Stockholm School of Economics
Master’s Thesis in Finance——Spring 2018
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What affects the VC spatial clustering in China?

Research on determinants of location selection and VC performance

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Abstract: As a key propeller for the economy development and technology industrialization, venture capital (VC) has attracted the attention of both academics and policy makers around the world. In China, the spatial distribution of VC industry exhibits a high degree of agglomeration: More than 60% of Chinese VC firms cluster in Beijing, Shanghai, Zhejiang and Guangdong and VC investment performance in these four provinces behaves significant better than other non VC clustering regions. With the knowledge of Finance and Regional Economics, this paper aims to examine the determinants of VC location selection and the reasons behind the provincial preference of VC investment in China using panel data regression. Besides, we test whether the location factor could have an impact on the VC performance and to what extent it could exert the influence. We find if the local government recruits more high-tech employers in the research work, takes active measures to introduce foreign capital and highly develops the tertiary industry, more VC institutions will fund their target firms in the province. Controlling for characteristics of VC firms that provide their funds as well as transaction-specific factors, we find location factor could exert a positive effect on the VC investment performance and the exit IRR of VC projects in VC clusters is significantly higher than those invested in non VC clustering regions.

Keywords: Venture Capital, spatial clustering, VC performance, location quotient

Acknowledgements: I would like to extend my sincerest gratitude to my supervisor, Assistant Professor Dong YAN, for her helpful guidance and instructions throughout the process of writing this thesis. I would also want to thank my parents for their tireless support and encouragement during my study in SSE in the past two years.

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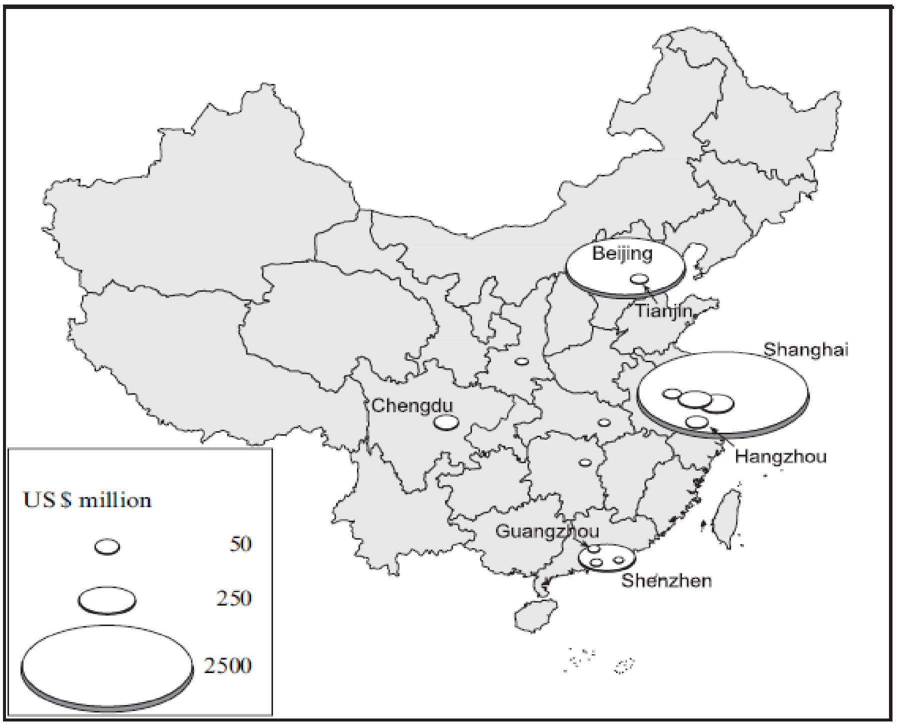
1. Introduction

1.1 Background of the Chinese VC industry

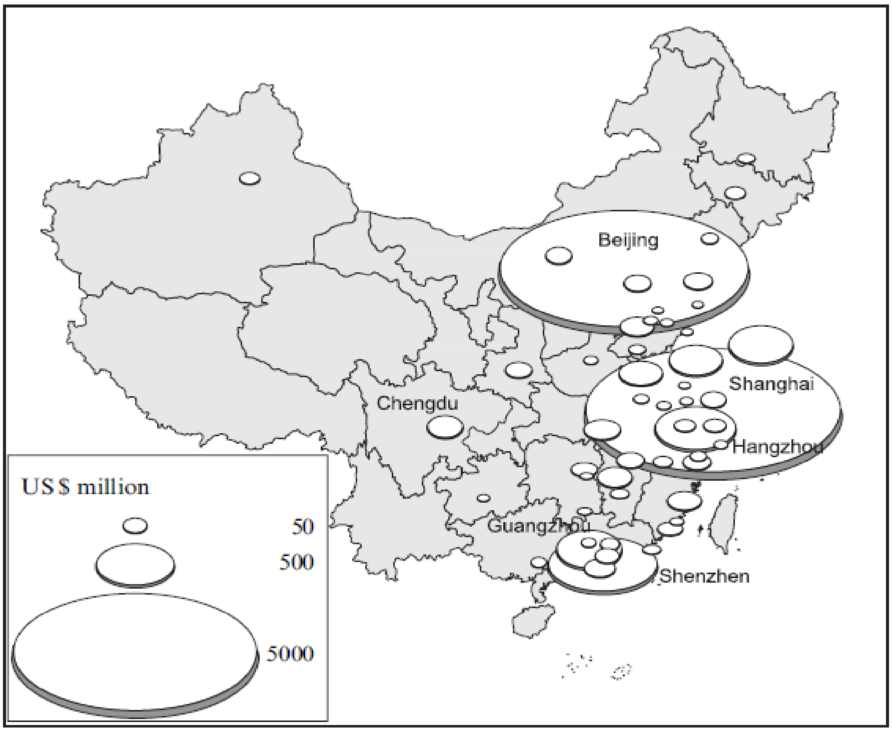
In March 1986, National Natural Science Foundation of China (NNSFC), also called "863 Program" was proposed. With the commencement of science and technology reform, Venture Capital (VC) programs were established by the Chinese central government in the mid-1980s (Xiao, 2002). Since 1978, Chinese economic system has transformed from centrally planned economy to a market-based economy and Chinese VC industry underwent tremendous changes afterwards (Guo and Jiang, 2013). At the beginning of the reform, VC industry did not take root in the Chinese market economy and the players only include the central and local government. The first breakthrough did not occur until the late 1990s when additional participants were allowed to enter the industry, including domestic corporations, universities and even individuals (Guo and Jiang, 2013). The expansion could arise from several aspects, including prosperous global equity markets, and the proposal in 2000 by the Shenzhen Stock Exchange to launch a NASDAQ-like venture board in support of start-up and high-tech companies (Jenner and Jo, 2013). In 2001, foreign VC firms finally were legally recognized in China. In 2005, split-share reform increased the liquidity of stock market in China, largely flouring the VC industry. Today, VC recipients collect capital from different sources like the government, state-owned enterprises, private firms, public companies, non-banking financial institutions, multinational corporations and foreign VC funds (Pukthuanthong and Walker, 2009). James Wolfensohn, the former World Bank President once said, "The Chinese have accomplished in only 20 years what would take many other countries two centuries to achieve." Among them included the highly developed VC industry.

