Resilience Through Collaborative Networks in Emerging Economies: Evidence from Chinese Venture Capital

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Abstract The high-speed growth of emerging economies attracts the attention of global investors, but the uncertain institutional environment in emerging and transitional economies makes investors uneasy. Using China's venture capital (VC) data, this article examines the performance consequences of differences in ownership between foreign and local investors, and network position established when VC firms (VCs) syndicate portfolio company investments. There is a phenomenon of separate institutional settings between China's local VCs and foreign VCs in China, which makes ownership significantly affect investment performance. The VCs' positions in the collaborative networks can play a mediating role; foreign VCs have better investment performance because of their more central-network position. Better-networked VCs can supplement or replace formal institutions in transitional economies.

1 Introduction

Since the first venture capital firm was founded in the 1940s, global VC has presented two characteristics. First, with a wealth of experience, VCs founded in developed countries are looking for investment opportunities on a global scale, and favor emerging economies that are growing. However, the unstable and immature institutional environments of transitional economies present challenges for foreign VCs (Ahlstrom and Bruton 2006; Prijcker et al. 2012; Zhang and Pezeshkan 2016). Foreign VCs are unfamiliar with the specific problems of transitional economies, for example, tax policy. Therefore, they are investing in emerging economies by

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registering offshore firms to avoid the negative impact caused by unstable institutions (Fuller 2010). Second, the governments are speeding up the development of the domestic VCs in emerging economies and welcome the foreign VCs (Bruton et al. 2009; Ahlstrom and Bruton 2006). For example, China's VC[1] industry experienced rapid growth, especially in local VCs, and related policies and regulations improved over time. For the first time, local Chinese funds, mostly RMB-denominated funds, led over USD-denominated foreign funds both concerning the number of funds and fundraising amount in 2009. From then on, local Chinese investment became the dominant force in China's VCs. At the same time, foreign VCs in China still play an important role; 98.39 % of foreign VCs are from developed countries, and 53.77 % are from the United States.[2] To avoid the changes and constraints of the institutional environment in China, foreign VCs often adopt a way of registering offshore firms to participate in China's VC investment, which results in a separate institutional phenomenon between foreign-owner and Chinese-owner VCs (Fuller 2010). While the literature documents the conception of the separate institutional settings between foreign VCs and Local VCs, the performance consequences of this independent ownership remain largely unknown. This paper investigates the impact of this phenomenon on performance. Controlling for other known determinants of VCs' performance, we find that foreign VCs outperform local ones.

How do foreign VCs achieve better investment performance in China than local VCs? Social network theory has built a bridge between macro and micro levels of sociological theory (Granovetter 1973). More specifically, collaborative innovation networks (COINs, Gloor 2006) provide a potential solution. Under the existing institutional environment, in addition to passively accepting the system, enterprises can also expand their invisible collaborative relationship border, facilitate trust formation between partners (Sorenson and Stuart 2008; Meuleman et al. 2017), reduce transaction costs, and thereby enhancing performance (Hochberg et al., 2007, 2015). Any VCs can be actively or passively involved in the network environment. They will draw on their networks to seek investment opportunities, share the risk, help the start-ups succeed, and improve their own performance (Hochberg et al. 2007, 2015; Abell and Nisar 2007; Ewens 2010). Prior research has studied the performance effect of VC networks, but the important intermediary role VC networks play between the macro system and microenterprises is still unknown. This paper examines the important mediating role of collaborative networks between ownership and investment performance of VCs. Our paper suggests that, besides passively accepting the system, VCs can increase resilience through collaborative networks to thrive in uncertain institutional environments in transitional economies.

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[1]Here, China's VC refers to the VC which has invested in Chinese mainland start-ups. Foreign VC firm is defined as the ownership of the firm is outside the Chinese mainland. A Chinese local VC firm is defined as the ownership of the firm is in Chinese mainland.

[2]Author is compiled from the data of CVsource database.

2 Theory and Hypothesis

2.1 *Ownership and Investment Performance*

Prior research has examined the impact of ownership on enterprise performance and shows that the performance of foreign owned enterprises is better than local enterprises in emerging and transitional economies (Aydin et al. 2007). Foreign owners have global managerial experience and can bring the latest and advanced technology and management that improves enterprise efficiency (Aydin et al. 2007). But few researchers have conducted empirical research on the impact of ownership on investment performance in the VC industry. In China, there is a significant amount of foreign VCs, 98.39% of them are from the developed countries. There are many differences between local VCs and foreign VCs, including registration, applicable law, sources, and exiting.

