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International entrepreneurship, venture capital networks, and reinvestment decisions

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Abstract Prior research has established that venture capitalists (VCs) may face significant obstacles in financing ventures from emerging or transition economies. Such hurdles are usually attributed to the weaknesses of host countries' institutional systems, especially regulatory. These institutional pitfalls may thwart VCs' ability to exit a portfolio company leading to lower returns than expected. Developing this approach, we argue that exit strategies may also be difficult to execute when VCs expand into advanced economies although for different reasons. Thus, we show that both necessity entrepreneurship prevalent in emerging economies and opportunity entrepreneurship prevalent in advanced economies are positively associated with the number of investment rounds received by portfolio companies. In contrast, we establish that VC firm capital and network density are negatively associated with the number of rounds provided to portfolio companies across distinct institutional environments. This suggests that VCs may improve their performance by choosing an appropriate strategy to navigate unfamiliar institutional environments to minimize their liability of foreignness. Finally, we find that the interaction of VC capital and network density is positively related to the number of VCs' investment rounds. Apparently, resource-rich VC firms may not fully realize the informational benefits of their dense "knowledge networks" due to insufficient collaboration with partners. At the same time, such VCs may no longer enjoy access to free information flows from prospective allies. Hence, network density and superior resources combined may lead to a greater number of investment rounds.

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Introduction

Venture capital firms have been known in the past for their proclivity to invest solely in those startups that are located within a short driving distance from their office (Freeman 2005; Ferrary and Granovetter 2009). This has recently changed. Responding to the continuing internalization of entrepreneurship (Etemad 2004; Etemad et al. 2010), venture capital (VC) is increasingly globalizing (Megginson 2004; Wright et al. 2005; Bruton et al. 2005). However, a host country's institutional environment may be quite different from the institutional system (Busenitz et al. 2000) of a VC's home country. That could pose a number of challenges. Prior research has focused on uncovering various institutional obstacles arising when VCs expand into emerging markets (Ahlstrom and Bruton 2006; Batjargal 2007). These particular hurdles were attributed to the weakness of the regulatory institutional regimes in transition economies that can be manifest in "undeveloped and inadequately enforced laws to support the fulfillment of contracts" (Bruton et al. 2009, p. 763).

Formal institutions required for successful functioning of the marketplace may not exist or be ineffective in transition economies. Therefore, local entrepreneurs rely on informal mechanisms utilizing personal relationships and clout. Pulling strings known as "*blat*" in Russia and "*guanxi*" in China permeates transition economies (Peng and Heath 1996; Peng et al. 2008). VCs coming from developed countries are expected to teach local entrepreneurs how to operate in the market environment. Ironically, VCs may first need to learn the ropes and take lessons from local entrepreneurs to survive in corruption-infested institutional environments of host countries. Such survival skills are based on cultivating informal relationships and forging dense networks (Ahlstrom and Bruton 2006).

VCs, of course, are no strangers to using the so-called strong ties and networks in their own countries (Hochberg et al. 2007, 2010). Furthermore, firm resources and network connections may be helpful when VCs expand not only into emerging but advanced economies as well. While institutional systems in these countries may not be weak or ineffective, VCs could still face obstacles due to the differences between the host country's institutional landscape and the institutional settings of their home base. Hence, we argue that to succeed across different institutional environments, VCs need to form and effectively manage knowledge networks (Etemad and Lee 2003). Based on network theory (Burt 1992; Gargiulo and Bennassi 2000), we define knowledge networks as dense networks in which VCs seek to create the knowledge advantage.

The reason dense networks may help VCs succeed in unfamiliar institutional environments is that they facilitate collective environmental adjustment. Grasping the importance of knowledge networks is critical for VCs trying to learn how to operate successfully in the new institutional settings. Prior studies have demonstrated that "venture capital firms invest in host countries characterized by technological, legal, financial, and political institutions that create innovative opportunities, protect

investors' rights, facilitate exit, and guarantee regulatory stability" (Guler and Guillen 2010a: 185). In other words, when VCs that usually come from advanced economies internationalize, they prefer to expand into other advanced economies. However, even these advanced economies require intense adjustment from foreign-based investors. As VC firms gain international experience, they are more likely "to overcome constraints related to these institutions" (Guler and Guillen 2010a: 185) but this may happen only as a result of adaptation.

Constraints inbuilt in particular institutional systems may complicate the implementation of VCs' exit strategy. As noted in prior studies, "many venture capital firms have discovered that when they do exit, their returns have not been as high as expected" (Bruton et al. 2004: 80). This observation was made summarizing the experience of VCs' operating in transition or emerging economies (Ahlstrom and Bruton 2006). Are VCs' exit strategies easier to realize in developed economies? Although these institutional environments may have well-developed regulatory regimes, they could still be considerably different from VCs' domestic institutions. Furthermore, substantial variance in normative and cognitive institutions may be observed among developed economies (Scott 2002; Peng et al. 2008).

The number of rounds of investment is often used to measure how long it takes a VC firm to realize its returns. VCs often overinvest and provide too many rounds of financing to poorly performing ventures (Birmingham et al. 2003; Guler 2007). Such overinvestment has been attributed to psychological reasons leading to escalation of commitment (Ryan 1995; Guler 2007). This begs the question if there are some additional factors that may affect overinvestment—providing too many rounds of financing to portfolio companies—in various institutional environments?

Respectively, it is important to examine: what strategies may allow VCs to reduce the number of rounds of investment to operate more efficiently and profitably. These are the principal questions raised in this paper. To answer these questions, we analyzed US-based VCs' investments in ten countries across the globe—from Asia to South Africa—during the period from the end of 2002 through 2007. Based on the concepts developed in studies conducted within the General Entrepreneurship Monitor (GEM) program (Reynolds et al. 2002; Bosma et al. 2008; Kelley et al. 2010), we investigated the association between entrepreneurship prevalence rates across different institutional environments and the number of rounds provided by VCs to portfolio companies. We also studied the relation between VCs' resources such as firm capital and the strategy of creating knowledge networks and the number of investment rounds.

International entrepreneurship and VCs' reinvestment decisions

Institutional contexts exert a strong influence on entrepreneurship (Bruton et al. 2010, Etemad et al. 2010). Prior research has emphasized, "the embeddedness of both the entrepreneur and the firm in their indigenous market and societal environments makes what they plan, do, or expect to do, a part of the broader, richer, and possibly spontaneous, social order of their indigenous society, imposing social constraints, norms and expectations on entrepreneurs and entrepreneurial processes" (Etemad 2004: 8). Thus, different aspects of the institutional environment (Scott 2002; Peng et

al. 2008), from regulatory (laws and regulations) to normative (behavioral patterns and expectations as to what is the perceived as a morally sanctioned way of behavior in a certain institutional system) to cognitive (taken for granted assumptions, beliefs and way of thinking) influence the setting in which local entrepreneurs create their new ventures.