1.2 Introduction to the research question

The second half of the 1990s has seen a tremendous growth of the VC market in many countries (Martin et al., 2002). During the wave of growth, global VC environment experienced dramatic changes: intensified competition resulted not only from the increase in funds raised and a proliferation of new VC firms, but also from the greater transparency and activity of alternative sources of financing such as corporate VC (CVC), independent VC (IVC) and business angels (J. L. Christensen et. al, 2007). In order to position themselves in the market and obtain a comparative advantage over their counterparts, VC firms have to select appropriate operating strategies to improve the investment performance. Many VC firms have thus concentrated on one or more dimensions: certain industries, stages of development of the target firm, or geographical areas. So we want to know the VC investment strategy and what on earth affects the VC investment performance? From the following regression results we find the location factor exerts a quite important influence on VC investment performance and regional clustering is evident in Chinese VC distribution. According to the Report of Venture Capital Development in China (2016), coastal and eastern regions, including Beijing, Shanghai, Zhejiang, Guangdong, Jiangsu, gather the largest number of VC institutions. “In 2015, these regions have 1130 VC institutions, accounting for 63.7% of the total in China. In developed regions represented by Jiangsu and Zhejiang, proportion of VC increased continuously from 18.2% in 2002 to 46.7% in 2015. Besides, VC sector in mid-west China such as Shandong, Chongqing, Anhui, Hunan and Hubei, etc. also displayed quite promising growth in recent years” (China Venture Capital Statistical Year Book, 2016).



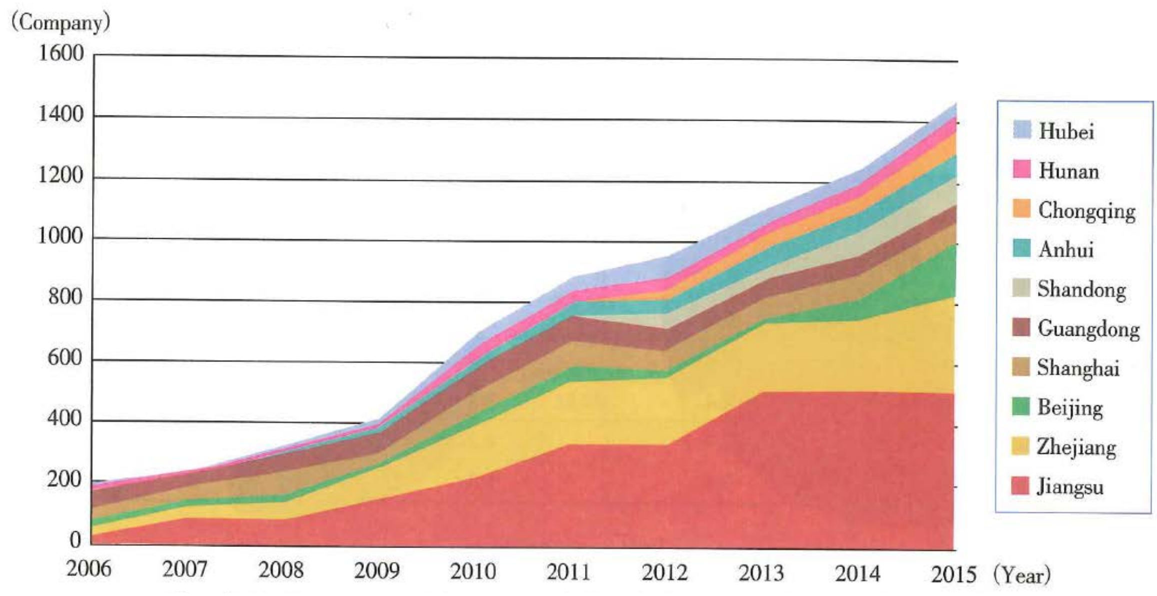
(a)



(b)

Graph 1: Spatial Distribution of VC investments in China: (a) 2003 and (b) 2008

Source: Jun Zhang, 2011



Graph 2: Regional distribution of VC institutions in China (2006-2015)
Source: China Venture Capital Statistical Year Book, 2016

With the development of Beijing Zhongguancun Science Technology Park, Beijing had already set up its reputation as China's Silicon Valley in the mid-1980s and gathered the first group of start-up firms and VC institutions in China (Zhou, 2005). Shenzhen, once a small fishing village before the Chinese economy reform, became one of the first Special Economic Zones (SEZ) under the leadership of Deng Xiaoping and grew rapidly with the help of Chinese government support and its unique geographical advantage. Today, Shenzhen as well as its surrounding regions-the Pearl River Delta (PRD) has grown to the heart of technology manufacturing hub of China and the world, represented by five tech giants namely Huawei, Tencent, ZTE, BGI and BYD. Besides, a majority of VC investments are made in China's eastern and coastal regions, where both foreign investors and Chinese local VC firms see a lot of promising investing opportunities (Walker and Pukthuanthong, 2009). Riding on the boom of overseas returnees and the evolving state-sponsored semiconductor cluster in Zhangjiang Science Park (Lin and Wang, 2009), Shanghai began to catch up with

Beijing in the second wave of Internet and VC boom in China after 2003. In Hangzhou, capital of Zhejiang province, hundreds of technology startups and big data firms are set up here and it is also the birthplace of e-commerce giant Alibaba Group, which earned annual revenues of 158 billion yuan ($25 billion) in its last financial year (2017). The above discussion may be the most important reasons why Beijing, Guangdong, Shanghai and Zhejiang could become VC clusters in China.

The spatial clustering phenomenon of VC investment is not unique in China. In the US the main centre for VC firms is San Francisco, Boston and New York. In Canada, VC offices are concentrated in Toronto (59%), with smaller concentrations in Calgary, Montreal (both 9%) and Vancouver (8%). In the UK 71% of VC firms have their headquarters in Greater London. But there is greater dispersal in Germany. Munich is the biggest single host to VC firms but accounts for less than 20% of the total (Fritsch and Schilder, 2006).

The following of the paper is arranged as followed: Chapter 2 provides an overview related to the nature and performance of VC investments. Chapter 3 discusses the mechanism of VC spatial clustering in China and proposes the hypotheses the paper mainly tests on. In the first part of Chapter 4, we describe the data and summarize the main results of the data sample. Then we evaluate the influence of environmental supportive factors on the number of VC projects and the VC location quotient (LQ) in each province separately, both of which could be used to describe the VC spatial clustering effect, but the former is an absolute index while the latter one is relative. After exploring the determinants of VC spatial clustering and explaining the reasons behind the provincial preference of VC investment, Chapter 5 tests whether the location factor could have an impact on the VC performance and to what extent it could exert the influence. Finally, Chapter 6 gives conclusion of the whole paper. We find if the local government recruits more high-tech employers in the research work, takes active measures to introduce foreign capital and highly develops the tertiary industry, more VC institutions will fund their target firms in the province.

Controlling for characteristics of VC firms that provide their funds as well as transaction-specific factors, the regression result shows location factor could exert a positive effect on the VC investment performance and the exit IRR of VC projects in VC clusters is significantly higher than those invested in non VC clustering regions.

2. Literature Overview

VC spatial clustering refers to the VC investment of a country is highly concentrated in several regions, and there exists significant difference among these districts. To put it more concretely, the VC projects and VC funds are more inclined to locate in certain areas, where the capitalists select as birth places for the VC institutions. Apart from these, the original VC projects or institutions could attract more and more new members to join in the area, so formed the VC regional clustering effect. Mcnaughton R.B and Green M.B (1989) study the geographical distribution of Canadian VC investment and found venture capitalists are shown to be highly concentrated in their portfolio selections. The behavior is interpreted as the aggregate result of the efforts of VC investors to minimize information asymmetries and the cost of transit.