Fuller (2010) uses the grounded theory to analyze the institutional separation of VCs in emerging economies. He believes that the government dominates one set of institutional arrangements while foreign VCs, through foreign direct investment, link their Chinese activities to a set of more market-based institutions located offshore. Most foreign VCs invest in Chinese start-ups by registering and exiting at offshore locations, while making substantial investments in the China region (Zhu 2015). Specific steps are as follows. The first step is registering a limited partnership at an offshore location at a tax haven (e.g., Virgin Islands, Cayman Islands). The second step is setting up offices in China, and searching for investment projects. The third step, when foreign VCs decide to invest in a Chinese start-up, they will ask Chinese start-ups to register a special purpose company in the tax haven, and then invest in the special purpose company. In the last step, the special purpose company raises money from other investors through an initial public offering (IPO) of its shares on a stock market outside China and foreign VCs exit the company. Thus, foreign VCs do not have to pay the income tax in China, practicing reasonable tax avoidance. However, local VCs must abide by the rules defined by the Chinese government and have been under a high tax burden and other restrictions. For example, without the legal entity status of a limited partnership in China before June 2007, local VCs had to be structured as corporate VCs and had to bear the burden of double taxation compared to corporate VCs and venture investors.

From the source of VC funds, foreign VC is mainly funded by pension funds, insurance funds, banks, large corporations, governments, wealthy individuals and families and so on. They have strong financial support-systems.[3] Chinese local VC funds mainly come from the government fiscal budget and state-owned institutions. In 2006, the government budget and state-owned institutions accounted for 82.97% of the total, compared to 62.54% in 2010 (Feng 2012). When high-risk VC and scarce resources combine, it is prone to government rent-seeking which would lead to worse investment performance (Lu et al. 2012; Hain et al. 2016). In July 2010,

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[3]From *Annual Statistics of China Venture Capital 2016.*

insurance funds were allowed for private equity investment in China but had been prohibited in the business of VC until 2014. Due to policy restriction, large capital sources are outside the reach of the Chinese local VCs. Thus, Chinese local VC's strength is much weaker than foreign VC's. The average total management funds of Chinese VCs was $202.93 million, compared to $4.5 billion of foreign VCs.

In addition, the exit channels of foreign VCs are more diverse than of local VCs in China. The best exit way of VCs from start-ups is through an IPO (Hochberg et al. 2007, 2015). According to the data of CVsource database, only 2.60% of Local VCs exit via an IPO out of China's mainland securities market, compared to 22.3% foreign VCs exiting via an IPO in China mainland A-share bourses, 30.54% of foreign VCs exit via NASDAQ, 20.10% via NYSE. Foreign VCs can exit from the China security markets, as well as other global securities markets. But for local VCs, it is difficult to exit out of China. Besides, M&A and trade resale are also important exit channels for VCs. Foreign VC can take advantage of the global multi-level capital market. However, Local VCs have to depend on the immature capital markets in China.

With all the differences between the different ownership VCs, we find that foreign VCs have distinct advantages. Thus, we hypothesize as follows:

Hypothesis 1: In China's VC market, VCs with different ownership have significantly different performance, and foreign VCs achieve better investment performance.

