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Social Capital and Cross-Border Venture Capital Investments in China

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Abstract: In the context of the Chinese market, foreign cross-border venture capitalists have devised specific strategies to mitigate the challenges associated with the liabilities of foreignness, such as risks and information asymmetry. They have strategically leveraged social capital to not only decrease investment risk but also to influence their investment preferences and behaviors. To investigate the influence of different types of social capital on the investment decisions of cross-border venture capitalists, hypotheses are proposed and tested using regression analysis. Our research reveals several key findings in this regard. Firstly, cross-border venture capitalists with a robust structural social capital network exhibit a greater propensity to invest in early-stage companies. This suggests that well-established connections and partnerships within the Chinese entrepreneurial ecosystem provide a level of comfort and confidence when investing in ventures at their infancy. Interestingly, relational and cognitive social capital, though undoubtedly valuable, do not significantly impact the decision to make early-stage investments. Furthermore, we have observed that venture capitalists with higher levels of structural and cognitive social capital are more inclined to form syndications. Collaborative partnerships and shared knowledge networks seem to be crucial factors that drive syndication decisions. Lastly, venture capitalists endowed with substantial structural and relational social capital tend to allocate larger investment amounts, signifying the influence of business or personal relationships and network connections on the scale of their investments.

Keywords: cross-border venture capital; social capital; investment behavior; cross-cultural investment

1. Introduction

Cross-border venture capital (VC) investment has grown significantly since the 1990s. This is due to increased competition in the domestic VC industry in developed countries and the need for start-up companies in emerging markets to access the experience of VC companies in developed countries. The United States has the largest net outflow of cross-border VC, while China has the largest net inflow. The inflow of cross-border VC has significantly fostered China's economic development.

Existing research on cross-border VC has focused on the integration of cross-border VC institutions and local investors. However, there is little research on the status of cross-border venture investors in the local network and the social capital derived from the network. Social capital, as the third largest capital in addition to physical capital and human capital, significantly affects the ability of companies to obtain information and resources. While there is some research on the social capital of cross-border VC companies, it is largely focused on specific aspects of social capital, such as trust, strong and weak relationships, and network status. There is little research on the overall impact of social capital on VC investment behavior.

This paper aims to bridge the academic research gap by providing a systematic and detailed examination of the impact of social capital on cross-border VC investment

behaviors. The paper's contributions are multiple: first, it expands the research literature by providing a detailed examination of different types of social capital and their impacts on the investment behaviors of cross-border VC institutions. Second, this research on social capital provides theoretical and empirical guidance on how to shape and manage the network structure of cross-border VC institutions and cultivate social capital, which will help in fostering cross-border VC investment and economic development in developing countries.

2. Literature Review

Cross-border VC investment has increased significantly since the early 1990s. This is due to a number of factors, such as increased competition in the domestic VC industry in developed countries, the need for start-up companies in emerging markets to access the experience of VC companies in developed countries, and the relaxation of regulations in many countries, making it easier for VC firms to enter new markets. Existing research on cross-border VC has focused on four main areas:

- Factors affecting cross-border VC flow (e.g., Black and Gilson 1998; Moore et al. 2015),
- Decision-making, operation, and management of cross-border VC (e.g., Wright et al. 2005; Li and Zahra 2012; Hall and Tu 2003),
- Performance of cross-border VC (e.g., Dai et al. 2012; Guler and Guillén 2010; Wang and Wang 2012; Humphery-Jenner and Suchard 2013), and
- Cross-border VC internationalization of the invested company (e.g., Devigne et al. 2011; Mäkelä and Maula 2005).

Cross-border VC investments face multiple disadvantages, such as information asymmetry, agency risks, and geographical, institutional, and cultural differences (e.g., Sorenson and Stuart 2001; Portes and Rey 2005; De Clercq and Sapienza 2006; Chan et al. 2005; Bell et al. 2012; Cumming et al. 2010; Bruton et al. 2005). These disadvantages motivate cross-border VC investors to find ways to reduce information uncertainty and asymmetry. For example, they can choose to invest in the later stages of a company's development (Hege et al. 2003; Wright et al. 2005), form investment syndications with local investors (Tian 2011; Hochberg et al. 2010; Nahata et al. 2014), or invest smaller amounts. Over time, cross-border VC investors can reduce their outsider disadvantages by building social networks in the local market. The access to social capital (which is usually considered as the resources that individuals and organizations can access through their social networks) can help them to reduce information asymmetry and agency risks, and make it easier to manage and exit their investments.