According to the existing literatures, there are two different opinions about the influence of VC geographical agglomeration on VC investment performance. According to Fritsch M and Schilder D, regional proximity does not necessarily lead to VC spatial clustering and the absence of VC firms in a district is not a main reason for severe regional equity gap (Fritsch M and Schilder D, 2006).

However, the mainstream opinions stand on the positive side. Christos K et al. empirically measure the strength and spatial degree of the relationships among the capital amount raised by funded firms based on a spatial autoregression (SAR) model and they find enterprise firms in such knowledge-based industry as biotech may cluster to benefit from local knowledge spillovers and network externalities (Christos K et al. 2011).

Douglas Cumming et al. study the PE industry in Canada and find 84.42% of investments were intra-provincial in terms of the numbers of transactions while in terms of the total value of these transactions, 61.5% was intra-provincial. From the authors' perspective, the phenomenon of provincial clustering in PE in connection with the Canada's fragmented provincial securities regulatory structure (Douglas C and Sofia, 2005).

Jun Zhang finds that the high degree of VC geographical agglomeration in Beijing, Shanghai and Shenzhen was aligned with the juxtaposition of spatial proximity effects, investment syndication, and interregional networks within China's unique institutional environment. And he further concludes that the spatial pattern of the globalizing venture capitalism has to be connected with the geo-institutional mechanism shaping the fundraising-investing-divesting "VC cycle" (Jun Zhang, 2011).

According to Florida et al, VC firms are found to agglomerate in areas with high concentrations of financial institutions or technology-intensive enterprises. The difference between these two forms of agglomeration is that VC firms which are based in financial centers tend to fund the projects elsewhere to other regions, while those clustering in technology centers are typically "import-oriented" and attract outside VC investors (Florida R.L. and Kenney M, 1988).

There is a third opinion proposed by J. L. Christensen, which is a comparatively more neutral perspective on the VC spatial dynamics. Christensen develops a theoretical dichotomy to demonstrate that the process of VC geographical specialization follows an inverted V-shaped curve, i.e., in the initial stage, VC development is characterized by spatial diversification because VC funds search broadly for investment opportunities. But as competition intensifies they tend to confine themselves within a closer geographical distance, and, ultimately, formed geographical specialization. The competence intensity and agglomeration degree was argued to go hand-in-hand (Christensen J.L., 2007).

In terms of spatial cluster, most previous studies focus on the collocation between start-ups and VC firms, and the collocation among start-ups while discuss little about the collocation among VC firms. Besides, the existing literatures have placed a strong emphasis on the role of “spatial proximity effects” which explains whether the interactions between portfolio companies and VC firms are exclusively local, as VC firms tend to focus a significant proportion of their investment in their nearby region to minimize the information asymmetries, principal-agent problems and other transaction costs (Martin et al, 2002) while ignore the “clustering effect” of VC firms, i.e. the collocation among the VC firms. In addition, existing VC studies in geography are predominantly on North America and Western Europe, where the VC industry has been established for a long time and form a comprehensive and mature system, but there are few studies explaining the reasons for VC spatial clustering in China. This paper will examine the determinants of regional specialization in Chinese VC industry and whether the location factor could have an influence on the investment performance.

3. Mechanism of VC spatial clustering and hypothesis

3.1 Mechanism of VC spatial clustering in China

In this section, we analyze the mechanism of VC spatial clustering in China. The uneven geographical distribution of VC investments can arise from the following aspects:

3.1.1 Information Transfer

The VC industry displays a high level of agglomeration due to the value of information in identifying investments, mobilizing resources and establishing business start-ups (Florida R.L. and Kenney M., 1986). We can divide the information into three types: public information, semi-public information and implicit information. Without the problem of value underestimation, the first type of information is not affected by the distance because it can spread through formal media and each investor has the same opportunity to accept the public information. But the semi-public and implicit information usually transfer through personal and informal channels, especially the latter one is highly connected with *"guanxi"* networking and largely affected by the distance. In fact, human capital resource plays a more important role in decision making in relationship-based economies than in rule-based economies (Zacharakis et. al. 2007). Lack of publicly available information, young business have few access to improve their unproven business models, untested management teams, new technologies and inchoate markets, and this could display many risks for the prudential investors (Sorenson and Stuart, 2001). By sharing information with other investors, consultants, accountants and a wide range of other actors, venture capitalists could overcome this uncertainty (Collin Mason, 2007). Hellman and Puri (2002) point out that to identify promising investment opportunities and actively participate in business affairs, venture capitalists require frequent communication as well as face-to-face contact with the investees, investment bankers, lawyers and this interaction could not be achieved over longer distances. As a consequence, VC firms tend to fund local target firms in order to compensate for ambiguous information, reduce transaction cost, and minimize uncertainty (Florida and Kenney, 1986).

3.1.2 Spatial clustering of supportive institutional infrastructures.

Secondly, we argue that VC industry displays a high degree of agglomeration because of the spatial clustering of supportive institutional infrastructures. In areas with high concentrations of financial institutions or technology-intensive enterprises, VC firms could easily find expertise to help find deals, organize investments and support their dedicated portfolio companies (Colin Mason, 2007).

On one hand, the phenomenon that VC firms cluster in financial centers reflects that many of them rely heavily on other financial institutions. Taking the deal flow stage for instance, venture capitalists rely on their networks and relationships such as law firms, accountancy firms and other venture capitalists to find the best deals (Zook, 2005). On the other hand, the establishment of well developed VC networks in technology-based regions will significantly speed up the pace of technological industrialization, and in return, the improvement of high-tech knowledge could help start-up firms develop innovative pipelines for new products and service to become financially successful. In the initial stage of VC industry, firms were founded in close proximity to research institutes and universities producing the latest cutting-edge science fruits (Zucker et al, 1998). Consider the case of Beijing and Shanghai, where there are a lot of research centers and top-tier China universities, the supportive institutions foster knowledge transfer and the knowledge spillovers accelerate the process of technology-based firms clustering, for example, Tsinghua Tongfang and Beida Jade Bird Group.

3.1.3. Reducing Principal-Agent problem

The relationship between VC firms and the funded companies is a Principal-Agent relationship. VC companies could add value to the enterprise firm and sell the investment shares with considerable profit by identifying promising investment opportunities and actively participating in post-investment activities, for example, monitoring and supervising the companies in their portfolio. So venture capitalists not only bring money, but also add value to the firms they fund by giving them timely suggestions and protecting them from taking unnecessary risks (Bruton and Ahlstrom, 2003). It is normal for VC firms to locate in areas that offer them the highest turnaround or profit, and travel to other geographies will be adopted only when a high enough return can be expected to compensate for the additional costs associated with the deal.

3.2 The environmental supportive factors for VC spatial clustering and hypothesis

Based on the data of mature VC industries in developed countries such as the US and Western Europe, the existing literatures mainly study the internal micro-factors on the transaction level such as the "*guanxi*" network and investing strategies of VC firms and try to find if they could exert influence on VC's geographical concentration. In this paper, we mainly focus on the external macro-factors of a specific province and try to explore their effects.

We divide the factors affecting VC's geographical concentration into two categories: knowledge and capitial, which are highly fungible, easily transportable, in short, weightless (Leadbeater, 2000).