2.2   The Mediator Effect of VC Network Position

The first Chinese local venture capital firm was founded in 1993, almost 50 years later than in the U.S. With 98.39% of Chinese foreign VCs coming from developed countries, foreign VCs' investment experience is much better than Chinese local VCs and they know the importance of the benefits of network position in the collaborative networks. Foreign VCs leverage their advantages of experience and financial strength to attract local VCs to co-invest in syndicates (Hopp 2010), and overcome entry barriers by cooperation with local VCs (Hochberg et al. 2010). Because more densely networked markets of VC experience fewer new entrants (Hochberg et al. 2010), we find that many foreign VCs had established better positions in the network in the early 2000s, when most Chinese local VCs did not pay much attention to it (Keil et al. 2010; Zhou and Song 2014). Therefore, at the very beginning, many foreign VCs have become the incumbents in the Chinese VC networks and built their more central network position by repeating interactions with other VCs to facilitate trust among them (Meuleman et al. 2017). Subsequently, foreign VCs used the externalities of the network to prevent the entry of new entrants (Hochberg et al. 2010; Zhou and Song 2014). Thus, they consolidated their central network positions.
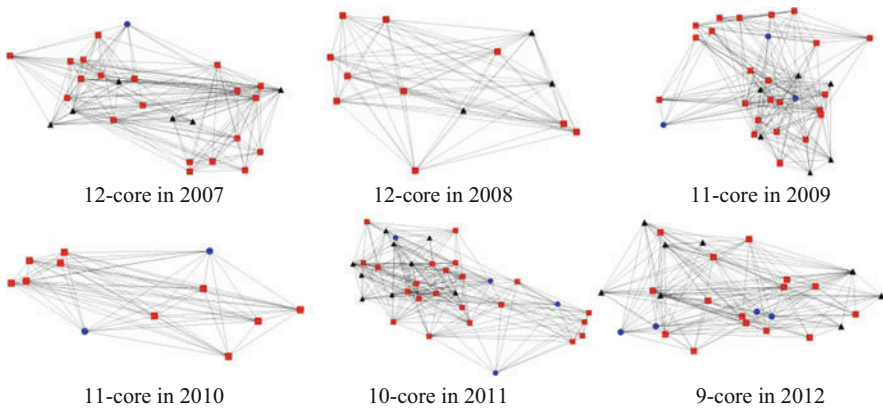
12-core in 2007   12-core in 2008   11-core in 2009

11-core in 2010   10-core in 2011   9-core in 2012

Fig. 1 Largest K-cores of China's VC networks, 2007–2012. The figure shows the largest K-core of the network that were established when VCs syndicate portfolio company investments. A blue dot is a China local VC, a red square is a foreign VC, a black triangle is a joint VC, a gray point is a missing item

Figure 1 shows the largest K-cores of China's VC networks from 2007 to 2012. A k-core is a maximal group of actors, all of whom are connected to some number (k) of other members of the group.[4] If K is larger, the member is more central in the network. Figure 1 illustrates that in the core part of China's VC networks, foreign VCs are most numerous, joint VCs followed, very few local VCs are part of the core network.

From the above information, we state that VCs with different ownership have different experience, consciousness, and motivation to set up their positions in the collaborative networks. Thus, we hypothesize as follows:

Hypothesis 2: In the Chinese market, VCs with different ownership will have different positions in the collaborative networks, and foreign VCs have more central positions in the network.

VCs tend to syndicate their investments with other VCs, rather than invest alone (Anne et al. 2016). Based on trust, they are bound by their current and past co-investments in the collaborative networks with other VCs (Hochberg et al. 2007, 2010, 2015; Abell and Nisar 2007; Ewens 2010; Zhou and Song 2014). Trusted networks can reduce transaction costs that exist in the market without the need to increase transaction costs within the organization due to the size of the firm (Carney 1998). VCs are diseconomies of scale in the industry, so it is an important way to reduce transaction costs through collaborative networks.

Local VCs are familiar with the local culture, politics, economy and institutional system, and are more likely to obtain information on investment businesses and to withdraw from the local secondary securities market. On the contrary, foreign VCs

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[4]http://faculty.ucr.edu/~hanneman/nettext/C11_Cliques.html#kcore

are not so familiar with the Chinese environment, and they have the liability of being foreigners in China (Barnard 2010; Geleilate et al. 2016). At the same time, foreign companies have the advantage of experience, financial strength, and can more easily achieve favorable exits through an IPO on a global scale. Therefore, VCs prefer to cooperate with other VCs to complement each other. After fundraising, VCs have started an overlapping cycle of investment processes, including searching for promising start-ups to invest in, post-investment management and value-added services, and then reaping the rewards. Syndication networks based on trust are a critical source of information and investment opportunities (Bygrave 1988). VCs invite others to co-invest in their promising deals for future returns. Through collaborative networks, VCs can share human resources, professional skills, and specialized knowledge to evaluate start-ups more accurately (Hopp 2010). Regardless of their financial strength, VCs can be combined into a larger pool of investment via VC networks (Hochberg et al. 2007) and share many of the risks associated with new start-ups with co-investing partners (Zhou and Song 2014). This is more practical for the underfunded local VCs. Because of the transitivity of the collaborative network, VCs can transmit their own certification of start-ups through the network (Large and Muegge 2008). They can also help start-ups recruit executives by networking (Carvalho et al. 2008), and transfer part of their social capital through the network to start-ups. All these opportunities, such as selecting promising start-ups, adding value to start-ups and achieving better exit rates, are main drivers of a VC's performance. Therefore, we hypothesize as follows:

Hypothesis 3: The network position of VCs is the mediator between VCs ownership and VCs investment performance. VCs with different ownership get better investment performance through a dominant network position.

