

DETERMINANTS OF VENTURE CAPITAL IN THE PEARL RIVER DELTA REGION

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Abstract

Venture capital is an important financial institutional arrangement for technology enterprises to obtain equity capital financing, and it is an important driving force in the process of integrated collaborative innovation in the Pearl River Delta region. Therefore, it is necessary to ensure the increasing trend of venture capital investment in the Pearl River Delta region. However, there is not enough evidence to examine the factors affecting venture capital in the Pearl River Delta region, as past researchers have focused research in this area on more macro areas. Therefore, this study explored the influencing factors of venture capital investment in the Pearl River Delta region. Using the method of econometrics, the panel data of NINE (9) prefecture-level cities in the Pearl River Delta region from 2001 to 2021 are selected as samples, and the panel measurement model was constructed by using statistical software for analysis. The empirical results show that, government policy environment, financial development level, scientific and technological innovation level, human resource environment, economic development level, intermediary service organization development level and information infrastructure level had affected the development of venture capital in the Pearl River Delta region. Therefore, by integrating these attributes into the relevant environment of the region, the development of venture capital in the Pearl River Delta region will be improved.

Keywords: Pearl River Delta Region, Venture Capital, Influencing Factors

1. INTRODUCTION

At present, with the spatial transfer of the venture capital industry worldwide, the focus of the development of the venture capital industry has gradually shifted to the developing countries, and the developing countries represented by China will become the focus and hot spot of the future venture capital research. China has become an important part of the global venture capital market, and the Pearl River Delta is an important part of the Chinese venture capital market. Venture capital is an important factor to promote innovation. Venture capital is the combination of financial capital and knowledge capital. As an important driving force of innovation, venture capital is reflected in providing funds for the innovation process, and even involves the spillover of knowledge and technology to promote the transformation of innovation into productivity and realize economic benefits (Cheng Siwei, 2008). The important role of venture capital in innovative economic development and regional economic growth has been widely recognized (Martin, Sunley and Turner, 2002).

Located in the central and southern part of Guangdong Province, China, the Pearl River Delta was called Guangzhou Province during the Ming and Qing Dynasties. It is the core area and flourishing place of Guangdong culture, covering nine cities including Guangzhou, Foshan, Zhaoqing, Shenzhen, Dongguan, Huizhou, Zhuhai, Zhongshan and Jiangmen. The total area of

the nine PRD cities is 55368.7 square kilometres, accounting for less than one third of the total territory of Guangdong Province. The pearl river delta region is China's population agglomeration, active economic development, high degree of openness, strong innovation ability, one of the pearl river deltas in China's national modernization construction and all-round open pattern has important strategic position, is the reform of Guangdong economic take-off, is also a new era of new journey lead the important engine driving the development of Guangdong. During his visit to Guangdong in October 2018, General Secretary Xi Jinping placed high hopes for the Pearl River Delta region, requiring Guangdong to accelerate the formation of a new pattern of coordinated regional development, make the core area of the Pearl River Delta region better and stronger, and point out the direction for the development of the Pearl River Delta in the new era.

By the end of 2021, the total permanent resident population of the Pearl River Delta region at the end of the year was 78.606 million, accounting for 61.97% of the province. The total GDP reached 10058525 billion yuan, exceeding 10-billion-yuan, accounting for 80.9% of the province's GDP. The three industrial structure of the Pearl River Delta urban agglomeration has been continuously optimized. Compared with 2012, the proportion of added value of the primary industry and secondary industry in GDP decreased by 0.3 and 6.2 percentage points respectively in 2021, the proportion of added value of the tertiary industry in GDP increased by 6.5 percentage points, and the proportion of the tertiary industry has increased significantly. From the per capita GDP of the nine cities in the Pearl River Delta region in 2021, the gap in economic development level among the regions is significant. The per capita GDP of Shenzhen, Zhuhai and Guangzhou is more than 150,000 yuan, while the per capita GDP of Huizhou, Zhongshan, Jiangmen and Zhaoqing is less than 90,000 yuan. There is a large gap in regional economic development in the Pearl River Delta region. The proportion of the added value of the tertiary industry is also different in GDP. The added value of the tertiary industry in Guangzhou has the highest proportion of GDP, reaching 71.6%, 62.9% in Shenzhen, and only 41.1% in Zhaoqing.