Social capital currently does not have a precise definition, given its ideological nature. For example, Coleman (1986, 1987, 1988, 1990) viewed social capital in terms of relational capital and network identity at a micro level. However, Putnam (1993, 2001) defined social capital from the macro perspective, wherein the network of social capital has the characteristics of trust and norms, and a social network in which citizens generally participate can promote the generation of these characteristics (i.e., social capital becomes the common capital of the whole society). In general, social capital can include things like trust, information, and access to markets. Social networks play a major role in the generation of social capital.

The impacts of social capital on the investment decisions of VC institutions have been discussed in the literature. For example, Shane and Cable (2002) found that VC institutions are more likely to invest in firms with a higher density of social networks. Hochberg et al. (2010) found that companies invested in by venture capitalists with a better social network were more likely to survive and receive the next round of investment. Sorenson and Stuart (2001) indicated that cross-regional social networks could help venture capitalists to enter new markets. Additionally, VC institutions that occupy structural holes in the network (i.e., the institutions that are able to bridge the gaps/disconnects between people or groups and connect different parts of the network) are more likely to invest in early-stage companies (Podolny 2001). These VC institutions with higher network power (i.e., the

ability to influence others in their network) are able to bring more financing to the invested companies (Alexy et al. 2012).

To better investigate the impacts of social capital on VC investment decisions, in recent studies social capital has been classified into different categories and the impact for each category has been studied. For example, Shao and Sun (2021) examined how entrepreneurs' social capital facilitates VC financing for their start-ups in China and found that the structural and cognitive dimensions facilitate VC financing, whereas the relational dimension does not. Kleinhempel et al. (2022) assessed how societal (rather than individual) social capital relates to individuals' initial interest in becoming an entrepreneur and found that regional social capital is relevant for formally setting up a venture, but it is not associated with initial interest, nor with venture survival after establishment. Xie et al. (2021) divided social capital into bonding social capital and bridging social capital and investigated their impact on the performance of agricultural entrepreneurs. They found that both bonding and bridging social capital have a significant positive effect on agricultural entrepreneurship performance. Herrero (2018) found that bonding social capital can provide information on value creation capabilities. Lechner et al. (2016) conducted case study research and investigated how social capital can influence habitual entrepreneurs regarding the emergence and exploitation of opportunities. Joshi et al. (2019) concluded that, in India, foreign VC firms with greater endowment of social capital as proxied by the age of the VC firm are seen to enhance the syndication intensity. Luo et al. (2019) indicated the important role of developing close relationships through informal social networks in the Chinese market, especially for foreign VC firms, due to institutional uncertainties faced by their investments.

The distinction between structural, cognitive, and relational social capital, made by Nahapiet and Ghoshal (1998), is a well-known framework for understanding social capital. Structural social capital refers to the network of relationships that an individual or organization possesses, with the argument that the more extensive and diverse a network is, the more likely it is for the individual or organization to be able to access information and resources. Relational social capital pertains to the quality of relationships characterized by trust, reciprocity, and shared norms, while cognitive social capital encompasses shared understanding, behavioral norms, historical traditions, and values within a network. It is generally believed that cognitive homogeneity can reduce the transaction costs of cooperation and forms the basis for a binding rule system. Considering that different types of social capital measure different perspectives and provide distinct benefits for businesses, they will have varying impacts on the investment behaviors of VC institutions.

In summary, we will explore how each of the three perspectives on social capital—structural, relational, and cognitive—affects the investment decisions of cross-border VC firms, including early-stage investment, joint investment behavior, and investment amount.

3. Research Methodology

3.1. Data Collection

Our data primarily came from the China Venture database, comprising 11,695 financing events with VC investment types from 2000 to 2014, including 3074 joint investment events. It is noteworthy that the global financial crisis occurred during the years 2007 and 2008. However, China's financial sector, which does not extensively trade in derivatives, largely avoided the devastation experienced by the United States and advanced economies in Europe. Therefore, our data collection, which encompasses the years of the global financial crisis, is considered dependable as the scope of the investigation is the environment in China, where the dynamics of social capital development for foreign VC firms vs. their investment behaviors is studied. We further refined the dataset by including only joint investments involving at least one cross-border VC institution. Due to the database's lack of information on the establishment times of certain institutions, we manually supplemented these data using sources such as Crunchbase, investment circles, and other websites.

3.2. The Rationale for the Hypotheses

First, VC firms typically invest in companies at four stages: early, development, expansion, and profitable. The risks associated with early-stage and development-stage companies are higher than those of later-stage companies (e.g., Wright et al. 2005). Hege et al. (2003) indicated that the earlier the investment stage of the VC investment, the less likely it is to be able to exit successfully. However, if a cross-border VC firm can actively participate in the local network and obtain sufficient information from its social network, it may be more willing to invest in early-stage companies. This is because the firm will have a better understanding of the prospects of the company and will be able to reduce its risk.