3   Methodology

3.1   Sample and Data

The data for our analysis comes from the CVsource database of China Venture group. Some of the missing data was complemented by the Z database.[5] We concentrate solely on the VC investment rounds which had been done at Chinese mainland start-ups before December 31, 2008.[6] We distinguish between VC firms. Our sample begins in 1989 and extends through 2008, with firm exit information

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[5]CVsource database and Z database are the only professional private equity databases in China. CVsource website is http://www.chinaventuregroup.com.cn/database/cvsource.shtml. Z database can be refered to http://www.pedata.cn/jsp/software/smt_win.jsp

[6]In order to focus on the study of Chinese venture capital, we only study the venture capital (VC) events, and exclude the Angles, PE-Growth, PE-Buyout, PE-PIPE, Bridge/Mezzanine events.

updated through 2016.[7] We construct the multiple regression models of unbalanced panel data and test the three hypotheses. The estimation data sets contain 1593 VCs that participated in 7151 investment rounds involving 5069 start-ups. Excluding 455 missing investment data points, we finally collected 6696 rounds of VC events and 108,416 connection relationships; 26.146% of the investment rounds and 38.651% of sample start-ups involve syndicated funding.

In addition, the data used to construct the VC network dates from before December 31, 2012. Networks are not static. Relationships may change, and entry to and exit from the network may change each VC's position in the network. To capture this dynamic change, we use the co-investment relationship in the 5 years before the investment happened to build the annual network (Hochberg et al. 2007, 2010, 2015). The actor in the network refers to the VC firm, and the tie refers to the co-investment relationship between the VCs in each investment round (Hochberg et al. 2007, 2010; Abell and Nisar 2007; Ewens 2010). In this paper, we construct a directed network and a non-directional network for every year. The directed network is used to distinguish between the leading syndicate VC and VC invited to co-invest in the portfolio company. The leading syndicate VC is the VC with the largest amount at this round of investment. Since there were fewer investment rounds before 1996, the VC network of 1996 consists of 50 investment rounds involving 29 VCs from 1989 to 1996. But from 1997 to 2012, we use the 5-year window, including the base year to build the annual network.

3.2 Variables

3.2.1 Dependent Variable: Investment Performance

Most prior researchers use the exit rate as the investment performance of VCs (Hochberg et al. 2007, 2015; Abell and Nisar 2007; Nahata 2008). For this paper, we also use the successful exit rate defined as the investment performance of VCs. The successful exit rate of a VC firm in a year is measured as the fraction of portfolio companies invested in the year that VCs successfully exit via IPO or a sale to another company or receipt of follow-on funding.

3.2.2 Independent Variable: The Ownership of VCs

The ownership of VCs can be divided into local VCs, foreign VCs, and joint VCs. As the proportion of joint ventures in Chinese VCs is very small and the average ratio is 9.94%, in the past 17 years, it will cause a high degree of multilinearity if the

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[7]Most VC funds are structured as closed-end, often 8-year in China. We close the sample period at the end of 2008 and use the following 8-year for measuring investment performance.

foreign capital and the Chinese capital ownership are introduced into the model simultaneously. Therefore, we use the foreign ownership (foreign) and joint venture ownership (CO) as a dummy variable to distinguish the three types of ownership of VCs.

3.2.3 Mediator: Network Position

For measuring the network position of VCs, we follow rules of Hochberg et al. (2007), Abell and Nisar (2007) and use five different centralities to capture five different aspects, including degree, indegree, outdegree, betweenness and closeness. To ensure comparability of networks with different size, we normalize each measure (Freeman 1979). To avoid strong multi-collinearity, we introduce the five different centralities in different models.

3.2.4 Control Variable

Our benchmark model mainly replicates Hochberg et al. (2007) and Nahata's (2008) model. We take the former research results of VCs' performance as the control variable, including the investment experience of VCs, investment risks, competition in the VC industry, and investment opportunities in the market. We will build the panel data model and focus on the impact of VC ownership and network position on investment performance.