Regulatory, normative, and cognitive dimensions of institutional environments may vary across the world (Hitt et al. 2004; Peng and Zhou 2005). The complex structure and broad variability of institutional regimes need to be taken into account as entrepreneurship internationalizes. Globalization of previously locally driven VC firms is part and parcel of this ongoing process of entrepreneurial internationalization. As VCs expand abroad, they need to be alert to the potential differences and uniqueness of host countries' institutional systems (Busenitz et al. 2000). The GEM research program conducts an annual assessment of country-level entrepreneurial activity. "Initiated in 1999 with 10 countries, expanded to 21 in the year 2000 and over 60 countries in 2008, the program covers both developed and developing countries" (Acs et al. 2008, p. 221). Within the GEM program, researchers estimate the level of the total entrepreneurial activity (TEA) in a country measured by entrepreneurship "prevalence rates." Both nascent firms and more established firms that are less than 42 months old are counted (Reynolds et al. 2005).

Researchers conducting GEM-based studies, typically contrast two principal types of entrepreneurship: opportunity- and necessity-driven (Reynolds et al. 2005; Acs et al. 2008). Opportunity-driven entrepreneurship arises when "entrepreneurs are pulled into entrepreneurship because they recognize an opportunity that can improve or maintain their incomes or increase their independence" (Kelley et al. 2010, p. 9). Conversely, necessity-driven entrepreneurship comes about whenever "entrepreneurs are pushed into entrepreneurship because they need a source of income" (Kelley et al. 2010, p. 9). Respectively, GEM-based studies contrast the TEA of "opportunity-pulled entrepreneurs" (defined as TEA opportunity) with the total entrepreneurial activity of "necessity-pushed entrepreneurs" (TEA necessity; Kelley et al. 2010). Table 1 summarizes these key concepts adopted in the GEM studies.

While both opportunity entrepreneurship and necessity entrepreneurship may be present at the same time, their proportional share of the TEA could vary (Porter 1990, 2000). Countries in the early stages of development whose competitiveness relies on "low cost efficiencies in the production of commodities or low value-added products" (Acs et al. 2008: 220) tend to have a greater share of necessity-based than opportunity-based ventures. It is easier and less costly to create a simple venture such as a street vendor's hotdog stand than a biotech startup seeking to develop a new technology. Hence, the TEA in countries where necessity entrepreneurship is dominant tends to be higher, too. In contrast, more industrialized nations exhibit diminishing rates of necessity-based entrepreneurship since "marginal managers find they can earn more money when employed by somebody else" (Acs et al. 2008, p. 220). Finally, in advanced economies, competitiveness is driven by intangible knowledge resources that thrive on innovation.

In such contexts, information technology and communications become especially important. This gives a boost to opportunity entrepreneurship. However, developed economies attract new immigrant population that often engages in necessity

Table 1 Key concepts used in GEM-based studies

Concept/source	Definition	Source
Total early-stage entrepreneurial activity (TEA)	Percentage of 18–64 population who are either a nascent entrepreneur or owner-manager of a new business	http://www.gemconsortium.org/about.aspx?page=variables
Necessity-driven entrepreneurial activity	Relative prevalence—percentage of those involved in TEA who are involved in entrepreneurship because they had no other option for work	http://www.gemconsortium.org/about.aspx?page=variables
Improvement-driven opportunity entrepreneurial activity	Relative prevalence—percentage of those involved in TEA who (1) claim to be driven by opportunity as opposed to finding no other option for work and (2) who indicate the main driver for being involved in this opportunity is being independent or increasing their income, rather than just maintaining their income is dominated by subsistence agriculture and extraction businesses, with a heavy reliance on labor and natural resources	http://www.gemconsortium.org/about.aspx?page=variables
The three phases of economic development	GEM groups the participating economies into three levels: factor-driven, efficiency-driven, and innovation- driven. These are based on GDP per capita and the share of exports comprising primary goods	World Economic Forum's (WEF) *Global Competitiveness Report* (Kelley et al. 2010, p. 7)
The factor-driven phase	Dominated by subsistence agriculture and extraction businesses, with a heavy reliance on labor and natural resources	World Economic Forum's (WEF) *Global Competitiveness Report* (Kelley et al. 2010, p. 7)
The efficiency-driven phase	In the efficiency-driven phase, further development is accompanied by industrialization and an increased reliance on economies of scale, with capital-intensive large organizations more dominant	World Economic Forum's (WEF) *Global Competitiveness Report* (Kelley et al. 2010, p. 7)
The innovation-driven phase	Businesses are more knowledge intensive, and the service sector expands	World Economic Forum's (WEF) *Global Competitiveness Report* (Kelley et al. 2010, p. 7)

entrepreneurship. This makes necessity entrepreneurship part and parcel of innovation-driven economies where it can be increased during periods of economic slowdown when many are pushed out of the workforce. VC firms often seek the benefits of agglomeration by operating as regional clusters (Saxenian 1994). Moreover, VCs often form investment groups (called syndicates) (Bygrave 1987, 1988). Syndicates are based on close, reciprocal relationships with other VCs (Sorenson and Stuart 2001, 2008; Freeman 2005). In the 1990s, the continuing internationalization of entrepreneurship was making investments in other countries more appealing (Etemad et al. 2010). Recognizing this momentous change, VC firms began investing overseas.

Recent research has shown that VCs' choice of a host location is influenced by various country factors. To operate successfully in a foreign location, VCs need access to various institutions, i.e., social structures that combine material resources, social activities, and symbolic activities (Scott 2002). Specifically, VCs "depend on a number of institutions in order to operate, including technological institutions providing for entrepreneurial opportunities, legal institutions facilitating contracts between the firm and the entrepreneur, financial institutions making it possible to exit the investment, and political institutions preventing any harm to or curtailment of their property rights" (Guler and Guillen 2010a, p. 187). Analysis of VC firms' internalization decisions has shown that "local demand for venture capital 'through national systems of innovation' has, indeed, a strong impact on VCs' choice of a particular foreign location". This indicates "the need to treat the choice of international markets as an endogenous one in examining the practices of venture capital firms in those markets" (Guler and Guillen 2010a, p. 200). Thus, VCs are selective in their entry decisions and carefully examine different aspects of the host country's institutional regime exhibiting preference for institutional systems similar to theirs.