The Pearl River Delta region is not only a strong economic active growth pole in China, but also the core area and main engine of Guangdong province leading the development of the whole province. The Pearl River Delta region is the earliest development of venture capital in China, and venture capital activities are at a high level in the country. By the end of 2021, the amount of venture capital in the Pearl River Delta region had reached 121.946 billion yuan, and the number of venture capital cases in the Pearl River Delta region had reached 558, accounting for 11.9% and 16.9% of the national total, respectively. The Pearl River Delta region is a very important economic region in China, and its status is very important (Chan, F. K. S. et al., 2021). Regarding venture capital, many studies have been done on the United States, China, and other regions (Jeong, J. et al., 2020; Schwartz, 2007; Fritsch 2012), but the Pearl River Delta region have been not investigated.

Therefore, how to clarify the development law of entrepreneurial venture capital in the Pearl River Delta and how to deepen the connection between venture capital among cities in the Pearl River Delta region are not only the need of top-level design, but also the urgent problem to be

solved. It appears to be important and worthy of investigation in the context of the development of venture capital and its influencing factors in the Pearl River Delta urban agglomeration. The main research question is:

To what extent does government policy, financial development level, technological innovation level, human resource environment, economic development level, intermediary service organization development level and information infrastructure level influence the Pearl River delta region in China?

2. LITERATURE REVIEW

A stable and high-level macroeconomic environment provides a good basis for the development of start-ups, such as broad market development space, low entrepreneurial risks, and costs (Zhuang Delin et al., 2020). Under different assumptions, recent evidence suggests that tax policies and regulatory measures provided by the government can play a positive role by reducing information asymmetry (Anson Wong, 2014). Policy environment is one of the important factors affecting venture capital. Many governments have begun to recognize the benefits of venture capital, and venture capital activities initiated and funded have increased significantly worldwide (Gilbert, Audretsch and Mc Dougall, 2004). Government policy can act as a catalyst to stimulate private capital flows and investment (Jeng and Wells, 2000). Government guide fund can effectively absorb social capital, and then improve the scientific and technological innovation ability of science and technology innovation enterprises (Othmar, 2014).

The level of local financial development can promote the development of venture capital in Ningbo (Ma Xiang and Li Xianqiang, 2019). Surveys showed that GDP growth, industrial production index and unemployment rate can significantly predict the amount of venture capital invested in the US (Ning and Wang, 2015). By analysing the statistical data of 14 European countries from 1988 to 2001, Italian scholars found that the degree of financial market openness to venture enterprises has a very important impact on the returns of both high-tech venture capital and venture capital in the early stage (Bottazzi, L. and Da Rin, 2004).

There is a positive correlation between venture capital and technological innovation, and the two interact (Liu Guang and Liu Yiping, 2019). This paper studies the favourable factors of the development of venture capital in Silicon Valley. The results show that its advanced technological innovation ability and rich financial resources make Silicon Valley the centre of venture capital in the world (Chahine, 2012). Recent evidence suggests that The reasons for the birth of venture capital in the United States are not only the continuous flow of technological inventions, patents and achievements, but also the environmental factors that promote venture capital such as capital, technology-oriented knowledge and free entrepreneurial spirit (Kortum and Lerner, 2001). The scale inside the city also confirms the trend that venture capital tends to gather in financial or high-tech centres (Chen Fei Fei & Cheok Mui Yee, 2023).

A number such as researchers have reported that Innovation patent is the cause of venture capital, and innovation creates the demand for venture capital, this is an empirical analysis

based on European panel data (Geronikolaou and Papachristou, 2012). The researchers carefully analysed the internal relationship between investment and entrepreneurship and industrial technological innovation in the process of economic and social development in India, a South Asian country, and made an empirical analysis. Finally, they concluded that the mutual influence between the two was highly positive (Bowonder Sunil and Mani, 2004). Schertler (2007) collected relevant data of 15 Western European countries for empirical research, and the research results pointed out that the development of science and technology finance in a region cannot be separated from the maintenance of regional policies and regulations and the popularization of innovation consciousness. The level of an investment fund management team is related to the quality of local professionals, and regions can promote the progress of local venture capital by improving the talent training mechanism and the quality of talents (Patzelt, 2010). Investment activities are forced to gather within a certain range due to the restriction of spatial proximity due to local human capital and social network (Madhavan, 2012).