3.3 Model Specification

To test the hypothesis 1, we set the regression model as (1)

$$Performance_{it} = \alpha + \beta Foreign_i + \gamma co_i + \sum_{j=1}^{k} \delta_j Control_{jit} + \varepsilon_{it} \qquad (1)$$

This model focuses on the impact of the ownership of VCs on investment performance, which controls the investment experience, investment risk, industry competition, and investment opportunities of VCs.

We introduce Baron and Kenny's three-stage models to test hypothesis 2 and hypothesis 3. We use models (1), (2), (3) to test the mediator effect of the network position of VCs between VCs' ownership and VCs' investment performance.

$$Centrality_{it} = \alpha + \beta Foreign_i + \gamma co_i + \sum_{i=1}^{k} \gamma_i Control_{it} + \varepsilon_{it} \qquad (2)$$

$$Performance_{it} = \alpha + \beta Foreign_i + \gamma co_i + \eta Centrality_{it} + \sum_{j=1}^{k} \delta_j Control_{jit}$$

$$+ \varepsilon_{it} \qquad (3)$$

4 Results and Discussion

After the LM test and Hausman test, we choose the unbalanced panel model with random effects. We use the three-step regression method to demonstrate how VC network position mediates the impact of ownership on investment performance. The results are shown in Tables 1 and 2.

Models 1–5 in Table 1 illustrate that the ownership of VC has a significant impact on network position. Models 1–4 show that foreign and joint VCs are associated with more central-network positions, including degree, outdegree, indegree and closeness. In Model 5, foreign ownership is not significant to betweenness, but joint ownership is very significant, indicating that joint VCs have the function of a "bridge" instead of foreign VCs in Chinese VC network. These results support hypothesis 2, ownership of VCs significantly impacts VCs' network position, and foreign VCs have more central position in the networks.

Model 6 in Table 2 shows that foreign VCs are associated with significantly better investment performance, and Hypothesis 1 has been supported. In Models 7–11, we add the five measures for network position respectively to model 6. The results show that foreign VC's significant positive impact on investment performance either completely disappeared or weakened. Results in models 7, 9, and 10 shows that the ownership is non-significant when we add network positions to model 6, including degree, indegree and closeness. Thus, these three network centralities are full mediators of the relationship between ownership and investment performance. The coefficients of ownership in models 8 and 11 are smaller and weaker than in model 6, which explains that the network position measured by outdegree and betweenness are partial mediators of the relationship between ownership and investment performance. In the five mediator variables, closeness has the biggest influence on investment performance. A one-standard-deviation increase in closeness is associated with a 13.898% point increase in successful exit rate. Degree and indegree come next. Outdegree and betweenness have relatively small effects economically.

In summary, the results in Tables 1 and 2 illustrate that the VC network position is a mediator variable between the relationship of ownership and investment performance and that foreign VCs have better investment performance because of their advantages of network position. Hypothesis 3 is confirmed.

Table 1 The impact of VCs' ownership on VCs' network position

| Variables | Network position: centrality | | | | |
| | (1) | (2) | (3) | (4) | (5) |
	nrmdegree	nrmoutdeg	nrmindeg	ncloseness	nbetween
Ownership					
foreign	0.1386***	0.0734***	0.0574***	8.8844***	−0.0413
	(0.024)	(0.015)	(0.012)	(2.305)	(0.107)
co	0.1990***	0.1252***	0.0892***	11.0046***	0.6319***
	(0.029)	(0.018)	(0.014)	(3.054)	(0.132)
VCs' experience					
norounds	0.0053***	0.0046***	0.0029***	0.0470	0.0252***
	(0.001)	(0.001)	(0.000)	(0.044)	(0.004)
lnfirinvdays	0.0007	0.0003	0.0018	0.1063	0.0398
	(0.008)	(0.005)	(0.004)	(0.478)	(0.035)
Investment risk					
lngrowdays	0.0142	0.0011	0.0045	1.6278***	0.0035
	(0.011)	(0.007)	(0.005)	(0.492)	(0.045)
vcseries	−0.0038	−0.0034	−0.0037	−0.2130	−0.0670
	(0.017)	(0.011)	(0.009)	(0.797)	(0.071)
avstage	−0.0119	0.0272**	−0.0071	0.1707	0.1374
	(0.022)	(0.014)	(0.011)	(0.998)	(0.090)
Competition					
lninvsize	−0.1633***	−0.1306***	−0.0828***	3.1704***	−0.2619***
	(0.017)	(0.011)	(0.008)	(0.807)	(0.069)
lnvcinflows	−0.0005	0.0028	0.0050	−0.3581	−0.0272
	(0.018)	(0.011)	(0.009)	(0.709)	(0.073)
Investment opportunities					
mk_pe	0.0031***	0.0026***	0.0015***	−0.2303***	−0.0009
	(0.001)	(0.000)	(0.000)	(0.030)	(0.003)
Constant	1.0364***	0.7853***	0.5029***	11.5914**	2.0358***
	(0.118)	(0.075)	(0.059)	(5.612)	(0.491)
Observations	868	868	868	868	868
NO. of VC	319	319	319	319	319