While a batch of recent studies have addressed VCs' host country choice (Guler and Guillen 2010a, b), the duration of VC investment into internationally located portfolio companies has received much less attention in the literature. We do know, however, that VC firms expanding into emerging or transition economies may experience significant difficulties in trying to exercise their exit strategies (Ahlstrom and Bruton 2006). Thus, "the ability to exit funded ventures is severely constrained in emerging markets in East Asia. The ability to list a firm is limited. There are several NASDAQ-type share markets in East Asia including new 'growth' equity markets in Hong Kong, Singapore, and Taiwan. These have had very limited success creating funding opportunities for fast-growth firms, and investors have proved skittish about committing much money to the firms that did secure listings on these markets" (Ahlstrom and Bruton 2006, p. 311–312). Such difficulties of exiting a venture from an emerging or transition economy could influence how long it may take a VC to guide a portfolio company from the initial round of investment to the so called "liquidation event" (defined as IPO and/or strategic sale).

Ideally, VCs prefer to realize their profits as soon as possible to invest the multiplied capital into new ventures. Moreover, less known or brand new VC firms may push sometimes their ventures to exit early to benefit from this success in their fund-raising activities. Such behavior is known as grandstanding (Gompers 1996). Despite this impetus, VCs' original investment is usually insufficient and additional inflow of capital is needed to get new ventures up to speed (Sahlman 1990). Under

these circumstances, VCs need to decide whether or not to commit more money to the venture. Research on escalation of commitment has shown that VCs often continue investing in underperforming ventures far too long (Ryan 1995; Birmingham et al. 2003; Guler 2007). Some researchers have argued that such escalation of commitment may occur due to a strong emotional bond formed early on between an entrepreneur and a VC (Ryan 1995). Other scholars have explained the tendency to provide redundant rounds of investment to errors of judgment typical of collective decision making in VC syndicates (Birmingham et al. 2003). Still others have proposed that VCs may simply fail to upgrade their expectations appropriately (Guler 2007). In turn, entrepreneurs show a strong proclivity for escalation of commitment (McCarthy et al. 1993).

Could institutional factors explain providing too many rounds of investment to foreign-based portfolio companies? We will argue that this is indeed the case and that both necessity- and opportunity-driven entrepreneurship could be associated with the number of investment rounds received by portfolio companies from foreign-based VCs. Studies conducted within the GEM program examine "entrepreneurial framework conditions" (EFCs) that include financial institutions, government policy, regulations, and programs, education and training, R & D transfer, commercial and legal infrastructure, internal market openness, access to physical infrastructure, and social, cultural norms that affect opportunity perception, and thus the rate of TEA opportunity in a country (Levie and Autio 2008). Therefore, TEA opportunity and TEA necessity and their relative share may be regarded as indicators of differences across institutional contexts.

Necessity entrepreneurship is prevalent in countries at the factor-driven stage (when the economy has not been effectively industrialized). There is a steep drop in necessity entrepreneurship once a country enters the efficiency stage characterized by advanced manufacturing and infrastructure. Subsequently, necessity entrepreneurship declines very slightly as countries grow economically. Hence, it remains an integral part of the entrepreneurial environment across economies at different stages of development (Kelley et al. 2010, pp. 27–28). Opportunity entrepreneurship is rare in countries whose economies are at the factor-driven stage. This is because in such countries, there is a relatively low supply of advanced ventures that may qualify for VC financing. Moreover, the general weakness of institutional systems in these countries could make VCs reluctant to enter such locations (Guler and Guillen 2010a, b). However, VCs could still be lured to expand into countries where necessity entrepreneurship is prevalent.

There are two reasons for this. First, entrepreneurial talent can be abundant and available in factor-driven countries. Second, the cost of venture financing may be quite low. Therefore, countries with relatively high levels of necessity entrepreneurship may attract some VC investments. However, once such investments are made, it could be difficult for VCs to bring their new portfolio companies up to speed. Local entrepreneurs may be exceedingly talented but not sufficiently educated and trained (Levie and Autio 2008). The weakness of the institutional system (Ahlstrom and Bruton 2010) may also complicate venture operations and reduce exit opportunities. Under these circumstances, VCs may have few choices but to continue investing in a venture. Hence, it is hypothesized that the prevalence rates of necessity

entrepreneurship in the host country will be positively related to the number of rounds VCs provide to portfolio companies:

H 1 The number of rounds foreign VCs provide to portfolio companies in international locations will be positively related to the prevalence rates of necessity entrepreneurship in the host country.

Conversely, TEA opportunity is more prevalent in efficiency-driven and innovation-driven than factor-driven economies (Kelley et al. 2010). Does this mean that the duration of VC investment in host countries where opportunity entrepreneurship is prevalent decreases? On the one hand, many arguments could support this approach. First, VCs operating in more advanced economies may certainly benefit from local entrepreneurs' greater knowledge base that would expedite the learning process and make it possible to achieve exit earlier so that fewer rounds of investment are needed. Second, savvier entrepreneurs could also exhibit greater familiarity with VCs' methods of financing. That would simplify VC management and oversight of portfolio companies and allow providing a greater amount of financing at each round so that the total number of rounds of investment may decrease. Finally, a smoother running institutional system could facilitate venture's access to the requisite resources. Such easier access to resources could also represent a factor that would allow decreasing the duration of VC investment and expedite exit.

On the other hand, there are even stronger arguments, in our view, indicating that the increasing prevalence of opportunity entrepreneurship in a host country may lead to increasing rather than decreasing the duration of investment, and thus, the number of investment rounds provided to portfolio companies. First, as the prevalence of opportunity entrepreneurship increases so does the intensity of competition. Such competition can be multifaceted and include (a) competition for resources (such as talented engineers and managers), (b) technological and marketing competition among new ventures for dominance, and (c) fierce competition among VCs for financing the best, most reputed ventures. During the so called "hot markets", there could, in fact, be too much money chasing too few deals (Gompers 1996). As a result of the excessive hype during the resulted bubble often fueled by unrealistic expectations some ventures may be financed by VCs even though they do not have a good chance to succeed. Furthermore, as a result of increased competition, it may take much longer for new ventures to prove themselves and that would raise the need in prolong periods of investment to nurture a venture to maturity.