Table 1: Definition of variables explaining VC's spatial agglomeration

Definition of variables explaining VC's spatial agglomeration	
Variables	Definition
Dependent variable	
NoProjects	Number of VC projects invested in each province
LQ	Location quotient in each province
Independent Variable	
Capitial:	
GovCap (yuan per person)	Government appropriation for education per person in each province
Fin (yuan per person)	Output value of financial industry per person in each province
ForeignInv (yuan per person)	Foreign investment per person in each province
Knowledge:	
HTEmp (man-year)	Number of employees involved in high-technology industry in each province
NewExp (yuan per person)	Expenditure on new products development per person in each province
RandD (yuan per person)	Expenditure on R&D per person in each province
Other:	
Third (%)	The fraction of tertiary industry's GDP to the whole GDP in each province
Trans (yuan per person)	Output value of Transport, Storage and Post industry per person in each province
dummy_VCclusterprovince	dummy variable used to indicate whether the province belongs to "Guangdong", "Beijing", "Zhejiang", "Shanghai".

3.2.1. The first category of independent variables: Capital

Enterprise firms receive financial support from multiple sources, through government research grants, R&D alliances with major corporations and selling minority equity stakes. The VC industry displays a high level of agglomeration mainly because the intensive nature of capital. Here we select three variables to describe the capital effect: the government appropriation for education in each province per person, which represents the support of local government; the output value of financial industry in each province per person, which represents the local financial industry's development level; the foreign investment in each province per person, which represents to what extent the local investment environment is preferred by foreign investors.

Compared with their domestic counterparts, which often have preferential access to local information and network resources, foreign VC firms are privileged with more mature and stable offshore fundraising sources, more professional managerial experience in offering value-added services to their investees, as well as better ability to link Chinese firms to business partners and IPO opportunities overseas. So VC firms are more likely to cluster in areas with higher foreign investment. Here comes our first hypothesis.

Hypothesis 1: Foreign investment contributes to the VC spatial clustering**.**

3.2.2 The second category of independent variables: Knowledge

In 1999, the State Council issued the "Decision to Develop High Technology through Innovation and Industrialization", which helps accelerate the growth of VC industry by developing the capital markets and providing incentives for venture capitalists to invest in high-tech industries (Xiao, 2002). Later that year, the State Council issued "Opinions on Establishing a Venture Capital Regime", suggesting that the government recognized supporting VC industry could help spur technology innovation among small and medium enterprises (SMEs) and vice versa.

Florida and Smith (1991) observed that VC firms located in high tech clusters tend to restrict their investing to the cluster. Here we select three variables to describe the knowledge effect on VC's spatial agglomeration: number of employees involved in high-tech industry, expenditure on new products development and R&D input in each province per person. Knowledge, especially those from the frontiers of cutting-edge science, has a strong tacit dimension (Neison and Winter, 1982). To achieve a financial success, the enterprise firm needs to develop innovative pipelines for new products and services, and such expansion projects tend to involve the introduction of new technologies aimed at reducing costs or boosting productivity. So we put up the second hypothesis:

Hypothesis 2: VC firms are more likely to agglomerate in regions with more high-tech employees and R&D expenditure involved in scientific research work.

3.2.3 Other independent variables

To do the regression analysis on spatial clustering of VC investment, we also need to control other external factors such as the fraction of tertiary industry's GDP to the whole GDP and output value of Transport, Storage, and Post industry in each province per person etc. According to Hellman and Puri (2002), to identify promising investment opportunities and actively participate in business affairs of start-up firms, venture capitalists may require intensive communication combined with frequent face-to-face contact with diverse parties. Therefore, developed transport and tertiary industry, which largely reduce the transportation cost on communication, could help attract more VC firms to join in the area. Here comes our third hypothesis:

Hypothesis 3: The development of tertiary industry could contribute to the VC spatial cluster.

4. Regression analysis on VC's spatial clustering

4.1 Data collection and data processing

One of our primary data source is *CVSource*, which covers the VC/ PE investment events from 2009 to 2015. This database is built by *ChinaVenture Inc.*, which is an information consulting firm providing the data about Chinese VC industry. It mainly includes the VC/PE transaction of equity investment, the information of VCs and PEs, the exit information for each transaction, the information of funds raised or managed by each VCs and PEs. For the aforementioned variables depicting macro characteristics of each province, I extract the data from the Chinese Statistic Yearbook, which is built by National Bureau of Statistics of China.

Firstly, I extract the transaction data recording VC investment to each funded firm from 2009 to 2015, including but not limited to the industry of the funded firm, the investment amount, the investment stage and the location of the firm from *CVSource*. Then I calculate the number of VC projects and the capital raised by all enterprise firms in each province, the latter is also the total VC investment amount into that province. Lastly I match all information above (the number of VC projects, the total investment amount in the province) and the aforementioned variables describing macro characteristics of different provinces together. We can only get the total amount of the data depicting each province's macro environment characteristics from the Chinese Statistic Yearbook. Considering the population base, I divide these data with the population in that province and get the value per capita.

4.2 Summary Statistics

Table 2: Descriptive statistics of variables explaining VC's spatial agglomeration

descriptive statistics of variables explaining VC's spatial agglomeration										
	NoProjects	LQ	Third (%)	HTEmp	Trans	RandD	NewExp	ForeignInv	GovCap	Fin
nobs	154	154.00	154.00	154	154	154	154	154	154	154
Minimum	1	0.00	29.30	618	393	10	14	4	126	373
Maximum	346	6.10	77.90	426330	12985	6397	8201	6151	8994	15603
1. Quartile	3	0.12	35.50	24001	1224	154	180	96	756	1030
3. Quartile	20	0.74	44.68	79114	2573	580	662	418	1589	2862
Mean	25	0.59	41.49	75852	2190	649	656	482	1459	2687
Median	7	0.30	39.15	44243	1782	340	369	211	1106	1607
Stdev	47	0.88	9.33	92842	1794	1081	1062	1029	1352	2912

4. 3 Measurement of VC spatial clustering effect

To explore what factors may explain the VC spatial clustering effect, we set up two regression equations:

4.3.1 Regression on number of VC projects in each province

(a) $$\mathrm{NoProjects}_{it} = \beta_0 + \beta_1 * \mathrm{GovCap}_{it} + \beta_2 * \mathrm{Third}_{it} + \beta_3 * \mathrm{Trans}_{it} + \beta_4 * \mathrm{Fin}_{it} + \beta_5 * \mathrm{RandD}_{it} + \beta_6 * \mathrm{HTEmp}_{it} + \beta_7 * \mathrm{ForeignInv}_{it} + \beta_8 * \mathrm{dummy\_developedprovince}_{it} + \varepsilon_{it}$$

For equation (a), we use the number of VC projects in each province to represent the degree of local VC agglomeration. In this regression, we set up five models. In the first model, we add *dummy_VCclusterprovince*, which is a dummy variable used to indicate whether the province belongs to "Guangdong", "Beijing", "Zhejiang", "Shanghai" in the OLS regression and find the coefficient of *dummy_VCclusterprovince* is positive under 1% significance level, suggesting that location factor does exert a positive effect on the VC geographical agglomeration: there are significantly more VC projects invested into economy developed provinces such as Beijing, Shanghai, Guangdong and Zhejiang. And this result is consistent with the statistics given by the 2016 Report of Chinese Venture Capital Development. In model (2) and (3), we do the panel data regression by using pooled OLS with province fixed effect and both province and year fixed effect. We find the coefficients of "*Third*", "*HTEmp*" and "*ForeignInv*" are significantly positive, suggesting that if the local government recruits more high-tech employers in the research work, takes active measures to introduce foreign capital and highly develops the tertiary industry, more VC institutions will fund their portfolio companies in the province and hence form the VC projects concentration. To further verify the result, In model (4) and (5) we use the province Fixed Effect estimator (FE) and First Difference estimator (FD) separately and find the coefficients of these three variables are still positively related to the VC projects number. Specifically, the coefficient of “*ForeignInv*” is still significant.

