1994; Davidsson & Honig, 2003).

This study also extends our knowledge of one important aspect of entrepreneurs' behavior – social competence – in the new venture creation process. It was not until very recently that the entrepreneurship literature started to recognize the importance of social competence in new venture creation and growth (Baron & Markman, 2000; 2003). According to the literature, social capital is used to access prospective investors, and social competence helps subsequently in gaining the funds (Baron & Markman, 2003). Our study suggests however that social competence may intervene in the venture financing process even earlier by broadening the scope for searching for potential investors. The earlier literature identified a few important aspects of social competence in business contexts, such as social perception, impression management, persuasiveness and social adaptability (Baron & Markman, 2003). This study suggests that "social boldness" – the ability to interact with strangers - should be one important aspect of social competence, at least for entrepreneurs.

Practical Implications

There are a number of implications for practitioners involved in the entrepreneurial process. Firstly, for individuals who intend to start their own ventures, it is important to leverage their occupational positions in existing employment to build network ties. An increased resourcefulness of entrepreneurs' networks leads to easier access to resource owners via their existing network route. More resourceful networks will be beneficial to entrepreneurs who create a venture in an industry where they have work experience. Therefore, for the people who inherently prefer the network route of initial resource acquisition to the more uncertain and often more stressful market search, it would be better to launch their ventures at a later stage of their careers and to look for opportunities in the industries of their expertise.

Secondly, developing a good ability to interact with strangers can to some extent help entrepreneurs overcome the constraints of existing networks by approaching investors in the broad marketplace. Social competence can be learned and one way of doing this is to work in managerial or marketing jobs. The clear implication, especially for scientists and engineers who are contemplating an entrepreneurial career, is that the nascent entrepreneurs should take all possible chances to obtain some non-technical and managerial experience before starting their new businesses.

Limitations and Directions for Further Research

In this study, we tested empirically a direct relationship between human capital dimensions and the network utilization decision and we explained these relationships theoretically via network resourcefulness and the ability to interact with strangers. Ideally, this logic could be tested empirically by measuring directly the above two constructs. However, this

was not possible in this case due to the lack of access to every member of the founding teams, which prevented us from measuring network resourcefulness and the ability to interact with strangers at the team level of analysis. That is in our view the study's main limitation. Despite this limitation, however, the hypotheses developed in the study are grounded on valid arguments supported by prior studies, and first-hand interview data are provided as evidence to back our logic.

To further expand our knowledge of the imprinting effects of entrepreneurs' human capital on the firms' network utilization decisions we propose longitudinal studies as a fruitful path. Our conceptual model stresses the importance of entrepreneurs' characteristics in venture financing at the early stage of venture creation. However, should we expect these factors to play a significant role beyond this stage? As the venture continues to grow, the organizational routines, social-political and other institutional factors may become prevalent in the resource acquisition process (Larson, 1992). Under these circumstances, it would be useful to test whether the individual influence of the entrepreneurs gradually diminishes.

In general, we call for more research on "network utilization decisions" answering the broader question "what factors influence the way entrepreneurs utilize their networks?" Future studies can also take other perspectives, such as entrepreneurs' financial resources, culture and social psychology (Argyle, 1969).

Conclusion

Overall, this study contributes to entrepreneurship research by enhancing our understanding of why entrepreneurs decide to utilize their existing networks over using the market methods to approach initial investors. The study is just a beginning rather than an end in

itself. It opens up a more general conversation on “network utilization decisions” – what types of networks are utilized in entrepreneurial process, under what circumstances and why?

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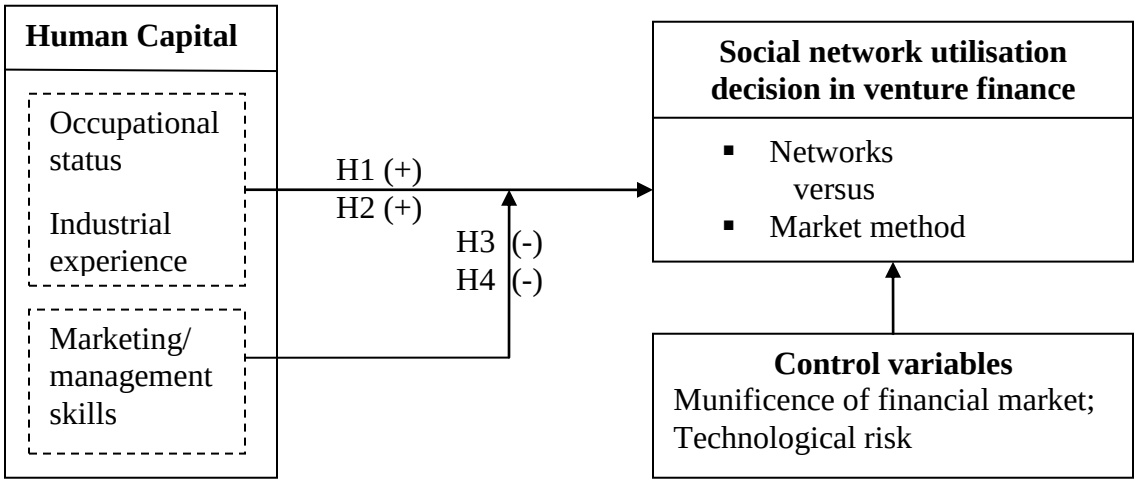
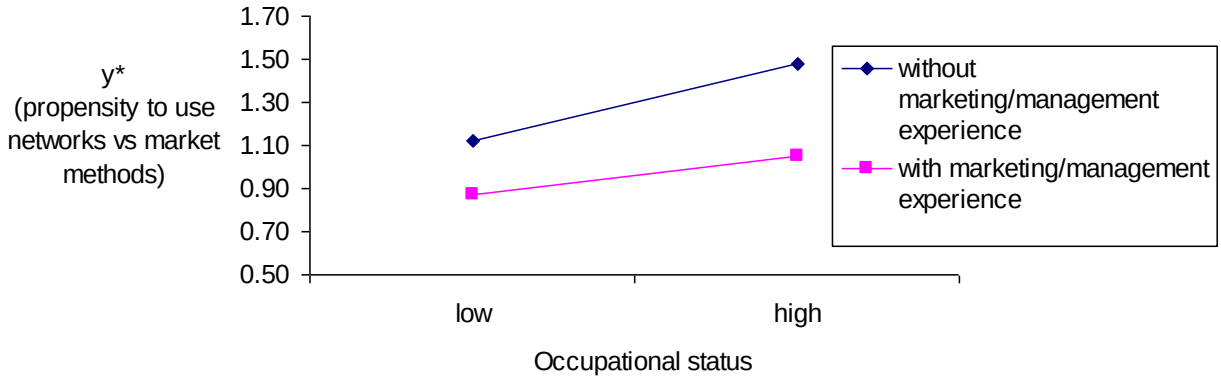