There is some evidence in the literature based on interviews with VCs that they could be more likely to terminate a venture in international locations (Makela and Maula 2006). However, VCs may also be more reluctant to abruptly terminate a foreign venture due to the implications of such decision for their relationship with foreign partners. Currently, political pressures coming from the host government are considered to be one of the greatest political risks faced by foreign investors expanding overseas (Henisz and Zelner 2010). Although VCs may be more prepared psychologically to say goodbye to an international entrepreneur with whom they have not formed a strong emotional bond, this may not seem to them like a reasonable strategy overall. Thus, it is

hypothesized that the prevalence rates of opportunity entrepreneurship in the host country will be positively related to the number of investment rounds VCs provide to portfolio companies:

H 2 The number of rounds foreign VCs provide to their portfolio companies in international locations will be positively related to the prevalence of opportunity entrepreneurship in the host country.

The impact of VC resources and network density on reinvestment decisions

VCs' entry decisions may be affected not only by host country factors (Guler and Guillen 2010a) but also by the characteristics of the actor: VC firm and the attributes of its network (Sorenson and Stuart 2008). Based on network theory (Burt 1992; Rowley et al. 2000; Sorenson and Stuart 2008), previous studies have shown that network advantages enjoyed by an actor (a VC firm) in the domestic network may be transferrable to international locations (Guler and Guillen 2010a). Thus, high status and the ability to act as a broker can be transmitted from domestic to international surroundings (Guler and Guillen 2010a). Although VCs' position and role in domestic networks may influence their position and role in foreign networks, domestic and international networks could also be quite different. Once VCs begin to expand internationally, they may need to adjust their new international networks so that they can operate more effectively in a particular institutional context. For instance, the ability of a VC to choose a promising venture often depends on their use of informants or referees. Such referees add transitivity to VC networks so that "referee-venture capitalist tie, referee-entrepreneur tie, and interpersonal trust between referee and venture capitalist have positive effects on referrals and investment decisions of venture capitalists" (Batjargal 2007). The extent of transitivity exhibited by international networks, however, may vary depending on their location such as China vs. Russia (Batjargal 2007).

VCs are more likely to form relationships with geographically distant partners when a certain region becomes popular and is seen as an investment opportunity (Sorenson and Stuart 2008). If VCs simply react to the perceived chance to enter an international location that is becoming popular, their resulting networks could be less dense. Under the new circumstances, VCs' international networks may include partners based on common interest in a particular location even though they would not do business with the same partners under normal circumstances. However, VCs' international networks could also be denser than domestic networks. One reason for that is that international locations present a number of new cognitive challenges. To win, VCs, similar to international entrepreneurs, may strive to benefit from knowledge networks (Etemad and Lee 2003) and seek to build rich, symbiotic relationships with partners in a new network (Etemad et al. 2010).

When VCs expand internationally, they face the liability of foreignness (Zaheer 1995; Zaheer and Mosakowski 1997) that could affect their ability to operate. Such liability of foreignness may arise due to a lack of embeddedness in a foreign culture and various legal and discriminatory encumbrances facing international entrants (Peng and Zhou 2005). Cognitive aspects of the liability of foreignness may result in greater information asymmetry between VCs and entrepreneurs (Makela and

Maula 2006). It is harder for foreign VCs to select best ventures and avoid the so-called moral hazard (deception) and, respectively, to monitor venture performance.

To make sure that they fully utilize their advantages when expanding internationally, VCs are likely to form close-knit groups or dense networks. The advantage of such dense networks is that they stimulate knowledge exchange and access to information. VCs operating as part of a dense network may create a collective mind of sorts with simultaneous access to information stored in its partners' storage and retention systems that could be dispersed around the world. Such network density enhances operability and communication or cooperation capability (Coleman 1988). At the same time, it has some disadvantages due to low inflow of fresh information. This is why sparsely connected networks may be more efficient in accessing novel information. They use structural holes (Burt 1992) to benefit from nonredundant information exchange.

Researchers have contrasted dense networks increasing the ability of actors to take advantage of exploitation strategy and sparse networks facilitating exploration strategy (Rowley et al. 2000). As VCs internationalize, they may use dense networks to increase information exchange and cooperation. Although leaving structural holes in the network could increase the inflow of fresh information, it could also lower the level of trust in the system. New entrants may be perceived by old timers as not being fully reliable. They may need to work for a long time to prove themselves or to develop their social capital. This process of embedding new members into the existing network could be time consuming and thus tend to slow down the process of knowledge acquisition (Kwon and Arenius 2010).

To sum up, VCs' reinvestment decisions could be improved if VCs operate as part of a dense knowledge network. Dense networks may be expected to enhance the quality of information exchange, produce trust, and cooperation and make it less likely that VCs would succumb to escalation of commitment and continue throwing good money after bad (Guler 2007). Foreign VCs operating in dense networks could also enhance their learning process and acquire greater cultural competence in unfamiliar institutional environments. Such dense knowledge networks would essentially allow foreign VCs to adjust faster and decrease their liability of foreignness. Research has shown that while foreign VCs may be hampered by differing institutional regimes of host countries, they also have the ability to learn fast new survival skills and eventually grasp how to overcome such cultural barriers over time (Guler and Guillen 2010a). Consequently, it is hypothesized that the density of knowledge networks formed by foreign VCs in international locations will be negatively related to the number of rounds of investment received by portfolio companies.

H 3 The density of foreign VCs' knowledge networks formed in international locations will be negatively related to the number of investment rounds received by portfolio companies in a host country.

Actor resources could provide additional advantages to foreign VCs. Such resources may represent elevated status or brokerage ability transferred successfully from domestic to international networks (Jensen 2008; Guler and Guillen 2010b). However, they could also stem from a VC firm's reputation in a particular area of investment. Most importantly, superior financial resources could help VCs purchase access to information unavailable to other players or

receive preferential treatment from foreign partners or even host governments. Additional information could be acquired by wealthier VCs by hiring top-level informants and well-connected employees. It could also come to VCs from foreign actors seeking them out for the privilege of working with the most famous players in the VC industry and consequently boost their own reputation, locally and internationally. These suppositions have been substantiated by a number of prior studies demonstrating that entrepreneurs may frequently be willing to accept a significant discount to work with high-flying VC firms (Hsu 2004). Furthermore, VCs' high status may also make them more eligible as syndicate partners in domestic and international settings (Hochberg et al. 2007).

Well-heeled VC could also exercise their political power and deter the entry of poorer and less known competitors into the local market (Hochberg et al. 2010). To recapitulate, resource-rich VC firms may be able to extract additional, less-known information from the institutional system to improve their reinvestment decisions. Such wealthy VCs may also know better how to deal with political pressures and be able to use their own political power and clout to achieve superior results. Therefore, we hypothesize that VCs' capital under management will be negatively related to the number of investment rounds provided to international portfolio companies.