Ning and Wang (2015) found that US GDP growth, industrial production index and unemployment rate can significantly predict its venture capital scale. The spatial distribution of venture capital is closely related to the local economic level. Venture capital is mostly distributed in economically developed regions such as North America and Europe (Subhash, 2007). Fang Jiawen and Liu Haimeng (2017) tested that there was a strong positive correlation between the level of economic development within entrepreneurship in Beijing-Tianjin-Hebei urban agglomeration and venture capital. However, there are also opposite views. According to research by (Chen Gongmeng, 2008), the uneven distribution of venture capital in China is caused by local macro-economic level, government policy environment, social and cultural consciousness, and other factors.

As for the intermediary service market, the study of (Shachmurove et al, 2012) shows that a region with perfect intermediary facilities supporting science and technology and finance will enhance the attractiveness of the region to venture capital. China's financial intermediary service market is still in a period of rising development, and eastern regions such as Shenzhen and Shanghai are developing rapidly. But in general, there is still a big gap with the United States and other developed countries, China accelerated the level of intermediary services to promote the development of venture capital (Gao Xiaoyan, 2003). Venture capital institutions and regional resource endowments, and proposed that different development stages, reputation, and the developed degree of intermediary service institutions of venture capital institutions affect the spatial agglomeration level of venture capital (Wang Xi and Dang Xinghua, 2013).

In terms of infrastructure, convenient transportation will affect the progress of investment and project selection. The regions with developed venture capital industry are often regions with convenient transportation, advanced communication equipment and complete public services. By means of social survey, about 90% of venture capital institutions expressed that convenient transportation could improve their cooperation and communication with the invested companies and help them to grasp the enterprise dynamics faster and better (Bemstein, 2016). The geographical distance between venture capital institutions and start-ups is very important, because if the geographical distance is too long, it will not be convenient for supervision during

the implementation of venture capital projects and the information transaction cost is high. However, the rapid transmission of information over the Internet will also reduce the remote cost of venture capital. Therefore, the role of infrastructure on venture capital and its impact on exit performance remain to be further studied (Long Yu and Li Yao, 2016).

3. METHODOLOGY

Using the method of econometrics, the panel data of 9 prefecture-level cities in the Pearl River Delta region from 2001 to 2021 are selected as samples, and the panel measurement model was constructed by using statistical software (SPSS and EVIEWS) for analysis.

This study adopts a quantitative research method, which is an empirical analysis method of econometrics. In this paper, the evaluation index system affecting the distribution of venture capital in the Pearl River Delta region is constructed, and a panel econometric model covering the seven influencing factors of venture capital in nine prefecture-level cities in the Pearl River Delta region from 2001 to 2021 is established. A longitudinal empirical study is conducted to quantitatively analyze the influencing factors of venture capital in the Pearl River Delta region. This paper analyzes the influencing factors and degree of entrepreneurial venture capital in the Pearl River Delta urban agglomeration and provides empirical support for the formulation of relevant policies for the sustainable development of entrepreneurial venture capital in the Pearl River Delta urban agglomeration. The study used secondary data. Based on the timeliness and availability of data, this paper will select relevant data from 2001 to 2021 from the entire region of the Pearl River Delta and nine prefecture-level cities, from the wind economy database, China City Statistical Yearbook, China Venture Capital Yearbook, etc.

4. RESULTS AND DISCUSSION

4.1 Distribution Analysis of Venture Capital in the Pearl River Delta Region

The scale of venture capital in the Pearl River Delta region is gradually expanding, and the investment amount accounts for about 14% of the whole country. The development of venture capital is driven by policies, consistent with the domestic macroeconomic environment situation, and fluctuates in response with the changes of the market economic cycle, showing an overall upward trend. Since 2004, many relevant policies have been issued, including the Interim Measures for the Management of Venture Capital, for foreign investment and venture capital, which has improved the policy environment for venture capital and stimulated the vigorous development of domestic venture capital. During the global financial crisis in 2008 and the Chinese stock market crash in 2013, the venture capital in the Pearl River Delta region experienced a slight decline. With the gradual recovery of the domestic macro economy, the total amount of investment gradually increased. In 2014, "Mass entrepreneurship risk, mass innovation" promoted the development of venture capital, and venture capital in the Pearl River Delta region began to achieve a substantial growth, reaching the peak of a decade in 2017. Affected by the tightening of financial regulatory policies, the venture capital investment in the Pearl River Delta region declined significantly in 2018 and increased in 2021.