Figure 1: The contingent model of network utilization in initial venture finance

Panel 1: Moderating Role of Job Function on the Effect of Occupational Status on Propensity to Use Networks



Panel 2: Moderating Role of Job Function on the Effect of Similarity of Industry on Propensity to Use Networks

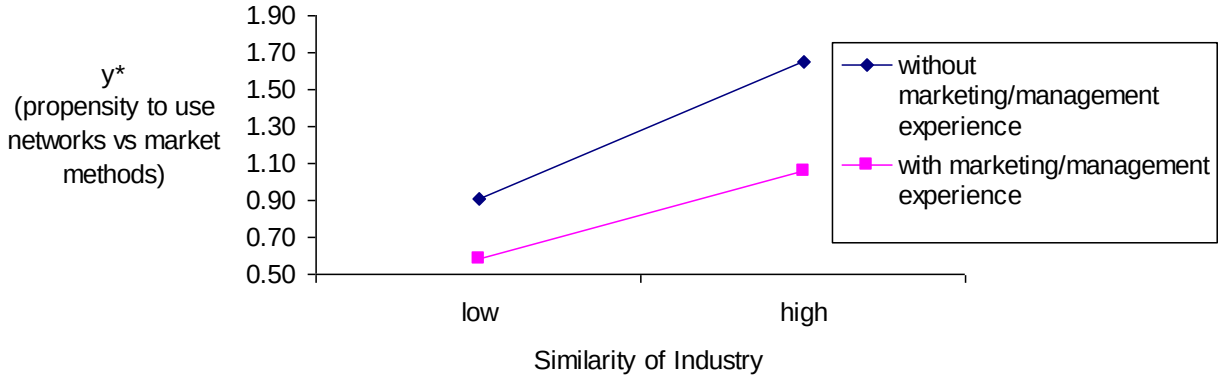


Figure 2: The moderating role of job function on the effects of human capital variables on entrepreneurs' propensity to use network ties

Table 1: Descriptive statistics and correlation matrix

	1	2	3	4	5	6	7	8	9
1. Propensity to use ties	1.00								
2. Occupational status	0.17**	1.00							
3. Similarity of industry	0.15**	0.06	1.00						
4. Job function	-0.08*	0.24**	0.05	1.00					
5. Hardware	-0.03	-0.05	0.07	-0.04	1.00				
6. Software	0.01	-0.05	0.00	-0.01	-0.43**	1.00			
7. Telecom	0.01	-0.07	-0.06	-0.06	-0.08	-0.31**	1.00		
8. Manufacturing	0.02	-0.06	0.02	-0.03	-0.09*	-0.23**	-0.07	1.00	
9. Country (China=1)	0.08*	0.54**	0.09*	0.18**	-0.12*	-0.09*	-0.13*	0.10*	1.00
Mean	0.71	1.99	3.69	0.85	0.10	0.58	0.06	0.18	0.55
St. Deviation	0.42	0.78	1.48	0.39	0.31	0.47	0.23	0.41	0.51

N=226

Key: ** $p < 0.01$; * $p < 0.05$

Table 2:
Ordered Probit regressions predicting the propensity to use network ties in approaching investors

	Model 1	Model 2	Model 3
Control Variables			
Hardware	-0.22 (0.10) *	-0.25 (0.12) *	-0.21 (0.11) *
Software	-0.19 (0.07) *	-0.20 (0.09) *	-0.24 (0.10) *
Telecom	-0.18 (0.07) *	-0.17 (0.08) *	-0.16 (0.08) *
Manufacturing	-0.38 (0.12) **	-0.42 (0.14) **	-0.44 (0.13) **
Country (China=1)	0.33 (0.10) **	0.35 (0.11) **	0.38 (0.13) **
Main Effects of Human Capital			
Occupational status		0.18 (0.06) **	0.20 (0.07) **
Similarity of industry		0.21 (0.05) **	0.25 (0.08) **
Job function		-0.14 (0.07) *	-0.13 (0.06) *
Moderating Effects of Human Capital			
Occupational status * Job function			-0.10 (0.05) *
Similarity of industry * Job function			-0.09 (0.04) *
Log Likelihood	-386.88	-332.56	-292.33
Likelihood ratio χ^2	39.88***	54.53***	65.08***

N=226

$^{+}$ $p < 0.10$
* $p < 0.05$
** $p < 0.01$
*** $p < 0.001$

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