H 4 Foreign VC firm's capital under management will be negatively related to the number of investment rounds provided to portfolio companies in host countries.

Both network density and VCs' capital under management may allow VCs to operate more effectively in foreign institutional environments albeit for different reasons. VCs forming dense networks essentially benefit from the so called strong ties based on familiarity, affinity, mutual trust, and cooperation (Coleman 1988) that could create complementary, almost symbiotic relationships generating the knowledge advantage (Etemad et al. 2010). VC firm capital can also facilitate gaining the knowledge advantage but in a different way. Resource-rich VC firms could buy more information or get it free from potential partners seeking them out to establish credibility. These are two opposite ways to attain the knowledge advantage that may not work mix well. Simply put, resource-rich firms may put too much faith into their ability to buy information and underestimate the knowledge advantages of cooperation facilitated by dense networks.

For this reason, resource-rich VC firms may not extract all the potential benefits of dense networks and rely solely on their ability to filter and process information independently. This self-reliance, though, could interfere with being a genuine contributing partner in a dense network, and thus diminish VCs' ability to process collective information. At the same time, VCs' membership in dense networks could negatively affect their ability to gain access to information provided voluntarily by potential partners in hope to secure collaboration in the future.

Such prospects might view VCs as part and parcel of existing networks, and lose interest to them as "taken" or unavailable. Hence, wealthy VCs may lose access to free information flows. Therefore, combining the two principal

methods of generating the knowledge advantage—network density and firm's capital under management—may produce negative outcomes.

Prior research has shown that strong ties may not be useful in dense networks as they produce redundancy and could affect performance negatively (Rowley et al. 2000; Zaheer et al. 2010). Similarly, dense networks may thwart rather than boost performance of firms with superior financial resources. This combination of substitutes could lead to poor reinvestment decisions because firms with superior financial resources may not be treat partners with inferior financial resources as peers. Rich firms could disregard advice coming from low-level partners and yet fail to use their own resources to obtain new information. Since wealthy VCs that belong to dense networks may not generate sufficient advantage from their membership, they may agree to provide additional capital to ventures that may not be justified by their performance outcomes. Based on the argument that VC firms with superior capital under management may be negatively rather than positively affected by their membership in dense networks, we hypothesize:

H 5 Foreign VC's capital under management combined with membership in a dense network will be positively related to the number of rounds provided to a portfolio company in the host country.

Research method

Sample and data collection

We collected information regarding VC investments from the VentureXpert database. VentureXpert is one of several databases maintained by the Securities Data Corporation Platinum. It provides a comprehensive coverage of VC investments (Li and Zahra 2012). The dataset includes US VCs' international investments during the period from December 2002 through December 2007, the era of globalization in the VC industry. We selected ten countries around the globe that include both advanced and emerging or transition economies as well as different geographic areas from Asia (Singapore, Taiwan, Hong Kong, Malaysia, and Japan) to Eastern Europe (Hungary, the Czech Republic, and Russia) to Australia and South Africa. Table 2 provides additional information regarding the number of VC firms and portfolio companies in each of the chosen countries as well as the data regarding each country's gross domestic product (GDP) and entrepreneurship prevalence rates. Table 3 provides definitions of the key variables used in this study.

Social network analysis

To assess the degree of collaboration between the VC firms represented in our sample, we applied the methods of social network analysis (SNA). SNA utilizes quantitative measurement to examine the structure and profile of a network, and the types of interaction among its groups and individual members of such a network. The social network analysis approaches an actor (in this case, a VC firm) as the unit of analysis portrayed graphically as a "bubble" or node (Hanneman 2001). When an

Table 2 Country sample

Country	VC firms (#)	Portfolio companies (#)	GDP (2005 $USD Trillions)	VC network density	TEA opportunity	TEA necessity
Australia	313	389	674	0.011	10.64	1.28
Czech Republic	22	23	125	0.062	5.45	2.40
Hong Kong	38	42	178	0.025		
Hungary	71	74	111	0.038	4.64	1.33
Japan	144	167	4,549	0.018	2.45	0.45
Malaysia	34	36	137	0.036	10.12	0.53
Russia	48	50	765	0.037	3.39	1.44
South Africa	39	45	242	0.037	3.47	1.51
Singapore	74	93	120	0.020	4.10	0.65
Taiwan	55	61		0.029		
OVERALL	838	980	767	0.031	5.53	1.20

actor interacts with another actor (for instance, two VCs are both members of the VC syndicate financing the same portfolio company), a measure of such relationship or tie is captured and presented on a map. The map depicts all the ties in the examined network. Social network mapping begins with the conventional rectangular measurement of actors or players within a selected team (Hanneman 2001). Each cell on the social relationships map is coded as a 0 (when no relationship between actors was formed), or a 1 (when a relationship between actors was formed). These data are summarized in a table used to compare actors and their relationships in binary form. A simple adjacency matrix is presented in Table 4.

Applying substructure analysis, one can detect the most connected subsections of a network. The most common subsection of this kind is a clique defined as a "sub-set of actors who are more closely tied to each other than they are to actors who are not a part of the group" (Hanneman 2001). Subsequently, the datasets were run in a simple clique network illustration, showing the interconnectedness of the population network. All networks are composed of groups (or subgraphs), that is, when two actors have a tie, they form a "group." A clique extends the dyad by adding to it more members who are tied to all members in the group (Hanneman 2001). As seen in the following figures, the networks formed by VCs in different countries vary quite dramatically (Figs. 1 and 2).

These networks clearly differ from each other in their interconnectedness. We have conducted a mean analysis in order to determine the degree of cohesion of the respective networks. The mean reflects the total number of ties divided by the maximum possible number of ties in the network matrix. Consequently, the most densely connected network would have a mean score of 1.0. Respectively, the mean score of the least connected network would be zero. In gist, the mean score represents the probability that any given tie between two random actors is present. Typically, means are used to describe the extent of cohesion or density in the network (Hanneman 2001). Clearly, the higher the mean score, the higher is network cohesion or density.