Table 3: Use the number of VC projects in each province as explained variable to do regression on VC spatial clustering effect

	Dependent variable:				
	NoProjects				
	OLS	*panel linear*			
	(1)OLS_dummy	(2)fixed_province	(3) fixed_provinceandyear	(4) FE	(5)FD
GovCap	−0.002	−0.003	−0.003	−0.002	−0.001
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Third	0.841**	1.201***	1.201***	0.102	−0.026
	(0.340)	(0.320)	(0.320)	(0.426)	(0.372)
Trans	−0.001	−0.002	−0.002	−0.004	−0.0004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Fin	0.0005	0.001	0.001	0.004	0.013**
	(0.002)	(0.002)	(0.002)	(0.003)	(0.005)
RandD	0.005	0.008	0.008	0.012	0.002
	(0.005)	(0.005)	(0.005)	(0.008)	(0.011)
HTEmp	0.0001***	0.0001***	0.0001***	0.00001	0.00002
	(0.00002)	(0.00002)	(0.00002)	(0.00004)	(0.00004)
ForeignInv	0.020***	0.020***	0.020***	0.014***	0.016***
	(0.003)	(0.003)	(0.003)	(0.005)	(0.006)
dummy_developedprovince	21.313***				
	(7.897)				
Constant	−30.502**	−44.200***	−44.200***		
	(12.705)	(11.908)	(11.908)		
Observations	147	147	147	147	118
R^2	0.869	0.862	0.862	0.390	0.263
Adjusted R^2	0.862	0.856	0.856	0.198	0.223
Residual Std. Error	17.563				
F Statistic	114.765***	124.492***	124.492***	10.158***	6.208***
Note:					*p<0.1; **p<0.05; ***p<0.01

4.3.2 Regression on Location Quotient

Since the allocation of social resource is unbalanced and there are large and persistent disparities in regional economy development in China, it is not objective to use an absolute indicator-the number of VC projects in each province to evaluate the degree of VC spatial agglomeration. Here we borrow a concept in Regional Economics-Location Quotient (LQ) to measure the VC spatial clustering in a region. It is a relative indicator which is more objective and comprehensive than the index we use in the last section.

Location Quotient (LQ) is a good metric to analyze how concentrated a particular industry, occupation, or demographic group is in a region as compared to the nation. "It is computed as an industry's share of a regional total for some economic statistic (earnings, GDP by metropolitan area, employment, etc.) divided by the industry's share of the national total for the same statistic".[1] As a quantitative statistic that measures a region's industrial specialization relative to a larger geographic unit (usually the nation), LQ can reveal what makes a particular region "unique" in comparison to the national average.

Suppose X is the amount of some asset in a region (e.g., high-tech employers), and Y is the total amount of assets of comparable types in the region (e.g., all employers). X/Y is then the regional "concentration" of that asset in the region. If X' and Y' are similar data points for some larger reference region (like a state or nation), then the LQ or relative concentration of that asset in the region compared to the nation is (X/Y) / (X'/Y'). [2]

Here we define the LQ of VC clustering degree in each province as:

$$LQ\_VCclustering_i = \frac{I_i/F_i}{I_n/F_n}$$

, where I_i/F_i is the fraction of the province's VC investment amount to the

1 http://www.economicmodeling.com/2011/10/14/understanding-location-quotient-2/
2 https://www.geoib.com/location-quotients.html

province’s total output value of financial industry in that year, and I_n/F_n is the country’s VC investment amount to the country’s total output value of financial industry in that year.

If $LQ\_VCclustering_i$>1, this indicates a high spatial concentration of the VC investment in the given province, compared to the average share of each province.

If $LQ\_VCclustering_i$=1, the VC investment has a share of the total financial industry output value in accordance with its share of the base.

If $LQ\_VCclustering_i$<1, then the spatial clustering level of that province is lower than the nation’s average.

Here, we use the LQ of VC clustering degree in each province as the explained variable to build our second regression:

(b) $\mathrm{LQ_{it}} = \beta_0 + \beta_1 * \mathrm{Third_{it}} + \beta_2 * \mathrm{HTEmp_{it}} + \beta_3 * \mathrm{RandD_{it}} + \beta_4 * \mathrm{ForeignInv_{it}} + \beta_5 * \mathrm{NewInv_{it}} + \beta_6 * \mathrm{GovCap_{it}} + \beta_7 * \mathrm{Trans_{it}} + \beta_8 * \mathrm{Dummy\_developedprovince_{it}} + \varepsilon_{it}$

The first column of the following table lists out the OLS estimation result of model (1), where we add the variable *dummy_VCclusterprovince* in the regression. The estimated effect of *RandD* is about 0.001, significantly under 1% significance level. It means that if the expenditure spent on R&D increases by 1%, the LQ value will increase by 0.001%, the changes of R&D expenditure and LQ are positively related. In model (2) and (3), we do the panel data regression by using pooled OLS with province fixed effect and both province and year fixed effect and find the result is similar to what we have done before: there is a significant positive relationship between value of LQ and factors “*Third*”, “*ForeignInvt*” and “*RandD*”. Here “*RandD*” and “*HTEmp*” has the same function to explain the external macro environment, both of which represent the intensity of government input on technology research. In model (4) and (5) we use the province Fixed Effect estimator (FE) and First

Difference estimator (FD) separately in the regression and find some coefficients of variables turn negative, but the effect is not significant. Specifically, the coefficient of "*RandD*" is still positive under 1% significance level in model (4) and (5), suggesting that high expenditure on R&D exerts quite a strong effect on the increase of VC agglomeration degree.

To sum up, when we use LQ of each province as the explained variable to do regression on VC spatial clustering effect, the result is still consistent with our hypotheses.

Table 4: Use the LQ in each province as the explained variable to do regression on VC spatial clustering effect

	Dependent variable:				
	LQ				
	OLS	*panel linear*			
	(1)OLS_dummy	(2)fixed_province	(3) fixed_provinceandyear	(4) FE	(5)FD
Third	0.028***	0.026***	0.026***	−0.003	−0.001
	(0.009)	(0.008)	(0.008)	(0.011)	(0.009)
HTEmp	0.000	0.000	0.000	0.000	0.000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
RandD	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
ForeignInv	0.0002**	0.0002**	0.0002**	−0.000	−0.000***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
NewExp	−0.0002	−0.0002	−0.0002	−0.0001	−0.0002
	(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0001)
GovCap	−0.00002	−0.00002	−0.00002		
	(0.0001)	(0.0001)	(0.0001)		
Trans	−0.0001***	−0.0001***	−0.0001***	−0.0001	−0.00003
	(0.00005)	(0.00005)	(0.00005)	(0.0001)	(0.0001)
dummy_developedprovince	−0.084				
	(0.224)				
Constant	−0.642**	−0.586**	−0.586**		
	(0.322)	(0.285)	(0.285)		
Observations	147	147	147	147	118
R^2	0.725	0.725	0.725	0.247	0.142
Adjusted R^2	0.709	0.711	0.711	0.019	0.103
Residual Std. Error	0.484				
F Statistic	45.561***	52.374***	52.374***	6.129***	3.194***
Note:					*p<0.1; **p<0.05; ***p<0.01

5. The influence of location factor on the VC investment performance

In the last section, we have explored the determinants of VC spatial clustering and explain the reasons behind the provincial preference of VC investment in China. The input of foreign investment, the involvement of high-tech employees and R&D expenditure, as well as the development of tertiary industry could contribute to the VC geographical agglomeration.