Standard errors in parentheses. We use ***, **, and * to denote significance at the 1, 5, and 10% level (two-sided), respectively

5 Conclusions

With the full data of China's VCs, we examine the performance consequences of enterprise's ownership and collaborative networks' position. To the best of our knowledge, this is the first study to examine the relation between ownership, collaborative network, and performance among VCs. Our findings are as follows.

Due to the separate institutional environment in Chinese VC (Fuller 2010), different ownership of VCs leads to significantly different investment performance.

Table 2 Mediator effect of VCs centrilities

Variables	Investment performance: exit rate					
	(6)	(7)	(8)	(9)	(10)	(11)
	su_rate	su_rate	su_rate	su_rate	su_rate	su_rate
Ownership						
foreign	0.1035**	0.0631	0.0874*	0.0713	0.0191	0.0923**
	(0.046)	(0.047)	(0.047)	(0.047)	(0.047)	(0.046)
co	0.0585	0.0111	0.0452	0.0282	−0.0337	0.0378
	(0.058)	(0.059)	(0.058)	(0.058)	(0.058)	(0.058)
Network position						
nrmdegree		0.1237***				
		(0.035)				
nrmoutdeg			0.0619*			
			(0.037)			
nrmindeg				0.1775***		
				(0.054)		
ncloseness					0.0059***	
					(0.001)	
nbetween						0.0296**
						(0.012)
VCs' experience						
norounds	0.0003**	0.0002	0.0001	−0.0005	−0.0003	−0.0008
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
lnfirinvdays	−0.0722	−0.0843***	−0.0737**	−0.0772**	−0.0777***	−0.0726**
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)

(continued)

Table 2 (continued)

Variables	Investment performance: exit rate					
	(6)	(7)	(8)	(9)	(10)	(11)
	su_rate	su_rate	su_rate	su_rate	su_rate	su_rate
Investment risk						
lngrowdays	0.0550***	0.0539***	0.0520***	0.0504***	0.0562***	0.0530***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
vcseries	0.0911***	0.0827***	0.0909***	0.0903***	0.0836***	0.0923***
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
avstage	−0.0465	−0.0446	−0.0436	−0.0467	−0.0525*	−0.0463
	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)
Competition						
lninvsize	−0.0513*	−0.0181	−0.0435	−0.0275	−0.0912***	−0.0430
	(0.027)	(0.029)	(0.028)	(0.028)	(0.028)	(0.028)
lnvcinflows	0.0204	0.0213	0.0291	0.0314	0.0136	0.0232
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Investment opportunities						
mk_pe	0.0002	0.0003	0.0003	0.0003	0.0004	0.0002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.8232***	0.6462***	0.7085***	0.6046***	1.0539***	0.7444***
	(0.223)	(0.227)	(0.228)	(0.230)	(0.230)	(0.227)
Observations	616	614	614	614	614	614
NO. of VC	252	252	252	252	252	252

Standard errors in parentheses. We use ***, **, and * to denote significance at the 1, 5, and 10% level (two-sided), respectively

Foreign VCs have better investment performance in China than local VCs. Their network centrality mediates performance and eliminates the effects of being a foreign or a local VC. Foreign VCs' more central network position is the reason why foreign VCs can have better investment performance. In certain institutional environments, VCs can expand their advantage and make up for their deficiencies through enhancing their network relationships, so as to achieve better investment performance.

In emerging economies, institutional theory is more powerful than traditional economic theory (Ahlstrom and Bruton 2006). For the first time, combining the macro-institutional environment, the meso-network position, and the micro-enterprise performance, this paper presents a way that micro-enterprises can adapt to the unstable environment through better-networked position. VCs can enhance their collaborative network positions to achieve complementary advantages instead of being completely passive in the face of the institutional environment.

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