All network analyses have been conducted in UCINET, special software created for SNA (Borgatti et al. 2006). UCINET was applied to develop density measures for

Table 3 The matrix

	3iGroup PLC	Advent International	AIF Capital (AKA: Asian Infrastructure fund Adviser, Ltd.)	Aisling Capital (FKA: Perseus-Soros Management company)	Alpinvest Partners NV (FKA: NIB Capital Private Equity NV)	Athena Consulting SA	Aurelia Private Equity GmbH	BC Brandenburg Capital GmbH	Bio*One Capital
A alst chocolate Pte., Ltd.	0	0	0	0	0	0	0	0	0
A-Bio Pharma Pte, Ltd. (FKA: Sembio)	0	0	0	0	0	0	0	0	1
Accord Express Holdings Pte., Ltd.	0	0	0	0	0	0	0	0	0
Advanced Network Technology Laboratories Pte, Ltd	0	0	0	0	0	0	0	0	0
AnytimePte, Ltd.	0	0	0	0	0	0	0	0	0
Asia Capital Holding	1	0	0	0	0	0	0	0	0
Asia Clean Energy Pte	0	0	0	0	0	0	0	0	0

Table 4 Variable definitions

Variable	Definition	Units	Source
Rounds received$_{cn}$	No investment rounds that a company received within a given country as of 2006	#	VentureXpert
GDP$_n$	Gross domestic product	2005 $USD (Trillions)	World Bank
Ind Pref: Tech./comm.$_f$	VC Firm prefers investing in technology and communications companies	{0,1}	VentureXpert
Ind Pref: Industry$_f$	VC Firm prefers investing in industrial companies	{0,1}	VentureXpert
Ind Pref: Biotech/Med$_f$	VC Firm prefers investing in biotechnology and medical companies	{0,1}	VentureXpert
Ind Pref: Consumer$_f$	VC Firm prefers investing in technology and consumer oriented companies	{0,1}	VentureXpert
Stage Pref: Early$_f$	VC Firm prefers to invest in early stage companies	{0,1}	VentureXpert
Stage Pref: Late$_f$	VC Firm prefers to invest in late stage companies	{0,1}	VentureXpert
Stage Pref: Buyout$_f$	VC Firm prefers to invest in company buyouts.	{0,1}	VentureXpert
VC network density$_n$	UCI Density Measure for the degree of interconnectedness of the VC Firms operating within a country (see detailed explanation for calculation)	[0,1]	UCI Network calculation using Venture Xpert
VC firm capitalization$_f$	Level of capitalization for the VC Firm investing in a company	$ USD millions	VentureXpert
VC firm capitalization X VC network density$_{fn}$	Interaction term of above variables		
TEA_opportunity$_n$	See Table 1	%	See Table 1
TEA_necessity$_n$	See Table 1	%	See Table 1

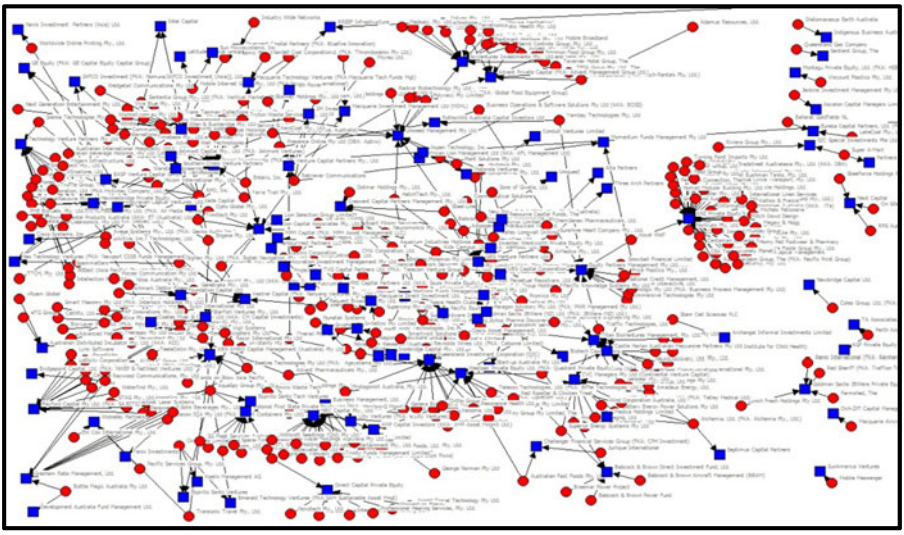

Fig. 1 VC networks in Australia

the knowledge networks formed by US VCs in each host country. To conduct these analyses, we created binary maps representing each firm in each representative country. Subsequently, these maps were imported from the spreadsheet into the UCINET software spreadsheets. Once properly formatted, the UCINET cohesion and density tools were utilized to produce a density measure for each country. At the group level, we calculated a measure of relational density and a centralization index. The density measure is based on the count of the number of edges present in a graph divided by the maximum possible number of edges in a graph of the same size. Such measures provide information about the group's relational intensity and the

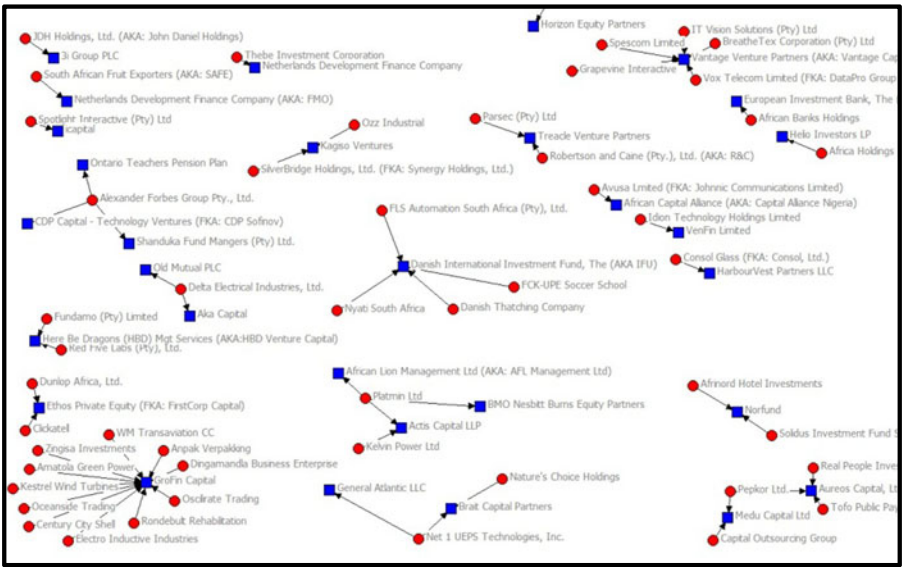

Fig. 2 VC networks in South Africa

cohesion of a graph. Network density may increase due to new relations formed by actors, exit of firms with a number of relations below the average, or entry of firms with a number of relations above the average. Density decreases because of interruption of relations, exit of firms with a number of relations above the average, and entry of firms with a number of relations below the average. In sum, network density increases due to the growing relational intensity and decreases due to entry of unrelated actors.