According to J. L. Christensen, the competence intensity and agglomeration degree are argued to go hand-in-hand (Christensen J.L., 2007). In the initial stage, VC investment performance tends to increase as more and more VC institutions concentrate in the VC cluster regions because they could make full use of the local cluster advantage of supportive institutions and knowledge spillovers. But in some districts where the competence among VCs is so strong that some members' performance is not as good as their counterparts in the non-VC clustering districts. So the location factor does not necessarily lead to an outstanding performance of VC institutions. In this section, we want test whether the location factor could have an impact on VC investment performance and to what extent it could exert the influence.

5.1 Measurement of the VC investment performance.

According to Wang L. F. and Wang S.S (2011), we can use some indirect methods to measure the VC investment performance such as exit rate, the fraction of successful exit to the total funded project for a certain VC. But she pointed out that IRR is the most direct method to measure the performance of VC investment. Internal Rate of Return (IRR) is a metric that is internationally recognized to estimate the profitability of VC institutions, i.e., "the discount rate that makes the net present value of all cash flows from a particular project equal to zero”.[3] The higher an enterprise firm’s internal rate of return, the more desirable it is to attract the LPs to invest into the project. However, the international measurement of VC institution’s performance focuses more on the whole portfolios. A VC fund usually has a portfolio of many projects with different payback periods and exit rates, so we can get the final IRR only when the whole capital fund ends up generating. Compared with Return on Investment (ROI), IRR is comparatively more accurate because it takes the time value of money into consideration. In the academic research of Manigart (2002), Hege and Palomino (2003), Cumming and Walz (2009), IRR is widely adopted to measure the income, and Chinese scholars also use IRR to calculate the performance of VC investment, such as Tan Y. (2012), Qian P. and Zhang W. (2007). So in this paper we use IRR to measure the VC exit performance:

$$R = \sqrt[\text{Dura}]{\frac{\text{Return}}{\text{Invt}}} - 1$$

5.2 Control of other variables

VC investments in China vary along several dimensions such as size, stage, voting control, duration, and location (Walker and Pukthuanthong, 2009). To investigate the influence of location factor on the VC investment performance, we divide the determinants of VC performance into two groups: VC-specific and transaction-specific characteristics.

The first group of independent variables describes the characteristic of VC firms, which are measured from two dimensions. One is the measurement of VC firm’ working experience, we use the difference between the year when the VC firm was founded and the deal year *(Dtime)* and the number of portfolio companies that the VC has invested before the deal year *(History)* to describe; And the other is the measurement of capital amount under VC firm’s management, which is abbreviated as

[3] https://www.investopedia.com/terms/i/irr.asp

"*VCscale*" in our regression. In the west, investors mainly concentrate on profit maximization, efficiency promotion and public information disclosure. On the contrary, personal relationship, networking and harmony are ranked highly in East Asia (Ahlstrom and Bruton, 2001). Since it takes time to develop the "*guanxi*" networks, we have sufficient reasons to believe that the more working experience a VC firm owns, the more likely the venture capitalists could offer and provide benefits to the parties with which they aim to establish a close relationship and improve their investment performance.

The second group variables concentrate on the transaction level and mainly describe the characteristic of transaction between VC firms and enterprise companies. They consist of the following six variables: Investment period, which is the difference between the deal year and the exit year (*Dura*); the aggregate capital invested into the funded firm (*Invt*); dummy variable indicating whether the project is a syndicated investment (*Synd*); dummy variable indicating whether the project's capital resource is coming from foreign investment (*Cap_source*), dummy variable indicating whether the VC project exits through an IPO (*Exit)* and dummy variable indicating whether the enterprise firm belongs to the high-tech industry (*Industry*). Take "*Exit*" for example, exiting an investment through an IPO tends to be the most profit venue for venture capitalists (Xiao, 2002). *Venture Economics* (1998) reports that "every $1 invested in a firm that later has an IPO will generate a profit of $1.95, whereas every $1 invested in a firm that is acquired only generates a profit of $0.40". So we believe the dummy variable "*Exit*" could have a positive effect on the VC investment performance. Table 5 summarizes the meaning of these variables.

Table 5: Definition of variables explaining the VC investment performance

Variables	Definition
VC firm-specific characteristic	
Dtime (Year)	the difference between the year when the VC firm was founded and the deal year.
History	the number of portfolio companies the VC has invested before the deal year
Vcscale ($ million)	the capital amount under the management of VC firm
Transaction-specific characteristic	
Dura (Year)	investment period, which is the difference between the deal year and the exit year
Invt ($ million)	the aggregate capital invested in the enterprise firm
Synd	dummy variable to indicate whether the project is a syndicated investment (1: syndicated investment; 0: otherwise)
Cap_source	dummy variable to indicate whether the capital comes from foreign investment (1: foreign; 0: domestic, domestic and foreign)
Exit	dummy variable to indicate whether the project exits through IPO (1: IPO; 0: M&A , trade sale and others)
Industry	dummy variable to indicate whether the enterprise firm belongs to the high-tech industry (1: Yes; 0: otherwise)
Location	dummy variable to indicate whether the VC firm is located in VC clustering regions: Guangdong, Beijing, Shanghai and Zhejiang (1: Yes; 0: Otherwise)

5.3 Data collection and data processing

With a history of 20 years in Chinese market, VC industry has performed well and become an indispensable incubator for economy development. But the collection of VC data, especially those recording VC turnaround and performance showed great difficulty in real practice because the data are not complete. In this section, we use the transaction data in *CVSource* from 2013 to 2015 to do the regression.

In order to construct the first dataset of VC investment transaction, we process the data in several steps. Firstly, we mainly focus on Chinese VC institutions, so we select those VCs whose center and office are both located in mainland China and drop out the non-domestic data, PEs or Angel Investments, and samples with incomplete VC information. This leaves me 449 exit records, representing 276 portfolio companies receiving investment from 387 VC firms.

Considering the fact that VC investment performance is based on each project, we need to transform the data from the transaction level into exit level, each of which incorporates the exit information of the funded project and basic information of VC firm. In order to achieve this, we firstly extract the exit information for each transaction from 2013 to 2015 and then merge it with the data recording the VC information, including who invested in the particular start-up in a specific year. For the purpose of eliminating the effect of extreme values, we winsorize the numeric values by setting the top and bottom 1% of the sample to the 1% quartile and 99% quartile of the sample data respectively. Finally, we do multivariate regression on these data.

5.4 Summary statistics

In our sample data we have 449 exit records, representing 276 portfolio companies receiving investment from 387 venture capital firms. In Table 6 (Panel A), we summarize the geographical distribution of these VC firms' headquarters. We find that more than 60% of these VC firms are concentrated in eastern and coastal provinces. Beijing, Shanghai, Guangdong and Zhejiang are still the most centralized areas where the venture capitalists prefer to locate their firms.

Table 6: Province Distribution of VC firms (Panel A)

Province	Freq.	Percentage	Cum.
Guangdong	112	24.94%	24.94%
Beijing	93	20.71%	45.66%
Zhejiang	43	9.58%	55.23%
Shanghai	37	8.24%	63.47%
Jiangsu	36	8.02%	71.49%
Hunan	13	2.90%	74.39%
Fujian	12	2.67%	77.06%
Shandong	12	2.67%	79.73%
Chongqing	11	2.45%	82.18%
Hubei	10	2.23%	84.41%
Anhui	8	1.78%	86.19%
Sichuan	8	1.78%	87.97%
Inner Mongolia	7	1.56%	89.53%
Henan	6	1.34%	90.87%
Shanxi	6	1.34%	92.20%
Tianjin	6	1.34%	93.54%
Guangxi	5	1.11%	94.65%
Liaoning	4	0.89%	95.55%
Yunnan	4	0.89%	96.44%
Jilin	3	0.67%	97.10%
Heilongjiang	2	0.45%	97.55%
Jiangxi	2	0.45%	98.00%
Ningxia	2	0.45%	98.44%
Qinghai	2	0.45%	98.89%
Shanxi	2	0.45%	99.33%
Gansu	1	0.22%	99.55%
Hebei	1	0.22%	99.78%
Xinjiang	1	0.22%	100.00%
Total	449		

In Table 6 (Panel B), we summarize the industry distribution of portfolio companies, including traditional industry and high-tech industry. Among the 449 VC recipients, over 40% belongs to IT technology and bio-pharmaceutical sectors, which reflects the fact that much of the accelerating investment focused on high-tech investments tied to the internet boom and China's high-tech industry has undergone explosive development.