The intensity of venture capital in the Pearl River Delta region has been on the rise since 2001, reaching its peak in 2006, and then declining year by year. After reaching the bottom in 2010, it began to rise with twists and turns. In 2021, the upward trend continues, and the investment intensity has increased from 105,22800 yuan in 2020 to 218,542,100 yuan per unit. The agglomeration effect of venture capital in the Pearl River Delta region is super prominent, and its development is unbalanced. The development of venture capital in Shenzhen stands out, and Shenzhen and Guangzhou jointly support the rapid development of venture capital in the whole Pearl River Delta region. Guangzhou and Shenzhen have become important regions for the development of venture capital in Guangdong Province.

In 2021, the investment amount and investment cases of the two cities accounted for 94.4% and 87.6% of the total amount of the whole region, respectively. In addition to Guangzhou and Shenzhen, the development of venture capital in the other seven cities in the Pearl River Delta region is slow, and the proportion of venture capital quota in the Pearl River Delta region is very small, all below 5%, and the internal development gap is gradually widening. It is obvious that the development of venture capital in the whole region has been divided into two echelons. The first-tier cities include Shenzhen and Guangzhou, and the second-tier cities include Zhuhai, Foshan, Zhongshan, Dongguan, Huizhou, Zhaoqing and Jiangmen. Driven by the two cluster centers of Shenzhen and Guangzhou, the venture capital of Zhuhai, Zhongshan, Foshan and Dongguan in the second-tier cities has grown rapidly.

4.2 Descriptive Statistics Of The Variables

From the descriptive statistical results, the minimum number of venture capital cases is 0, indicating that the number of venture capital cases in some cities is 0, and the standard deviation is 196.1317 respectively, reflecting the great difference in the distribution of venture capital in the nine cities in the Pearl River Delta region. Local government financial expenditure on science, ex-positos of financial institutions at year-end, loans of financial institutions at year-end, patent application, patent certified, total retail sales of consumer goods, per capital GDP, gross domestic product, number of subscribers of mobile telephones at year-end, revenue from telecommunication services, number of subscribers, the difference between the maximum and minimum values of these factors is large, so the fluctuations are large. The standard deviations of the tertiary sector of the economy as a percentage of GDP and proportion of GDP are 9.103684 and 9.607103, respectively, with small data fluctuations and small differences between maximum and minimum values.

4.3 Unit Root Test

Considering that the variable logarithmic number does not change its main properties, and the logarithmic number can also reduce the non-normal distribution and heterosexuality of the residuals, logarithm the variables. After logarithmic analysis, the ADF test was continued. The p-value of the variable ADF test is less than 0.05 after the first-order difference, and the null hypothesis was rejected. There is no unit root, that is, the first-order difference of all variables is stationary variables, and the regression analysis of the panel data can be conducted.

4.4 Regression Analysis of Panel Data in the Pearl River Delta

The panel models involving three models are mixed POOL model, fixed-effect FE model and random-effect RE model, which are first tested to find the optimal model. Based on the empirical result, the F test showed a 5% level of significance $F(8,166) = 12.195$, $p = 0.000 < 0.05$, meaning that the FE model is superior relative to the POOL model. The BP test showed a 5% level of significance of $\chi^2(1) = 20.109$, $p = 0.000 < 0.05$, meaning that the RE model was superior relative to the POOL model. The Hausman test showed a 5% level of significance $\chi^2(13) = 1273.859$, $p = 0.000 < 0.05$, meaning that the FE model is better compared to the RE model. Considering the above analysis, the FE model was used as the result. For local government financial expenditure on science, it shows a significance of 0.01 ($t = 2.956$, $p = 0.004 < 0.01$), and the regression coefficient value is $0.331 > 0$, indicating the local government financial expenditure on science has a significant positive impact on number of venture capital events. For deposits of financial institutions at year-end, it showed a significance of 0.01 ($t = 2.716$, $p = 0.007 < 0.01$), and the regression coefficient value was $0.054 > 0$, indicating that the deposits of financial institutions at year-end has a significant positive impact on number of venture capital events. For loans of financial institutions at year-end, it does not show significance ($t = -0.023$, $p = 0.981 > 0.05$), thus indicating that loans of financial institutions at year-end is not several venture capital events do not affect relationships. For patent application, it showed a significance of 0.05 ($t = 2.088$, $p = 0.038 < 0.05$), and the regression coefficient value was $0.332 > 0$, indicating that patent application had a significant positive impact on number of venture capital events.