Measures

We used the results of the mean analysis conducted to derive measures of *VC network density* within a host country and subsequently incorporated these derived measures into a larger dataset including information from VentureXpert about the number of investment rounds received by portfolio companies, VC firms' industry preferences (*Ind Pref*) and investment stage preferences (*Stage Pref*) as well as VC firm's capital under management (*VC firm capitalization*). In addition, we included GEM's measures of TEA and its two subsections: *TEA opportunity* and *TEA necessity*. GEM measures were drawn from studies conducted for each country within the GEM program. Finally, we used country GDP as a control. These data were obtained from the World Bank Doing Business Database for 2005. See Table 5 below for the full variable definitions and Table 6 for the relevant descriptive statistics.

Regression analysis

To test hypotheses 1–5, we employed an ordinary least squares regression to determine how VC network density within a host country and VC firm's capital under management are related to the number of investment rounds a portfolio company received. To control for possible influences because of VCs' preferences for a certain stage of investment and industry, we included the respective indicator variables (*Ind Pref* and *Stage Pref*). We also used the GDP of the country to control for the effects of overall size of the economy. Table 6 below presents the results of the regression analysis.

The results are supportive of all hypotheses introduced above. Specifically, for hypothesis 1, a 1 percentage point increase in the rate of "necessity-pushed entrepreneurs" enhances the average number of investment rounds for companies in a country by 0.81. For hypothesis 2, a 1 percentage point increase in the rate of "opportunity pulled entrepreneurs" in a country is met with an additional 0.06 additional rounds of investment financing. In regards to hypothesis 3, a 0.10 increase in *VC* network density is on average associated with a reduction of 1.33 investment rounds (when assuming *VC* firm capitalization at the mean of the data in the study). Since there is an interaction term that enters into this equation, the coefficient is calculated as [(*VC* firm capitalization)$\times 0.006 - 20.668$] and given the range of *VC* firm capitalization observed in the data. Respectively, the change in investment rounds estimated as stemming from a 0.10 increase in *VC* network density is −2.67 to 466. For hypothesis 4, a 10 million dollar increase in VC firm capitalization (when situating at the mean value of network density) is related to a net increase of merely 0.00026 investment rounds. The process of calculating this coefficient is as follows [(network density)×

Table 5 Regression variable descriptive statistics

	Mean	SD	Min	Max	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Rounds received	1.77	1.72	1	12	1													
GDP	1,193	1,573	111	4,549	−0.07	1												
Ind Pref: Tech./comm.	0.205	0.404	0	1	−0.01	0.04	1											
Ind Pref: Industry	0.104	0.306	0	1	−0.08	−0.02	−0.17	1										
Ind Pref: Biotech/Med	0.095	0.293	0	1	0.14	−0.01	−0.17	−0.11	1									
Ind Pref: Consumer	0.360	0.481	0	1	−0.06	−0.13	−0.38	−0.26	−0.24	1								
Stage Pref: Early	0.356	0.479	0	1	0.19	0.01	0.05	−0.19	0.33	−0.41	1							
Stage Pref: Late	0.475	0.500	0	1	−0.15	−0.14	0.05	0.12	−0.25	0.31	−0.71	1						
Stage Pref: Buyout	0.157	0.364	0	1	−0.05	0.15	−0.13	0.10	−0.08	0.13	−0.32	−0.41	1					
VC network density	0.021	0.013	0.011	0.062	−0.13	−0.21	0.25	0.06	−0.18	−0.07	−0.12	0.11	−0.00	1				
VC firm capitalization	1,230	5,712	0.100	81,100	0.03	0.14	0.01	0.09	−0.02	−0.04	−0.03	−0.14	0.23	0.02	1			
VC firm capitalization X VC network density	27.29	125	0.002	1.550	0.10	0.08	0.02	0.06	−0.03	−0.01	0.02	−0.14	0.17	0.13	0.91	1		
TEA_opportunity	7	3.59	2.45	10.64	0.21	−0.50	−0.21	−0.11	0.16	0.16	0.02	0.07	−0.10	−0.50	−0.14	−0.16	1	
TEA_necessity	1.09	0.44	0.45	2.4	0.15	−0.63	−0.13	−0.04	−0.01	0.21	−0.10	0.15	−0.07	0.32	−0.11	−0.02	0.38	1

Table 6 Regression results table

Variable	Rounds for company
GDP_n	0
	0.00
Ind Pref: Tech./comm.$_f$	0.288
	−0.20
Ind Pref: Industry$_f$	−0.034
	−0.26
Ind Pref: Biotech/Med$_f$	0.334
	−0.25
Ind Pref: Consumer$_f$	−0.143
	−0.20
Stage Pref: Early$_f$	0.395
	−0.59
Stage Pref: Late$_f$	−0.121
	−0.59
Stage Pref: Buyout$_f$	0.071
	−0.60
VC network density$_n$	−20.668**
	−8.70
VC firm capitalization$_f$	−0.0001***
	(2.80621e-05)
VC firm capitalization × VC network density	0.006***
	(1.27628e-03)
TEA_opportunity$_c$	0.066**
	(3.25560e-02)
TEA_necessity$_c$	0.811***
	(2.12611e-01)
Constant	0.579
	(7.23648e-01)
No of observations	663
Adjusted R^2	0.122

Standard errors in parentheses

*p<0.1, **p<0.05, ***p<0.01

0.006−0.0001]. Therefore, the range of this coefficient based on the minimum and maximum values for network density is [−0.00034, 0.00272].

Discussion

The ongoing internationalization of entrepreneurship (Etemad and Lee 2003; Etemad et al. 2010) is accompanied by globalization of venture capital (Megginson 2004;

Wright et al. 2005; Bell et al. 2008). Although entrepreneurial ventures in other countries have become more attractive to VCs as potential investment targets, both entering and exiting unfamiliar and sometimes unique and quite difficult institutional environments could pose serious challenges for VCs. The problem is exacerbated by that VCs have traditionally operated locally rather than internationally. VCs may encounter different types of hurdles in different types of institutional environments. Hence, it is vital to evaluate what factors facilitate and/or complicate VCs' ability to enter, operate productively, and exercise an appropriate and profitable exit strategy in a host country. Such research could inform governments how to stimulate internalization of venture capital.