Table 6: Industry Distribution of portfolio companies (Panel B)

Industry	Freq.	Percentage	Cum.
Traditional industry			
Chemical materials and chemical products	20	4.5%	4.5%
Equipment	84	18.7%	23.2%
Furniture and architecture	33	7.3%	30.5%
Food manufacturing	12	2.7%	33.2%
Mining and metals	22	4.9%	38.1%
Petroleum processing	1	0.2%	38.3%
Real estate	6	1.3%	39.6%
Textile, Garment and shoes	7	1.6%	41.2%
High-tech industry			
Electronic product	27	6.0%	47.2%
Environmental protection industry	21	4.7%	51.9%
IT industry	32	7.1%	59.0%
Pharmaceutical products	37	8.2%	67.3%
Tele-communication and computer	14	3.1%	70.4%
Website, game and e-commerce	74	16.5%	86.9%
Others	59	13.1%	100.0%
Total	449		

Then we do the significance test on spatial difference. Firstly, we divide the 28 provinces into two groups, one is the VC clustering regions represented by Beijing, Shanghai, Guangdong and Zhejiang, and the remaining provinces are classified as the non-VC clustering regions automatically. In Table 7 (Panel A) we compare the VC investment performance of these two groups and find IRR in the four VC clusters mentioned above is 6% higher than that of non VC clustering regions. Additionally, the F-test (p value <0.001) also supports that there is significant difference on VC investment performance between different regions. Then we do the significant difference test based on different exit methods and exit years. The results are shown in Panel B and Panel C.

Table 7: Comparison of IRR among different regions (Panel A)

sample:	freq.	average	stdev	p value	
VC clustering regions	285	10.52%	0.17	0.00044	***
non VC clustering regions	164	4.85%	0.14		
Total	449				

Table 7: Comparison of IRR among different regions in different years (Panel B)

	VC clustering district			non VC clustering district				
Year	freq.	average	stdev	freq.	average	stdev	p value	
2013	47	8.64%	0.21	29	-1.46%	0.15	0.025518	**
2014	134	14.86%	0.17	87	6.15%	0.17	0.000058	***
2015	104	5.78%	0.24	48	303.14%	0.16	0.84	

Table 7: Comparison of IRR among different regions based on exit methods (Panel C)

	VC clustering district			non VC clustering district				
Exit	freq.	average	stdev	freq.	average	stdev	p value	
IPO	123	13.81%	0.187	69	6.69%	0.14	0.0063962	***
M&A	151	8.07%	0.160	92	3.20%	0.14	0.0176538	**
Others*	11	7.37%	0.163	3	13.46%	0.06	0.55	

*Others include trade sale, liquidation etc.

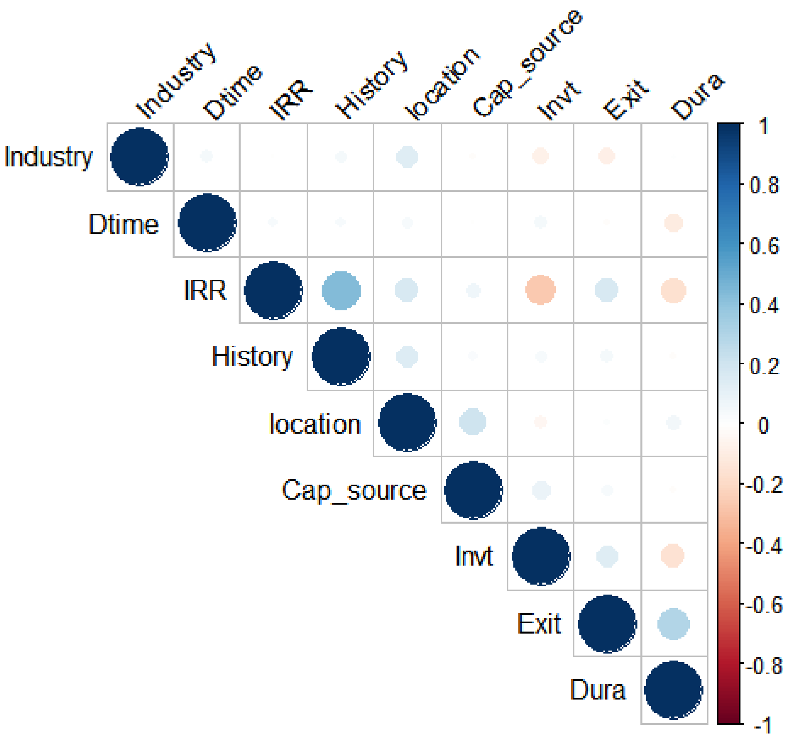
Table 8: Summary statistics for the key variables explaining the VC investment performance

	IRR	location	Exit	Industry	Cap_source	Dura	Invt	History	Dtime	Vcscale	Synd
nobs	449	449	449	449	449	449	449	449	449	449	449
Minimum	-50.11	0	0	0	0	0.29	0.03	0	0	0	0
Maximum	76.47	1	1	1	1	14.43	247.89	91	39.21	13600	1
1. Quartile	-3.31	0	0	0	0	2.27	2.10	1	2.44	161.29	0
3. Quartile	18.09	1	1	1	1	4.45	8.14	13	9.59	2000	1
Mean	8.45	0.63	0.43	0.37	0.41	3.65	10.90	11.04	6.23	1741.38	0.60
Median	9.39	1	0	0	0	3.59	3.90	3	5.01	792.38	1
Variance	273.52	0.23	0.25	0.23	0.24	4.25	657.82	348.47	24.95	5810087.47	0.24
Stdev	16.54	0.48	0.50	0.48	0.49	2.06	25.65	18.67	4.99	2410.41	0.49

Before doing the regression, we need to check the correlation between variables to prevent the multicollinearity problem. Table 9 lists the correlation of key variables. From the plot below, we can vividly see most variables do not have strong correlation with each other.