We argue that the decision to make or avoid early-stage investments by cross-border VC firms is significantly influenced by structural social capital. This is because structural social capital gives the firm access to a wider range of information sources and a higher network status. For example, structural social capital can help VC firms to identify promising investment opportunities by providing access to information about early-stage companies, assessing the risk and return of investment opportunities by leveraging the knowledge and experience of other network members, and building trust with other network members, which is essential for successful joint investment.

On the other hand, relational social capital and cognitive social capital may not be as important as structural social capital for VC firms' choices regarding early-stage investment. Although helpful, they are not as essential as structural social capital for identifying and assessing investment opportunities. We believe that structural social capital is the most important factor affecting the selection of early-stage investments by cross-border VC firms. Relational social capital and cognitive social capital can also play a role, but this may be more involved in the later stages of the investment process than the early stages. Therefore, three hypotheses are proposed as follows with regard to the early-stage investments of cross-border VC institutions:

Hypothesis 1. *With increased structural social capital, the cross-border VC institution tends to invest at an earlier stage.*

Hypothesis 2. *Relationship social capital has no significant impact on cross-border VC firms' decisions to invest at an early stage.*

Hypothesis 3. *Cognitive social capital has no significant impact on cross-border VC firms' decisions to invest at an early stage.*

Second, cross-border VC firms often invest in partnerships with local VC firms. This can help them to screen projects, gain access to local knowledge, and reduce risk. However, cultural differences and uncertainty can make it difficult to form these partnerships (e.g., Dai and Nahata 2016).

China's VC environment is often considered uncertain as compared to other economies in terms of information transparency, investor protection, and legal systems. Social capital can alleviate the disadvantages of cross-border VC institutions as an outsider in the Chinese market (Sorenson and Stuart 2008) and thus increase the cross-border VC investors' willingness to form alliances with local investors. Mäkelä and Maula (2005) found that local investors have two essential responsibilities in cross-border joint investments. First, they provide advice to entrepreneurial teams and offer valuable value-added services in operations management. Second, they have important knowledge of the local market and a dense network of contacts, which can help cross-border VC firms significantly reduce the "outsider disadvantage".

We argue that social capital can help to overcome the above-mentioned challenges faced by cross-border VC investors in China in forming partnerships with local VC investors. Structural social capital can help to connect cross-border and local VC firms. Relational social capital can help to build trust and cooperation between the two groups.

Cognitive social capital can help in sharing knowledge and understanding of the local market. Therefore, we propose three hypotheses regarding syndication investment:

Hypothesis 4. *With increased structural social capital, cross-border VC institutions are more likely to form joint investments.*

Hypothesis 5. *With increased relational social capital, cross-border VC institutions are more likely to form joint investments.*

Hypothesis 6. *With increased cognitive social capital, cross-border VC institutions are more likely to form joint investments.*

Third, the investment amount is a direct expression of the VC institution's expectations for the invested company. As mentioned above, VC institutions with higher social capital have a better understanding of the invested companies at the pre-investment stage. At the post-investment stage, VC institutions can actively use their social capital to improve the likelihood of investment success (Pratch 2005). Cross-border VC institutions with higher structural social capital can obtain high-quality information to evaluate the invested companies, which reduces their information disadvantages and increases their willingness to invest. Relational social capital builds trust, which is conducive to reducing agency costs. Cognitive social capital reduces communication costs and reduces the cultural distance in a cross-cultural partnership. Thus, we argue that social capital can help cross-border VC institutions to have a better understanding of the invested companies and thus be more willing to invest in China. Another three hypotheses are proposed as follows:

Hypothesis 7. *Structural social capital increases the investment amount of cross-border VC institutions.*

Hypothesis 8. *Relational social capital increases the investment amount of cross-border VC institutions.*

Hypothesis 9. *Cognitive social capital increases the investment amount of cross-border VC institutions.*

3.3. Defining Variables

In the China Venture database, investment stages are categorized into early stage, development stage, expansion stage, and profitable stage. We use three dependent variables to describe investment behavior; the first one is "Stage", representing the proportion of early-stage investment. More specifically, "Stage" is calculated as the number of early-stage investments made by the cross-border VC institution divided by the total number of investments.

The other two dependent variables are 'Syn" and "Log_amount", which measure the ratio of syndication investments and investment amount, respectively. More specifically, "Syn" denotes the ratio of the number of syndication investments made by the cross-border VC institution to the total number of investments, and "Log_amount" represents the total investment amount from a cross-border VC firm in millions of dollars. Since the data regarding investment amounts appeared to be highly skewed, we took the log of the value of this amount.