For patent certified, it showed a significance of 0.01 ($t = -3.185$, $p = 0.002 < 0.01$), and the regression coefficient value was $-0.908 < 0$, indicating that patent certified would have a significant negative impact on number of venture capital events. For the number of students in regular institutions of higher education, it did not show significance ($t = -0.797$, $p = 0.426 > 0.05$), thus indicating that the number of students in regular institutions of higher education does not affect the number of venture capital events. For total retail sales of consumer goods, it showed a significance of 0.01 ($t = 2.726$, $p = 0.007 < 0.01$), and the regression coefficient value was $1.524 > 0$, indicating that total retail sales of consumer goods will have a significant positive impact on number of venture capital events. For per capita GDP, it did not show significance ($t = -0.664$, $p = 0.507 > 0.05$), so it shows that per capita GDP has no effect on number of venture capital events. For gross domestic product, it did not show significance ($t = 1.034$, $p = 0.303 > 0.05$), indicating that gross domestic product has no influence on number of venture capital events.

For the tertiary sector of the economy as a percentage of GDP, it did not show significance ($t = 0.176$, $p = 0.861 > 0.05$), thus indicating that the tertiary sector of the economy as a percentage of GDP is a relative to the number of venture capital events do not affect relationships. For the added value of the tertiary industry accounts for the proportion of GDP, it does not show significance ($t = 0.686$, $p = 0.494 > 0.05$), thus indicating that the added value of the tertiary industry accounts for the proportion of GDP has no effect on the number of venture capital events. For the number of subscribers of mobile telephones at

year-end, it does not show significance ($t=-1.201$, $p=0.231>0.05$), thus indicating number of subscribers of mobile telephones at year-end have no impact on number of venture capital events. For revenue from telecommunication services, it did not show significance ($t=-0.010$, $p=0.992>0.05$), thus indicating that revenue from telecommunication services is important for number of venture capital events do not affect relationships. For number of subscribers of internet services, it does not show significance ($t=-0.385$, $p=0.701>0.05$), thus indicating that number of subscribers of internet services is not significant ($t=-0.385$, $p=0.701>0.05$). Venture capital events do not affect relationships.

5. CONCLUSION

Based on the empirical result, the spatial distribution is significantly unbalanced, with Shenzhen dominating the list and supporting the rapid development of venture capital in the entire Pearl River Delta region. The Pearl River Delta region has formed two echelons, with Guangzhou and Shenzhen as the first echelon of the three agglomeration centres, and Zhuhai, Foshan, Dongguan, Zhongshan, Macao, Jiangmen and Zhaoqing as the second echelon.

In terms of the influencing factors of venture capital, the direction and degree of influence of venture capital in the Pearl River Delta region are further analyzed through empirical evidence. The study found that the Government policy environment, financial development level, economic development positive level, and Intermediary service level are all significantly positively correlated with venture capital, indicating that it can significantly increase the degree of venture capital in a city. Scientific and technological innovation level, Human resource environment and information infrastructure level were negatively correlated with venture capital, but they were not significant, indicating that the impact of these factors on venture capital was not obvious. In general, venture capital has become an irreplaceable force in the Pearl River Delta region to support entrepreneurial activities and promote economic growth. Financial development level, economic development level, and Intermediary service level can significantly increase the level of venture capital in a city. Therefore, whether it is the Pearl River Delta region or the nine cities in the Pearl River Delta region, in the future development, they can improve their government policy level, financial development level, economic development level and intermediary service level.