Table 9: Correlation between variables explaining the VC investment performance

	location	Exit	Industry	Cap_source	Dura	Invt	History	Dtime	Vcscale	log_Vcscale	Synd
location	1										
Exit	0.01	1									
Industry	0.14	-0.09	1								
Cap_source	0.21	0.04	-0.01	1							
Dura	0.06	0.3	0.01	-0.01	1						
Invt	-0.05	0.13	-0.07	0.09	-0.16	1					
History	0.14	0.05	0.04	0.03	-0.01	0.03	1				
Dtime	0.04	-0.01	0.05	0.00	-0.10	0.05	0.03	1			
Vcscale	0.04	0.06	0.03	0.03	0.02	0.19	0.24	0.31	1		
log_Vcscale	0.06	0.02	0.02	0.03	0.08	0.16	0.38	0.29	0.73	1	
Synd	0.05	-0.01	0.02	-0.08	0	-0.03	-0.02	0	-0.05	-0.10	1



Graph 3: correlation plot between variables explaining the VC investment performance

5.5 Regression Analysis

Table 10: Regression on VC investment performance (with no interaction term)

	Dependent variable:			
	IRR			
	(1)	(2)	(3)	(4)
Dtime	−0.109		−0.036	
	(0.145)		(0.130)	
History		0.359***	0.358***	0.369***
		(0.034)	(0.034)	(0.033)
Dura	−2.655***	−2.486***	−2.497***	−2.478***
	(0.359)	(0.319)	(0.322)	(0.319)
Invt	−0.247***	−0.242***	−0.242***	−0.231***
	(0.028)	(0.025)	(0.025)	(0.025)
Vcscale	0.001***	0.0004	0.0004	
	(0.0003)	(0.0003)	(0.0003)	
Synd	−0.887	−0.670	−0.666	
	(1.405)	(1.258)	(1.259)	
Cap_source	1.636	1.756	1.750	
	(1.434)	(1.283)	(1.284)	
Exit	9.838***	9.181***	9.184***	9.363***
	(1.481)	(1.326)	(1.328)	(1.323)
location	5.206***	3.280**	3.293**	3.488***
	(1.477)	(1.333)	(1.336)	(1.290)
Industry	−0.922	−1.210	−1.198	
	(1.439)	(1.287)	(1.289)	
Constant	12.275***	9.661***	9.872***	9.707***
	(2.204)	(1.831)	(1.988)	(1.553)
Observations	449	449	449	449
R^2	0.247	0.397	0.397	0.390
Adjusted R^2	0.232	0.385	0.384	0.383
Residual Std. Error	14.494 (df = 439)	12.971 (df = 439)	12.985 (df = 438)	12.989 (df = 443)
F Statistic	16.031*** (df = 9; 439)	32.147*** (df = 9; 439)	28.879*** (df = 10; 438)	56.669*** (df = 5; 443)
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 11: Regression on VC investment performance (with interaction term)

	Dependent variable:			
	IRR			
	(1)	(2)	(3)	(4)
Dtime	−0.031	−0.051	−0.037	−0.034
	(0.130)	(0.130)	(0.130)	(0.130)
History	0.358***	0.353***	0.356***	0.357***
	(0.034)	(0.034)	(0.034)	(0.034)
Dura	−2.484***	−2.527***	−2.487***	−2.496***
	(0.322)	(0.320)	(0.321)	(0.322)
Invt	−0.273***	−0.249***	−0.241***	−0.242***
	(0.038)	(0.025)	(0.025)	(0.025)
Vcscale	0.0004	−0.0004	0.0004	0.0004
	(0.0003)	(0.0004)	(0.0003)	(0.0003)
Synd	−0.703	−0.834	2.251	−0.668
	(1.259)	(1.255)	(2.055)	(1.260)
Cap_source	1.737	1.696	1.722	0.742
	(1.284)	(1.278)	(1.281)	(2.274)
Exit	9.064***	9.206***	8.999***	9.220***
	(1.332)	(1.321)	(1.328)	(1.330)
location	2.705*	1.252	6.053***	2.785*
	(1.447)	(1.597)	(2.036)	(1.637)
Industry	−1.204	−1.157	−1.339	−1.190
	(1.289)	(1.283)	(1.288)	(1.290)
Invt:location	0.052			
	(0.050)			
location:Vcscale		0.001**		
		(0.001)		
Synd:location			−4.656*	
			(2.597)	
Cap_source:location				1.475
				(2.744)
Constant	10.324***	11.499***	8.272***	10.137***
	(2.033)	(2.100)	(2.175)	(2.050)
Observations	449	449	449	449
R^2	0.399	0.405	0.402	0.398
Adjusted R^2	0.384	0.390	0.387	0.383
Residual Std. Error (df = 437)	12.983	12.921	12.952	12.995
F Statistic (df = 11; 437)	26.361***	26.994***	26.678***	26.237***
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 10 and Table 11 show the results of regression on VC investment performance with and without interaction terms respectively. From the estimated coefficients for the VC-specific control variables, we find that a one percent increase in the "*History*" is associated with approximately 0.35 percent direct increase in the exit IRR of VC project. And the exit method also exerts significant positive influence on the VC investment performance. We can find the coefficients of "*Exit*" are positive under 1% significance level in all models listed in Table 10 and Table 11, so we believe exiting the VC project by means of IPO tends to be the most profitable venue for investors compared with acquisition, trade sale and liquidation.

For the "*location*" factor, we did not add interaction terms in Table 10 and find the coefficients of "*location*" are significant positive in all models, suggesting that VC projects invested in economy developed and VC clustering provinces such as Beijing, Shanghai, Guangdong and Zhejiang usually have significantly higher exit IRR than other regions. In Table 11, we add interaction terms and find the coefficients of "*location*" are significant in all models except for the second one, but when we add the interaction term with "*VCscale*", the coefficient of the interaction term becomes positive and is significant. This can also support our hypothesis that the location factor does play an active role in enhancing VC investment performance.

6. Conclusion

This paper mainly explores the determinants of VC spatial clustering and explains the reasons behind the provincial preference of VC investment in China. There are significantly more VC projects invested into Beijing, Shanghai, Guangdong and Zhejiang because of the nature of knowledge agglomeration and capital agglomeration in these provinces. The involvement of high-tech employees and R&D expenditure, the input of foreign investment, as well as the development of tertiary industry could contribute to the VC regional concentration. Then we test whether the agglomeration of VCs could have an impact on the VC investment performance. The answer is yes. Controlling for other VC-specific and transaction-specific variables, we find the location factor could still exert significant positive effect on the project's exit IRR, suggesting that projects invested in a VC cluster could achieve higher profit than those invested in other regions.

As a high-risk and high-reward industry, VC attracts the attention of promising start-ups which lack access to other capital source (Pukthuranthong and Walker, 2007). As it is growing, more and more players enter into the VC industry and the distribution of VC firms displays a high degree of agglomeration. This spatial concentration allows the VC firms to diversify risks and benefit more from close proximity to customers or suppliers, access to high quality labor and knowledge spillovers from nearby firms. Venture capitalists work closely to share information with entrepreneurs, investment bankers, lawyers and a variety of other institutions to identify investment opportunities, process investments, and mobilize resources for their investee companies in a quick and efficient manner. The spatial concentration advantages create a positive cycle: The more firms that are located in a cluster, the more advantageous it is for a new firm to start up there. This "VC clustering, return increasing" feedback loop continues until the density of VC firms in the region reaches a point where the cost of overcrowding, such as high rent price, traffic jam, and excess competition, offsets the benefits from agglomeration (Jun Zhang, 2011)

Suggestions for the market participants:

We suggest the local government to recruit more high-tech employers in the scientific research work, take active measures to introduce foreign investment and highly develop the tertiary industry, thus more VC institutions will fund their projects in the province. The establishment of well developed VC networks in the region will significantly speed up the pace of local technological industrialization, and in return, the improvement of high-tech knowledge could help start-up firms develop innovative pipelines for new products and service to become financially successful.

Limitation

The main limitation of my study is the small sample size. Condition permitting, we could extract the transaction data recording VC investment to each funded firm in a longer time horizon and take the influence of government policy into consideration, such as the split-share reform, the government adjustment of real estate price etc. My study lays a foundation for future research including deeper analysis of Chinese VC's location selection and investment strategies. Finally, it would also be of interest to conduct qualitative interviews with professional VC investors to get more comprehensive understanding of their investment selection and their response to macro economy policy.

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