To be concise, the definitions of all dependent, explanatory, and control variables are summarized in Table 1. Note that, similarly to previous studies, we used a three-year rolling window to measure social capital explanatory variables. This means that the social capital variable for a cross-border VC institution in year t is calculated based on the joint investment network status during the previous three years.

Table 1. Description of variables.

Variables	Descriptions
Dependent	
Stage	Early investment ratio: the ratio of the number of early-stage investments to the total number of investments for the VC institution (at any time)
Syn	Syndication investment ratio: the ratio of syndication investments to the total number of investments for the VC institution (at any time)
Log_amount	Investment amount: the log of the total investment amount (in millions of dollars) for the VC institution (at any time)
Explanatory	
Degr	Centrality degree: the absolute degree of centrality of an investment institution, which is the number of investment institutions directly connected to it within the entire investment network and can be directly obtained from the UCINE6 software
Clos	Proximity centrality degree: a measure of how close a node is to other nodes in a network, which is calculated by taking the average shortest path distance between a node and all other nodes in the network and can be obtained from the UCINE6 software
Dur	Variable to measure relationship length
Fre	Variable to measure relationship frequency
Cogn	Variable to measure cognitive social capital
Control	
Year	Time of the investment, which has the value between 2003 to 2014
Age	Age of the VC institution at the time of observation
Inv	The number of the VC institution's investments in the three-year rolling window prior to the time of observation

The calculation of network centrality, centrality degree ("*Degr*"), and proximity centrality degree ("*Clos*") to measure structural social capital follows the method of Freeman (1977, 1979). Relationship length, "*Dur*", is defined as follows, wherein the added subscripts i and t represent VC institution i in year t:

$$Dur_{it} = \left[\frac{\sum_j \left(r_{ij}/6 \right)}{d(n_i)} \right]_t. \tag{1}$$

The above r_{ij} is the duration (in months) between VC institution i and VC firm j since syndication, and $d(n_i)$ is the absolute degree of centrality of VC company i (i.e., $d(n_i)$ at time t means $Degr_{it}$). The incremental relationship duration is counted every 6 months since the first joint investment. That is, if the relationship timespan between one VC institution and another VC institution since the first joint investment is one year, the length of the relationship is recorded as 2 increments (12 months/6 months). Dur_{it} is the sum of VC institution i's relationship in incremental lengths, with all the other institutions divided by its absolute degree of centrality.

Relationship frequency, "*Fre*", is the measure of the strength of relationships between institutions (Podolny 2001):

$$Fre_{it} = \left[\frac{\sum s_{ij}}{d(n_i)} \right]_t. \tag{2}$$

s_{ij} is the number of joint investments between institutions i and j, and $d(n_i)$ is the absolute degree of centrality of investment institution i.

With regard to cognitive social capital, we use "network specialization index" (Alexy et al. 2012) to measure the homogeneity of an investment institution relative to other institutions in the investment industry, where "*Cogn*" is defined below for VC institution *i* over a three-year window prior to year *t*:

$$Cogn_{it} = \left[\sum_j a_{ij} V_i \cdot V_j \right]_t \tag{3}$$

a_{ij} is the proportion of total investments made by VC institution i involving VC institution *j*. V_i and V_j represent the standardized vectors of investment institutions *i* and *j*, respectively, investing in different industries. This vector is calculated based on the number of investments the VC institution made in different industries and there are a total of 18 different industries according to the national standard in our study. $V_i \cdot V_j$ is the inner product of V_i and V_j and the value of $Cogn_{it}$, and it should be between 0 and 1 for any *i* and *t*. The closer the variable "*Cogn*" is to 1, the greater the similarity of a VC institution to other VC institutions in terms of their investments, and thus the higher the cognitive social capital.

3.4. Data Testing

The data to be tested include the variable values calculated from the cross-border VC institutions observed from 2000 to 2014, where available. The descriptive statistics of our data are shown in Table 2. Table 3 shows Pearson correlations between explanatory and control variables and the VIF values for these variables.

Table 2. Descriptive statistics.

Variables	N	Min	Max	Mean	Std. Dev.
Stage	1112	0.000	1.000	0.144	0.2663
Syn	1112	0.000	1.000	0.632	0.3676
Log_amount	996	−3.219	7.614	3.419	1.432
Deg	1112	0.006	10.870	0.373	0.770
Clos	1112	0.103	2.872	1.349	0.804
Dur	1112	0.000	6.111	2.365	1.239
Fre	1112	1.000	1.750	1.045	0.082
Cogn	1112	0.066	1.000	0.747	0.165
Year	1112	2003	2014	2009.35	3.004
Age	1112	0	158	13.93	16.998
Inv	1112	1	233	12.58	20.766

Note: N = sample size.