References

- 1) Anson Wong. (2014). The role of government in the venture capital market with asymmetric information. *Quantitative Finance*, 14(6), 1107-1114.
- 2) Bottazzi, L., Da Rin, M., & Hellmann, T. (2004). The changing face of the European venture capital industry: Facts and analysis. *The Journal of Private Equity*, 26-53.
- 3) Bowonder, B., & Mani, S. (2004). Venture capital and innovation: the Indian experience. *Financial Systems, Corporate Investment in Innovation, and Venture Capital*, 197.
- 4) Bernstein, S., Giroud, X., & Townsend, R. R. (2016). The impact of venture capital monitoring. *The Journal of Finance*, 71(4), 1591-1622.
- 5) Cheng Siwei. (2008). Create a good environment for China's venture capital. *China's venture capital and*

- high-tech, 23(04), 4-5.
- 6) Chan, F. K. S., Yang, L. E., Scheffran, J., Mitchell, G., Adekola, O., Griffiths, J., ... & McDonald, A. (2021). Urban flood risks and emerging challenges in a Chinese delta: The case of the Pearl River Delta. *Environmental Science & Policy*, 122, 101-115.
 - 7) Chahine, S., Arthurs, J. D., Filatotchev, I., & Hoskisson, R. E. (2012). The effects of venture capital syndicate diversity on earnings management and performance of IPOs in the US and UK: An institutional perspective. *Journal of Corporate Finance*, 18(1), 179-192.
 - 8) Chen Fei Fei, & Cheok Mui Yee. (2023). Venture Capital: A Systematic Literature Review. *International Journal of Management, Accounting, Governance and Education*, 3(1), 4-14.
 - 9) Fritsch M, Schilder D. (2012). The regional supply of venture capital: Can syndication overcome bottlenecks? *Economic Geography*, 88(1), 59-76.
 - 10) Gilbert, B. A., Audretsch, D. B., & McDougall, P. P. (2004). The emergence of entrepreneurship policy. *Small Business Economics*, 22, 313-323.
 - 11) Geronikolaou, G., & Papachristou, G. (2012). *Venture capital and innovation in Europe*. Grecia: University of Thessaloniki. Working papers).
 - 12) Jeong, J., Kim, J., Son, H., & Nam, D. I. (2020). The role of venture capital investment in startups' sustainable growth and performance: Focusing on absorptive capacity and venture capitalists' reputation. *Sustainability*, 12(8), 3447.
 - 13) Jeng, L, Wells. P. (2000). The determinants of venture capital funding: evidence across countries. *Journal of Corporate Finance*, 6, 241-289.
 - 14) Kortum, S., & Lerner, J. (2001). Does venture capital spur innovation? In *Entrepreneurial inputs and outcomes: New studies of entrepreneurship in the United States* (pp. 1-44). Emerald Group Publishing Limited.
 - 15) Martin, R., Sunley, P., & Turner, D. (2002). Taking risks in regions: the geographical anatomy of Europe's emerging venture capital market. *Journal of Economic Geography*, 2(2), 121-150.
 - 16) Madhavan, R., & Iriyama, A. (2012). Spread, scope, and scale in venture capital globalization: A clustered globalization model.
 - 17) Ning Y, Wang, W, Yu. B. (2015). The driving forces of venture capital investments. *Small Business Economics*, (Feb) 315-344.
 - 18) Othmar M Lehner, Alex Nicholls. (2014). Social finance and crowdfunding for social enterprises: a public-private case study providing legitimacy and leverage. *Venture Capital*, 1(3), 271-286.
 - 19) Patzelt, H. (2010). CEO human capital, top management teams, and the acquisition of venture capital in new technology ventures: An empirical analysis. *Journal of Engineering and Technology Management*, 27(3-4), 131-147.
 - 20) Schertler, A. (2007). Knowledge capital and venture capital investments: new evidence from European panel data. *German Economic Review*, 8(1), 64-88.
 - 21) Schwartz D, Bar-el R. (2007). Venture investments in Israel-a regional perspective
 - 22) *European Planning Studies*, 15(5), 623-644.
 - 23) Zhuang Delin, Wang Pengpeng, Xu Jilan, Zhang Di. (2020). Research on the Evolution of Urban Cyberspace Structure of China's Venture Capital-Based on the analytical perspective of four investment stages. *Geography Science*, 22(8), 1256-1265.