Prior studies have established that that VCs generally prefer more stable and predictable institutional environments closer related to their own since such stability, predictability and institutional similarity facilitate VCs' successful operations in a host country (Guler and Guillen 2010a, b). In parallel, other researchers have explored numerous institutional hurdles arising in emerging or transition economies that may hamper VCs' exit strategy and thus make foreign investments less attractive to VCs (Ahlstrom and Bruton 2006, 2010). Following these two streams of research on the globalization of venture capital, we examined in this paper the factors that may increase the number of investment rounds provided to portfolio companies across varying institutional settings. GEM reports differentiate between factor-, efficiency-, and innovation-driven economies (Autio 2007; Kelley et al. 2010). Furthermore, these reports provide evidence that the relative share of necessity entrepreneurship that arises when self-employment represents the only viable employment choice vs. opportunity entrepreneurship that comes about as a vehicle of innovation and commercial initiative may vary depending on the host country's stage of economic development (Acs et al. 2008).

Consequently, we examined whether or not the prevalence rates of opportunity entrepreneurship (TEA opportunity) vs. necessity entrepreneurship (TEA necessity) in ten host countries that differ geographically, institutionally and economically, are related to the number of investment rounds provided by foreign VCs to portfolio companies. The number of investment rounds represents an indicator of VC performance since it sheds light on the duration of VC engagement with portfolio companies, the amount of capital needed to get a portfolio company up to speed, and the resulting profitability or perceived success of VC investment (Guler 2007). VCs may exhibit escalation of commitment in their home countries for emotional and cognitive reasons by continuing to invest in poorly performing companies (Ryan 1995; Birmingham et al. 2003). We proposed, however, that other factors than forming an emotional bond with an entrepreneur (Ryan 1995), such as the difficulty of finding and exercising a fitting exit strategy (Ahlstrom and Bruton 2006) could explain why VCs provide too many rounds of investment in international locations.

Furthermore, we hypothesized that these complicating factors could differ depending on whether a VC firms expands into advanced economy in which opportunity entrepreneurship is prevalent or it expands into an emerging or transition economy in which necessity entrepreneurship is prevalent. Using a sample of US-based VCs' investments in portfolio companies located around the globe, we contended that the number of rounds received by portfolio companies will be positively associated both with TEA necessity and TEA opportunity rates albeit for different reasons. When

TEA necessity is prevalent in a host country, a greater number of foreign VCs' investment rounds could be attributed to (a) VCs' lack of knowledge and skills to survive in corruption-infested environments (Peng et al. 2008) that requires building personal relationships and pulling strings to succeed (Batjargal 2007); infrastructure weaknesses making it harder to ramp up a new venture; and local entrepreneurs' lack of preparedness to effective collaboration with VCs.

Conversely, TEA opportunity could be related to a greater number of rounds provided by VCs to portfolio companies due to(a) a lack of full understanding of the institutional landscape or the liability of foreignness making it harder for US-based VCs to select most promising ventures; (b) increased competition in the host country including competition among new ventures and for most promising ventures, and heightened competition with established companies; and (c) the "hidden risks" of political pressures since venture termination could be opposed by host governments.

Contrary to prior research suggesting based on interviews with VCs that it could be psychologically easier to terminate a venture in a foreign location as geographic and cultural distance increases (Makela and Maula 2006), we demonstrate that it may actually be more difficult to discontinue a venture and that different reasons may explain such complications depending on whether the host country is dominated by necessity or opportunity entrepreneurship. We argue, however, that such increased problems with exercising a viable exit strategy in a foreign location can be offset when firms effectively use their resources and create knowledge networks (Etemad and Lee 2003) that allow them to generate the knowledge advantage. Such advantage is obtained when VC firms gradually learn how to operate in a different institutional environment and consequently improve the quality of their reinvestment decisions.

Specifically, we argued that both VC firm's capital as its primary resource and network density may improve the quality of VCs' decision making and lead to reduction of investment rounds provided to portfolio companies. Such improvement can be due to strong ties and network closure among foreign VCs actively collaborating in foreign locations (Coleman 1988), and trust, cooperation and accumulated social capital (Kwon and Arenius 2010). We show, however, that firm capital and network density do not always mix well. Curiously, the interaction of these two factors may have a negative effect on the number of investment rounds provided to portfolio companies. Prior research has shown that strong ties may be less useful in dense networks as they produce redundancy and affect performance negatively (Rowley et al. 2000; Zaheer et al. 2010). Along similar lines, we argue that resource-rich companies may not fully realize the benefits of cooperation within knowledge networks as they distrust lower-level partners and yet lose access to information that could be available to them outside of dense networks.

Conclusions

The first contribution of this study lies in the inclusion of entrepreneurship prevalence rates uncovered in GEM studies (Reynolds et al. 2002; Autio 2007; Kelley et al. 2010) into the repertory of institutional factors influencing VCs' investment decisions (Guler and Guillen 2010a, b). The prevalence rates of TEA in the host country and the relative share of opportunity entrepreneurship (TEA opportunity) vs. necessity

entrepreneurship (TEA necessity) could serve as a proxy for various institutional factors affecting the efficacy of VCs' investment activities in a certain international location. The second contribution of our study is that it establishes that the number of investment rounds provided by foreign VCs to a portfolio company is positively related to the host country's entrepreneurship prevalence rates. Specifically, both host countries where necessity entrepreneurship prevails and host countries where opportunity entrepreneurship prevails may create some particular hurdles for the realization of VCs' exit strategies increasing the number of investment rounds that need to be provided.

Our third contribution is that we have demonstrated that VC firm's capital under management and VC network density help reduce the number of investment rounds provided by foreign VCs to portfolio companies. Thus, VC firm's capital under management and the density of VCs' networks formed in a host country represent ways of reducing the liability of foreignness (Zaheer 1995) and generate the knowledge advantage for VCs in unfamiliar institutional environments. The fourth contribution of this paper is that it shows that it may be difficult to extract synergistic benefits from combining firm capital and network density since resource-rich firms may not fully realize the benefits of collaboration while losing their privileged status as highly sought-after partners that may facilitate free information flows when they operate independently.

Managerial implications

VCs should carefully assess the prevalence rates of necessity entrepreneurship vs. opportunity entrepreneurship in a host country. This is important because VCs may face different types of hurdles that could affect their exit strategy depending on what entrepreneurship type prevails in the country. VCs also need to exploit the benefits of knowledge networks not only when they expand into emerging or transition economies but when they expand into advanced economies. VCs should seek to generate a specific knowledge advantage that is most relevant for a particular institutional environment. VCs also need to be aware of the fact that while capital under management and network density may both provide informational benefits facilitating operations in a host country's institutional environment it is not always effective to combine these two resources. Thus, VCs need to carve a specific institutional strategy for the host country's institutional system in order to reduce the number of investment rounds and improve their performance.

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