Table 3. Correlation analysis.

	Deg	*Clos*	*Dur*	*Fre*	*Cogn*	*Year*	*Age*	*Inv*	VIF
Deg	1								1.384
Clos	0.366	1							3.401
Dur	−0.027	−0.136	1						1.032
Fre	0.035	−0.120	0.008	1					1.104
Cogn	0.113	0.070	−0.093	0.150	1				1.068
Year	−0.455	−0.838	0.143	0.127	−0.127	1			3.937
Age	−0.030	0.028	0.029	0.006	−0.055	0.004	1		1.010
Inv	0.153	−0.176	0.012	0.259	0.091	0.213	−0.049	1	1.210

Table 2 shows that the mean proportion of cross-border VC investments made at the early stage is only 14.4%. This low proportion suggests that cross-border VC firms tend to wait until later stages to invest in local firms. On the contrary, the mean proportion of syndication investments is 63.2%. That is, on average, 63.2% of all cross-border VC investments are made through syndications. In Table 3, the VIF values for all of the independent variables are smaller than 5. This implies that multi-collinearity is not a significant problem.

Three regression models, Models 1, 2, and 3, are proposed for testing the aforementioned hypotheses using our data over all cross-border VC institutions *i* and years *t* (ranging from 2000 to 2014). By sequentially adding the explanatory variable(s) representing each type of social capital into the model, in the order of structural social capital, relational social capital, and cognitive social capital, Model 1 is designed for testing Hypotheses 1, 2, and 3, Model 2 for Hypotheses 4, 5, and 6, and Model 3 for Hypotheses 7, 8, and 9. The models use mathematical forms for null (H_0) and alternative (H_a) hypotheses for testing, and results are presented as follows.

The formulation of Model 1 is shown below:

$$Stage_{it} = \beta_0 + \beta_1 Degr_{it} + \beta_2 Clos_{it} + \beta_3 Dur_{it} + \beta_4 Fre_{it} + \beta_5 Cogn_{it} + \beta_6 Age_{it} + \beta_7 Inv_{it} + \beta_8 Year_t + \varepsilon_{it}.$$

$H_0 : \beta_1 \leq 0, \beta_2 \leq 0$ & $H_a : \beta_1 > 0, \beta_2 > 0$ are used for testing Hypothesis 1. $H_0 : \beta_3 = \beta_4 = 0$ & $H_a : \beta_3 \neq 0, \beta_4 \neq 0$ are used for testing Hypothesis 2. $H_0 : \beta_5 = 0$ & $H_a : \beta_5 \neq 0$ are used for testing Hypothesis 3. For the coefficients of $\beta_0, \beta_6, \beta_7$, and β_8, the null hypothesis is that they are zero. Table 4 shows the findings:

Table 4. Regression results for early-stage investments vs. social capital (Model 1).

Variables	Structural Social Capital as Independent Variables		Structural and Relational Social Capital as Independent Variables		Structural, Relational, and Cognitive Social Capital as Independent Variables	
	Coefficients	*p* Value	Coefficients	*p* Value	Coefficients	*p* Value
Constant	−24.227 **	0.020	−23.845 **	0.023	−25.814 **	0.014
Degr	0.039 ***	0.000	0.039 ***	0.001	0.038 ***	0.001
Clos	0.029 **	0.048	0.030 **	0.045	0.031 **	0.042
Dur			0.002	0.714	0.003	0.632
Fre			0.062	0.539	0.040	0.693
Cogn					0.074	0.137
Year	0.012 **	0.020	0.012 **	0.022	0.013 **	0.014
Age	−0.002 ***	0.001	−0.002 ***	0.001	−0.002 ***	0.001
Inv	0.000	0.517	0.000	0.450	0.000	0.388
N	1112		1112		1112	
Adjusted R^2	0.0166		0.0168		0.0159	

Note: ** and *** represent significance levels at *p* < 5% and 1%, respectively.

The formulation of Model 2 is shown below:

$$Syn_{it} = \beta_0 + \beta_1 Degr_{it} + \beta_2 Clos_{it} + \beta_3 Dur_{it} + \beta_4 Fre_{it} + \beta_5 Cogn_{it} + \beta_6 Age_{it} + \beta_7 Inv_{it} + \beta_8 Year_t + \varepsilon_{it}$$

$H_0 : \beta_1 \leq 0, \beta_2 \leq 0$ & $H_a : \beta_1 > 0, \beta_2 > 0$ are used for testing Hypothesis 4. $H_0 : \beta_3 \leq 0, \beta_4 \leq 0$ & $H_a : \beta_3 > 0, \beta_4 > 0$ are used for testing Hypothesis 5. $H_0 : \beta_5 \leq 0$ & $H_a : \beta_5 > 0$ are used for testing Hypothesis 6. For the coefficients of $\beta_0, \beta_6, \beta_7$, and β_8, the null hypothesis is that they are zero. Table 5 shows the findings:

Table 5. Regression results for syndication investment rate vs. social capital (Model 2).

Variables	Structural Social Capital as Independent Variables		Structural and Relational Social Capital as Independent Variables		Structural, Relational, and Cognitive Social Capital as Independent Variables	
	Coefficients	*p* Value	Coefficients	*p* Value	Coefficients	*p* Value
Constant	−22.473	0.113	−22.878	0.107	−25.844 *	0.071
Degr	0.042 ***	0.006	0.042 ***	0.006	0.041 ***	0.007
Clos	0.064 ***	0.005	0.064 ***	0.005	0.067 ***	0.004
Dur			−0.007	0.791	−0.006	0.752
Fre			0.164	0.114	0.132	0.169
Cogn					0.111 *	0.050
Year	0.011	0.104	0.012	0.101	0.013	0.067
Age	0.002 ***	0.000	0.002 ***	0.000	0.002 ***	0.000
Inv	−0.003 ***	0.000	−0.003 ***	0.000	−0.003 ***	0.000
N	1112		1112		1112	
Adjusted R^2	0.0477		0.0470		0.0492	

Note: * and *** represent significance levels at *p* < 10% and 1%, respectively.

The formulation of Model 3 is shown below:

$$Log\_amount_{it} = \beta_0 + \beta_1 Degr_{it} + \beta_2 Clos_{it} + \beta_3 Dur_{it} + \beta_4 Fre_{it} + \beta_5 Cogn_{it} + \beta_6 Age_{it} + \beta_7 Inv_{it} + \beta_8 Year_t + \varepsilon_{it}$$

$H_0 : \beta_1 \leq 0, \beta_2 \leq 0$ & $H_a : \beta_1 > 0, \beta_2 > 0$ are used for testing Hypothesis 7. $H_0 : \beta_3 \leq 0, \beta_4 \leq 0$ & $H_a : \beta_3 > 0, \beta_4 > 0$ are used for testing Hypothesis 8. $H_0 : \beta_5 \leq 0$ & $H_a : \beta_5 > 0$ are used for testing Hypothesis 9. For the coefficients of $\beta_0, \beta_6, \beta_7,$ and β_8, the null hypothesis is that they are zero. Table 6 shows the findings:

Table 6. Regression result for investment amount vs. social capital (Model 3).

	Structural Social Capital as Independent Variables		Structural and Relational Social Capital as Independent Variables		Structural, Relational, and Cognitive Social Capital as Independent Variables	
	Coefficients	*p* Value	Coefficients	*p* Value	Coefficients	*p* Value
Variables	−292.017 ***	0.000	−292.138 ***	0.000	−283.800 ***	0.000
Degr	0.240 ***	0.000	0.235 ***	0.000	0.237 ***	0.000
Clos	0.495 ***	0.000	0.504 ***	0.000	0.498 ***	0.000
Dur			−0.024	0.762	−0.028	0.791
Fre			1.793 ***	0.000	1.882 ***	0.000
Cogn					−0.338	0.897
Year	0.146 ***	0.000	0.146 ***	0.000	0.142 ***	0.000
Age	0.006 ***	0.008	0.006 ***	0.008	0.006 ***	0.009
Inv	0.023 ***	0.000	0.021 ***	0.000	0.021 ***	0.000
N	996		996		996	
Adjusted R^2	0.1799		0.1883		0.1895	

Note: *** represents the significance level at *p* < 1%.

4. Discussion

4.1. Early-Stage Investments vs. Social Capital

Table 4 shows that the coefficients for "centrality degree" (*Degr*) are all positive and significant at a 1% level. The coefficients of variable "proximity centrality degree" (*Clos*) are also positive and significant at the 5% significance level. This supports our Hypothesis 1, which states that with the increase of structural social capital, cross-border VC institutions are more likely to invest at the early stage of the invested companies.

The reasons behind this observation are twofold: firstly, a higher centrality degree means more direct sources of information, making it easier for VC institutions to obtain useful information. Secondly, increased proximity centrality means closer connections to other investment institutions, facilitating easier and more direct access to information. This helps mitigate information disadvantages relative to local investors, reducing the risk of investing in early-stage companies.

The above observation also explains the role of information acquisition in shaping investment stage decisions for cross-border VC institutions by enabling them to assess risks, identify opportunities, build relationships, and maintain a competitive edge in the dynamic VC landscape. This is because access to timely and relevant information is crucial for making informed investment decisions, especially in the context of VC, where investments are often made in early-stage companies with high uncertainty.

Additionally, Table 4 shows that the coefficients of relational social capital variables "duration" or "length" (*Dur*) and "frequency" (*Fre*), as well as cognitive social capital variable "cognitive" (*Cogn*), are not significant. This supports our Hypotheses 2 and 3, which state that the relational social capital and cognitive social capital of cross-border VC institutions have no significant impact on cross-border VC institutions' decision to invest at an early stage. The reasoning behind this lack of significance is that relational and cognitive social capital typically do not enhance channels for information acquisition, and thus do not significantly influence the investment decisions of VC institutions at an early stage of their ventures.

In summary, the testing results from Table 4 imply that structural social capital, particularly centrality degree and proximity centrality degree, plays a significant role in influencing cross-border VC institutions' decisions to invest in early-stage companies. On the other hand, relational and cognitive social capital do not show significant impacts on investment decisions at an early stage of ventures, likely due to their limited influence on information acquisition channels.

4.2. Syndication Investment vs. Social Capital

In Table 5, the regression results examine the factors that influence VC institutions' syndication investment decisions. The coefficients for the variables "centrality degree" (*Degr*) and "proximity centrality degree" (*Clos*) are both positive and significant at the 1% level. This suggests that structural social capital motivates cross-border VC institutions to form syndications in investment, which supports Hypothesis 4. That is, the presence of positive and significant coefficients suggests that VC institutions with higher centrality and proximity centrality are more likely to engage in syndication agreements, possibly due to their broader networks and increased access to valuable information and resources.

The coefficients for the variables "relationship length" (*Dur*) and "relationship frequency" (*Fre*) are not significant, which does not support Hypothesis 5. This suggests that relational social capital has no significant influence on the joint investment decisions of cross-border VC institutions. We also examined the descriptive statistics in Table 5 and found that the maximum of relationship length (*Dur*) in Table 2 is 6.111, which is about 36 months (=6.111 × 6 months), with a mean of 2.365, which is about 14 months (=2.365 × 6 months). This indicates that the cooperation between cross-border VC institutions and their partners generally spans a period of up to three years. The above finding implies that cross-border VC institutions are more inclined to form syndications with new

investment partners, rather than previous ones. Thus, it renders relational social capital less impactful in joint investment decisions.

However, the coefficient for the variable "cognitive" (*Cogn*) is positive and significant at the 10% level, which supports Hypothesis 6. This suggests that cognitive social capital increases the likelihood that cross-border VC institutions form investment syndications. The positive coefficient suggests that VC institutions with shared knowledge and understanding of the investment environment, focusing on similar industries and tracking similar information, are more inclined to collaborate and invest together.

In summary, the testing results reveal that structural and cognitive social capital play significant roles in influencing the syndication investment decisions of cross-border VC institutions. Structural social capital, represented by centrality and proximity centrality, facilitates syndication formation by providing access to diverse networks and valuable resources. Cognitive social capital, characterized by shared knowledge and understanding, enhances syndication likelihood by fostering collaboration among VC institutions with similar investment focus and information tracking patterns. Conversely, relational social capital, as measured by relationship length and frequency, does not significantly impact joint investment decisions, possibly due to the preference for forming syndications with new partners rather than relying solely on previous relationships.

4.3. Investment Amount vs. Social Capital

Table 6 shows the results regarding investment amount as the dependent variable (Model 3). The coefficients for the variables "centrality degree" (*Degr*) and "proximity centrality degree" (*Clos*) are both positive and significant at the 1% level. This confirms Hypothesis 7, which states that cross-border VC institutions with more structural social capital tend to invest more money in a project. The presence of positive and significant coefficients suggests that higher structural social capital enables cross-border VC institutions to gather and assess information more effectively, boosting their confidence in investment projects and leading to larger investment amounts.

The coefficient for the variable "relational length" (*Dur*) is not significant, but the coefficient for the variable "relational frequency" (*Fre*) is positive and significant at the 1% level. This partially supports Hypothesis 8, which states that cross-border VC institutions are more likely to invest more money in a project if they have a frequent and positive relationship with other investors. The insignificant coefficient for "relational length" indicates that the duration of the relationship between VC institutions and other investors does not significantly influence investment amounts. However, the positive and significant coefficient for "relational frequency" suggests that frequent interactions with other investors contribute to larger investment amounts.

The coefficient for the variable "cognitive" (*Cogn*) is not significant, and therefore does not support Hypothesis 9. That is, cognitive social capital does not have a significant influence on VC firms' decision-making regarding investment amount. In our study, we used industry similarity to measure cognitive social capital. One possible explanation for the above finding is that while industry similarity can enhance information extraction and processing efficiency, it may also limit innovation capabilities and investment horizons, and thus does not offer VC investors clear guidance as to whether greater or less involvement is beneficial. On the other hand, we wonder whether industry similarity alone may not sufficiently capture the impact of cognitive social capital on the investment amount decisions of cross-border VC institutions.

In summary, the testing results imply that structural social capital significantly influences the investment amount decisions of cross-border VC institutions, while relational social capital, particularly in terms of frequency of interactions, also plays a role. However, the impact of cognitive social capital on investment amount decisions appears to be more complex and may not be fully captured by industry similarity alone. Further research is needed to explore the multifaceted nature of cognitive social capital and its implications for investment decisions.

5. Conclusions

This paper examines the impacts of different dimensions of social capital on the investment behaviors of cross-border VC institutions in China. We found that:

- Structural social capital (e.g., centrality degree and proximity centrality degree) motivates cross-border VC institutions to invest during the early stage of the invested companies. This is because structural social capital broadens the access to information resources for cross-border VC institutions, reducing their outsider disadvantages and enabling them to have a more comprehensive grasp of the prospects of invested companies. Relational social capital and cognitive social capital do not appear to be as helpful with regard to enhancing the channels for information acquisition.

- Both structural social capital and cognitive social capital (e.g., industry similarity) motivate cross-border VC institutions to form investment alliances. This is because structural social capital enhances the network status of cross-border VC institutions, connecting them with more investment institutions and increasing the chances of participating in joint investment. Cognitive social capital, on the other hand, reduces the cost of communication between cross-border VC institutions and is conducive to forming investment syndications.

- Structural social capital plays a crucial role in increasing the investment amount of cross-border VC institutions. Institutions with high structural social capital can access high-quality information through their network connections, enabling them to make informed judgments about the future risks and returns associated with invested companies. This access to valuable information helps to alleviate information disadvantages and stimulates cross-border VC institutions to invest larger amounts. Furthermore, the relationship frequency (i.e., the frequency of interactions between the cross-border VC institution and other VC investors) also increases the investment amount. A higher frequency of relationships fosters mutual understanding among VC institutions, builds trust, reduces agency costs, and consequently enhances the investment willingness of cross-border VC institutions.

We see that social capital generally has positive effects for cross-border VC institutions, and different categories of social capital have different impacts. Our research provides insights for the network management of cross-border VC from several perspectives. First, we see that the outsider disadvantages faced by cross-border VC institutions when investing in China can be significantly alleviated through network operations. Cross-border VC institutions should actively seek joint investment with local investors and embed in local investment networks. This will help them to enhance their structural social capital, which can help them to overcome the challenges of investing in a foreign market. At the same time, cross-border VC institutions should not overlook the importance of relational social capital, as it can strengthen trust, reduce agency costs, and alleviate the disadvantages of outsiders as well.

In addition, when embedding in the local network, cross-border VC institutions should first use their cognitive social capital to seek homogeneous partners. This is because cognitive social capital can help them to find partners who share similar investment interests and goals. This can lead to more joint opportunities, as the partners will be more likely to agree on investment decisions. However, they should also be aware of the limitations of specialized networks in transmitting information. Specialized networks tend to focus on a narrow range of industries or topics, which can limit the amount of information that is available to the members of the network. Therefore, cross-border VC institutions should also seek joint partners with heterogeneous resources, as this can help them to obtain a wider range of information. That is, leveraging cognitive social capital for partnerships with similar partners is beneficial, but considering diverse partners for a broader information base is advised.

Although our research focused on cross-border VC institutions in China, the findings may be applicable for other emerging markets. The challenges faced by cross-border VC institutions in China may be similar to the challenges faced by cross-border VC institutions

in other emerging markets, such as outsider disadvantages, a lack of knowledge of the local market, and a lack of trust from local investors. Cross-border VC institutions in other emerging markets can benefit from the strategies that were considered effective in China, such as seeking joint investment with local investors, embedding in local investment networks, using cognitive social capital to seek homogeneous partners, and being aware of the limitations of specialized networks.

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